

AD-A086 351

NEW YORK STATE DEPT OF ENVIRONMENTAL CONSERVATION ALBANY F/0 13/13  
NATIONAL DAM SAFETY PROGRAM. DAM NUMBER 2. INVENTORY NUMBER NY --ETC (11)  
FEB 80 J B STETSON

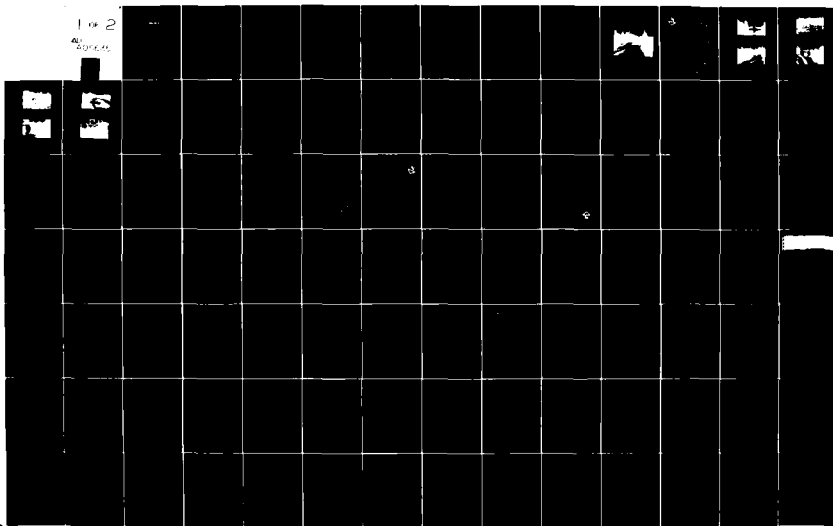
DACH-51-79-C-0001

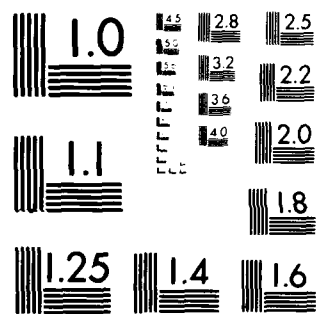
UNCLASSIFIED

NL

1 OF 2

AD-A086 351





MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS 1963-A

ADA 086351

Inventory Number NY 770

ST. LAWRENCE RIVER BASIN

National Dam Safety Program. Dam Number 2, V

JEFFERSON COUNTY,  
NEW YORK.

INVENTORY NO NY 780

PHASE I INSPECTION REPORT.  
NATIONAL DAM SAFETY PROGRAM

John B. Estlin

APPROVED FOR PUBLIC RELEASE;  
DISTRIBUTION UNLIMITED  
CONTRACT NO. DACW-51-78-C-0001



11/14 FILED

313970

NEW YORK DISTRICT CORPS OF ENGINEERS

JULY 1979

80 7 3 106

DOC FILE COPY

## **DISCLAIMER NOTICE**

**THIS DOCUMENT IS BEST QUALITY  
PRACTICABLE. THE COPY FURNISHED  
TO DTIC CONTAINED A SIGNIFICANT  
NUMBER OF PAGES WHICH DO NOT  
REPRODUCE LEGIBLY.**

ADA 086351

FILE COPY

| REPORT DOCUMENTATION PAGE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                               | READ INSTRUCTIONS<br>BEFORE COMPLETING FORM |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|---------------------------------------------|
| 1. REPORT NUMBER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 2. GOVT ACCESSION NO.                                                         | 3. RECIPIENT'S CATALOG NUMBER               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | AD-A086351                                                                    |                                             |
| 4. TITLE (and Subtitle)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 5. TYPE OF REPORT & PERIOD COVERED                                            |                                             |
| Phase I Inspection Report<br>Dam No. 2<br>St. Lawrence River Basin, Jefferson City, NY<br>Inventory No. NY 780                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Phase I Inspection Report<br>National Dam Safety Program                      |                                             |
| 6. AUTHOR(s)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 7. PERFORMING ORGANIZATION NAME AND ADDRESS                                   |                                             |
| John B. Stetson, P.E.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Statson-Dale Engineering Company<br>Bankers Trust Building<br>Utica, NY 13501 |                                             |
| 8. CONTROLLING OFFICE NAME AND ADDRESS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 9. SECURITY CLASS. (of this report)                                           |                                             |
| New York State Department of Environmental Conservation/<br>50 Wolf Road<br>Albany, New York 12233                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | UNCLASSIFIED                                                                  |                                             |
| 10. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 11. DISTRIBUTION STATEMENT (of this Report)                                   |                                             |
| Department of the Army<br>26 Federal Plaza/ New York District, CofE<br>New York, New York 10007                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Approved for public release; Distribution unlimited.                          |                                             |
| 12. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                               |                                             |
| 13. SUPPLEMENTARY NOTES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                               |                                             |
| <p>THE COPY FURNISHED TO DDC CONTAINED A<br/>SIGNIFICANT NUMBER OF PAGES WHICH DO NOT<br/>REPRODUCE LEGIBLY.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                               |                                             |
| 14. KEY WORDS (Continue on reverse side if necessary and identify by block number)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                               |                                             |
| <p>Dam Safety<br/>National Dam Safety Program<br/>Visual Inspection<br/>Hydrology, Structural Stability</p> <p>Dam No. 2<br/>Jefferson County<br/>Antwerp</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                               |                                             |
| 15. ABSTRACT (Continue on reverse side if necessary and identify by block number)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                               |                                             |
| <p>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.</p> <p>Dam No. 2, located near Antwerp, New York, is a concrete and stone work gravity dam and is classified as a high hazard. The dam impounds a small linear reservoir which is used to regulate flow into the Village of Antwerp water supply system. Visual inspections of the dam did not reveal conditions which constitute an immediate hazard to human life or property. No plans were available.</p> |                                                                               |                                             |

however, surveys of the dam were made for this inspection. Additional studies should be undertaken to further evaluate conditions affecting the dam. Seepage has been located under the stone masonry wall of the south end of the dam at the junction of the wall and the bedrock. Stability computations performed on the dam indicate it is unstable under the loading condition of ice, seismic, and hydrostatic uplift forces, with an associated factor of safety against overturning of 0.92.

Computations prepared using the Corps of Engineer's Screening Criteria have determined that the embankment would be overtopped for all storms exceeding approximately 1% of the PMF (Probable Maximum Flood). A dam break analysis, assuming a partial breaching of the south dam wall, indicates that water surface levels downstream of the dam would not rise appreciably more than if the dam does not break under high flows. The spillway is, therefore, adjudged as not seriously inadequate.

The following remedial actions are recommended:

1. Further investigation regarding the structural stability of the dam should be undertaken. This investigation should include the evaluation of hydrostatic uplift which may exist at the foundation interface and investigation of any tiedown elements which may be presently incorporated in the dam.
2. Repairs should be made to eliminate seepage and improve structural stability at the south abutment of the masonry dam section.

It is, therefore, recommended that within 6 months of the date of notification of the Owners, the above-mentioned investigations or improvements of the structure should be undertaken to determine the appropriate mitigating measures to be taken. Within 18 months of the date of notification, appropriate remedial measures should be completed.

## PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

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

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

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway 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 aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

|                    |                                            |
|--------------------|--------------------------------------------|
| Accession For      |                                            |
| NTIS Annual        | <input checked="checked" type="checkbox"/> |
| DOC TAB            | <input type="checkbox"/>                   |
| Unannounced        | <input type="checkbox"/>                   |
| Justification      |                                            |
| By _____           |                                            |
| Distribution/_____ |                                            |
| Availability Codes |                                            |
| Dist.              | Avail and/or special                       |
| A                  | 93                                         |

## TABLE OF CONTENTS

|                                          | <u>Page</u> |
|------------------------------------------|-------------|
| Preface                                  |             |
| Assessment of General Conditions         | i-ii        |
| Overall View of Dam                      | iii-viii    |
| Section 1 - Project Information          | 1-4         |
| Section 2 - Engineering Data             | 5           |
| Section 3 - Visual Inspection            | 6-7         |
| Section 4 - Operational Procedures       | 8           |
| Section 5 - Hydraulic/Hydrologic         | 9-11        |
| Section 6 - Structural Stability         | 12-15       |
| Section 7 - Assessment/Remedial Measures | 16-17       |

## FIGURES

|                                                        |
|--------------------------------------------------------|
| Figure 1 - Location Plan                               |
| Figure 2 - Surveyed Plan of Dam                        |
| Figure 3 - Surveyed Sections of Dam & Upstream Control |
| Figure 4 - Downstream Control                          |
| Figure 5 - Drainage Basin Plan                         |
| Figure 6 - Geology Map                                 |

## APPENDIX

|                                                    |   |
|----------------------------------------------------|---|
| Field Inspection Report                            | A |
| Previous Inspection Report/Relevant Correspondence | B |
| Hydrologic and Hydraulic Computations              | C |
| Stability Analysis                                 | D |
| References                                         | E |

PHASE I REPORT  
NATIONAL DAM SAFETY PROGRAM

Name of Dam Dam No. 2, New Antwerp, NY780

State Located New York  
County Located Jefferson  
Stream Indian River  
Date of Inspection May 2, 1979

ASSESSMENT OF  
GENERAL CONDITIONS

Dam No. 2, located near Antwerp, New York, is a concrete and stone work gravity dam and is classified as a high hazard. The dam impounds a small linear reservoir which is used to regulate flow into the Village of Antwerp water supply system. Visual inspections of the dam did not reveal conditions which constitute an immediate hazard to human life or property. No plans were available, however, surveys of the dam were made for this inspection. Additional studies should be undertaken to further evaluate conditions affecting the dam. Seepage has been located under the stone masonry wall of the south end of the dam at the junction of the wall and the bedrock. Stability computations performed on the dam indicate it is unstable under the loading condition of ice, seismic, and hydrostatic uplift forces, with an associated factor of safety against overturning of 0.92.

Computations prepared using the Corps of Engineer's Screening Criteria have determined that the embankment would be overtopped for all storms exceeding approximately 1% of the PMF (Probable Maximum Flood). A dam break analysis, assuming a partial breaching of the south dam wall, indicates that water surface levels downstream of the dam would not rise appreciably more than if the dam does not break under high flows. The spillway is, therefore, adjudged as not seriously inadequate.

The following remedial actions are recommended:

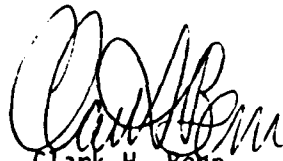
1. Further investigation regarding the structural stability of the dam should be undertaken. This investigation should include the evaluation of hydrostatic uplift which may exist at the foundation interface and investigation of any tiedown elements which may be presently incorporated in the dam.
2. Repairs should be made to eliminate seepage and improve structural stability at the south abutment of the masonry dam section.

It is, therefore, recommended that within 6 months of the date of notification of the Owners, the above-mentioned investigations or improvements of the structure should be undertaken to determine the appropriate mitigating measures to be taken. Within 18 months of the date of notification, appropriate remedial measures should be completed.

Dale Engineering Company

  
John B. Stetson, President

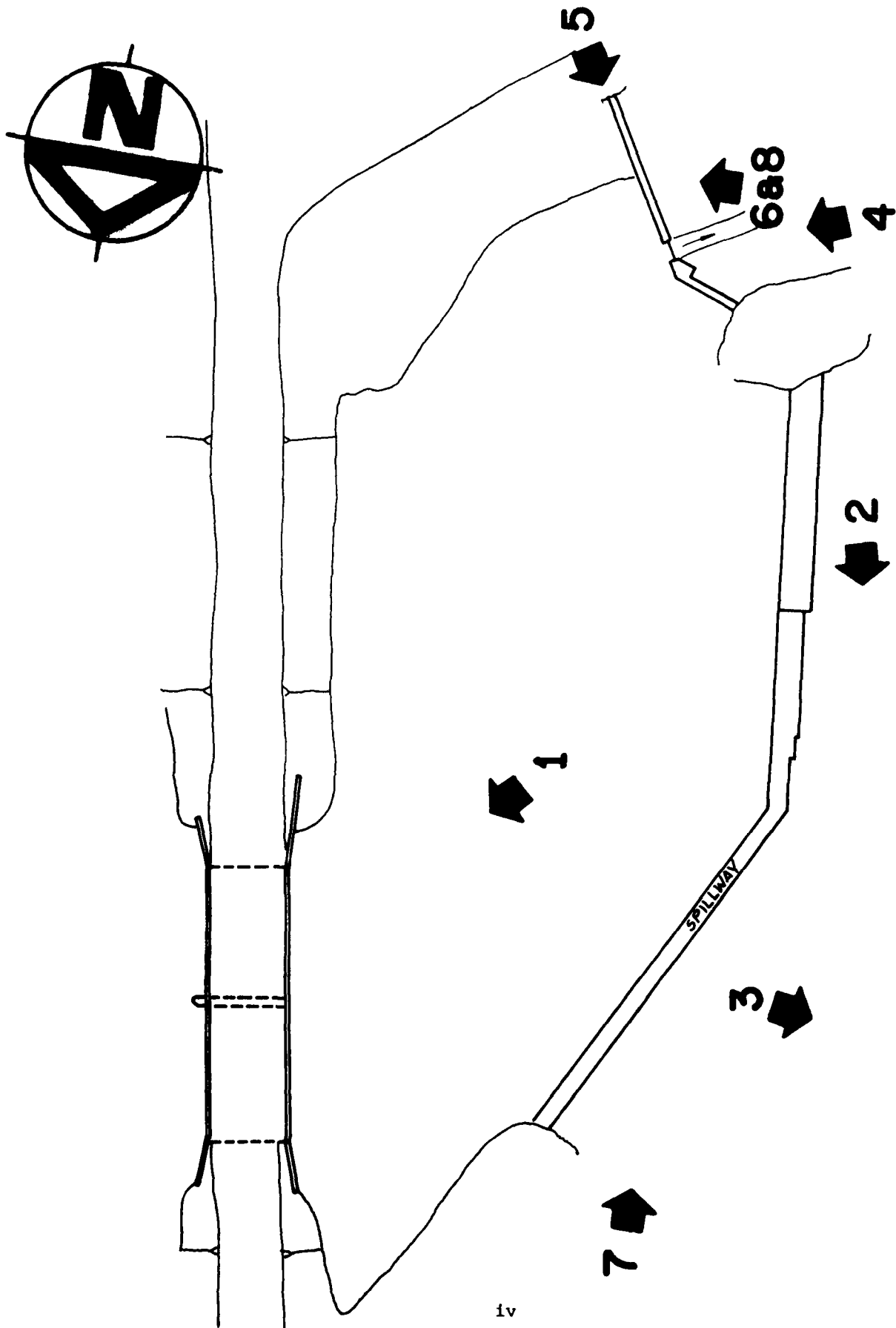
Approved By:  
Date: 14 Feb 80

  
Col. Clark H. Behn  
New York District Engineer

---



Overview of dam spillway looking north. Spillway caps bedrock providing reservoir area above rapids.



PHOTOGRAPH KEY PLAN



1. View of reservoir area immediately above spillway area. The reservoir is long and narrow. The bridge crosses the reservoir with a substantial portion of the reservoir upstream of the bridge.



2. Bedrock outcropping and rapids at the dam.



3. Downstream area below spillway.



4. Service spillway passage near south abutment of dam with stop planks removed.



5. View across dam looking north.



6. Area between service spillway and south abutment showing seepage between bedrock and masonry wall section.



7. View across spillway from north abutment looking south.



8. Close-up view of seepage area next to service spillway passage.

PHASE I INSPECTION REPORT  
NATIONAL DAM SAFETY PROGRAM  
NAME OF DAM - DAM NUMBER TWO ID# - 780

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

Authority for this report is provided by the National Dam Inspection Act, Public Law 92-367 of 1972. It has been prepared in accordance with a contract for professional services between Stetson-Dale and Department of the Army, New York District, Corps of Engineers.

b. Purpose of Inspection

The purpose of this inspection is to evaluate the structural and hydraulic condition of Dam Number Two and appurtenant structures, owned by the Village of Antwerp, New York, and to determine if the dam constitutes a hazard to human life or property and to transmit findings to the New York District, Corps of Engineers.

This Phase I inspection report does not relieve an Owner or Operator of a dam of the legal duties, obligations or liabilities associated with the ownership or operation of the dam. In addition, due to the limited scope of services for these Phase I investigations, the investigators had to rely upon the data furnished to them. Therefore, this investigation is limited to visual inspection, review of data prepared by others, and simplified hydrologic, hydraulic and structural stability evaluations where appropriate. The investigators do not assume responsibility for defects or deficiencies in the dam or in the data provided.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances

Dam Number Two is a concrete and masonry gravity structure composed of two sections. One section is approximately 192 feet long, the second section approximately 60 feet long. The dam is approximately 12.3 feet high at its highest point. The dam is founded on bedrock and spans the Indian River immediately downstream from a road used by the Fort Drum Military Reservation. The service spillway consists of a broad crested weir which composes approximately 145 feet of the longer section of the dam. The shorter section of the dam near the south abutment also contains a 4.7 foot long stop plank structure which is used to regulate pond levels. The dam is founded entirely on bedrock. Bedrock outcrops between the two sections form part of the impounding structure. The receiving channel immediately downstream from the dam is composed entirely of bedrock. There are no

1

signs of recent erosion. There is some debris lodged in the downstream channel. The impoundment from another dam located in the Village of Antwerp extends to a point approximately 400 feet downstream from Dam Number Two.

b. Location

Dam Number Two is located in the Town of Antwerp, Jefferson County, New York. The dam is also located within the boundaries of the Fort Drum Military Reservation.

c. Size Classification

The maximum height of the dam is approximately 12.3 feet. The storage volume of the dam is approximately 36 acre feet. Therefore, the dam is in the Small Size Category as defined by The Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification

The Village of Antwerp is located on the Indian River approximately 3/4 mile downstream from Dam Number 2. A Village street spans the Indian River just downstream from another dam located on the Indian River. Therefore, the dam is in the High Hazard Category as defined by The Recommended Guidelines for Safety Inspection of Dams.

e. Ownership

The dam is owned by the Village of Antwerp, New York.

f. Purpose of Dam

The dam presently impounds a reservoir which is used to regulate flow into the Village of Antwerp water supply system.

g. Design and Construction History

A New York State Conservation Commission Dam Report indicates that a dam was constructed in approximately 1885 at a location which approximates the existing dam. This dam was reconstructed in 1912. Data presented by a dam inventory taken by the Fort Drum facility engineer indicates that the dam was constructed in approximately 1925. Investigations at the dam site with the Mayor of the Village of Antwerp indicate that the dam was faced with concrete on the downstream face and capped with concrete in 1967. No other details of construction were available.

h. Normal Operating Procedures

The control outlets near the south abutment are used to regulate the level of the downstream impoundment which serves as an emergency source of water supply for the Village of Antwerp.

### 1.3 PERTINENT DATA

#### a. Drainage Area

The drainage area of Dam Number Two (Fort Drum) is 152.10 square miles.

#### b. Discharge at Dam Site

No discharge records are available for this site.

Computed discharges:

|                              |            |
|------------------------------|------------|
| Spillway, top of dam         | 454 cfs    |
| Ungated Spillway, PMF        | 62,800 cfs |
| 1/2 PMF                      | 30,100 cfs |
| Gated drawdown (stop planks) | N.C.       |

#### c. Elevation (Feet Above MSL)

Note: There is no U.S.G.S. control in the area. Elevations are given in local datum and approximate U.S.G.S. elevations are given in parenthesis.

|                                                                     |       |         |
|---------------------------------------------------------------------|-------|---------|
| Top of dam                                                          | 123.0 | (515)   |
| Maximum pool, PMF                                                   | 130.3 | (522.3) |
| 1/2 PMF                                                             | 127.4 | (519.4) |
| Spillway crest                                                      | 121.9 | (514)   |
| Stream bed at centerline of dam<br>(rapids occur beyond this point) | 110.7 | (502.7) |

#### d. Reservoir

Length of normal pool 3000+ Ft

#### e. Storage\*

|             |               |
|-------------|---------------|
| Top of dam  | 50 Acre Feet  |
| PMF         | 410 Acre Feet |
| 1/2 PMF     | 210 Acre Feet |
| Normal pool | 36 Acre Feet  |

#### f. Reservoir Area

Spillway pool (very approximate) 8 Acres

\*Approximated from U.S.G.S. topographic maps.

g. Dam

Type - Concrete Gravity, Capping Bedrock.  
Length - 252 feet.  
Height - Varies, Maximum Concrete Section 10 feet founded on graded bedrock.  
Freeboard between normal reservoir and top of dam - 1.23 feet.  
Top width - Varies.  
Side slopes - Varies  
Zoning - N/A.  
Impervious Core - Unknown.  
Grout Curtain - Unknown.

h. Spillway

Type - Broad to sharp crested.  
Length - 143 feet.  
Crest Elevation - 121.90 (514).  
Gates - None.  
U/S Channel - Reservoir.  
D/S Channel - Rapids/Bedrock.

i. Regulating Outlets

4.7 foot long stop plank outlet near south abutment.

## SECTION 2 - ENGINEERING DATA

### 2.1 DESIGN

All the information available to evaluate this dam has been included in this report. The information consists mainly of survey data taken by the dam inspection crew prior to the inspection.

### 2.2 CONSTRUCTION

No information is available regarding the construction of the project.

### 2.3 OPERATION

See Section 4.

### 2.4 EVALUATION

Engineering data cannot be assessed since it is incomplete. No information is available on the materials of construction and the inspection is guided only by visual observations in the field. However, sufficient information has been gathered through the field inspection efforts to provide information adequate for the Phase I investigation.

### SECTION 3 - VISUAL INSPECTION

#### 3.1 FINDINGS

##### a. General

Dam Number Two on the Indian River was inspected on May 2, 1979. The dam presently functions to maintain water elevations downstream in the Indian River to provide for adequate emergency water supply to the Village of Antwerp. The Village's main source of water supply are springs which are remote from the river.

##### b. Dam

The dam and spillway system are shown in the sketches prepared by Stetson-Dale in Figures 2 and 3. The dam was originally constructed in 1855, and subsequent modifications have taken place with the last modification having been completed in 1967. At the time of the inspection the flow in the Indian River was cresting the entire length the spillway and the regulating weir near the south abutment was open with all stop planks removed. Because of the flow in the Indian River at this time, the inspection crew was unable to observe the condition of the front face of the dam. However, field observations indicate that the entire structure is founded on bedrock. There was no evidence of misalignment of the top of the spillway or of the concrete dam section. The southerly section of the dam near the south abutment is constructed of masonry. Leakage was detected through the base of the masonry near the south abutment. This leakage was of a substantial quantity at the time of the inspection.

##### c. Spillway

The service spillway was operating at a head of approximately 1 foot at the time of the inspection. Flow over the spillway appeared uniform and there was no evidence of deterioration of the spillway crest as observed with a head of water flowing.

##### d. Appurtenant Structures

There are no structures appurtenant to this dam. No provisions are provided for draining of the dam except for the removal of stop planks in the control outlet.

##### e. Control Outlet

A small stop plank structure is located near the south abutment of the dam. This structure was operating under a head of approximately 2 feet at the time of the inspection.

f. Reservoir Area

The reservoir area is generally forested and does not contribute significant amounts of sediment into the impoundment. There are no areas where bank instability exists around the impoundment.

g. Downstream Channel

The downstream channel is formed in bedrock and is generally in good condition.

3.2 EVALUATION

Field observations indicate substantial leakage exists at the south abutment of the southerly section of the dam. This leakage appears to occur between the masonry and the bedrock foundation. No displacement or misalignment of the structure was noted during the inspection. The concrete surfaces which were visible appear to be in good condition.

## SECTION 4 - OPERATIONAL PROCEDURES

### 4.1 PROCEDURES

The operation of the stop planks in the control spillway was not observed by the Inspection Team. The Village of Antwerp manipulates stop planks to control the water level in the downstream impoundment.

### 4.2 MAINTENANCE OF THE DAM

The dam is maintained by the Village of Antwerp.

## SECTION 5 - HYDRAULIC/HYDROLOGIC

### 5.1 DRAINAGE BASIN CHARACTERISTICS

Dam Number 2 is located on the Indian River in Jefferson County just upstream from the Village of Antwerp. The basin has a drainage area of 152 square miles. The upland headwaters contain wooded and marshy areas including Lake Bonaparte from which the river system collects from a complex tributary system and flows north through the Village of Antwerp, eventually discharging into the St. Lawrence River. Alpina dam, a small water level control structure for Lake Bonaparte, is upstream of Dam Number 2.

### 5.2 ANALYSIS CRITERIA

The purpose of this investigation is to evaluate the dam and spillway with respect to their flood control potential and adequacy. The dam's stability and flood discharge capacity is assessed through the evaluation of the Probable Maximum Flood (PMF) for the watershed and the subsequent routing of the flood through the dam's spillway system.

The PMF event is that hypothetical flow induced by the most critical combination of precipitation, minimum infiltration loss and concentration runoff of a specific location that is considered reasonably possible for a particular drainage area. Since this dam is in the Small Dam Category and is a High Hazard, the guidelines criteria (Ref. 1) require that the dam be capable of passing one-half the Probable Maximum Flood.

The hydrologic analysis was performed using the unit hydrograph method to develop the flood hydrograph. Due to the limited scope of this Phase I investigation, certain assumptions, based on experience and existing data were used in this analysis and in the determination of the dam's spillway capacity to pass the PMF.

The U.S. Army Corps of Engineers, Hydrologic Engineering Center's Computer Program HEC-1DB was utilized to evaluate the PMF hydrology. The Probable Maximum Precipitation (PMP) was 18.50 inches, Hydrometeorological Report (HMR #33) for a 24 hour duration, 200 square mile basin. Loss rates adopted for the analysis were 1.0 initial abstraction and 0.1 inches/hour continuous loss rate. Clark parameters were used to develop the unit hydrograph.

The drainage basin was divided into 12 sub-areas to describe the complex basin geometry. One sub-area was located below the dam so that flood routing could be performed to within the Village. Modified-Puls routing parameters within HEC1-DB were utilized with data obtained from USGS mapping. The computed PMF flow at the dam was 62,800 cfs and the 1/2 PMF was 30,095 cfs. Routed flood flows to the village were 62,605 cfs for the PMF and 30,035 cfs for 1/2 PMF.

### 5.3 SPILLWAY CAPACITY

The spillway system is somewhat unique in that it sets atop of a rapids area with rock outcropping existing below the dam as well as across the dam. Rock outcropping also exists in the center of the spillway. The concrete dam sets on top of the rock with a low flow spillway section of the northern side and a small spillway passage with stop planks on the south side. The low flow spillway capacity is 454 cfs.

#### SPILLWAY CAPACITY

|         | <u>Discharge</u> | <u>Capacity</u> |
|---------|------------------|-----------------|
| PMF     | 62,800           | 1.0%            |
| 1/2 PMF | 30,095           | 1.5%            |

Since the entire dam is made of concrete overtopping is most meaningful at the abutment areas which have been found to be largely on rock.

### 5.4 RESERVOIR CAPACITY

No drawings were available for this investigation. Topographic information derived from USGS mapping suggests the reservoir storage may be only 50 acre feet at the top of the dam. At 1/2 PMF stage, the reservoir total storage is 210 acre feet. USGS maps can only provide a cursory screening level evaluation.

### 5.5 FLOOD OF RECORD

No records, basin ungaged.

### 5.6 OVERTOPPING ANALYSIS

The HEC1-DB analysis indicates that the dam would be overtopped as follows:

#### OVERTOPPING IN FEET

|         | <u>At Dam</u> | <u>Bridge at Village</u> |
|---------|---------------|--------------------------|
| PMF     | 7.3           | 13.1                     |
| 1/2 PMF | 4.4           | 6.2                      |

Overtopping was performed with a dam break analysis which resulted in an insignificant increase in flood flows for the 1/2 PMF and PMF. Stability calculations indicated that the dam was stable for both these events, assuming the uplift forces for these events are the same as assumed for normal operating conditions.

#### 5.7 EVALUATION

The spillway is inadequate to pass the 1/2 Probable Maximum flood without overtopping the dam. However, based on the Corps of Engineers' Screening Criteria, it is not considered seriously inadequate, since failure of the dam will not significantly increase the hazard.

## SECTION 6 - STRUCTURAL STABILITY

### 6.1 EVALUATION OF STRUCTURAL STABILITY

#### a. Visual Observations And Data Review

Rock outcrops prevail at the location of this dam. Virtually all of the main dam spillway, a concrete structure, is founded directly on the exposed bedrock and/or incorporates the rock as part of the structure. A short section of dam which forms the southerly segment of the total dam structure is "separated" from the main section by a rock outcropping. This separate section consists of masonry and concrete, and includes a service spillway of limited size; this separate dam section and spillway apparently represented the flume area for a water-powered mill, ice harvesting or wood operation which existed at the site in the past. The downstream pool area immediately below the dam consists essentially of rock.

The main dam and spillway section retains stability at this time with no indication of structural distress. The physical condition of the concrete visible at the time of the inspection is good. The separate masonry section forming the southerly segment of the total dam appears structurally stable but some of the masonry rock elements have experienced limited movement, probably from frost effects, and noticeable seepage occurs through the section. This section occurs at the junction with bedrock.

#### b. Geology and Seismic Stability

The Antwerp Dam and reservoir is located within the western edge of the foothills of the Adirondack Province. The New York State Conservation Report of September 14, 1914, indicates the dam is sited on solid rock. Both abutments terminate in bedrock and bedrock also forms a portion of the spillway. Bedrock is a biotite-hornblende granitic gneiss (Precambrian) locally pyroxeneic with subordinate amounts of leucogranitic gneiss. Amphibolites are locally present. Foliation strikes northeast and dips northwest.

Although gneiss has considerable strength and bearing capacity, weathering of the biotite, hornblende and pyroxene components of the rock as well as the amphibolites may yield rotted seams conducive to seepage.

There are no known faults or shear zones in the vicinity of the reservoir according to the New York State Geologic Map (1970) and the Preliminary Brittle Structures Map of the New York State Geologic Survey (1977). The Brittle Structures Map does show a linear feature trending east-west which apparently follows the trend of Indian River east of the village of Antwerp. This linear feature appears to be either near or through the dam site. It may represent a fracture or fault, but is not indicated or shown on the New York State Geologic Map. If a fracture or shear zone does exist, it would be out of view beneath the river.

A shear zone trending northeast lies about 9 miles northwest of the dam according to the New York State Geologic Map. An extensive shear zone, about 2 miles wide and also trending northeast, is located about 10 miles southeast of the dam according to the 1977 Preliminary Brittle Structures Map. This map also shows another shear zone about 7 miles east-northeast of the dam and trending northeast.

Although the dam site is located in Zone 3 on the Seismic Probability Map, a Zone 2 designation would be proper. No earthquake activity has been recorded in the immediate vicinity of the dam. Between 1932 and 1963 five minor earthquakes were recorded from the Watertown area approximately 22 miles southwest of the dam site. None were of an intensity greater than III (modified Mercalli scale). An earthquake of intensity III was recorded from Alexandria Bay 18 miles to the northwest and another of intensity of VI had been recorded near Lowville approximately 34 miles to the south.

c. Data Review and Stability Evaluation

Information from the past relating to the as-built construction of the dam is limited to rough sketches of plan alignment and cross-sections from a field inspection report of 1914, a date that is a few years after the reported construction date. A field survey undertaken as part of this Phase I study has provided information on the present dam cross-section (Figures 2 - 4) but did not extend to determining properties of the dam materials and foundation rocks. Stability evaluations have been performed, utilizing the obtained cross-section information to obtain an indication of the dam's performance when subject to different possible loading conditions. In these analyses, some assumptions were required in regard to concrete and rock properties and the geometry of the dam cross-section.

The effects of a reservoir at the main spillway level along with ice affects, and a reservoir at the PMF level, have been studied. The results for these conditions are summarized in the following table. The analyses are included in Appendix D.

# RESULTS OF STABILITY COMPUTATIONS

|       | <u>Loading Condition</u>                                                                                                                   | <u>Factor of Safety*</u> |                  | <u>Location of Resultant***<br/>Passing through Base</u> |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------------------|----------------------------------------------------------|
|       |                                                                                                                                            | <u>Overturning</u>       | <u>Sliding**</u> |                                                          |
| (I)   | Reservoir level at spillway elevation,                                                                                                     |                          |                  |                                                          |
|       | (i) no uplift on base, no ice acting                                                                                                       | 8+ <u>  </u>             | ---              |                                                          |
|       | (ii) uplift on base, no ice acting                                                                                                         | 2.8+ <u>  </u>           | 37+ <u>  </u>    | 0.46b                                                    |
|       | (iii) uplift on base, ice one foot thick acting                                                                                            | 1.14+ <u>  </u>          | 12+ <u>  </u>    | 0.09b                                                    |
|       | (iv) no uplift on base, ice one foot thick acting                                                                                          | 1.56+ <u>  </u>          | ---              |                                                          |
| (II)  | Reservoir level at 1/2 PMF elevation, uplift acting on base as computed for normal operating conditions.                                   | 1.8+ <u>  </u>           | 17+ <u>  </u>    | 0.33b                                                    |
| (III) | Reservoir level at PMF elevation, uplift acting on base as computed for normal operating conditions.                                       | 1.75+ <u>  </u>          | 13+ <u>  </u>    | 0.37b                                                    |
| (IV)  | Reservoir level at spillway elevation with earthquake forces acting (utilizing seismic coefficients applicable to Zone 3 Probability Area) |                          |                  |                                                          |
|       | (i) uplift, no ice                                                                                                                         | 1.77+ <u>  </u>          | ---              | 0.36b                                                    |
|       | (ii) uplift, ice one foot thick acting                                                                                                     | 0.92+ <u>  </u>          | ---              |                                                          |

\*These factors of safety indicate the ratio of moments resisting overturning to moments causing, and the ratio of forces resisting sliding to those causing sliding; a ratio less than unity indicates instability. Upstream and downstream pool levels were obtained from HEC-1DB analysis.

\*\*As determined applying the friction-shear method.

\*\*\*Indicated in terms of the dam's base dimension, b, measured from the toe of the dam.

The analyses indicate unsatisfactory stability against overturning for certain combinations of loading.

Critical to the analysis and resulting indication of stability are the items of uplift water pressures acting on the foundation of the dam and the permeability of the foundation site's bedrock. The analysis uplift force was based on full headwater hydrostatic pressure acting at the dam's foundation upstream corner and a zero tailwater hydrostatic pressure acting at the dam's downstream corner, with the resulting triangular force pattern applied to 100 percent of the dam's section. The resulting uplift force represents a condition that is significant to the analysis in arriving at the computed low factors of safety against overturning.

The assigned uplift force is believed to be conservative but could be too severe if the dam is embedded in sound rock. The prediction of uplift acting on the base of a gravity dam founded on rock without information on the permeability and seepage properties of the rock stratum represents an analytical area of great uncertainty. If the rock is very sound and impermeable, seepage would be very low and uplift pressures of significance would require a long period of time to develop. A conclusion for such a condition is that the computed uplift may not exist at the present time, and only develop at some future time.

The analysis indicates instability could occur if the dam is subject to earthquake forces of magnitude. Though the reservoir area is grouped into a Zone 3 Seismic Probability location, a current geologic-seismic evaluation recommends a Zone 2 designation for the site.

Requirement for attention at this time includes proper repair of the masonry flume dam/spillway structural comprising the "separate" southerly section of the (total) dam to improve the structural integrity and to limit seepage.

## SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

### 7.1 DAM ASSESSMENT

#### a. Safety

1. At the southerly section of the dam near the south abutment, the wall is constructed of stone masonry. Leakage was detected at the foundation of this masonry section. This leakage was of a substantial quantity at the time of inspection.
2. At the time of inspection, all the stop planks in the regulating weir were removed.
3. The entire structure was observed to be founded on bedrock.
4. There was no evidence of misalignment of the top of the spillway or the dam.
5. The stability analysis shows that the dam is unstable under conditions of uplift, ice and seismic loading, with a factor of safety of 0.92.
6. The abutments of the dam should be inspected to evaluate erosion potential under high floods which would overtop the dam.
7. The dam is founded on bedrock and is located on top of a rapids area. A small low level overflow spillway has a capacity of 454 cfs. Considering this discharge to be the top of dam capacity, the dam can pass 1.0% of the PMF without overtopping. The 1/2 PMF overtops the dam by 4.4 feet and the Village bridge, crossing the Indian River, by 6.2 feet.

#### b. Adequacy of Information

1. The sections of the dam were obtained from field surveys conducted while the spillway was operating under substantial head. There is no outlet in the dam to allow the dam to be drawn down.
2. The basin is ungaged and no flow records or information on high water levels were available to use to develop and calibrate the HEC-1DB model. High water mark data would have been of benefit in the Hydrologic/Hydraulic Analysis.
3. Topographic information at the dam site and in the Village was limited to USGS mapping data and the limited surveys in this report. More detailed information is necessary to evaluate flood flow characteristics at the dam site and in the Village.

c. Urgency

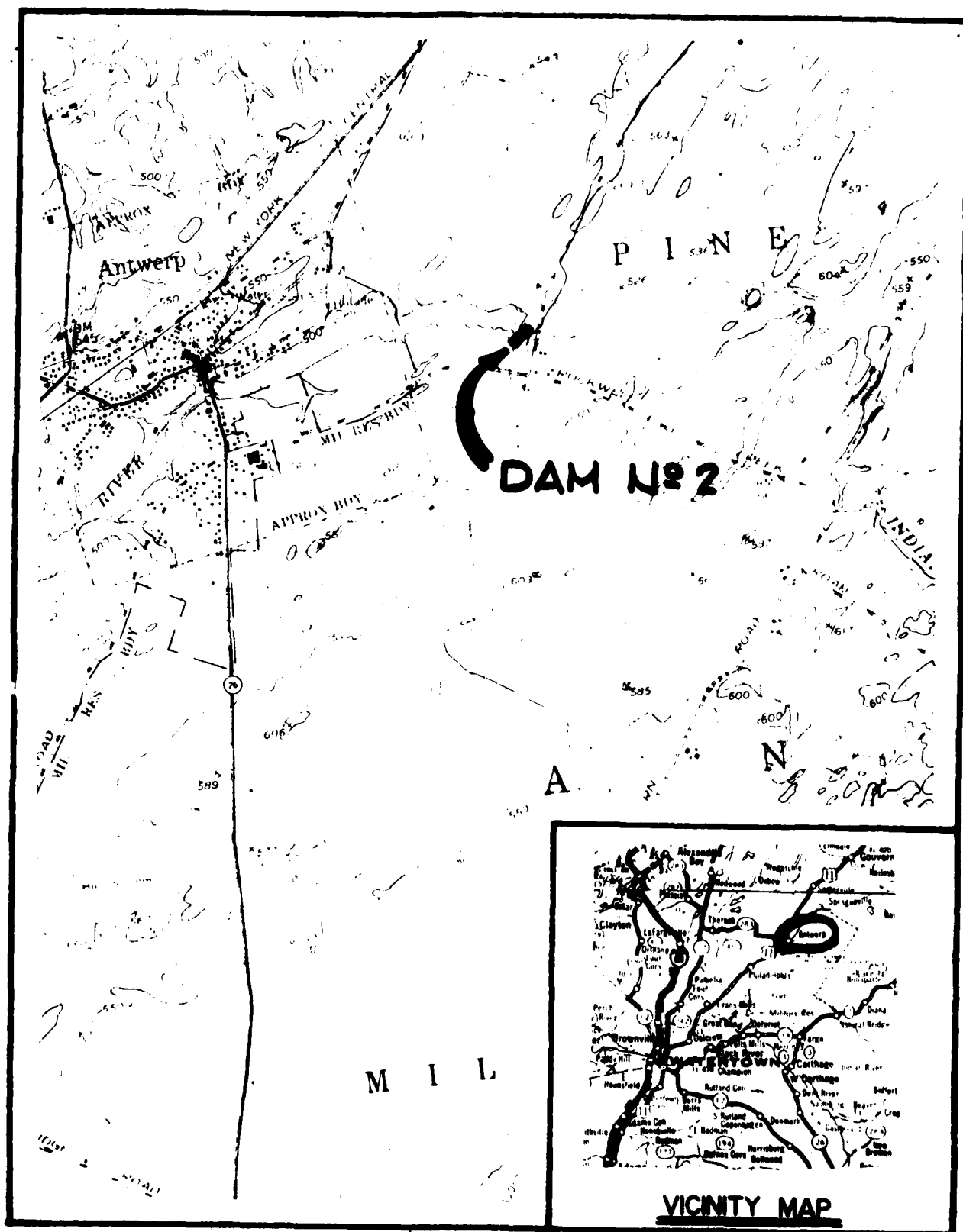
Further investigations regarding the dam's structural stability should be undertaken.

d. Need for Additional Information

Additional topographic and hydrological data is necessary to complete the recommended investigations. Additional information on the dam cross section and foundation conditions are also necessary to properly assess the dam stability. The interrelation of the stability with the hydraulic computations are critical to the findings of this report. More accurate data in these areas could affect these findings.

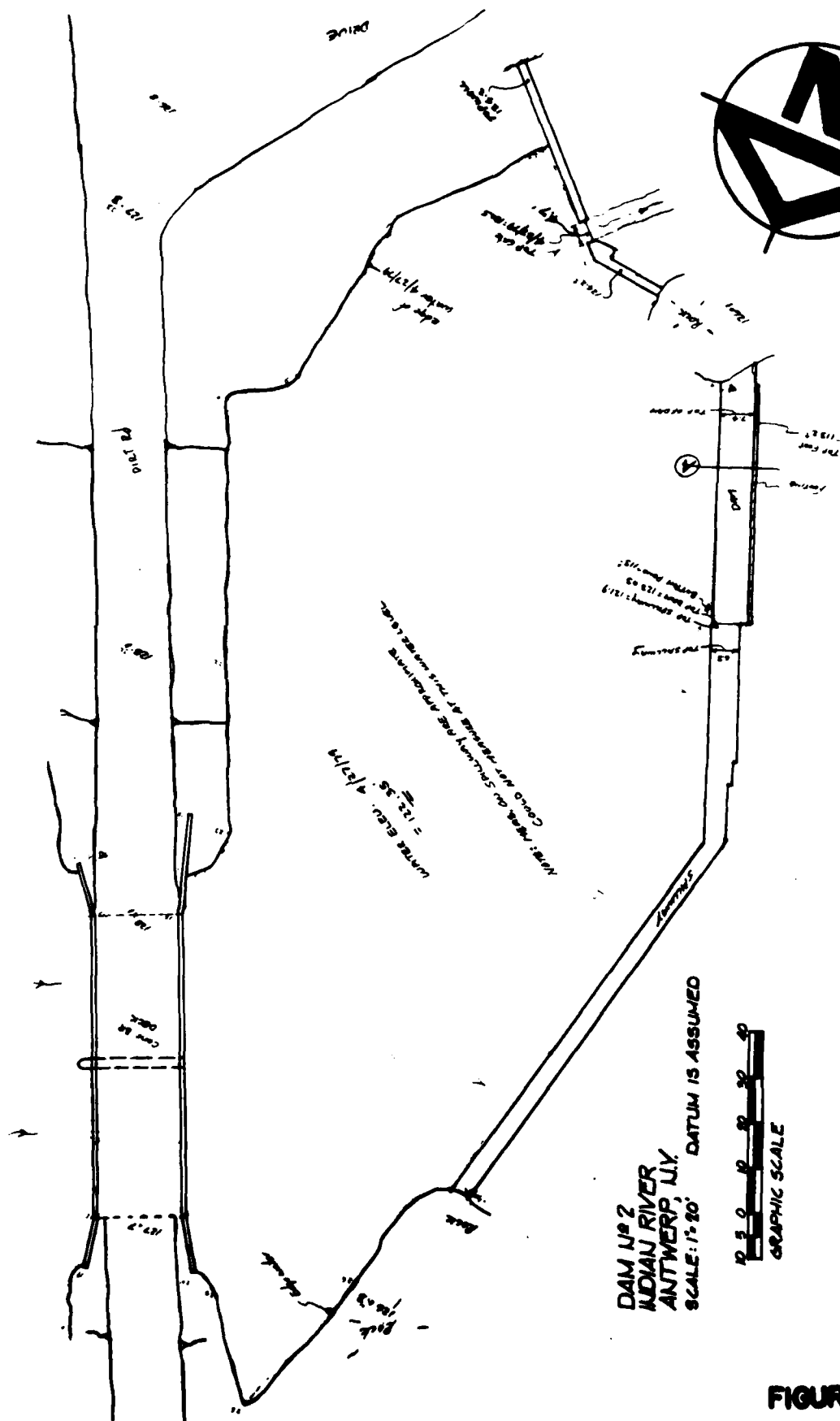
7.2 RECOMMENDED MEASURES

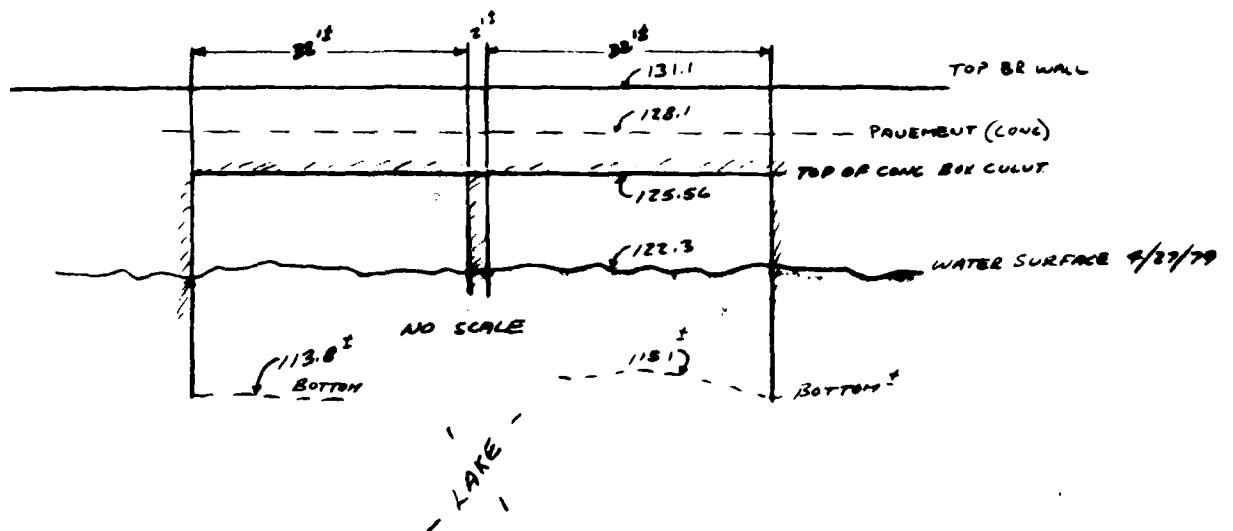
- a. Further investigation regarding the structural stability of the dam should be undertaken. This investigation should include the evaluation of hydrostatic uplift which may exist at the foundation interface and investigation of any tiedown elements which may be presently incorporated into the dam.
- b. Repairs should be made to eliminate seepage and improve structural stability at the south abutment of the masonry dam section.



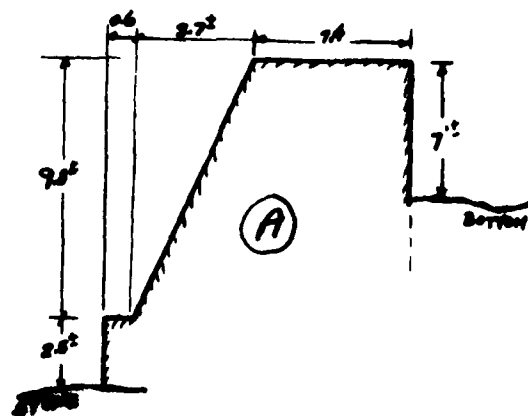
## LOCATION PLAN

FIGURE 1





BRIDGE ELEVATION



DAM SECTION

DAM NO 2 - INDIAN RIVER  
ANTWERP, N.Y.  
SCALE: 1" = 20' DATUM IS ASSUMED

FIGURE 3

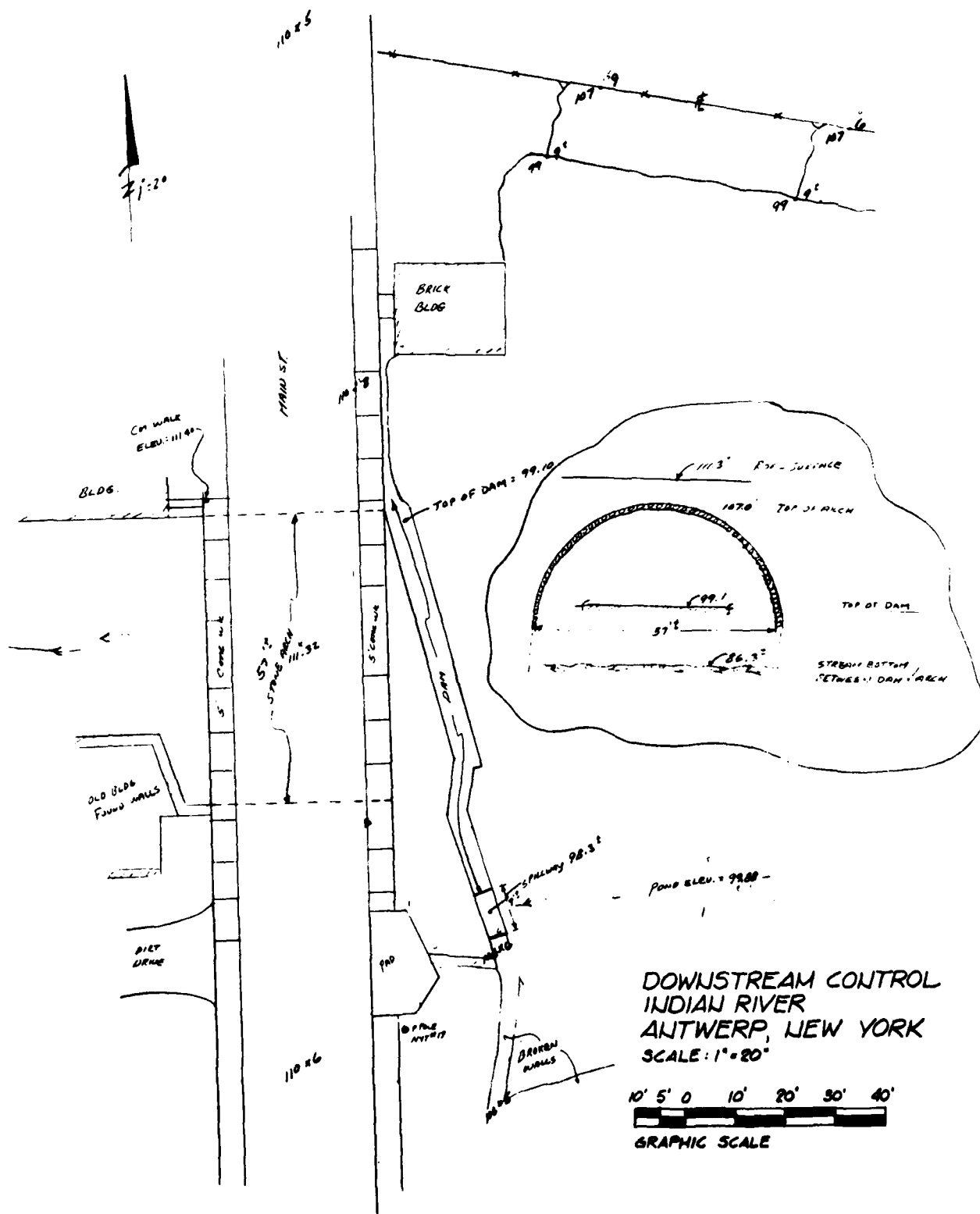
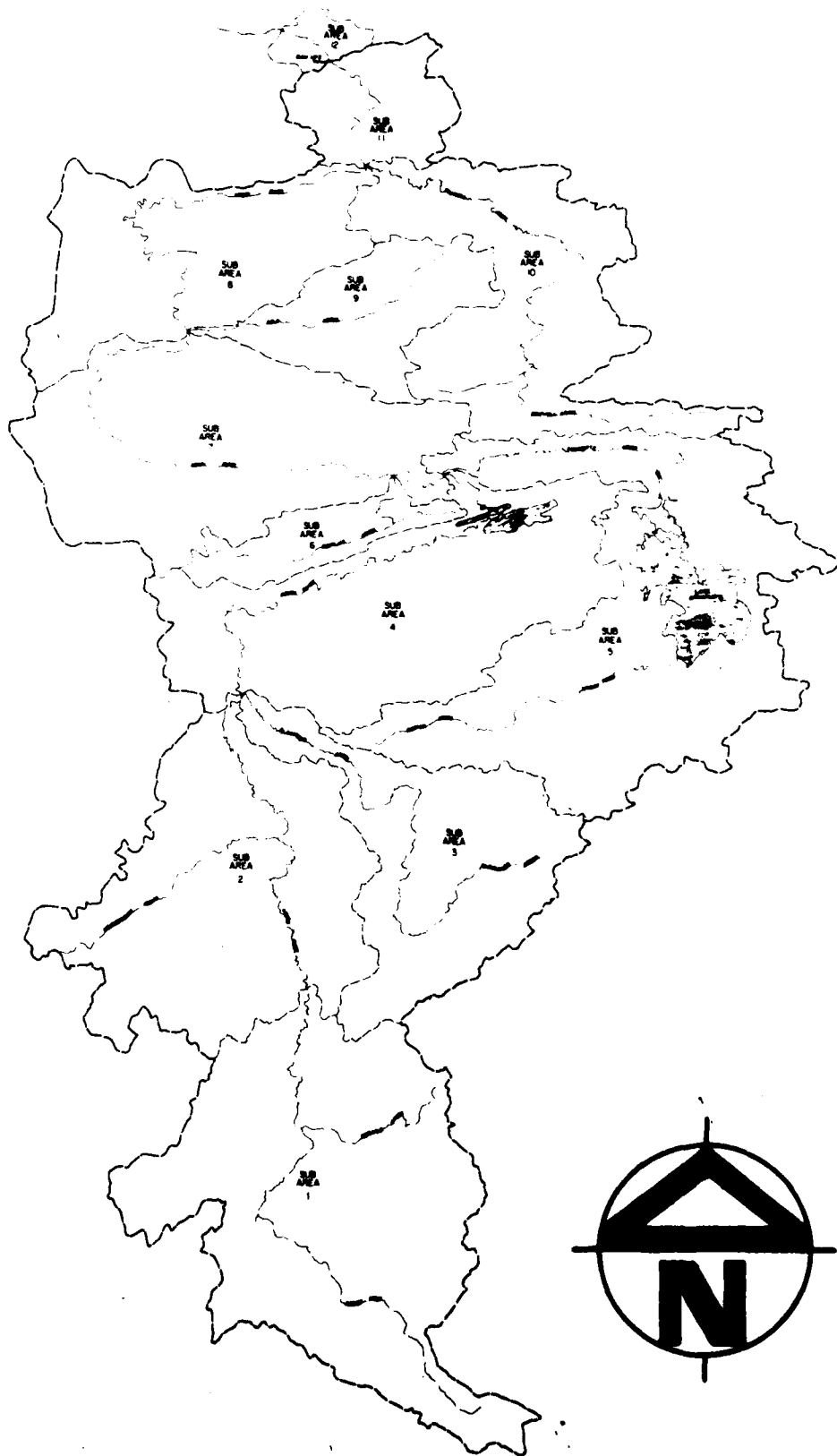
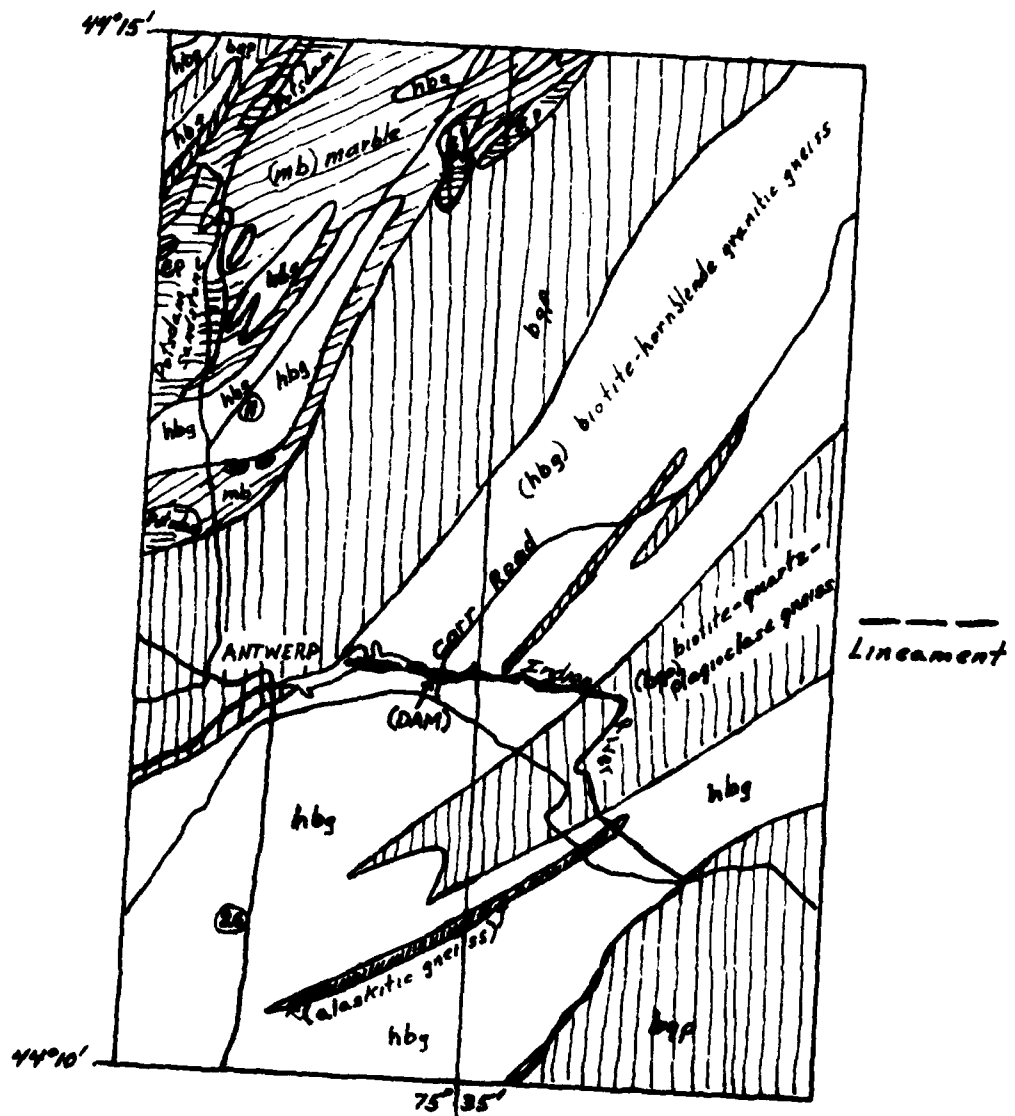


FIGURE 4



# DRAINAGE BASIN PLAN



GEOLOGIC MAP

APPENDIX A  
FIELD INSPECTION REPORT

CHECK LIST  
VISUAL INSPECTION

PHASE 1

|                    |             |                  |       |                 |             |     |
|--------------------|-------------|------------------|-------|-----------------|-------------|-----|
| Name Dam           | Dam No. 2   | Town: Antwerp    | State | N.Y.            | ID #        | 345 |
| Type of Dam        | Concrete    | County Jefferson |       |                 |             |     |
| Date(s) Inspection | May 2, 1979 | Weather          | Fair  | Hazard Category | Significant |     |
|                    |             |                  |       | Temperature     |             |     |

Pool Elevation at Time of Inspection 122.4 M.S.L. Tailwater at Time of Inspection Below Rapids

Inspection Personnel:

|                             |                             |
|-----------------------------|-----------------------------|
| <u>F. W. Byszewski</u>      | <u>Stetson-Dale</u>         |
| <u>F. D. McCarthy</u>       | <u>Stetson-Dale</u>         |
| <u>N. F. Dunlevy</u>        | <u>Stetson-Dale</u>         |
| <u>                    </u> | <u>                    </u> |

N. F. Dunlevy Recorder

CONCRETE/MASONRY DAMS

| VISUAL EXAMINATION OF                      | OBSERVATIONS                                                                                        | REMARKS OR RECOMMENDATIONS                                                                                                |
|--------------------------------------------|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| ANY NOTICEABLE SEEPAGE                     | Along south abutment at contact with rock foundation. Water at base of dam from spillway discharge. | Flow between base of masonry stone section and bedrock outcropping. Height of section - 6 feet, length of seep - 10 feet. |
| STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS | See above description of seepage. Abutment is largely bedrock.                                      |                                                                                                                           |
| DRAINS                                     | None noticeable                                                                                     |                                                                                                                           |
| WATER PASSAGES                             | Stop plank service spillway exists near south abutment.                                             |                                                                                                                           |
| FOUNDATION                                 | None                                                                                                |                                                                                                                           |

CONCRETE/MASONRY DAMS

| VISUAL EXAMINATION OF               | OBSERVATIONS                      | REMARKS OR RECOMMENDATIONS                      |
|-------------------------------------|-----------------------------------|-------------------------------------------------|
| SURFACE CRACKS<br>CONCRETE SURFACES | None. Concrete in good condition. | Area water spillway looks in good condition.    |
| STRUCTURAL CRACKING                 | None                              | Seepage in between bedrock and masonry contact. |
| VERTICAL & HORIZONTAL<br>ALIGNMENT  | Good Condition.                   |                                                 |
| MONOLITH JOINTS                     | None                              |                                                 |
| CONSTRUCTION JOINTS                 | ---                               |                                                 |
| STAFF GAGE OF RECORDER              | ---                               |                                                 |

EMBANKMENT

| VISUAL EXAMINATION OF                                        | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|--------------------------------------------------------------|--------------|----------------------------|
| SURFACE CRACKS                                               | N/A          |                            |
| UNUSUAL MOVEMENT OR<br>CRACKING AT OR BEYOND<br>THE TOE      | N/A          |                            |
| SLOUGHING OR EROSION OF<br>EMBANKMENT AND ABUTMENT<br>SLOPES | N/A          |                            |
| VERTICAL AND HORIZONTAL<br>ALIGNMENT OF THE CREST            | N/A          |                            |
| RIPRAP FAILURES                                              | N/A          |                            |

EMBANKMENT

| VISUAL EXAMINATION OF                                       | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|-------------------------------------------------------------|--------------|----------------------------|
|                                                             |              |                            |
| JUNCTION OF EMBANKMENT<br>AND ABUTMENT, SPILLWAY<br>AND DAM | N/A          |                            |
| ANY NOTICEABLE SEEPAGE                                      | N/A          |                            |
| STAFF GAGE AND RECORDER                                     | N/A          |                            |
| DRAINS                                                      | N/A          |                            |

UNGATED SPILLWAY

| VISUAL EXAMINATION OF | OBSERVATIONS                                                                     | REMARKS OR RECOMMENDATIONS                   |
|-----------------------|----------------------------------------------------------------------------------|----------------------------------------------|
| CONCRETE WEIR         | Founded on bedrock. At time of inspection under 6 inches of water.               |                                              |
| APPROACH CHANNEL      | Head of Dam                                                                      | Bridge crosses reservoir 300 feet above dam. |
| DISCHARGE CHANNEL     | On bedrock. Well graded, rapids.                                                 |                                              |
| BRIDGE AND PIERS      | No bridge on dam - a bridge crosses the reservoir 300 feet just upstream of dam. |                                              |
|                       |                                                                                  |                                              |

**GATED SPILLWAY**

(Stop Plank Operated Sluiceway)

| VISUAL EXAMINATION OF         | OBSERVATIONS                                        | REMARKS OR RECOMMENDATIONS |
|-------------------------------|-----------------------------------------------------|----------------------------|
| CONCRETE SILL                 | Submerged. About 12-16 inch discharge.              |                            |
| APPROACH CHANNEL              | Head of dam.                                        |                            |
| DISCHARGE CHANNEL             | Rock spillway, well graded, rapids.                 |                            |
| BRIDGE AND PIERS              | --                                                  |                            |
| GATES AND OPERATION EQUIPMENT | At time of inspection stop planks were all removed. |                            |

OUTLET WORKS

| VISUAL EXAMINATION OF                                              | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|--------------------------------------------------------------------|--------------|----------------------------|
| CRACKING AND SPALLING<br>OF CONCRETE SURFACES<br>IN OUTLET CONDUIT | None         |                            |
| INTAKE STRUCTURE                                                   | None         |                            |
| OUTLET STRUCTURE                                                   | None         |                            |
| OUTLET CHANNEL                                                     | None         |                            |
| EMERGENCY GATE                                                     | None         |                            |

DOWNSTREAM CHANNEL

| VISUAL EXAMINATION OF                         | OBSERVATIONS                                                                                                                       | REMARKS OR RECOMMENDATIONS                                                                                                                                                                        |
|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CONDITION<br>(OBSTRUCTIONS,<br>DEBRIS, ETC.)  | Unobstructed flow, bedrock. Whole<br>logs piled into channel, no ob-<br>struction however.                                         |                                                                                                                                                                                                   |
| SLOPES                                        | Well graded, rapids.                                                                                                               |                                                                                                                                                                                                   |
| APPROXIMATE NO.<br>OF HOMES AND<br>POPULATION | Village of Antwerp homes on lake<br>below dam. Hazard at residential<br>and commercial structure adjacent<br>to bridge in Village. | Structures parallel to lake are<br>about 20 feet above spillway level.<br>Structures normal to lake on street<br>that bridges spillway is much lower<br>and is a potentially high hazard<br>area. |
|                                               |                                                                                                                                    |                                                                                                                                                                                                   |
|                                               |                                                                                                                                    |                                                                                                                                                                                                   |

INSTRUMENTATION

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|-----------------------|--------------|----------------------------|
| MONUMENTATION/SURVEYS | N/A          |                            |
| OBSERVATION WELLS     | N/A          |                            |
| WEIRS                 | N/A          |                            |
| PIEZOMETERS           | N/A          |                            |
| OTHER                 | N/A          |                            |

RESERVOIR

| VISUAL EXAMINATION OF | OBSERVATIONS                        | REMARKS OR RECOMMENDATIONS |
|-----------------------|-------------------------------------|----------------------------|
| SLOPES                | Flat terrain adjacent to reservoir. |                            |
| SEDIMENTATION         | Unknown                             |                            |
|                       |                                     |                            |
|                       |                                     |                            |
|                       |                                     |                            |
|                       |                                     |                            |

CHECK LIST  
ENGINEERING DATA  
DESIGN, CONSTRUCTION, OPERATION  
PHASE 1

NAME OF DAM                      Dam No. 2  
ID # 345

| ITEM                                                                | REMARKS                                   |
|---------------------------------------------------------------------|-------------------------------------------|
| AS-BUILT DRAWINGS                                                   | None                                      |
| REGIONAL VICINITY MAP                                               | See this report.                          |
| CONSTRUCTION HISTORY                                                | Unknown                                   |
| TYPICAL SECTIONS OF DAM                                             | See information prepared for this report. |
| OUTLETS - PLAN<br>- DETAILS<br>- CONSTRAINTS<br>- DISCHARGE RATINGS | No data.                                  |
| RAINFALL/RESERVOIR RECORDS                                          | No data.                                  |

| ITEM                                                                              | REMARKS                                   |
|-----------------------------------------------------------------------------------|-------------------------------------------|
| DESIGN REPORTS                                                                    | No data.                                  |
| GEOLOGY REPORTS                                                                   | No data.                                  |
| DESIGN COMPUTATIONS<br>HYDROLOGY & HYDRAULICS<br>DAM STABILITY<br>SEEPAGE STUDIES | No data.                                  |
| MATERIALS INVESTIGATIONS<br>BORING RECORDS<br>LABORATORY<br>FIELD                 | No data.                                  |
| POST-CONSTRUCTION<br>SURVEYS OF DAM                                               | See information prepared for this report. |
| BORROW SOURCES                                                                    | No data.                                  |

| ITEM                                                        | REMARKS  |
|-------------------------------------------------------------|----------|
| MONITORING SYSTEMS                                          | None     |
| MODIFICATIONS                                               | No data. |
| HIGH POOL RECORDS                                           | No data. |
| POST CONSTRUCTION<br>ENGINEERING STUDIES<br>AND REPORTS     | No data. |
| PRIOR ACCIDENTS OR FAILURE OF DAM<br>DESCRIPTION<br>REPORTS | No data. |
| MAINTENANCE<br>OPERATION:<br>RECORDS                        | No data. |

| ITEM                                         | REMARKS  |
|----------------------------------------------|----------|
| SPILLWAY PLAN<br><br>SECTIONS<br><br>DETAILS | No data. |
| OPERATING EQUIPMENT<br>PLANS & DETAILS       | No data. |

- d. Length 140 feet
- e. Location Spillover Full width of dam.
- f. Number and Type of Gates Stop log sluiceway (logs not in place)

OUTLET WORKS:

- a. Type Stop logs sluiceway mentioned above.
- b. Location South abutment area of dam
- c. Entrance Inverts \_\_\_\_\_
- d. Exit Inverts same
- e. Emergency Draindown Facilities --

HYDROMETEOROLOGICAL GATES:

- a. Type None
- b. Location None
- c. Records None

MAXIMUM NON-DAMAGING DISCHARGE: No data.

APPENDIX B

PREVIOUS INSPECTION REPORTS/RELEVANT CORRESPONDENCE

345 60 chis

FORM NO. 1 (JULY 1914)

(NOTICE: After filling out one of these forms as completely as possible for each dam in your district, return it at once to the Conservation Commission, Albany.)

STATE OF NEW YORK  
CONSERVATION COMMISSION  
ALBANY

RECEIVED  
OCT 3 1914  
DIVISION OF INLAND WATERS  
J. D. M.

B

DAM REPORT

Sept. 21, 1914  
(Date)

CONSERVATION COMMISSION,

DIVISION OF INLAND WATERS.

GENTLEMEN:

I have the honor to make the following report in relation to the structure known as the Sterlingburg Dam.

This dam is situated upon the Indian River  
(Give name of stream)  
in the Town of Antwerp, Jefferson County,  
about 3/4 miles from the Village or City of Antwerp.  
(State distance)

The distance up stream from the dam, to the Sterlingburg Bridge,  
(Up or down) (Give name of nearest important stream or of a bridge)  
is about 100 feet.  
(State distance)

The dam is now owned by W. S. Brookes, Philadelphia, N. Y.  
(Give name in full)  
and was built in or about the year 1885, and was ~~originally~~ reconstructed  
during the year 1912.

As it now stands, the spillway portion of this dam is built of concrete + stone  
(State whether of masonry, concrete or timber)  
and the other portions are built of concrete and stone  
(State whether of masonry, concrete, earth or timber with or without rock fill)

As nearly as I can learn, the character of the foundation bed under the spillway portion of the dam is solid rock and under the remaining portions such foundation bed is solid rock.

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION  
DAM INSPECTION REPORT  
(By Visual Inspection)

| Dam Number | River Basin | Town    | County    | Hazard Class* | Date & Inspector |
|------------|-------------|---------|-----------|---------------|------------------|
| 345        | Catskill    | Antwerp | Jefferson | B             | 5/28/75 H.H.     |

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: \_\_\_\_\_

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 old dam Mill gage

ENVIRONMENTAL CONSERVATION  
 TION REPORT  
 Inspection)

| County    | Hazard Class* | Date & Inspector |
|-----------|---------------|------------------|
| Jefferson | B             | 5/28/75 k14      |



- ☐ 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: \_\_\_\_\_

- Condition of Non-Overflow Section
- ☒ Satisfactory  
☐ In need of repair or maintenance Explain: \_\_\_\_\_

- Condition of Mechanical Equipment
- ☐ Satisfactory *none*  
☐ In need of repair or maintenance Explain: \_\_\_\_\_

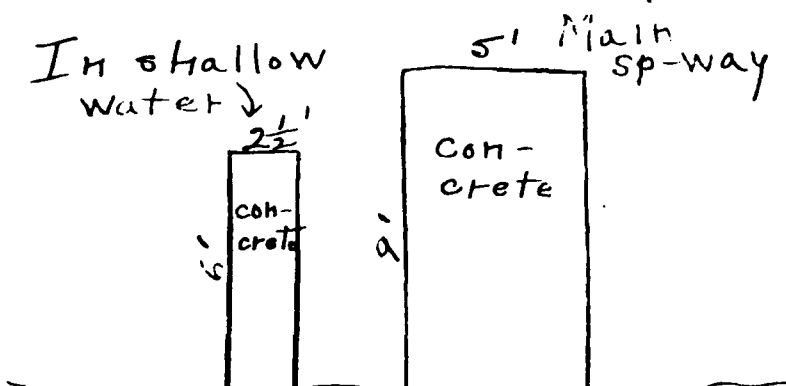
Evaluation (From Visual Inspection)

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

\*Explain Hazard Class, if Necessary *Very old dam Mill gage*

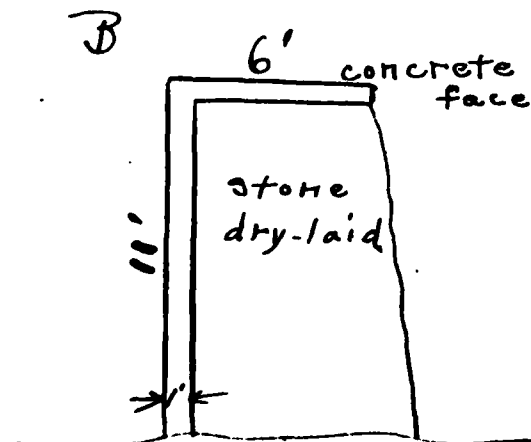
(In the space below, make one sketch showing the form and dimensions of a cross section through the spillway or waste-weir of this dam, and a second sketch showing the same information for a cross section through the other portion of the dam. Show particularly the greatest height of the dam above the stream bed, its thickness at the top, and thickness at the bottom, as nearly as you can learn.)

## Spillway sections—

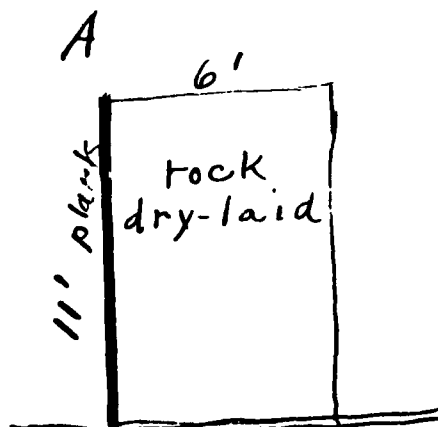


(In the space below, make a third sketch showing the general plan of the dam, and its approximate position in relation to buildings or other conspicuous objects in the vicinity.)

Section through 30' wall containing waste gate



Wall across to mill from island



The total length of this dam is 155 feet. The spillway or waste-weir portion, is about 85 feet long, and the crest of the spillway is about 3 feet below the top of the dam.

The number, size and location of discharge pipes, waste pipes or gates which may be used for drawing off the water from behind the dam, are as follows: One waste gate 5' deep and 2½' wide (see general view.)

State briefly, in the space below, whether, in your judgment, this dam is in good condition, or bad condition, describing particularly any leaks or cracks which you may have observed.)

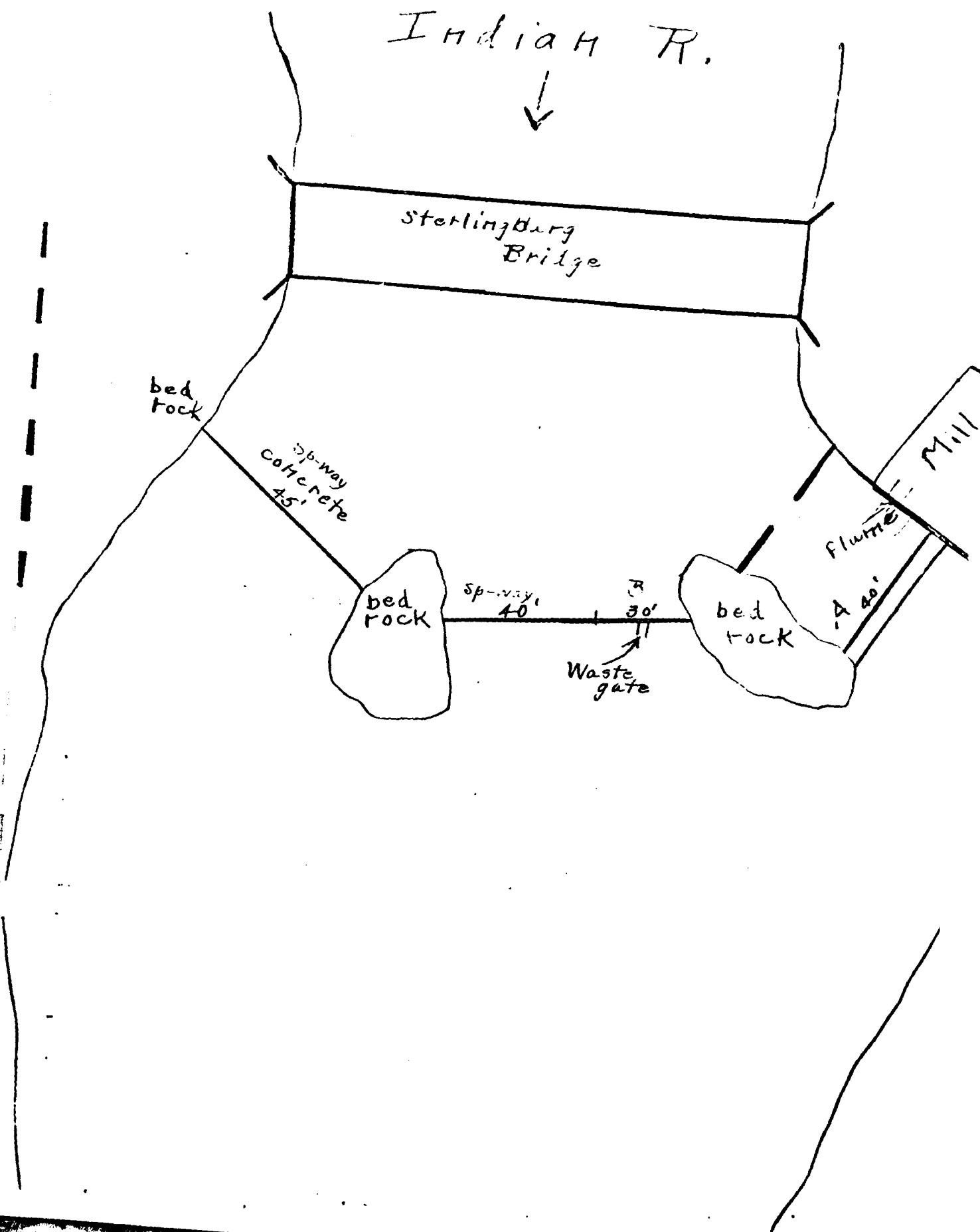
This dam is in good condition and does not leak.

Reported by C. W. H. Douglass,  
(Signature)

115 Standart St.,  
(Address—Street and number, P. O. Box or R. F. D. route)

Syracuse, N. Y.  
(Name of place)

(SEE OTHER SIDE)



APPENDIX C  
HYDROLOGY AND HYDRAULICS



STETSON • DALE

BANKERS TRUST BUILDING  
UTICA • NEW YORK • 13501

TEL 315-797-5800

DESIGN BRIEF

PROJECT NAME NEW YORK STATE DAM INSPECTIONDATE 5.4.79SUBJECT DAM N° 2 (VIC ANTWERP) FORT DRUM, NYPROJECT NO. 2277ESTIMATE OF CLARK'S PARAMETERSDRAWN BY JPGESTIMATE OF  $T_c$ ASSUME:  $R/(T_c + R) =$  $R = T_c *$ 

$$T_c = 11.9 (L^2/H)^{.385}$$

|          |    | <u>L (m)</u> | <u>H (ft)</u> | <u><math>T_c</math> &amp; <math>R</math></u> |
|----------|----|--------------|---------------|----------------------------------------------|
| SUB AREA | 1  | 13.598       | 415           | 23.81                                        |
| "        | 2  | 7.670        | 178           | 17.02                                        |
| "        | 3  | 10.417       | 178           | 24.25                                        |
| "        | 4  | 8.712        | 215           | 18.34                                        |
| "        | 5  | 14.394       | 215           | 32.75                                        |
| "        | 6  | 6.004        | 125           | 14.70                                        |
| "        | 7  | 9.091        | 155           | 21.85                                        |
| "        | 8  | 8.475        | 95            | 24.33                                        |
| "        | 9  | 5.682        | 90            | 15.65                                        |
| "        | 10 | 15.379       | 255           | 33.11                                        |
| "        | 11 | 2.652        | 109           | 6.03                                         |
| "        | 12 | .871         | 100           | 1.72                                         |

SCS

$$L = \frac{1.48 (S+1)^{.7}}{1900 Y^{.5}}$$

$$T_c = L/.6$$

$$S = \frac{1000}{L_n} - 10$$

|          |    | <u>L (m)</u> | <u>S</u> | <u>Y (%)</u> | <u>L</u> | <u><math>T_c</math> &amp; <math>R</math> (Sec)</u> |
|----------|----|--------------|----------|--------------|----------|----------------------------------------------------|
| SUB AREA | 1  | 71800        | 4.706    | 4            | 6.832    | 11.39                                              |
| "        | 2  | 40500        | 4.286    | 3            | 4.730    | 7.88                                               |
| "        | 3  | 55000        | 4.706    | 3            | 6.374    | 10.62                                              |
| "        | 4  | 44000        | 4.286    | 3            | 5.237    | 8.73                                               |
| "        | 5  | 76000        | 4.286    | 5            | 6.062    | 10.10                                              |
| "        | 6  | 31700        | 3.889    | 3            | 3.681    | 6.14                                               |
| "        | 7  | 48000        | 3.889    | 3            | 5.130    | 8.55                                               |
| "        | 8  | 44750        | 4.493    | 3            | 5.262    | 8.77                                               |
| "        | 9  | 30000        | 4.706    | 3            | 3.924    | 6.54                                               |
| "        | 10 | 82000        | 3.889    | 3            | 7.874    | 13.12                                              |
| "        | 11 | 14000        | 3.889    | 4            | 1.638    | 2.76                                               |
| "        | 12 | 4600         | 3.889    | 4            | .681     | 1.13                                               |

C-1



STETSON • DALE

BANKERS TRUST BUILDING  
UTICA • NEW YORK • 13501

TEL 315-797-5800

DESIGN BRIEF

PROJECT NAME NEW YORK STATE DAM INSPECTION DATE 5.7.79  
 SUBJECT DAM N° 2 (VIC ANTWERP) FORT DRUM, NY PROJECT NO 2277  
ESTIMATE OF SNYDER'S PARAMETERS DRAWN BY JPG

640 Cp

Cp IS .625 FOR

SUB AREA 1 THRU 12

$$t_p = C + (L \cdot L_{ca})^3$$

|            | <u>C</u> | <u>L(mi)</u> | <u>L<sub>ca</sub>(mi)</u> | <u>t<sub>p</sub></u> |
|------------|----------|--------------|---------------------------|----------------------|
| SUB AREA 1 | 2.0      | 13.598       | 3.69                      | 6.47                 |
| " 2        | 2.0      | 7.670        | 3.31                      | 5.23                 |
| " 3        | 2.0      | 10.417       | 4.45                      | 6.32                 |
| " 4        | 2.0      | 8.712        | 3.13                      | 5.39                 |
| " 5        | 2.0      | 14.394       | 7.29                      | 8.08                 |
| " 6        | 2.0      | 6.004        | 1.80                      | 4.08                 |
| " 7        | 2.0      | 9.091        | 2.18                      | 4.90                 |
| " 8        | 2.0      | 8.475        | 3.13                      | 5.35                 |
| " 9        | 2.0      | 5.682        | 3.03                      | 4.70                 |
| " 10       | 2.0      | 15.379       | 4.54                      | 7.15                 |
| " 11       | 2.0      | 2.652        | 1.04                      | 2.71                 |
| " 12       | 2.0      | .871         | .75                       | 1.76                 |

$$t_r = t_p / 5.5$$

|            | <u>t<sub>p</sub></u> | <u>t<sub>r</sub></u> |
|------------|----------------------|----------------------|
| SUB AREA 1 | 6.47                 | 1.18                 |
| " 2        | 5.23                 | .95                  |
| " 3        | 6.32                 | 1.15                 |
| " 4        | 5.39                 | .98                  |
| " 5        | 8.08                 | 1.47                 |
| " 6        | 4.08                 | .74                  |
| " 7        | 4.90                 | .89                  |
| " 8        | 5.35                 | .97                  |
| " 9        | 4.70                 | .85                  |
| " 10       | 7.15                 | 1.30                 |
| " 11       | 2.71                 | .49                  |
| " 12       | 1.76                 | .32                  |

$$t_{pr} = t_p + .25 (t_r - t_p)$$

|            | <u>t<sub>p</sub></u> | <u>t<sub>r</sub></u> | <u>t<sub>r</sub></u> | <u>t<sub>pr</sub></u> |
|------------|----------------------|----------------------|----------------------|-----------------------|
| SUB AREA 1 | 6.47                 | 1.0                  | 1.18                 | 6.43                  |
| " 2        | 5.23                 | 1.0                  | .95                  | 5.24                  |
| " 3        | 6.32                 | 1.0                  | 1.15                 | 6.28                  |
| " 4        | 5.39                 | 1.0                  | .98                  | 5.39                  |
| " 5        | 8.08                 | 1.0                  | 1.47                 | 7.96                  |
| " 6        | 4.08                 | 1.0                  | .74                  | 4.15                  |
| " 7        | 4.90                 | 1.0                  | .89                  | 4.93                  |
| " 8        | 5.35                 | 1.0                  | .97                  | 5.35                  |
| " 9        | 4.70                 | 1.0                  | .85                  | 4.74                  |
| " 10       | 7.15                 | 1.0                  | 1.30                 | 7.08                  |
| " 11       | 2.71                 | 1.0                  | .49                  | 2.84                  |
| " 12       | 1.76                 | 1.0                  | .32                  | 1.93                  |



STETSON • DALE

BANKERS TRUST BUILDING  
UTICA • NEW YORK • 13501  
TEL 315-797-5800

DESIGN BRIEF

PROJECT NAME NEW YORK STATE DAM INSPECTION DATE 5.4.79  
SUBJECT DAM NO 2 (VIC ANTWERP) FORT DRUM, NY PROJECT NO 2277  
CALCULATION OF WEIGHTED CN DRAWN BY JPG

SUB AREA 1

$$\begin{aligned} 83 \times 10 &= 830 \\ 66 \times 90 &= 5940 \\ 6770 \div 100 &= 68 \end{aligned}$$

SUB AREA 2

$$\begin{aligned} 83 \times 22 &= 1826 \\ 66 \times 78 &= 5148 \\ 6974 \div 100 &= 70 \end{aligned}$$

SUB AREA 3

$$\begin{aligned} 83 \times 14 &= 1162 \\ 66 \times 86 &= 5673 \\ 6838 \div 100 &= 68 \end{aligned}$$

SUB AREA 4

$$\begin{aligned} 83 \times 21 &= 1743 \\ 66 \times 79 &= 5214 \\ 6957 \div 100 &= 70 \end{aligned}$$

SUB AREA 5

$$\begin{aligned} 83 \times 23 &= 1909 \\ 66 \times 77 &= 5082 \\ 6991 \div 100 &= 70 \end{aligned}$$

SUB AREA 8

$$\begin{aligned} 83 \times 15 &= 1245 \\ 66 \times 85 &= 5610 \\ 6855 \div 100 &= 69 \end{aligned}$$

SUB AREA 9

$$\begin{aligned} 83 \times 10 &= 830 \\ 66 \times 90 &= 5940 \\ 6770 \div 100 &= 68 \end{aligned}$$



STETSON • DALE

BANKERS TRUST BUILDING  
UTICA • NEW YORK • 13501  
TEL 315-797-5800

DESIGN BRIEF

PROJECT NAME NEW YORK STATE DAM INSPECTION DATE 5-3-77  
SUBJECT DAM NO 2 (VIC ANTWERP) FORT DRUM, NY PROJECT NO 2277  
DEPTH-DURATION RELATIONSHIP DRAWN BY JPG

HYDROMETEOROLOGICAL REPORT NO 33

PMP INDEX RAINFALL

200 SQ MI

24 HR - 18.5"

| <u>DURATION</u> | <u>%</u> | <u>DEPTH</u> |
|-----------------|----------|--------------|
| 6 HR            | 85       | 15.73        |
| 12 HR           | 97       | 17.95        |
| 24 HR           | 105      | 19.43        |
| 48 HR           | 120      | 22.22        |

[illegible]

(0040) Y C C C T

|        |    |     |     |     |
|--------|----|-----|-----|-----|
| (0042) | 16 | .04 | .05 | 716 |
|--------|----|-----|-----|-----|

| (6044) | Y7 | 85: | 69. | 71.6 | 925 |
|--------|----|-----|-----|------|-----|
|        |    |     |     |      |     |

(0045) K1 SUB AREA 4 RU,C,F

| Case   | Age  | Sex | Occupation | Duration of Illness (days) | Onset of Illness | Course of Illness | Outcome |
|--------|------|-----|------------|----------------------------|------------------|-------------------|---------|
| 1      | 18.5 | 55  | 57         | 105                        |                  |                   |         |
| (UJ48) |      |     |            |                            |                  |                   |         |

0050 0.73 0.75

(UUSZ) K 5 J

| Year | 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 |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 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 |      |

1 (9557) 7

(00-00) X 4 6L

K1 CO-SINE S HUN... 413

| CHANEL ROUTE 10 | AREA 7 | 1 |
|-----------------|--------|---|
| K1              |        |   |
| (00-2)          |        |   |
| (00-3)          |        |   |

| Year | 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 |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 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 |      |

|        |    |     |     |      |     |      |
|--------|----|-----|-----|------|-----|------|
| (00-8) | 77 | 100 | 720 | 131  | 716 | 1550 |
| (00-2) | 77 | 100 | 710 | 1519 | 716 | 1550 |

334919 - 4-28-71 LK (1971)

[illegible]

|        |   |      |      |
|--------|---|------|------|
| (0612) | - | 6.14 | 6.14 |
| (0613) | - | 6.14 | 6.14 |

(6670)

(6671)

(6672)

(6673)

(6674)

(6675)

(6676)

(6677)

(6678)

(6679)

(6680)

(6681)

(6682)

(6683)

(6684)

(6685)

(6686)

(6687)

(6688)

(6689)

(6690)

(6691)

(6692)

(6693)

(6694)

(6695)

(6696)

(6697)

(6698)

(6699)

(6700)

(6701)

(6702)

(6703)

(6704)

(6705)

(6706)

(6707)

(6708)

(6709)

(6710)

(6711)

(6712)

(6713)

(6714)

(6715)

(6716)

(6717)

(6718)

(6719)

(6720)

(6721)

(6722)

(6723)

(6724)

(6725)

(6726)

(6727)

(6728)

(6729)

(6730)

(6731)

(6732)

(6733)

(6734)

(6735)

(6736)

(6737)

(6738)

(6739)

(6740)

(6741)

(6742)

(6743)

(6744)

(6745)

(6746)

(6747)

(6748)

(6749)

(6750)

(6751)

(6752)

(6753)

(6754)

(6755)

(6756)

(6757)

(6758)

(6759)

(6760)

(6761)

(6762)

(6763)

(6764)

(6765)

(6766)

(6767)

(6768)

(6769)

(6770)

(6771)

(6772)

(6773)

(6774)

(6775)

(6776)

(6777)

(6778)

(6779)

(6780)

(6781)

(6782)

(6783)

(6784)

(6785)

(6786)

(6787)

(6788)

(6789)

(6790)

(6791)

(6792)

(6793)

(6794)

(6795)

(6796)

(6797)

(6798)

(6799)

(6800)

(6801)

(6802)

(6803)

(6804)

(6805)

(6806)

(6807)

(6808)

(6809)

(6810)

(6811)

(6812)

(6813)

(6814)

(6815)

(6816)

(6817)

(6818)

(6819)

(6820)

(6821)

(6822)

(6823)

(6824)

(6825)

(6826)

(6827)

(6828)

(6829)

(6830)

(6831)

(6832)

(6833)

(6834)

(6835)

(6836)

(6837)

(6838)

(6839)

(6840)

(6841)

(6842)

(6843)

(6844)

(6845)

(6846)

(6847)

(6848)

(6849)

(6850)

(6851)

(6852)

(6853)

(6854)

(6855)

(6856)

(6857)

(6858)

(6859)

(6860)

(6861)

(6862)

(6863)

(6864)

(6865)

(6866)

(6867)

(6868)

(6869)

(6870)

(6871)

(6872)

(6873)

(6874)

(6875)

(6876)

(6877)

(6878)

(6879)

(6880)

(6881)

(6882)

(6883)

(6884)

(6885)

(6886)

(6887)

(6888)

(6889)

(6890)

(6891)

(6892)

(6893)

(6894)

(6895)

(6896)

(6897)

(6898)

(6899)

(6900)

(6901)

(6902)

(6903)

(6904)

(6905)

(6906)

(6907)

(6908)

(6909)

(6910)

(6911)

(6912)

(6913)

(6914)

(6915)

(6916)

(6917)

(6918)

(6919)

(6920)

(6921)

(6922)

(6923)

(6924)

(6925)

(6926)

(6927)

(6928)

(6929)

(6930)

(6931)

(6932)

(6933)

(6934)

(6935)

(6936)

(6937)

(6938)

(6939)

(6940)

(6941)

(6942)

(6943)

(6944)

(6945)

(6946)

(6947)

(6948)

(6949)

(6950)

(6951)

(6952)

(6953)

(6954)

(6955)

(6956)

(6957)

(6958)

(6959)

(6960)

(6961)

(6962)

(6963)

(6964)

(6965)

(6966)

(6967)

(6968)

(6969)

(6970)

(6971)

(6972)

(6973)

(6974)

(6975)

(6976)

(6977)

(6978)

(6979)

(6980)

(6981)

(6982)

(6983)

(6984)

(6985)

(6986)

(6987)

(6988)

(6989)

(6990)

(6991)

(6992)

(6993)

(6994)

(6995)

(6996)

(6997)

(6998)

(6999)

(7000)

(7001)

(7002)

(7003)

(7004)

(7005)

(7006)

(7007)

(7008)

(7009)

(7010)

(7011)

(7012)

(7013)

(7014)

(7015)

(7016)

(7017)

(7018)

(7019)

(7020)

(7021)

(7022)

(7023)

(7024)

(7025)

(7026)

(7027)

(7028)

(7029)

(7030)

(7031)

(7032)

(7033)

(7034)

(7035)

(7036)

(7037)

(7038)

(7039)

(7040)

(7041)

(7042)

(7043)

(7044)

(7045)

(7046)

(7047)

(7048)

(7049)

(7050)

(7051)

(7052)

(7053)

(7054)

(7055)

(7056)

(7057)

(7058)

(7059)

(7060)

(7061)

(7062)

(7063)

(7064)

(7065)

(7066)

(7067)

(7068)

(7069)

(7070)

(7071)

(7072)

(7073)

(7074)

(7075)

(7076)

(7077)

(7078)

(7079)

(7080)

(7081)

(7082)

(7083)

(7084)

(7085)

(7086)

(7087)

(7088)

(7089)

(7090)

(7091)

(7092)

(7093)

(7094)

(7095)

(7096)

(7097)

(7098)

(7099)

(7100)

(7101)

(7102)

(7103)

(7104)

(7105)

(7106)

(7107)

(7108)

(7109)

(7110)

(7111)

(7112)

(7113)

(7114)

(7115)

(7116)

(7117)

(7118)

(7119)

(7120)

(7121)

(7122)

(7123)

(7124)

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  
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  
84

|        |    |                            |        |        |      |       |      |      |   |
|--------|----|----------------------------|--------|--------|------|-------|------|------|---|
| (0077) | K  | 1                          | 5      | 0      | 0    | 0     | 0    | 0    | 1 |
| (0078) | F1 | CHANNEL ROUTE THRU AREA 1  | 1      | 0      | 0    | 0     | 0    | 0    | 1 |
| (0079) | Y1 | 1                          | 0      | 1      | 1    | 1     | 1    | 1    | 1 |
| (0080) | Y1 | 1                          | 0      | 0      | 0    | 0     | 0    | 0    | 1 |
| (0081) | Y0 | 0.04                       | 0.04   | 0.04   | 0.04 | 0.04  | 0.04 | 0.04 | 1 |
| (0082) | Y7 | 1.00                       | 620    | 300    | 610  | 450   | 610  | 450  | 1 |
| (0083) | Y7 | 620                        | 600    | 600    | 610  | 1000  | 620  | 620  | 1 |
| (0084) | K  | 0                          | 7      | 0      | 0    | 0     | 0    | 0    | 1 |
| (0085) | K1 | SUB AREA 7 RUNOFF          | 17.0.5 | 0      | 0    | 0     | 0    | 0    | 1 |
| (0086) | M  | 1                          | 0      | 17.0.5 | 0    | 152.1 | 120  | 120  | 1 |
| (0087) | F  | 0                          | 10.5   | 5      | 0    | 105   | 0    | 0    | 1 |
| (0088) | T  | 0                          | 0      | 0      | 0    | 0     | 0    | 0    | 1 |
| (0089) | V  | 8.55                       | 0.55   | 0      | 0    | 0     | 0    | 0    | 1 |
| (0090) | X  | 34                         | 34     | 1      | 0    | 0     | 0    | 0    | 1 |
| (0091) | K  | 0                          | 0      | 0      | 0    | 0     | 0    | 0    | 1 |
| (0092) | K1 | SUB AREA 7 RUNOFF          | 5.998  | 0      | 0    | 152.1 | 0    | 0    | 1 |
| (0093) | M  | 1                          | 0      | 5.998  | 0    | 105   | 0    | 0    | 1 |
| (0094) | F  | 0                          | 18.0   | 0      | 0    | 0     | 0    | 0    | 1 |
| (0095) | T  | 0                          | 0      | 0      | 0    | 0     | 0    | 0    | 1 |
| (0096) | V  | 0.54                       | 0.54   | 0      | 0    | 0     | 0    | 0    | 1 |
| (0097) | X  | 12                         | 12     | 1      | 0    | 0     | 0    | 0    | 1 |
| (0098) | K  | 0                          | 0      | 0      | 0    | 0     | 0    | 0    | 1 |
| (0099) | K1 | COMBINE 3 PHOTOGRAPHS AT 5 | 0      | 0      | 0    | 0     | 0    | 0    | 1 |
| (0100) | K  | 1                          | 0      | 0      | 0    | 0     | 0    | 0    | 1 |
| (0101) | K1 | CHANNEL ROUTE THRU AREA 0  | 0      | 0      | 0    | 0     | 0    | 0    | 1 |
| (0102) | V  | 0                          | 0      | 0      | 1    | 1     | 0    | 0    | 1 |
| (0103) | Y1 | 1                          | 0      | 0      | 0    | 0     | 0    | 0    | 1 |
| (0104) | Y0 | 0.04                       | 0.04   | 0.04   | 0.04 | 0.04  | 0.04 | 0.04 | 1 |
| (0105) | Y7 | 1.00                       | 620    | 200    | 590  | 350   | 590  | 350  | 1 |
| (0106) | Y7 | 620                        | 590    | 590    | 590  | 590   | 590  | 590  | 1 |
| (0107) | K  | 0                          | 0      | 0      | 0    | 0     | 0    | 0    | 1 |
| (0108) | K1 | SUB AREA 0 RUNOFF          | 11.70  | 0      | 0    | 152.1 | 0    | 0    | 1 |
| (0109) | M  | 1                          | 0      | 11.70  | 0    | 105   | 0    | 0    | 1 |
| (0110) | F  | 0                          | 18.0   | 0      | 0    | 0     | 0    | 0    | 1 |
| (0111) | T  | 0                          | 0      | 0      | 0    | 0     | 0    | 0    | 1 |
| (0112) | V  | 0.55                       | 0.55   | 0      | 0    | 0     | 0    | 0    | 1 |
| (0113) | X  | 24                         | 24     | 1      | 0    | 0     | 0    | 0    | 1 |
| (0114) | K  | 0                          | 0      | 0      | 0    | 0     | 0    | 0    | 1 |

|        |    |                                    |       |    |       |     |     |   |
|--------|----|------------------------------------|-------|----|-------|-----|-----|---|
| (0115) | K1 | SUB AREA 1L RUNOFF                 | 13.9  | 0  | 152.1 | 0   | 0   | 1 |
| (0116) | F  | 1                                  | 13.9  | 97 | 105   | 120 | 0   | 0 |
| (0117) | F  | 1                                  | 18.5  | 0  | 0     | 0   | 0.1 | 0 |
| (0118) | T  | 0                                  | 0     | 0  | 0     | 0   | 0   | 0 |
| (0119) | V  | 13.12                              | 13.12 | 0  | 0     | 0   | 0   | 0 |
| (0120) | K  | 20                                 | 20    | 1  | 0     | 0   | 0   | 0 |
| (0121) | K  | 0                                  | 0     | 0  | 0     | 0   | 0   | 0 |
| (0122) | K1 | COMBINE 5 HYDROGRAPHS AT 6         | 0     | 0  | 0     | 0   | 0   | 0 |
| (0123) | K  | 1                                  | 0     | 0  | 0     | 0   | 0   | 0 |
| (0124) | A1 | CHANNEL ROUTE THRU AREA 11         | 0     | 0  | 0     | 0   | 0   | 0 |
| (0125) | V  | 0                                  | 0     | 1  | 1     | 0   | 0   | 0 |
| (0126) | V  | 0                                  | 0     | 0  | 0     | 0   | 0   | 0 |
| (0127) | V  | 0                                  | 0     | 0  | 0     | 0   | 0   | 0 |
| (0128) | V  | 0                                  | 0     | 0  | 0     | 0   | 0   | 0 |
| (0129) | V  | 0                                  | 0     | 0  | 0     | 0   | 0   | 0 |
| (0130) | V  | 0                                  | 0     | 0  | 0     | 0   | 0   | 0 |
| (0131) | K1 | SUB AREA 11 RUNOFF                 | 4.05  | 0  | 152.1 | 0   | 0   | 1 |
| (0132) | F  | 1                                  | 4.05  | 97 | 115   | 120 | 0   | 0 |
| (0133) | F  | 1                                  | 18.5  | 0  | 0     | 0   | 0   | 0 |
| (0134) | T  | 0                                  | 0     | 0  | 0     | 0   | 0   | 0 |
| (0135) | V  | 2.76                               | 2.76  | 0  | 0     | 0   | 0.1 | 0 |
| (0136) | V  | 0                                  | 0     | 0  | 0     | 0   | 0   | 0 |
| (0137) | V  | 0                                  | 0     | 0  | 0     | 0   | 0   | 0 |
| (0138) | K1 | COMBINE 2 HYDROGRAPHS AT 7         | 0     | 0  | 0     | 0   | 0   | 0 |
| (0139) | K  | 1                                  | 0     | 0  | 0     | 0   | 0   | 0 |
| (0140) | A1 | ROUTE OVER DAM NO. 2 (VIC ANTWERP) | 0     | 0  | 0     | 0   | 0   | 0 |
| (0141) | V  | 0                                  | 0     | 1  | 1     | 0   | 0   | 0 |
| (0142) | V  | 0                                  | 0     | 0  | 0     | 0   | 0   | 0 |
| (0143) | V  | 0                                  | 0     | 0  | 0     | 0   | 0   | 0 |
| (0144) | V  | 0                                  | 0     | 0  | 0     | 0   | 0   | 0 |
| (0145) | V  | 0                                  | 0     | 0  | 0     | 0   | 0   | 0 |
| (0146) | V  | 0                                  | 0     | 0  | 0     | 0   | 0   | 0 |
| (0147) | V  | 0                                  | 0     | 0  | 0     | 0   | 0   | 0 |
| (0148) | K1 | SUB AREA 12 RUNOFF                 | 1.13  | 0  | 152.1 | 0   | 0   | 1 |
| (0149) | F  | 1                                  | 1.13  | 97 | 115   | 120 | 0   | 0 |
| (0150) | F  | 1                                  | 18.5  | 0  | 0     | 0   | 0   | 0 |
| (0151) | T  | 0                                  | 0     | 0  | 0     | 0   | 0   | 0 |
| (0152) | V  | 1.13                               | 1.13  | 0  | 0     | 0   | 0.1 | 0 |

AT DAN NO 2 (ANTHER)

PAGE 0005

|        |    |                            |      |      |      |  |  |  |  |  |
|--------|----|----------------------------|------|------|------|--|--|--|--|--|
| (0153) | X  | C                          | 2    | 1    |      |  |  |  |  |  |
| (0154) | K  | C                          | 8    | 1    |      |  |  |  |  |  |
| (0155) | K1 | COMBINE 2 HYDROGRAPHS AT P | C    |      |      |  |  |  |  |  |
| (0156) | K  | C                          | 1    |      |      |  |  |  |  |  |
| (0157) | K1 | ROUTE OVER DAP AT ANTHER   | C    |      |      |  |  |  |  |  |
| (0158) | Y  | C                          | 1    |      |      |  |  |  |  |  |
| (0159) | V1 | 1                          |      |      |      |  |  |  |  |  |
| (0160) | V4 | 490.3                      | 495  | 497  | 500  |  |  |  |  |  |
| (0161) | V5 | 700                        | 1900 | 3500 | 6550 |  |  |  |  |  |
| (0162) | VS | 90                         | 175  | 265  | 425  |  |  |  |  |  |
| (0163) | SE | 490.3                      | 495  | 497  | 500  |  |  |  |  |  |
| (0164) | SE | 490.3                      | 495  | 497  | 500  |  |  |  |  |  |
| (0165) | SU | 491.1                      | 2.64 | 1.5  | 0.1  |  |  |  |  |  |
| (0166) | K  | 59                         |      |      |      |  |  |  |  |  |
| (0167) | A  |                            |      |      |      |  |  |  |  |  |
| (0168) | A  |                            |      |      |      |  |  |  |  |  |
| (0169) | A  |                            |      |      |      |  |  |  |  |  |
| (0170) | A  |                            |      |      |      |  |  |  |  |  |
| (0171) | A  |                            |      |      |      |  |  |  |  |  |

-1  
503.5  
13000  
765  
505

510  
32000  
1250  
510

518  
70000  
2470  
518

# PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

|                          |    |
|--------------------------|----|
| RUNOFF HYDROGRAPH AT     | 1  |
| ROUTE HYDROGRAPH TO      | 2  |
| RUNOFF HYDROGRAPH AT     | 1  |
| RUNOFF HYDROGRAPH AT     | 3  |
| COMBINE 3 HYDROGRAPHS AT | 2  |
| ROUTE HYDROGRAPH TO      | 3  |
| RUNOFF HYDROGRAPH AT     | 4  |
| RUNOFF HYDROGRAPH AT     | 3  |
| COMBINE 3 HYDROGRAPHS AT | 4  |
| ROUTE HYDROGRAPH TO      | 6  |
| RUNOFF HYDROGRAPH AT     | 4  |
| COMBINE 4 HYDROGRAPHS AT | 4  |
| ROUTE HYDROGRAPH TO      | 5  |
| RUNOFF HYDROGRAPH AT     | 7  |
| RUNOFF HYDROGRAPH AT     | 9  |
| COMBINE 5 HYDROGRAPHS AT | 5  |
| ROUTE HYDROGRAPH TO      | 6  |
| RUNOFF HYDROGRAPH AT     | 8  |
| RUNOFF HYDROGRAPH AT     | 10 |
| COMBINE 5 HYDROGRAPHS AT | 6  |
| ROUTE HYDROGRAPH TO      | 7  |
| RUNOFF HYDROGRAPH AT     | 11 |
| COMBINE 3 HYDROGRAPHS AT | 7  |
| ROUTE HYDROGRAPH TO      | 7  |
| RUNOFF HYDROGRAPH AT     | 12 |
| COMBINE 2 HYDROGRAPHS AT | 8  |
| ROUTE HYDROGRAPH TO      | 8  |
| END OF NETWORK           |    |

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

RUN DATE=ED, NOV 14 1979  
 TIME=15:22:51

DAM NO 2 (ANT-ERP)  
 HEC-1DB  
 PMF-DAM OVERTOPPING ANALYSIS

| JOB SPECIFICATION |     |     |      |     |       |       |      |      |        |
|-------------------|-----|-----|------|-----|-------|-------|------|------|--------|
| NQ                | APR | AVI | UDAY | IMR | IMIN  | NETRC | IPLT | IFRT | INSTAN |
| 9                 | 1   | 0   | 0    | 0   | 0     | 0     | 0    | 4    | 0      |
| JCFER             |     |     |      | NMT | LRGFT | TRACE |      |      |        |
| 5                 |     |     |      | 0   | 0     | 0     |      |      |        |

MULTI-PLAN ANALYSIS TO BE PERFORMED  
 WFLANE 1 NATION= C LATIQ= 1  
 RTIOS= 0.20 0.40 0.50 0.70 0.80 1.00

\*\*\*\*\* \*\*\*\*\* \*\*\*\*\*

SUB-AREA RUN-OFF COMPLETION

| CLARK'S PARAMETERS |   |        |       |       |       |       |      |      |       |        |       |
|--------------------|---|--------|-------|-------|-------|-------|------|------|-------|--------|-------|
| SUB AREA           | 1 | RUNOFF | ISTAG | ICOMP | IECON | ITAFE | JPLT | JFRT | INAPE | ISTAGE | I-UTO |
| 1                  | 0 | 0      | 0     | 0     | 0     | 0     | 0    | 0    | 1     | 0      | 0     |

| HYDROGRAPH DATA |   |      |       |        |       |       |       |       |       |       |
|-----------------|---|------|-------|--------|-------|-------|-------|-------|-------|-------|
| INHYD           | 1 | INUG | TAREA | SNAP   | TRSDA | TRSEC | KATIO | ISNEM | ISAME | LOCAL |
| 1               | 0 | 3.02 | 0.00  | 152.10 | 0.00  | 0.00  | 0.00  | 0     | 1     | 0     |

| PRECIP DATA |      |      |      |      |      |      |      |      |      |
|-------------|------|------|------|------|------|------|------|------|------|
| SPFT        | 1    | PM5  | PM6  | PM7  | PM8  | PM9  | PM10 | PM11 | PM12 |
| 1           | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

TRSPC COMPUTED BY THE PROGRAM IS 0.877

| LOSS DATA |       |       |       |       |       |       |       |       |       |       |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| LRGFT     | STRKE | ULTRK | FTIOL | ERAIN | STRKS | RTIOL | STRTL | CNSTL | ALSMX | RTIMP |
| 0.00      | 0.00  | 0.00  | 1.00  | 0.00  | 0.00  | 1.00  | 1.00  | 0.10  | 0.00  | 0.00  |

UNIT HYDROGRAPH DATA  
 TC= 11.39 RE= 11.39 NTA= C

RECESSION DATA

[illegible]

| C | MQ.DA | HR.MN | PERIOD | RAIN. | EXCS | LOSS | END-OF-PERIOD FLOW<br>CUM.P.G | MO.DA | HR.MN | PERIOD | RAIN    | EXCS    | LOSS   | COMP.G    |
|---|-------|-------|--------|-------|------|------|-------------------------------|-------|-------|--------|---------|---------|--------|-----------|
|   |       |       |        |       |      |      |                               |       |       | SUM    | 19.46   | 15.70   | 3.76   | 30587.    |
|   |       |       |        |       |      |      |                               |       |       |        | ( 494.) | ( 349.) | ( 95.) | ( 866.13) |

[illegible]

## HYDROGRAPH ROUTING

CHANNEL ROUTE THRU AREA 2

[illegible]

NORMAL WITH CHANNEL ROUTING

| $\nu(1)$ | $\nu_2(2)$ | $\nu_N(5)$ | $\nu_{LAT}$ | $\nu_{LAT}$ | $\nu_{LAT}$ |
|----------|------------|------------|-------------|-------------|-------------|
| 0.11506  | 0.1446     | 1.08(0)    | 22.0        | 25.0        | 45.0        |
|          |            |            |             |             | 0.1003(0)   |

MASS SPECIFIC COORDINATES--STA, FLEV, STA, FLEV--ETC

[illegible]



|     |       |       |      |         |
|-----|-------|-------|------|---------|
| SUM | 19.46 | 15.70 | 3.76 | 118450. |
|-----|-------|-------|------|---------|

( 494. ) ( 39.2 ) ( 95. ) ( 3354.13 )

\*\*\*\*\*

COMBINE HYDROGRAPHS

COPELINE 3 HYDROGRAPHS AT 2

|       |      |       |       |      |      |       |        |       |
|-------|------|-------|-------|------|------|-------|--------|-------|
| ISTAG | ICMP | IECON | ITATE | JPLT | JFRT | INAME | ISTAGE | IAUTO |
| 2     | 3    | 0     | 0     | 3    | 0    | 1     | C      | 0     |

\*\*\*\*\*

HYDROGRAPH ROUTING

CHANNEL ROUTE THRU AREA 4

|       |        |       |              |       |       |       |        |       |
|-------|--------|-------|--------------|-------|-------|-------|--------|-------|
| ISTAG | ICMP   | IECON | ITATE        | JPLT  | JFRT  | INAME | ISTAGE | IAUTO |
| 3     | 1      | 0     | 0            | 0     | 0     | 1     | C      | 0     |
| QLOSS | CLASS  | AVG   | ROUTING DATA |       |       |       |        |       |
| 0.0   | 0.00   | 0.00  | IES ISAME    | IOFT  | IFMP  |       | LSTR   |       |
|       |        |       | 1            | 0     | 0     |       |        |       |
| NSTES | INSTOL | LAG   | AMSKK        | X     | TSK   | STORA | ISPRAT |       |
| 1     | 0      | 0     | 0.000        | 0.000 | 0.000 | -1.   | C      |       |

NORMAL DEPTH CHANNEL ROUTING

ON(1) ON(2) ON(3) ELNVT ELMAX RLNT) SEL  
0.0000 0.0000 0.0000 605.0 710.0 4000. 0.00300

CROSS SECTION COORDINATES--STA=ELEV,STA=ELEV--ETC  
100.00 710.00 100.00 700.00 150.00 690.00 475.00 605.00 525.00 605.00  
850.00 690.00 970.00 700.00 925.00 710.00

|         |          |          |          |          |          |          |           |           |           |
|---------|----------|----------|----------|----------|----------|----------|-----------|-----------|-----------|
| STORAGE | 0.00     | 100.20   | 614.21   | 1277.77  | 2174.47  | 3155.90  | 4150.29   | 5157.39   | 6177.29   |
|         | 2255.40  | 9313.70  | 10304.35 | 11405.22 | 12556.13 | 13657.11 | 14768.13  | 1589.21   | 17020.35  |
| OUTLET  | 70350.27 | 315.21   | 1543.42  | 411.47   | 802.70   | 15975.29 | 25051.13  | 35713.49  | 47865.05  |
|         |          | 22591.11 | 11017.9  | 12087.3  | 14000.70 | 16994.60 | 192250.75 | 215765.19 | 240128.51 |
| STAGE   | 685.00   | 606.32   | 607.63   | 608.90   | 690.20   | 691.50   | 692.89    | 694.21    | 695.53    |
|         | 677.10   | 659.47   | 700.79   | 702.1    | 713.42   | 714.74   | 706.05    | 707.37    | 708.68    |
| ELV.    | 0.00     | 315.21   | 1543.42  | 411.47   | 802.70   | 15975.29 | 25051.13  | 35713.49  | 47865.05  |
|         | 70350.27 | 22591.11 | 11017.9  | 12087.3  | 14000.70 | 16994.60 | 192250.75 | 215765.19 | 240128.51 |

MAXIMUM STAGE IS 685.5

MAXIMUM STAGE IS 689.7  
 MAXIMUM STAGE IS 690.2  
 MAXIMUM STAGE IS 690.6  
 MAXIMUM STAGE IS 691.2  
 MAXIMUM STAGE IS 691.8

\*\*\*\*\* SUB-AREA RUNOFF COMPLETION \*\*\*\*\*

SUB AREA 4 RUNOFF  
 ISTAQ 4 ICCPF C IECON 0 ITAPE 0 JPLT 0 JERT 0 INAPE 1 ISTAGE C IAUTO 0

IMYDS 1 IUNO C TAREA 17.37 SHAF 0.00 TRSDA 152.10 G.00 RATIO 0.000 ISNOW 0 ISAME 1 LOCAL 1

PRECIP DATA  
 SFC 10 R12 R24 R48 R72 R96  
 0.00 15.50 35.00 97.00 135.00 145.00 0.00 0.00

TRSPC COMPUTED BY THE PROGRAM IS 0.877

LOSS DATA  
 LROFT STKRP 0.00 DLTRK 1.00 RTICL 1.00 ERAIN 0.00 STRKS 0.00 RTIOK 1.00 STRIL 1.00 CNSTL 0.10 ALSPX 0.00 RTIMP 0.00

UNIT HYDROGRAPH DATA  
 IC= 0.73 RE 0.73 RTA= C

RECESSION DATA  
 STRIM= 34.00 CRCSH= 34.00 RTION= 1.00

UNIT HYDROGRAPH 51 END-OF-PERIOD COORDINATES LACE 7.98 HOURS CP= C.57 VOL= 1.00  
 33. 124. 250. 395. 547. 700. 815. 862. 736.  
 650. 585. 522. 465. 415. 370. 330. 294. 234.  
 200. 166. 140. 117. 105. 93. 83. 74.  
 60. 59. 47. 42. 37. 30. 26. 24.  
 21. 17. 15. 13. 12. 11. 8. 7.

0  
 A. DR PERIOD RAIN EXCS LOSS END-OF-PERIOD FLOW A. DR PERIOD RAIN EXCS LOSS COMP 0

SUP 19.46 15.70 3.76 178062.  
( 494.)( 359.)( 95.)( 5042.15)

\*\*\*\*\*

SUB-AREA RUN-OFF COMPLETION

SUB AREA 5 RUNOFF  
ISTAG 5 ICOMP C IECON 0 ITAPE 0 JFLT 0 JPRI INAME ISTAGE IAUTO 0

HYDROGRAPH DATA  
IHYDG 1 IAREA 19.65 SNAF C.00 TRSFC 0.00 RATIO 0.000 ISNOW 0 ISAME 1 LOCAL 0

PRECIP DATA  
SFEET FMS PG R1C P24 R48 R72 R96  
C.00 15.50 15.00 97.00 15.00 121.00 C.00 C.00

TRSPC COMPUTED BY THE PROGRAM IS 0.877

LOSS DATA  
LROPT STRKE DLTRK PTIOL ERAIN STRKS RTIOK STRTL CNSTL ALSMX RTIIF  
C.00 C.00 1.00 C.00 C.00 1.00 1.00 C.00 C.00 0.00 0.00

UNIT HYDROGRAPH DATA  
TC= 10.10 R= 10.10 NTA= C

RECESSION DATA  
STRKE= 40.00 UNCSNE 40.00 RTIOK= 1.00

UNIT HYDROGRAPH BY END-OF-PERIOD ORDINATES, LAGE 9.22 HOURS, CP= 0.57 VOL= 1.00  
40. 98. 240. 312. 445. 571. 677. 752. 794.  
154. 685. 619. 500. 400. 416. 377. 341. 309.  
200. 254. 200. 100. 171. 155. 140. 127. 115.  
104. 94. 77. 60. 65. 57. 52. 47. 43.  
59. 52. 29. 24. 21. 19. 17. 16.  
14. 12. 11. 10. 9. 8. 7. 6.

END-OF-PERIOD FLOW  
M.00 DA HR. MN PERIOD MAIN EXCS LOSS COMP G FU. DA HR. MN PERIOD RAIN EXCS LOSS COMP G  
SUM 19.46 15.70 3.76 200619.  
( 494.)( 359.)( 95.)( 5042.15)

\*\*\*\*\*

COMPLETE HYDROGRAPHS

COMPLETE HYDROGRAPHS 21 5

ISTAG 3 ICMP 3 IECON 0 IIAPE 0 JFLT 0 JFRT 0 INAME 1 IASTAGE 0 IAUTO 0

\*\*\*\*\*

HYDROGRAPH ROUTING

CHANNEL ROUTE TO AREA 7

ISTAG 4 ICMP 1 IECON 0 IIAPE 0 JFLT 0 JFRT 0 INAME 1 IASTAGE 0 IAUTO 0  
 ROUTING DATA  
 QLOSS 0.0 CLOSS 0.000 AVG 0.000 IRES 1 ISAVE 1 IOFT 0 IFPP 0 LSTR 0  
 NSTFS 1 NSTOL 0 LAG 0 ANSKK 0 X TSK STORA ISFRAT 0

NORMAL DEPTH CHANNEL ROUTING

MAX(1) 64(2) 64(3) ELMT ELMT ELMT SEL  
 675.15 1073.25 1300.75 1555.95 1837.14 2126.20 2419.15 2715.99 3016.73

CROSS SECTION COORDINATES--STA/ELEV/STAGE--ETC  
 100.00 720.00 150.00 710.00 375.00 700.00 450.00 685.00 510.00 685.00  
 1000.00 700.00 1500.00 710.00 1550.00 720.00

|         |          |         |         |         |         |          |          |          |          |
|---------|----------|---------|---------|---------|---------|----------|----------|----------|----------|
| STORAGE | 675.15   | 1073.25 | 1300.75 | 1555.95 | 1837.14 | 2126.20  | 2419.15  | 2715.99  | 3016.73  |
| OUTFLOW | 61577.06 | 311.07  | 1290.71 | 3170.43 | 6130.01 | 10312.39 | 16082.39 | 23401.45 | 32496.41 |
| STAGE   | 675.15   | 675.15  | 675.15  | 675.15  | 675.15  | 675.15   | 675.15   | 675.15   | 675.15   |
| FLOW    | 61577.06 | 311.07  | 1290.71 | 3170.43 | 6130.01 | 10312.39 | 16082.39 | 23401.45 | 32496.41 |

MAXIMUM STAGE IS 675.15  
 MAXIMUM STAGE IS 675.15  
 MAXIMUM STAGE IS 675.15  
 MAXIMUM STAGE IS 675.15

MAXIMUM STAGE IS 699.4

MAXIMUM STAGE IS 700.7

\*\*\*\*\* SUB-AREA RUNOFF COMPIATION \*\*\*\*\*

SUB AREA 6 PUNOFF

ISTAG 0 ICOMP 0 IECON 0 ITAPE 0 JFLT 0 JFRT 0 INAME 1 I-UTO 0

INVL 1 TAREA 3.16 SNAF 0.00 TRSDA 152.10 RATIO 0.000 ISNO 0 ISAME 1 LOCAL 0

HYDROGRAPH DATA

SPFE 0.00 PWS 16.50 R12 624 R48 R72 R96  
C.00 16.50 85.00 97.00 105.00 120.00 0.00 0.00

TRSPC COMPUTED BY THE PROGRAM IS 0.077

LOSS DATA

EMPT STARR 0.00 RTICL 1.00 STRKE 0.00 RTIOW 1.00 STRTL 1.00 CISTL 0.10 ALSPX 0.00 RTIMP 0.00

UNIT HYDROGRAPH DATA

TC= 0.14 R= 0.14 RTA= 0

RECESSION DATA

STPTG= 0.00 WRCSE= 0.00 RTIOW= 1.00

U IT HYDROGRAPH 36 END-OF-REPTED CORDATES, LATE 5.51 HOURS, CP= 0.57 VOL= 1.00  
14. 52. 104. 157. 210. 263. 316. 369. 422. 475. 528. 581. 634. 687. 740. 793. 846. 899. 952. 1005. 1058. 1111. 1164. 1217. 1270. 1323. 1376. 1429. 1482. 1535. 1588. 1641. 1694. 1747. 1800. 1853. 1906. 1959. 2012. 2065. 2118. 2171. 2224. 2277. 2330. 2383. 2436. 2489. 2542. 2595. 2648. 2701. 2754. 2807. 2860. 2913. 2966. 3019. 3072. 3125. 3178. 3231. 3284. 3337. 3390. 3443. 3496. 3549. 3602. 3655. 3708. 3761. 3814. 3867. 3920. 3973. 4026. 4079. 4132. 4185. 4238. 4291. 4344. 4397. 4450. 4503. 4556. 4609. 4662. 4715. 4768. 4821. 4874. 4927. 4980. 5033. 5086. 5139. 5192. 5245. 5298. 5351. 5404. 5457. 5510. 5563. 5616. 5669. 5722. 5775. 5828. 5881. 5934. 5987. 6040. 6093. 6146. 6199. 6252. 6305. 6358. 6411. 6464. 6517. 6570. 6623. 6676. 6729. 6782. 6835. 6888. 6941. 6994. 7047. 7100. 7153. 7206. 7259. 7312. 7365. 7418. 7471. 7524. 7577. 7630. 7683. 7736. 7789. 7842. 7895. 7948. 8001. 8054. 8107. 8160. 8213. 8266. 8319. 8372. 8425. 8478. 8531. 8584. 8637. 8690. 8743. 8796. 8849. 8902. 8955. 9008. 9061. 9114. 9167. 9220. 9273. 9326. 9379. 9432. 9485. 9538. 9591. 9644. 9697. 9750. 9803. 9856. 9909. 9962. 10015. 10068. 10121. 10174. 10227. 10280. 10333. 10386. 10439. 10492. 10545. 10598. 10651. 10704. 10757. 10810. 10863. 10916. 10969. 11022. 11075. 11128. 11181. 11234. 11287. 11340. 11393. 11446. 11499. 11552. 11605. 11658. 11711. 11764. 11817. 11870. 11923. 11976. 12029. 12082. 12135. 12188. 12241. 12294. 12347. 12400. 12453. 12506. 12559. 12612. 12665. 12718. 12771. 12824. 12877. 12930. 12983. 13036. 13089. 13142. 13195. 13248. 13301. 13354. 13407. 13460. 13513. 13566. 13619. 13672. 13725. 13778. 13831. 13884. 13937. 13990. 14043. 14096. 14149. 14202. 14255. 14308. 14361. 14414. 14467. 14520. 14573. 14626. 14679. 14732. 14785. 14838. 14891. 14944. 14997. 15050. 15103. 15156. 15209. 15262. 15315. 15368. 15421. 15474. 15527. 15580. 15633. 15686. 15739. 15792. 15845. 15898. 15951. 16004. 16057. 16110. 16163. 16216. 16269. 16322. 16375. 16428. 16481. 16534. 16587. 16640. 16693. 16746. 16799. 16852. 16905. 16958. 17011. 17064. 17117. 17170. 17223. 17276. 17329. 17382. 17435. 17488. 17541. 17594. 17647. 17700. 17753. 17806. 17859. 17912. 17965. 18018. 18071. 18124. 18177. 18230. 18283. 18336. 18389. 18442. 18495. 18548. 18601. 18654. 18707. 18760. 18813. 18866. 18919. 18972. 19025. 19078. 19131. 19184. 19237. 19290. 19343. 19396. 19449. 19502. 19555. 19608. 19661. 19714. 19767. 19820. 19873. 19926. 19979. 20032. 20085. 20138. 20191. 20244. 20297. 20350. 20403. 20456. 20509. 20562. 20615. 20668. 20721. 20774. 20827. 20880. 20933. 20986. 21039. 21092. 21145. 21198. 21251. 21304. 21357. 21410. 21463. 21516. 21569. 21622. 21675. 21728. 21781. 21834. 21887. 21940. 21993. 22046. 22099. 22152. 22205. 22258. 22311. 22364. 22417. 22470. 22523. 22576. 22629. 22682. 22735. 22788. 22841. 22894. 22947. 23000. 23053. 23106. 23159. 23212. 23265. 23318. 23371. 23424. 23477. 23530. 23583. 23636. 23689. 23742. 23795. 23848. 23901. 23954. 24007. 24060. 24113. 24166. 24219. 24272. 24325. 24378. 24431. 24484. 24537. 24590. 24643. 24696. 24749. 24802. 24855. 24908. 24961. 25014. 25067. 25120. 25173. 25226. 25279. 25332. 25385. 25438. 25491. 25544. 25597. 25650. 25703. 25756. 25809. 25862. 25915. 25968. 26021. 26074. 26127. 26180. 26233. 26286. 26339. 26392. 26445. 26498. 26551. 26604. 26657. 26710. 26763. 26816. 26869. 26922. 26975. 27028. 27081. 27134. 27187. 27240. 27293. 27346. 27399. 27452. 27505. 27558. 27611. 27664. 27717. 27770. 27823. 27876. 27929. 27982. 28035. 28088. 28141. 28194. 28247. 28300. 28353. 28406. 28459. 28512. 28565. 28618. 28671. 28724. 28777. 28830. 28883. 28936. 28989. 29042. 29095. 29148. 29201. 29254. 29307. 29360. 29413. 29466. 29519. 29572. 29625. 29678. 29731. 29784. 29837. 29890. 29943. 29996. 30049. 30102. 30155. 30208. 30261. 30314. 30367. 30420. 30473. 30526. 30579. 30632. 30685. 30738. 30791. 30844. 30897. 30950. 31003. 31056. 31109. 31162. 31215. 31268. 31321. 31374. 31427. 31480. 31533. 31586. 31639. 31692. 31745. 31798. 31851. 31904. 31957. 32010. 32063. 32116. 32169. 32222. 32275. 32328. 32381. 32434. 32487. 32540. 32593. 32646. 32699. 32752. 32805. 32858. 32911. 32964. 33017. 33070. 33123. 33176. 33229. 33282. 33335. 33388. 33441. 33494. 33547. 33600. 33653. 33706. 33759. 33812. 33865. 33918. 33971. 34024. 34077. 34130. 34183. 34236. 34289. 34342. 34395. 34448. 34501. 34554. 34607. 34660. 34713. 34766. 34819. 34872. 34925. 34978. 35031. 35084. 35137. 35190. 35243. 35296. 35349. 35402. 35455. 35508. 35561. 35614. 35667. 35720. 35773. 35826. 35879. 35932. 35985. 36038. 36091. 36144. 36197. 36250. 36303. 36356. 36409. 36462. 36515. 36568. 36621. 36674. 36727. 36780. 36833. 36886. 36939. 36992. 37045. 37098. 37151. 37204. 37257. 37310. 37363. 37416. 37469. 37522. 37575. 37628. 37681. 37734. 37787. 37840. 37893. 37946. 38000. 38053. 38106. 38159. 38212. 38265. 38318. 38371. 38424. 38477. 38530. 38583. 38636. 38689. 38742. 38795. 38848. 38901. 38954. 39007. 39060. 39113. 39166. 39219. 39272. 39325. 39378. 39431. 39484. 39537. 39590. 39643. 39696. 39749. 39802. 39855. 39908. 39961. 40014. 40067. 40120. 40173. 40226. 40279. 40332. 40385. 40438. 40491. 40544. 40597. 40650. 40703. 40756. 40809. 40862. 40915. 40968. 41021. 41074. 41127. 41180. 41233. 41286. 41339. 41392. 41445. 41498. 41551. 41604. 41657. 41710. 41763. 41816. 41869. 41922. 41975. 42028. 42081. 42134. 42187. 42240. 42293. 42346. 42399. 42452. 42505. 42558. 42611. 42664. 42717. 42770. 42823. 42876. 42929. 42982. 43035. 43088. 43141. 43194. 43247. 43300. 43353. 43406. 43459. 43512. 43565. 43618. 43671. 43724. 43777. 43830. 43883. 43936. 43989. 44042. 44095. 44148. 44201. 44254. 44307. 44360. 44413. 44466. 44519. 44572. 44625. 44678. 44731. 44784. 44837. 44890. 44943. 44996. 45049. 45102. 45155. 45208. 45261. 45314. 45367. 45420. 45473. 45526. 45579. 45632. 45685. 45738. 45791. 45844. 45897. 45950. 46003. 46056. 46109. 46162. 46215. 46268. 46321. 46374. 46427. 46480. 46533. 46586. 46639. 46692. 46745. 46798. 46851. 46904. 46957. 47010. 47063. 47116. 47169. 47222. 47275. 47328. 47381. 47434. 47487. 47540. 47593. 47646. 47699. 47752. 47805. 47858. 47911. 47964. 48017. 48070. 48123. 48176. 48229. 48282. 48335. 48388. 48441. 48494. 48547. 48600. 48653. 48706. 48759. 48812. 48865. 48918. 48971. 49024. 49077. 49130. 49183. 49236. 49289. 49342. 49395. 49448. 49501. 49554. 49607. 49660. 49713. 49766. 49819. 49872. 49925. 49978. 50031. 50084. 50137. 50190. 50243. 50296. 50349. 50402. 50455. 50508. 50561. 50614. 50667. 50720. 50773. 50826. 50879. 50932. 50985. 51038. 51091. 51144. 51197. 51250. 51303. 51356. 51409. 51462. 51515. 51568. 51621. 51674. 51727. 51780. 51833. 51886. 51939. 51992. 52045. 52098. 52151. 52204. 52257. 52310. 52363. 52416. 52469. 52522. 52575. 52628. 52681. 52734. 52787. 52840. 52893. 52946. 53000. 53053. 53106. 53159. 53212. 53265. 53318. 53371. 53424. 53477. 53530. 53583. 53636. 53689. 53742. 53795. 53848. 53901. 53954. 54007. 54060. 54113. 54166. 54219. 54272. 54325. 54378. 54431. 54484. 54537. 54590. 54643. 54696. 54749. 54802. 54855. 54908. 54961. 55014. 55067. 55120. 55173. 55226. 55279. 55332. 55385. 55438. 55491. 55544. 55597. 55650. 55703. 55756. 55809. 55862. 55915. 55968. 56021. 56074. 56127. 56180. 56233. 56286. 56339. 56392. 56445. 56498. 56551. 56604. 56657. 56710. 56763. 56816. 56869. 56922. 56975. 57028. 57081. 57134. 57187. 57240. 57293. 57346. 57399. 57452. 57505. 57558. 57611. 57664. 57717. 57770. 57823. 57876. 57929. 57982. 58035. 58088. 58141. 58194. 58247. 58300. 58353. 58406. 58459. 58512. 58565. 58618. 58671. 58724. 58777. 58830. 58883. 58936. 58989. 59042. 59095. 59148. 59201. 59254. 59307. 59360. 59413. 59466. 59519. 59572. 59625. 59678. 59731. 59784. 59837. 59890. 59943. 60000. 60053. 60106. 60159. 60212. 60265. 60318. 60371. 60424. 60477. 60530. 60583. 60636. 60689. 60742. 60795. 60848. 60901. 60954. 61007. 61060. 61113. 61166. 61219. 61272. 61325. 61378. 61431. 61484. 61537. 61590. 61643. 61696. 61749. 61802. 61855. 61908. 61961. 62014. 62067. 62120. 62173. 62226. 62279. 62332. 62385. 62438. 62491. 62544. 62597. 62650. 62703. 62756. 62809. 62862. 62915. 62968. 63021. 63074. 63127. 63180. 63233. 63286. 63339. 63392. 63445. 63498. 63551. 63604. 63657. 63710. 63763. 63816. 63869. 63922. 63975. 64028. 64081. 64134. 64187. 64240. 64293. 64346. 64399. 64452. 64505. 64558. 64611. 64664. 64717. 64770. 64823. 64876. 64929. 64982. 65035. 65088. 65141. 65194. 65247. 65300. 65353. 65406. 65459. 65512. 65565. 65618. 65671. 65724. 65777. 65830. 65883. 65936. 65989. 66042. 66095. 66148. 66201. 66254. 66307. 66360. 66413. 66466. 66519. 66572. 66625. 66678. 66731. 66784. 66837. 66890. 66943. 66996. 67049. 67102. 67155. 67208. 67261. 67314. 67367. 67420. 67473. 67526. 67579. 67632. 67685. 67738. 67791. 67844. 67897. 67950. 68003. 68056. 68109. 68162. 68215. 68268. 68321. 68374. 68427. 68480. 68533. 68586. 68639. 68692. 68745. 68798. 68851. 68904. 68957. 69010. 69063. 69116. 69169. 69222. 69275. 69328. 69381. 69434. 69487. 69540. 69593. 69646. 69699. 69752. 69805. 69858. 69911. 69964. 70017. 70070. 70123. 70176. 70229. 70282. 70335. 70388. 70441. 70494. 70547. 70600. 70653. 70706. 70759. 70812. 70865. 70918. 70971. 71024. 71077. 71130. 71183. 71236. 71289. 71342. 71395. 71448. 71501. 71554. 71607. 71660. 71713. 71766. 71819. 71872. 71925. 71978. 72031. 72084. 72137. 72190. 72243. 72296. 72349. 72402. 72455. 72508. 72561. 72614. 72667. 72720. 72773. 72826. 72879. 72932. 72985. 73038. 73091. 73144. 73197. 73250. 73303. 73356. 73409. 73462. 73515. 73568. 73621. 73674. 73727. 73780. 73833. 73886. 73939. 73992. 74045. 74098. 74151. 74204. 74257. 74310. 74363. 74416. 74469. 74522. 74575. 74628. 74681. 74734. 74787. 74840. 74893. 74946. 75000. 75053. 75106. 75159. 75212. 75265. 75318. 75371. 75424. 75477. 75530. 75583. 75636. 75689. 75742. 75795. 75848. 75901. 75954. 76007. 76060. 76113. 76166. 76219. 76272. 76325. 76378. 76431. 76484. 76537. 76590. 76643. 76696. 76749. 76802. 76855. 76908. 76961. 77014. 77067. 77120. 77173. 77226. 77279. 77332. 77385. 77438. 77491. 77544. 77597. 77650. 77703. 77756. 77809. 77862. 77915. 77968. 78021. 78074. 78127. 78180. 78233. 78286. 78339. 78392. 78445. 78498. 78551. 78604. 78657. 78710. 78763. 78816. 78869. 78922. 78975. 79028. 79081. 79134. 79187. 79240. 79293. 79346. 79399. 79452. 79505. 79558. 79611. 79664. 79717. 79770. 79823. 79876. 79929. 79982. 80035. 80088. 80141. 80194. 80247. 80300. 80353. 80406. 80459. 80512. 80565. 80618. 80671. 80724. 80777. 80830. 80883. 80936. 80989. 81042. 81095. 81148. 81201. 81254. 81307. 81360. 81413. 81466. 81519. 81572. 81625. 81678. 81731. 81784. 81837. 81890. 81943. 81996. 82049. 82102. 82155. 82208. 82261. 82314. 82367. 82420. 82473. 82526. 82579. 82632. 82685. 82738. 82791. 82844. 82897. 82950. 83003. 83056. 83109. 83162. 83215. 83268. 83321. 83374. 83427. 83480. 83533. 83586. 83639. 83692. 83745. 83798. 83851. 83904. 83957. 84010. 84063. 84116. 84169. 84222. 84275. 84328. 84381. 84434. 84487. 84540. 84593. 84646. 84699. 84752. 84805. 84858. 84911. 84964. 85017. 85070. 85123. 85176. 85229. 85282. 85335. 85388. 85441. 85494. 85547. 85600. 85653. 85706. 85759. 85812. 85865. 85918. 85971. 86024. 86077. 86130. 86183. 86236. 86289. 86342. 86395. 86448. 86501. 86554. 86607. 86660. 86713. 86766. 86819. 86872. 86925. 86978. 87031. 87084. 87137. 87190. 87243. 87296. 87349. 87402. 87455. 87508. 87561. 87614. 87667. 87720. 87773. 87826. 87879. 87932. 87985. 88038. 88091. 88144. 88197. 88250. 88303. 88356.

\*\*\*\*\*

4 2 U U U U U

\*\*\*\*\*

\*\*\*\*\*

\*\*\*\*\*

U L U

\*\*\*\*\*

HYDROGRAPH ROUTING

CHANNEL ROUTE THRU WEIR

ISTAG ICOMP 1

ROUTING DATA

IRIS ISAME 1

AVG 0.00

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

NORMAL DEPTH CHANNEL ROUTING

4 (1) UN(C) UN(C) FLWVT LKWA RLNTA SEL  
0.0000 0.0000 0.0000 595.0 620.0 4300. 0.00200

CROSS SECTION COORDINATES--STA/ELEV/STA/ELEV--ETC

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

|         |          |          |          |          |          |          |          |          |          |
|---------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| STORAGE | 0.00     | 141.64   | 307.60   | 497.21   | 711.02   | 953.33   | 1226.35  | 1530.22  | 1864.80  |
|         | 2640.25  | 3053.09  | 3522.04  | 4079.81  | 4731.72  | 5477.54  | 6317.32  | 7251.10  | 8278.86  |
| OUTFLOW | 19331.73 | 271.95   | 916.42   | 1835.00  | 3126.81  | 4924.60  | 7177.90  | 9500.19  | 12466.04 |
|         | 0.00     | 23334.71 | 27554.00 | 32345.10 | 37663.59 | 43579.75 | 50135.20 | 57744.62 | 65337.88 |
| STAGE   | 595.00   | 590.30   | 597.62   | 595.95   | 600.26   | 611.50   | 622.09   | 634.21   | 645.53   |
|         | 0.10     | 0.64     | 0.79     | 0.81     | 0.84     | 0.87     | 0.90     | 0.93     | 0.96     |
| FLOW    | 0.00     | 271.95   | 916.42   | 1835.00  | 3126.81  | 4924.60  | 7177.90  | 9500.19  | 12466.04 |
|         | 19331.73 | 23334.71 | 27554.00 | 32345.10 | 37663.59 | 43579.75 | 50135.20 | 57744.62 | 65337.88 |

MAXIMUM STAGE IS 0.96

MAXIMUM FLOW IS 0.00

MAXIMUM STAGE IS 0.96

MAXIMUM STAGE IS 0.96

MAXIMUM STAGE IS 0.96

MAXIMUM STAGE IS 0.96

MAXIMUM STAGE IS 0.96

MAXIMUM STAGE IS 0.96

\*\*\*\*\*

SUB-AREA 7 RUNOFF

ISTAG 7 ICONF IECON ITATE JILT JERT INAPE ISTAGE IAUTO  
0 0 0 0 0 0 0 0

INVEL IUPG IAREA TAREA SNAF TRSDA TRSDC RATIO ISNOW ISAME LOCAL  
1 0 17.05 0.00 152.10 0.00 0.00 0 1 0

PRECIP DATA  
R12 R24 R72 R96  
0.00 16.50 25.00 97.00 1.5.00 120.00 0.00 0.00

TRSDC COMPUTED BY THE PROGRAM IS 0.877

LOSS DATA

LRDPT STRK ULTR RTJOL ERAJ STAKS RTJOL STJLT CNSTL ALSPX RTIME  
0.00 0.00 1.00 0.00 0.00 0.00 1.00 1.00 0.10 0.00 0.0

UNIT HYDROGRAPH DATA  
TC= 0.55 DE= 0.55 RTIA= 0

RECESSION DATA

STRIG= 34.00 GRCSN= 34.00 RTIOF= 1.00

UNIT HYDROGRAPH 5. END-OF-PERIOD COORDINATES, LAL= 7.00 HOURS, CP= 0.50 VOL= 1.00  
34. 120. 250. 407. 541. 692. 779. 819. 859. 721.  
041. 570. 507. 451. 411. 357. 310. 263. 211. 224.  
100. 177. 140. 104. 111. 94. 88. 78. 69.  
42. 55. 40. 43. 34. 31. 27. 24. 21.  
17. 15. 13. 12. 11. 9. 7. 7.

END-OF-PERIOD FLOW  
M.D.A. M.D.A. PERIOD EXLS LOSS COMPE M.D.A. PERIOD RAIN EXCS LOSS COMPE  
SUM 14.40 15.70 3.70 174869.  
( 494.00 ) ( 599.00 ) ( 95.00 ) ( 4951.73 )

\*\*\*\*\*

SUB-AREA 8 RUNOFF

ISTAG 8 ICONF IECON ITATE JILT JERT INAPE ISTAGE IAUTO  
0 0 0 0 0 0 0 0

HYDROGRAPH DATA

| INVC | ISPC | TAREA | SNAP | TRSDA  | TRSPC | RATIO | ISNOW | ISAME | LOCAL |
|------|------|-------|------|--------|-------|-------|-------|-------|-------|
| 1    | 0.00 | 0.00  | 0.00 | 152.10 | 0.00  | 0.000 | 0     | 1     | 0     |

PRECIP DATA

| SPFL | PMS   | RC    | R12   | R24    | R48    | R72  | R96  |
|------|-------|-------|-------|--------|--------|------|------|
| 0.00 | 18.50 | 85.00 | 97.00 | 115.00 | 120.00 | 0.00 | 0.00 |

TRSPC COMPUTED BY THE PROGRAM IS 0.877

LOSS DATA

| LRPT | STRN | ALTR | RTIOL | ERAIN | STRS | RTIOL | SIRTL | CNSTL | ALSMX | RTIME |
|------|------|------|-------|-------|------|-------|-------|-------|-------|-------|
| 0.00 | 0.00 | 0.00 | 1.00  | 0.00  | 0.00 | 1.00  | 1.00  | 0.10  | 0.00  | 0.00  |

UNIT HYDROGRAPH DATA

TC= 6.54 R= 0.54 NTA= 0

RECESSION DATA

STRTG= 12.00 QRCSE= 12.00 RTIOR= 1.00

UNIT HYDROGRAPH 35 END-OF-PERIOD ORIGINATES LAG= 5.91 HOURS CP= 0.57 VOL= 1.00

| 43.  | 66.  | 171. | 262. | 334. | 372. | 343. | 321. | 275. | 236. |
|------|------|------|------|------|------|------|------|------|------|
| 203. | 174. | 149. | 128. | 110. | 94.  | 81.  | 69.  | 59.  | 51.  |
| 44.  | 38.  | 32.  | 28.  | 24.  | 20.  | 17.  | 15.  | 13.  | 11.  |
| 7.   | 7.   | 6.   | 5.   | 5.   | 4.   | 4.   | 3.   | 3.   | 3.   |

SUM 19.46 15.70 3.76 61564.  
( 494.)( 359.)( 95.)( 1743.30)

\*\*\*\*\*

COMBINE HYDROGRAPHS

COMBINE 3 HYDROGRAPHS AT 5

| ISTAG | ICMP | TECON | ITAFE | JFT | JFT | INAME | ISTAGE | IAUTO |
|-------|------|-------|-------|-----|-----|-------|--------|-------|
| 5     | 5    | 0     | 0     | 0   | 0   | 1     | 0      | 0     |

\*\*\*\*\*

HYDROGRAPH ROUTING

CHANGED ROUTE TOTAL AREA 0

| ISTAG | ICMP | IECON | ITAFE | JFT | JFT | INAME | ISTAGE | IAUTO |
|-------|------|-------|-------|-----|-----|-------|--------|-------|
| 6     | 1    | 0     | 0     | 0   | 0   | 1     | 0      | 0     |

ROUTING DATA

| GLSS | CLASS | AVG  | IRCS | ISAME | IUFT | IFPF | LSTR |
|------|-------|------|------|-------|------|------|------|
| 0.00 | 0.00  | 0.00 | 1    | 1     | 0    | 0    | 0    |

| NSIT | NSUL | LAB | AMSK  | X     | ISK   | STCR | ASPRAT |
|------|------|-----|-------|-------|-------|------|--------|
| 1    | C    | J   | 0.000 | 0.000 | 0.000 | -1.  | 0      |

| QN(1)  | QN(2)  | QN(3)  | ELNVT | ELMAX | RLNTH  | SEL     |
|--------|--------|--------|-------|-------|--------|---------|
| 0.0800 | 0.0400 | 0.0000 | 505.0 | 600.0 | 44750. | 0.00070 |

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

| USS SECTION COORDINATES---STA,ELEV,STA,ELEV---ETC |       |         |       |
|---------------------------------------------------|-------|---------|-------|
| 100.00                                            | 60.00 | 200.00  | 50.00 |
| 200.00                                            | 50.00 | 300.00  | 40.00 |
| 300.00                                            | 40.00 | 400.00  | 30.00 |
| 400.00                                            | 30.00 | 500.00  | 20.00 |
| 500.00                                            | 20.00 | 600.00  | 10.00 |
| 600.00                                            | 10.00 | 700.00  | 0.00  |
| 700.00                                            | 0.00  | 800.00  | 0.00  |
| 800.00                                            | 0.00  | 900.00  | 0.00  |
| 900.00                                            | 0.00  | 1000.00 | 0.00  |

| STORAGE | 0.00     | 407.52   | 873.14   | 1396.85  | 1978.06  | 2618.57  | 3316.58   | 4172.68   | 4886.88   |
|---------|----------|----------|----------|----------|----------|----------|-----------|-----------|-----------|
|         | 6769.61  | 7725.47  | 8811.06  | 9966.37  | 11185.79 | 12468.36 | 13745.21  | 15182.34  | 16617.77  |
| OUTFLOW | 0.00     | 560.74   | 1836.22  | 3730.04  | 6232.67  | 9355.65  | 13119.19  | 17547.56  | 22667.09  |
|         | 37141.91 | 45640.11 | 54939.71 | 65048.55 | 75992.66 | 87774.97 | 100367.95 | 113772.08 | 127989.44 |
| STAGE   | 565.00   | 566.84   | 568.68   | 570.53   | 572.37   | 574.21   | 576.05    | 577.89    | 579.74    |
|         | 583.42   | 585.26   | 587.10   | 588.95   | 590.79   | 592.63   | 594.47    | 596.31    | 598.16    |
| FLOW    | 0.00     | 560.74   | 1836.22  | 3730.04  | 6232.67  | 9355.65  | 13119.19  | 17547.56  | 22667.09  |
|         | 37141.91 | 45640.11 | 54939.71 | 65048.55 | 75992.66 | 87774.97 | 100367.95 | 113772.08 | 127989.44 |

MAXIMUM STAGE IS 573.9

MAXIMUM STAGE IS 570.4

MAXIMUM STAGE IS 580.1

MAXIMUM STAGE IS 581.0

MAXIMUM STAGE IS 564-1

MAXIMUM STAGE IS 300.2

[illegible]

## SUB-AREA RUJCFF COMPLETION

| SUE AREA & RUNOFF |       |       |      |        |       |        |         |  |  |
|-------------------|-------|-------|------|--------|-------|--------|---------|--|--|
| IMYD              | IUNB  | TAREA | SNAP | TRSC4  | TRSF3 | PRECIP | DATA    |  |  |
| 1                 | C     | 11.70 | 0.00 | 152.10 | 0.00  |        |         |  |  |
| HYDROGRAPH DATA   |       |       |      |        |       |        |         |  |  |
| ICOPP             | FECON | ITAFE | JFLT | JFRT   | INAME | ISTAGE | 1. AUTO |  |  |
| C                 | U     | U     | U    | U      | 1     | C      | 0       |  |  |
| RATIG             |       |       |      |        |       |        |         |  |  |
| ISNUM             |       |       |      |        |       |        |         |  |  |
| ISAME             |       |       |      |        |       |        |         |  |  |
| LOCAL             |       |       |      |        |       |        |         |  |  |
| 1                 |       |       |      |        |       |        |         |  |  |
| 0                 |       |       |      |        |       |        |         |  |  |

SPFE PMS R6 R12 R24 R48 R72 R96  
 0.00 18.50 85.00 97.00 105.00 120.00 0.00 C.00

TRSPC COMPUTED BY THE PROGRAM IS 0.877

LOSS DATA  
 LPROPT STKR DLTKR RTIOL ERAIN STRKS RTIOL STRTL CNSTL ALSMX RTIMP  
 C 0.00 0.00 1.00 1.00 C.00 0.00 1.00 1.00 0.10 C.00 0.00

UNIT HYDROGRAPH DATA  
 TC= 8.77 R= 8.77 NTA= C

RECESSION DATA  
 STRTQ= 24.00 GRCSN= 24.00 RTIOR= 1.00

UNIT HYDROGRAPH 52 END-OF-PERIOD ORDINATES, LAG= 8.01 HOURS, CP= 0.57 VOL= 1.00  
 22. 82. 167. 263. 364. 453. 514. 546. 539. 496.  
 442. 395. 352. 314. 280. 250. 223. 199. 172. 158.  
 141. 126. 112. 100. 89. 80. 71. 64. 57. 51.  
 45. 40. 36. 32. 29. 25. 23. 20. 18. 16.  
 14. 13. 11. 10. 9. 8. 7. 6. 6. 5.  
 4. 5.

MO.DA HR.MN PERIOD RAIN EXCS LOSS COMP Q MO.DA HR.MN PERIOD RAIN EXCS LOSS COMP Q  
 0 19.46 15.70 3.76 120050.  
 ( 494. ) ( 359. ) ( 95. ) ( 3399.43 )

\*\*\*\*\*

# SUB-AREA RUNOFF COMPUTATION

SUB AREA 10 RUNOFF  
 ISTAQ 10 ICCMP IECON ITAFE JPLT JPRT INAME ISTAGE IAUTO  
 10 0 0 0 0 0 0 0 0

HYDROGRAPH DATA  
 INYDG IUPG TAREA SNAF TRSDA TRSPC RATIO ISNOW ISAME LOCAL  
 1 0 13.90 0.00 152.10 0.00 0.000 0 1 0

PRECIP DATA  
 SPFE PMS R6 R12 R24 R48 R72 R96  
 0.00 18.50 85.00 97.00 105.00 120.00 0.00 C.00

TRSPC COMPUTED BY THE PROGRAM IS 0.877

LOSS DATA  
 LPROPT STKR DLTKR RTIOL ERAIN STRKS RTIOL STRTL CNSTL ALSMX RTIMP  
 C 0.00 0.00 1.00 1.00 C.00 0.00 1.00 1.00 0.10 C.00 0.00

UNIT HYDROGRAPH DATA

۲

21 HCLIPS - CP= 0 58 VOL - 1 00

◆◆◆◆◆

COMBINE HYDROGRAPHS

•  
•  
•  
•  
•  
•  
•  
•  
•

## HYDROGRAPH ROUTING

# NORMAL DEPTH CHANNEL ROUTING

64. (1) 34(2) PN(2) FIMVT FIMEX RINTA

|         | 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     |          |          |          |          |          |          |          |           |
|---------|------|--------|--------|---------|---------|---------|---------|---------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
| STORAGE | 0.00 | 28.37  | 72.86  | 133.53  | 210.32  | 303.25  | 412.33  | 537.55  | 677.09   | 826.87   | 986.90   | 1157.18  | 1337.71  | 1528.49  | 1729.52  | 1940.80  | 2162.33  | 2394.11  | 2636.14  | 2888.42  | 3150.95  | 3423.73  | 3706.76  | 3999.94  | 4303.27  | 4616.75  | 4940.38  | 5274.16  | 5618.09  | 5972.17  | 6336.40  | 6710.78  | 7095.31  | 7489.99  | 7894.82  | 8309.80  | 8734.93  | 9170.21  | 9615.64  | 10071.22 | 10536.95 | 11012.83 | 11498.86 | 11995.04 | 12501.37 | 13017.85 | 13544.48 | 14081.26 | 14628.19 | 15185.27 | 15752.50 | 16329.88 | 16917.41 | 17515.09 | 18122.92 | 18740.90 | 19369.04 | 20007.34 | 20655.80 | 21314.42 | 21983.20 | 22662.14 | 23351.24 | 24050.50 | 24760.02 | 25479.80 | 26209.94 | 26950.44 | 27701.30 | 28462.52 | 29234.10 | 30016.04 | 30808.34 | 31611.00 | 32424.02 | 33247.40 | 34081.14 | 34925.24 | 35779.70 | 36644.52 | 37519.70 | 38405.24 | 39301.14 | 40207.40 | 41124.02 | 42051.00 | 42988.34 | 43936.04 | 44894.10 | 45862.52 | 46841.30 | 47830.44 | 48829.94 | 49839.80 | 50850.02 | 51870.60 | 52891.64 | 53923.14 | 54965.10 | 56017.52 | 57080.40 | 58153.74 | 59237.54 | 60331.80 | 61436.52 | 62551.70 | 63677.44 | 64813.74 | 65960.60 | 67118.02 | 68286.00 | 69464.54 | 70653.64 | 71853.30 | 73063.52 | 74284.30 | 75515.64 | 76757.54 | 78009.90 | 79282.82 | 80566.30 | 81860.34 | 83164.94 | 84479.10 | 85802.82 | 87136.10 | 88479.94 | 89834.34 | 91199.30 | 92574.82 | 93960.94 | 95357.66 | 96764.98 | 98182.90 | 99611.42 | 100000.00 |
| OUTFLOW | 0.00 | 156.92 | 592.05 | 1350.75 | 2517.03 | 4124.25 | 6234.65 | 8699.94 | 12013.69 | 15177.03 | 18199.94 | 21082.33 | 23824.17 | 26425.56 | 28896.50 | 31237.00 | 33447.04 | 35526.64 | 37475.80 | 39294.52 | 40982.80 | 42550.64 | 44008.04 | 45354.99 | 46591.50 | 47717.59 | 48733.17 | 49638.24 | 50432.80 | 51116.85 | 51690.39 | 52153.43 | 52505.97 | 52747.00 | 52876.52 | 52894.54 | 52800.06 | 52592.08 | 52269.50 | 51832.32 | 51280.54 | 50624.16 | 49863.18 | 49007.60 | 48057.42 | 47012.64 | 45873.26 | 44639.28 | 43310.70 | 41887.52 | 40369.74 | 38757.36 | 37050.28 | 35248.50 | 33352.02 | 31360.74 | 29274.66 | 27093.78 | 24818.10 | 22447.62 | 20082.34 | 17722.26 | 15367.38 | 13017.70 | 10673.22 | 8333.94  |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |           |

|         |          |       |
|---------|----------|-------|
| MAXIMUM | STAGE 1S | 526.4 |
| MAXIMUM | STAGE 1S | 522.5 |
| MAXIMUM | STAGE 1S | 523.4 |
| MAXIMUM | STAGE 1S | 524.3 |
| MAXIMUM | STAGE 1S | 525.7 |
| MAXIMUM | STAGE 1S | 527.0 |

[illegible]

## SUB-AREA RUNOFF COMPUTATION

[illegible]

| PRECIP DATA |       |
|-------------|-------|
| R1          | R24   |
| 97.11       | 15.00 |

TRANSPOSE COMPUTED BY THE PROGRAM IS C-277

| LCROFT | STKR | DLTF | RTGL | ERAIN | STKS | RTIUK | STRTL | CNSTL | ALSMX | RTIME |
|--------|------|------|------|-------|------|-------|-------|-------|-------|-------|
| 0      | 1.00 | 1.00 | 1.00 | 0.00  | 0.00 | 1.00  | 1.00  | 0.10  | 0.00  | 0.10  |

UNIT FILED: 2.60 R= 2.60 CIA= C

```

UNIT HYDROGRAPH 16 END-OF-PERIOD OPERATES, LAG= 2.58 HOURS, CP= 0.58 VOL= 1.00
124. 557. 404. 468. 325. 225. 156. 108. 75. 52.
36. 25. 12. 8. 6.

RECESSION DATA
STRID= 8.00 QRCN= 6.00 RTIOK= 1.00

END-OF-PERIOD FLOW
MU.DA HR.MN PERIOD RAIN EXCS LOSS COMP Q MU.DA HR.MN PERIOD RAIN EXCS LOSS COMP Q
SUM 19.46 15.70 3.76 41534.
( 494. )( 359. )( 95. )( 1176.11)

```

[illegible]

COMBINE HYDROGRAPHS

| COMBINE 2 HYDROGRAPHS AT 7 |       |       |       |      |      |       |        |       |  |
|----------------------------|-------|-------|-------|------|------|-------|--------|-------|--|
| ISTAQ                      | ICCNF | IECON | ITAFE | JPLT | JFRT | INAME | ISTAGE | IAUTO |  |
| 7                          | 2     | 0     | 0     | 0    | 0    | 1     | 0      | 0     |  |

[illegible]

## HYDROGRAPH ROUTING

| ROUTE OVER DAM NO 2 (VIC ANTIERP) |       |       |       |      |      |       |        |       |  |
|-----------------------------------|-------|-------|-------|------|------|-------|--------|-------|--|
| ISTAQ                             | ICAMP | IECON | ITAPE | JPLT | JFRT | INAME | ISTAGE | IAUTO |  |
| 7                                 | 1     | 0     | 0     | 0    | 0    | 1     | 0      | 0     |  |

| ROUTING DATA |       |      |      |      |     |      |      |
|--------------|-------|------|------|------|-----|------|------|
| QLOSS        | CLOSS | AUC  | TRES | ISAE | IOT | IFMP | LSTR |
| 0.6          | 0.000 | 0.00 | 1    | 1    | 0   | 0    | 0    |

|        |        |     |       |       |       |       |        |
|--------|--------|-----|-------|-------|-------|-------|--------|
| INSTPS | INSTDL | LAG | AMSKK | X     | ISK   | STCRA | ISFRAT |
| 1      | 0      | 0   | 0.000 | 0.000 | 0.000 | -514. | 0      |

|            |      |      |      |      |      |      |      |       |
|------------|------|------|------|------|------|------|------|-------|
| CAPACITY=  | 0.   | 10.  | 30.  | 70.  | 140. | 240. | 610. | 1120. |
| ELEVATION= | 505. | 510. | 514. | 514. | 515. | 520. | 525. | 530.  |

| CHNL  | SPWID | CUGW | EXPW | ELEV | CUCL | CAREA | EXPL |
|-------|-------|------|------|------|------|-------|------|
| 514.0 | 142.0 | 5.2  | 1.5  | 6.0  | 0.0  | 0.0   | 0.0  |

| LAW DATA |      |         |
|----------|------|---------|
| TOTEL    | C.WD | EXPD    |
| 515.0    | 4.6  | 1.5     |
|          |      | DAM. ID |
|          |      | 100.    |

PEAK OUTPUT IS 11164. AT TIME 50.00 HOURS

PEAK OUTFLOW IS 20000. AT TIME 51.00 HOURS  
 PEAK OUTFLOW IS 30096. AT TIME 51.00 HOURS  
 PEAK OUTFLOW IS 36713. AT TIME 51.00 HOURS  
 PEAK OUTFLOW IS 45872. AT TIME 50.00 HOURS  
 PEAK OUTFLOW IS 62799. AT TIME 50.00 HOURS

\*\*\*\*\*

# SUB AREA 12 RUNOFF

ISTAT 12  
 ICOMP 0  
 IECON 0  
 IFAE 0  
 JPLT 0  
 JFRT 0  
 INAME 1  
 ISTAGE 0  
 IAUTO 0

INVDG 1  
 IUNG 0  
 TAREA 1.03  
 SNAP 0.00  
 TRSDA 152.10  
 RATIO 0.00  
 ISNOW 0  
 ISAME 1  
 LOCAL 0

PRECIP DATA  
 R12 0.00  
 R24 10.50  
 R48 25.00  
 R72 97.00  
 R96 105.00  
 R120 120.00

LOSS DATA  
 STRK 0.00  
 RTIOL 1.00  
 ERIN 0.00  
 STRKS 0.00  
 RTIOL 1.00  
 STRIL 1.00  
 CNSTL 0.10  
 ALSPX 0.00  
 RTIMP 0.00

UNIT HYDROGRAPH DATA  
 TC= 1.13  
 R= 1.1  
 NTA= 0

RECESION DATA  
 STRK= 2.00  
 GRCSH= 2.00  
 RTIOL= 1.00

UNIT HYDROGRAPH / END-OF-PERIOD ORDINATES, LAG= 1.07 HOURS, CP= 0.53 VOL= 1.00  
 193. 272. 119. 46. 10. 7. 3.

P.M.DA HR-MN PERIOD RAIN EXCS LUSS END-OF-PERIOD FLOW  
 CUMPG W.DA HR-MN PERIOD RAIN EXCS LOSS COMP G  
 SUM 19.46 15.70 3.76 10584.  
 ( 494.)( 359.)( 95.)( 299.71)

\*\*\*\*\*

COMBINE HYDROGRAPHS

COMBINE 2 HYDROGRAPHS AT 8  
 ISTAQ ICCPF 2  
 8

\*\*\*\*\*

\*\*\*\*\*

\*\*\*\*\*

\*\*\*\*\*

HYDROGRAPH ROUTING

ROUTE OVER DAM AT ANTIWERF

ISTAQ ICCPF IECON ITAFE JPLT JFRT INAPE ISTAGE IAUO  
 8 1 0 0 0 1 0 0

ROUTING DATA

QLOSS CLOSS AVG IRES ISAME IOIT IFMP LSTR  
 0.0 0.000 0.00 1 1 0 0

NSTPS NSTDL LAG AMSKK X TSK STORA ISPRAT  
 1 0 0 0.000 0.000 -490. -1

|            |        |        |         |         |         |          |          |          |
|------------|--------|--------|---------|---------|---------|----------|----------|----------|
| STAGE      | 490.30 | 495.00 | 497.00  | 500.00  | 502.00  | 503.50   | 505.00   | 510.00   |
| FLOW       | 0.00   | 700.00 | 1900.00 | 3500.00 | 6550.00 | 10000.00 | 13000.00 | 32000.00 |
| CAPACITY=  | 0.     | 90.    | 175.    | 265.    | 420.    | 560.     | 660.     | 1250.    |
| ELEVATION= | 490.   | 493.   | 495.    | 497.    | 500.    | 502.     | 504.     | 510.     |

| CREL  | SPRID | CCGW | EXFL | ELEV | CCGL | CAREA | EXFL |
|-------|-------|------|------|------|------|-------|------|
| 490.3 | 0.0   | 0.0  | 0.0  | 0.0  | 0.0  | 0.0   | 0.0  |

| DAM DATA |      |      |       |
|----------|------|------|-------|
| TOTEL    | CCGW | EXFL | DAMID |
| 491.1    | 2.0  | 1.5  | 0.    |

|                 |        |         |             |
|-----------------|--------|---------|-------------|
| PEAK OUTFLOW IS | 11130. | AT TIME | 52.00 HOURS |
| PEAK OUTFLOW IS | 25500. | AT TIME | 51.00 HOURS |
| PEAK OUTFLOW IS | 30036. | AT TIME | 51.00 HOURS |
| PEAK OUTFLOW IS | 30724. | AT TIME | 51.00 HOURS |
| PEAK OUTFLOW IS | 49797. | AT TIME | 51.00 HOURS |
| PEAK OUTFLOW IS | 62003. | AT TIME | 51.00 HOURS |

\*\*\*\*\*

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

RATIOS APPLIED TO FLOWS

| OPERATION     | STATION | AREA      | PLAN | RATIO 1   | RATIO 2   | RATIO 3   | RATIO 4   | RATIO 5   | RATIO 6    |
|---------------|---------|-----------|------|-----------|-----------|-----------|-----------|-----------|------------|
|               |         |           |      | 0.20      | 0.40      | 0.50      | 0.60      | 0.80      | 1.00       |
| HYDROGRAPH AT | 1       | 3.02      | 1    | 301.      | 602.      | 753.      | 904.      | 1205.     | 1506.      |
|               | (       | ( 6.82)   | (    | ( 8.53)   | ( 17.06)  | ( 21.52)  | ( 25.59)  | ( 34.12)  | ( 42.65)   |
| ROUTED TO     | 2       | 3.12      | 1    | 220.      | 422.      | 599.      | 730.      | 968.      | 1193.      |
|               | (       | ( 7.52)   | (    | ( 6.22)   | ( 13.57)  | ( 16.96)  | ( 20.68)  | ( 27.42)  | ( 33.76)   |
| HYDROGRAPH AT | 1       | 18.11     | 1    | 2450.     | 4900.     | 6125.     | 7351.     | 9801.     | 12251.     |
|               | (       | ( 46.90)  | (    | ( 69.38)  | ( 138.76) | ( 173.45) | ( 208.14) | ( 277.52) | ( 346.90)  |
| HYDROGRAPH AT | 3       | 11.03     | 1    | 1230.     | 2460.     | 3076.     | 3691.     | 4921.     | 6151.      |
|               | (       | ( 30.12)  | (    | ( 34.84)  | ( 69.67)  | ( 87.09)  | ( 104.51) | ( 139.34) | ( 174.18)  |
| 3 COMBINED    | 4       | 32.76     | 1    | 3705.     | 7450.     | 9325.     | 11204.    | 14965.    | 18734.     |
|               | (       | ( 84.85)  | (    | ( 104.91) | ( 210.95) | ( 264.04) | ( 317.26) | ( 423.75) | ( 530.48)  |
| ROUTED TO     | 5       | 32.76     | 1    | 5153.     | 6020.     | 8331.     | 10345.    | 14049.    | 17759.     |
|               | (       | ( 84.85)  | (    | ( 89.29)  | ( 187.47) | ( 255.90) | ( 292.95) | ( 397.83) | ( 502.87)  |
| HYDROGRAPH AT | 4       | 17.37     | 1    | 2170.     | 4340.     | 5424.     | 6509.     | 8679.     | 10849.     |
|               | (       | ( 44.99)  | (    | ( 61.44)  | ( 122.88) | ( 153.60) | ( 184.33) | ( 245.77) | ( 307.21)  |
| HYDROGRAPH AT | 5       | 19.65     | 1    | 2175.     | 4340.     | 5435.     | 6519.     | 8692.     | 10865.     |
|               | (       | ( 50.89)  | (    | ( 61.53)  | ( 123.07) | ( 153.83) | ( 184.60) | ( 246.13) | ( 307.66)  |
| 3 COMBINED    | 5       | 69.72     | 1    | 7226.     | 14453.    | 16771.    | 22929.    | 31028.    | 39133.     |
|               | (       | ( 180.73) | (    | ( 204.63) | ( 422.56) | ( 531.54) | ( 649.59) | ( 878.62) | ( 1108.11) |
| ROUTED TO     | 6       | 69.72     | 1    | 7245.     | 14514.    | 18722.    | 22839.    | 30954.    | 39082.     |
|               | (       | ( 180.73) | (    | ( 205.16) | ( 422.52) | ( 530.14) | ( 646.72) | ( 876.52) | ( 1106.49) |
| HYDROGRAPH AT | 6       | 5.16      | 1    | 523.      | 1045.     | 1306.     | 1568.     | 2090.     | 2613.      |
|               | (       | ( 8.18)   | (    | ( 14.70)  | ( 29.39)  | ( 36.99)  | ( 44.59)  | ( 59.19)  | ( 73.98)   |
| 2 COMBINED    | 4       | 72.94     | 1    | 7573.     | 15632.    | 19655.    | 23972.    | 32488.    | 41000.     |
|               | (       | ( 180.71) | (    | ( 214.44) | ( 442.65) | ( 550.56) | ( 676.00) | ( 919.97) | ( 1161.00) |
| ROUTED TO     | 5       | 72.94     | 1    | 7295.     | 15130.    | 19039.    | 23121.    | 31186.    | 39166.     |
|               | (       | ( 180.91) | (    | ( 200.50) | ( 420.42) | ( 529.12) | ( 656.41) | ( 883.10) | ( 1107.57) |

\*\*\*\*\*

\*\*\*\*\*

\*\*\*\*\*

\*\*\*\*\*

|               |    |         |   |         |           |           |            |            |            |
|---------------|----|---------|---|---------|-----------|-----------|------------|------------|------------|
| HYDROGRAPH AT | 7  | 17.05   | 1 | 2166.   | 4335.     | 5416.     | 6459.      | 8666.      | 10832.     |
|               | (  | 44.16)  | ( | 61.35)  | ( 122.70) | ( 153.37) | ( 184.04)  | ( 245.39)  | ( 306.74)  |
| HYDROGRAPH AT | 9  | 6.00    | 1 | 962.    | 1885.     | 2356.     | 2827.      | 3769.      | 4712.      |
|               | (  | 15.53)  | ( | 20.08)  | ( 55.37)  | ( 66.71)  | ( 80.65)   | ( 106.73)  | ( 133.42)  |
| 3 COMBINED    | 5  | 45.99   | 1 | 9717.   | 20127.    | 25355.    | 30749.     | 41452.     | 51944.     |
|               | (  | 240.01) | ( | 275.14) | ( 569.92) | ( 717.96) | ( 872.12)  | ( 1173.79) | ( 1472.29) |
| ROUTED TO     | 6  | 95.99   | 1 | 2878.   | 18865.    | 24015.    | 29337.     | 39888.     | 50256.     |
|               | (  | 248.61) | ( | 251.40) | ( 534.32) | ( 680.02) | ( 830.72)  | ( 1129.51) | ( 1423.10) |
| HYDROGRAPH AT | 8  | 11.70   | 1 | 1456.   | 2912.     | 3640.     | 4368.      | 5824.      | 7281.      |
|               | (  | 30.30)  | ( | 41.23)  | ( 62.46)  | ( 103.02) | ( 123.70)  | ( 164.93)  | ( 206.16)  |
| HYDROGRAPH AT | 10 | 13.90   | 1 | 1228.   | 2455.     | 3069.     | 3683.      | 4910.      | 6138.      |
|               | (  | 50.00)  | ( | 34.76)  | ( 69.52)  | ( 86.90)  | ( 104.28)  | ( 135.04)  | ( 173.80)  |
| 3 COMBINED    | 4  | 121.59  | 1 | 11117.  | 23511.    | 29844.    | 36562.     | 49630.     | 62434.     |
|               | (  | 314.91) | ( | 314.80) | ( 665.74) | ( 845.09) | ( 1035.32) | ( 1405.37) | ( 1767.93) |
| ROUTED TO     | 7  | 121.59  | 1 | 11094.  | 23509.    | 29884.    | 36448.     | 49466.     | 62315.     |
|               | (  | 314.91) | ( | 314.15) | ( 665.09) | ( 846.22) | ( 1032.08) | ( 1400.72) | ( 1764.56) |
| HYDROGRAPH AT | 11 | 4.05    | 1 | 1120.   | 2241.     | 2601.     | 3361.      | 4482.      | 5602.      |
|               | (  | 10.49)  | ( | 31.73)  | ( 63.45)  | ( 79.32)  | ( 95.18)   | ( 126.91)  | ( 158.63)  |
| 2 COMBINED    | 7  | 125.64  | 1 | 11147.  | 23601.    | 30075.    | 36676.     | 49901.     | 62859.     |
|               | (  | 325.40) | ( | 315.65) | ( 670.01) | ( 851.62) | ( 1038.56) | ( 1413.04) | ( 1779.96) |
| ROUTED TO     | 7  | 125.64  | 1 | 11164.  | 23600.    | 30096.    | 36713.     | 49876.     | 62799.     |
|               | (  | 325.40) | ( | 316.12) | ( 670.20) | ( 852.22) | ( 1039.60) | ( 1412.32) | ( 1778.26) |
| HYDROGRAPH AT | 12 | 1.05    | 1 | 423.    | 845.      | 1057.     | 1268.      | 1691.      | 2115.      |
|               | (  | 2.57)   | ( | 11.97)  | ( 23.94)  | ( 29.92)  | ( 35.91)   | ( 47.88)   | ( 59.85)   |
| 2 COMBINED    | 8  | 126.67  | 1 | 11164.  | 23670.    | 30098.    | 36716.     | 49882.     | 62806.     |
|               | (  | 328.07) | ( | 316.13) | ( 670.24) | ( 852.26) | ( 1039.68) | ( 1412.49) | ( 1778.48) |
| ROUTED TO     | 8  | 126.67  | 1 | 11156.  | 23587.    | 30036.    | 36729.     | 49797.     | 62615.     |
|               | (  | 328.07) | ( | 315.54) | ( 667.93) | ( 850.57) | ( 1040.05) | ( 1410.11) | ( 1772.72) |

PLAN 1 STATION 2

| RATIO | MAXIMUM   |           | MAXIMUM   |       | TIME  |       |
|-------|-----------|-----------|-----------|-------|-------|-------|
|       | FLOW, CFS | STAGE, FT | STAGE, FT | HOURS | HOURS | HOURS |
| 0.20  | 220.      | 826.6     | 826.6     | 55.00 | 55.00 | 55.00 |
| 0.40  | 472.      | 828.7     | 828.7     | 54.00 | 54.00 | 54.00 |
| 0.50  | 599.      | 829.5     | 829.5     | 53.00 | 53.00 | 53.00 |

|      |       |       |       |
|------|-------|-------|-------|
| C-60 | 730.  | 830.2 | 53.00 |
| C-80 | 908.  | 831.2 | 53.00 |
| 1.00 | 1153. | 831.9 | 54.00 |

PLAN 1 STATION 3

| RATIO | MAXIMUM<br>FLOW,CFS | MAXIMUM<br>STAGE,FT | TIME<br>HOURS |
|-------|---------------------|---------------------|---------------|
| C-20  | 3153.               | 686.5               | 50.00         |
| C-40  | 6620.               | 689.7               | 50.00         |
| C-50  | 8331.               | 690.2               | 50.00         |
| C-60  | 10345.              | 690.6               | 49.00         |
| C-80  | 14049.              | 691.2               | 49.00         |
| 1.00  | 17759.              | 691.8               | 49.00         |

PLAN 1 STATION 4

| RATIO | MAXIMUM<br>FLOW,CFS | MAXIMUM<br>STAGE,FT | TIME<br>HOURS |
|-------|---------------------|---------------------|---------------|
| C-20  | 7245.               | 692.8               | 49.00         |
| C-40  | 14914.              | 695.7               | 49.00         |
| C-50  | 18722.              | 696.7               | 49.00         |
| C-60  | 22839.              | 697.8               | 49.00         |
| C-80  | 30954.              | 699.4               | 48.00         |
| 1.00  | 39122.              | 700.7               | 46.00         |

PLAN 1 STATION 5

| RATIO | MAXIMUM<br>FLOW,CFS | MAXIMUM<br>STAGE,FT | TIME<br>HOURS |
|-------|---------------------|---------------------|---------------|
| C-20  | 7245.               | 603.0               | 50.00         |
| C-40  | 15130.              | 606.6               | 50.00         |
| C-50  | 19039.              | 608.1               | 50.00         |
| C-60  | 23181.              | 609.4               | 50.00         |
| C-80  | 31156.              | 611.8               | 50.00         |
| 1.00  | 39106.              | 613.7               | 50.00         |

PLAN 1 STATION 6

| RATIO | MAXIMUM<br>FLOW,CFS | MAXIMUM<br>STAGE,FT | TIME<br>HOURS |
|-------|---------------------|---------------------|---------------|
| C-20  | 8078.               | 573.9               | 52.00         |
| C-40  | 18669.              | 578.4               | 51.00         |
| C-50  | 24115.              | 580.1               | 51.00         |
| C-60  | 29337.              | 581.6               | 51.00         |
| C-80  | 39008.              | 584.0               | 50.00         |
| 1.00  | 50256.              | 586.2               | 50.00         |

| PLAN 1 |                   | STATION           |            | / |  |
|--------|-------------------|-------------------|------------|---|--|
| RATIO  | MAXIMUM FLOW, CFS | MAXIMUM STAGE, FT | TIME HOURS |   |  |
| 0.20   | 11094.            | 521.4             | 52.00      |   |  |
| 0.40   | 23509.            | 522.5             | 51.00      |   |  |
| 0.50   | 29004.            | 523.4             | 51.00      |   |  |
| 0.60   | 36448.            | 524.3             | 51.00      |   |  |
| 0.80   | 49400.            | 525.7             | 50.00      |   |  |
| 1.00   | 62315.            | 527.0             | 50.00      |   |  |

# SUMMARY OF DAM SAFETY ANALYSIS

| PLAN 1 ..... | RATIO OF PMF | ELEVATION STORAGE |         | INITIAL VALUE |         | SPILLWAY CREST |         | TOP OF DAM |         | DURATION OVER TOF HOURS | TIME OF MAX CUTFLOW HOURS |         | TIME OF FAILURE HOURS |
|--------------|--------------|-------------------|---------|---------------|---------|----------------|---------|------------|---------|-------------------------|---------------------------|---------|-----------------------|
|              |              | MAXIMUM           | MINIMUM | MAXIMUM       | MINIMUM | MAXIMUM        | MINIMUM | MAXIMUM    | MINIMUM |                         | MAXIMUM                   | MINIMUM |                       |
|              | 0.40         | 517.19            | 117     | 11164         | 62.00   | 514.00         | 50.     | 515.00     | 53.     | 62.00                   | 52.00                     | 0.00    | 0.00                  |
|              | 0.40         | 518.23            | 177     | 23668         | 69.00   | 50.            | 0.      | 51.00      | 51.00   | 69.00                   | 51.00                     | 0.00    | 0.00                  |
|              | 0.50         | 519.40            | 212     | 30096         | 72.00   | 50.            | 0.      | 51.00      | 51.00   | 72.00                   | 51.00                     | 0.00    | 0.00                  |
|              | 0.60         | 520.05            | 246     | 36713         | 73.00   | 50.            | 0.      | 51.00      | 51.00   | 73.00                   | 51.00                     | 0.00    | 0.00                  |
|              | 0.80         | 521.23            | 332     | 49876         | 73.00   | 50.            | 0.      | 50.00      | 50.00   | 73.00                   | 50.00                     | 0.00    | 0.00                  |
|              | 1.00         | 522.29            | 410     | 62799         | 74.00   | 50.            | 0.      | 50.00      | 50.00   | 74.00                   | 50.00                     | 0.00    | 0.00                  |

AD-A086 351

NEW YORK STATE DEPT OF ENVIRONMENTAL CONSERVATION ALBANY F/8 13/13  
NATIONAL DAM SAFETY PROGRAM. DAM NUMBER 2. INVENTORY NUMBER NY --ETC(11)  
FEB 80 J B STETSON DACW-51-79-C-0001

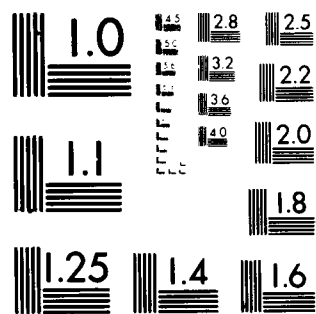
UNCLASSIFIED

NL

2 18 2

AL  
AD-6881

END  
DATE  
FILMED  
8-80  
DTIC



MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS-1963-A

# SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

| RATIO<br>OF<br>PMF | MAXIMUM<br>RESERVOIR<br>W.S.-ELEV | ELEVATION<br>STORAGE<br>OUTFLOW | INITIAL VALUE | SPILLWAY CREST | TOP OF DAM | DURATION<br>OVER TOP<br>HOURS | MAXIMUM<br>OUTFLOW<br>CFS | MAXIMUM<br>STORAGE<br>AC-FT | MAXIMUM<br>DEPTH<br>OVER DAM | TIME OF<br>MAX OUTFLOW<br>HOURS | TIME OF<br>FAILURE<br>HOURS |
|--------------------|-----------------------------------|---------------------------------|---------------|----------------|------------|-------------------------------|---------------------------|-----------------------------|------------------------------|---------------------------------|-----------------------------|
|                    |                                   |                                 |               |                |            |                               |                           |                             |                              |                                 |                             |
| 0.20               | 504.05                            |                                 | 490.30        | 490.30         | 491.10     | 68.00                         | 11136.                    | 699.                        | 12.56                        | 52.00                           | 0.00                        |
| 0.40               | 507.78                            |                                 | 0.            | 0.             | 27.        | 73.00                         | 23588.                    | 1035.                       | 16.68                        | 51.00                           | 0.00                        |
| 0.50               | 509.48                            |                                 | 0.            | 0.             | 207.       | 74.00                         | 30038.                    | 1199.                       | 18.38                        | 51.00                           | 0.00                        |
| 0.60               | 510.99                            |                                 |               |                |            | 74.00                         | 36729.                    | 1401.                       | 19.25                        | 51.00                           | 0.00                        |
| 0.80               | 513.74                            |                                 |               |                |            | 75.00                         | 49797.                    | 1820.                       | 22.64                        | 51.00                           | 0.00                        |
| 1.00               | 516.44                            |                                 |               |                |            | 88.00                         | 62603.                    | 2231.                       | 25.34                        | 51.00                           | 0.00                        |



[illegible]

[illegible]

| K1        | SUB AREA 10 RUNOFF | C     | 152.1 | C  | C     | 0  | 1   |
|-----------|--------------------|-------|-------|----|-------|----|-----|
| K1 (0115) | 1                  | 0     | 13.5  | C  | 152.1 | C  | 1   |
| K1 (0116) | 0                  | 18.5  | 25    | Y7 | 105   | 12 | 0   |
| K1 (0117) | 0                  | 0     | 0     | C  | 0     | 0  | 0.1 |
| K1 (0118) | 13.12              | 13.12 | 1     | 0  | 0     | 0  | 0   |
| K1 (0119) | 28                 | 28    | 1     | 0  | 0     | 0  | 0   |
| K1 (0120) | 3                  | 6     | 0     | 0  | 0     | 0  | 0   |
| K1 (0121) | 1                  | 7     | 0     | 0  | 0     | 0  | 0   |
| K1 (0122) | 1                  | 7     | 0     | 0  | 0     | 0  | 0   |
| K1 (0123) | 1                  | 7     | 0     | 0  | 0     | 0  | 0   |
| K1 (0124) | 1                  | 7     | 0     | 0  | 0     | 0  | 0   |
| K1 (0125) | 1                  | 7     | 0     | 0  | 0     | 0  | 0   |
| K1 (0126) | 1                  | 7     | 0     | 0  | 0     | 0  | 0   |
| K1 (0127) | 1                  | 7     | 0     | 0  | 0     | 0  | 0   |
| K1 (0128) | 1                  | 7     | 0     | 0  | 0     | 0  | 0   |
| K1 (0129) | 1                  | 7     | 0     | 0  | 0     | 0  | 0   |
| K1 (0130) | 1                  | 7     | 0     | 0  | 0     | 0  | 0   |
| K1 (0131) | 1                  | 7     | 0     | 0  | 0     | 0  | 0   |
| K1 (0132) | 1                  | 7     | 0     | 0  | 0     | 0  | 0   |
| K1 (0133) | 1                  | 7     | 0     | 0  | 0     | 0  | 0   |
| K1 (0134) | 1                  | 7     | 0     | 0  | 0     | 0  | 0   |
| K1 (0135) | 1                  | 7     | 0     | 0  | 0     | 0  | 0   |
| K1 (0136) | 1                  | 7     | 0     | 0  | 0     | 0  | 0   |
| K1 (0137) | 1                  | 7     | 0     | 0  | 0     | 0  | 0   |
| K1 (0138) | 1                  | 7     | 0     | 0  | 0     | 0  | 0   |
| K1 (0139) | 1                  | 7     | 0     | 0  | 0     | 0  | 0   |
| K1 (0140) | 1                  | 7     | 0     | 0  | 0     | 0  | 0   |
| K1 (0141) | 1                  | 7     | 0     | 0  | 0     | 0  | 0   |
| K1 (0142) | 1                  | 7     | 0     | 0  | 0     | 0  | 0   |
| K1 (0143) | 1                  | 7     | 0     | 0  | 0     | 0  | 0   |
| K1 (0144) | 1                  | 7     | 0     | 0  | 0     | 0  | 0   |
| K1 (0145) | 1                  | 7     | 0     | 0  | 0     | 0  | 0   |
| K1 (0146) | 1                  | 7     | 0     | 0  | 0     | 0  | 0   |
| K1 (0147) | 1                  | 7     | 0     | 0  | 0     | 0  | 0   |
| K1 (0148) | 1                  | 7     | 0     | 0  | 0     | 0  | 0   |
| K1 (0149) | 1                  | 7     | 0     | 0  | 0     | 0  | 0   |
| K1 (0150) | 1                  | 7     | 0     | 0  | 0     | 0  | 0   |
| K1 (0151) | 1                  | 7     | 0     | 0  | 0     | 0  | 0   |
| K1 (0152) | 1                  | 7     | 0     | 0  | 0     | 0  | 0   |



PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

|                          |    |
|--------------------------|----|
| RUNOFF HYDROGRAPH AT     | 1  |
| ROUTE HYDROGRAPH TO      | 2  |
| RUNOFF HYDROGRAPH AT     | 1  |
| RUNOFF HYDROGRAPH AT     | 3  |
| COMBINE 3 HYDROGRAPHS AT | 2  |
| ROUTE HYDROGRAPH TO      | 3  |
| RUNOFF HYDROGRAPH AT     | 4  |
| RUNOFF HYDROGRAPH AT     | 5  |
| COMBINE 5 HYDROGRAPHS AT | 3  |
| ROUTE HYDROGRAPH TO      | 4  |
| RUNOFF HYDROGRAPH AT     | 5  |
| COMBINE 2 HYDROGRAPHS AT | 4  |
| ROUTE HYDROGRAPH TO      | 5  |
| RUNOFF HYDROGRAPH AT     | 7  |
| RUNOFF HYDROGRAPH AT     | 9  |
| COMBINE 3 HYDROGRAPHS AT | 5  |
| ROUTE HYDROGRAPH TO      | 6  |
| RUNOFF HYDROGRAPH AT     | 8  |
| RUNOFF HYDROGRAPH AT     | 10 |
| COMBINE 5 HYDROGRAPHS AT | 6  |
| ROUTE HYDROGRAPH TO      | 7  |
| RUNOFF HYDROGRAPH AT     | 11 |
| COMBINE 2 HYDROGRAPHS AT | 7  |
| ROUTE HYDROGRAPH TO      | 7  |
| RUNOFF HYDROGRAPH AT     | 12 |
| COMBINE 2 HYDROGRAPHS AT | 8  |
| ROUTE HYDROGRAPH TO      | 8  |
| END OF NETWORK           |    |

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

RUN DATE? MED, NOV 14 1979  
 TIME? 15:26:24

DAM NO 2 (ANTHERP)  
 HEC-1DB  
 FMF-DAM BREAK ANALYSIS

| JOB SPECIFICATION |     |      |      |     |       |       |      |      |       |
|-------------------|-----|------|------|-----|-------|-------|------|------|-------|
| NO                | NFR | NMIN | IDAY | IHR | IMIN  | MEIRC | IFLT | IFRT | NSTAN |
| 91                | 1   | 0    | 0    | 0   | 0     | 0     | 0    | 4    | 0     |
| JOPER             |     |      |      | NWT | LEOPT | TRACE |      |      |       |
|                   |     |      |      | 5   | 0     | 0     |      |      |       |

MULTI-PLAN ANALYSES TO BE PERFORMED

PIICS= 0.20 0.40 0.50 0.60 0.80 1.00  
 NPLAN= 5 NRTIC= 6 LATIO= 1

\*\*\*\*\*

SUB-AREA RUNOFF COMPUTATION

| CLARK'S PARAMETERS |       |       |       |      |      |       |        |       |  |
|--------------------|-------|-------|-------|------|------|-------|--------|-------|--|
| ISTAQ              | ICRIP | IECON | ITRFE | JFLT | JFRT | INAME | ISTAGE | I:UTO |  |
| 1                  | 0     | 0     | 0     | 0    | 0    | 1     | 0      | 0     |  |

| HYDROGRAPH DATA |    |       |      |        |       |       |      |       |       |
|-----------------|----|-------|------|--------|-------|-------|------|-------|-------|
| IMYD            | ID | TAREA | SNAP | TRSDA  | TRSHC | FATT2 | ISN2 | ISAME | LOCAL |
| 1               | 1  | 3.00  | 0.00 | 152.10 | 0.10  | 0.000 | 0    | 1     | 0     |

PRECIP DATA

| SFFE | PMS   | R0    | R12   | R24    | R48    | R72  | R96  |
|------|-------|-------|-------|--------|--------|------|------|
| 0.00 | 10.50 | 15.00 | 27.00 | 115.00 | 140.00 | 0.50 | 0.00 |

TRSPC COMPUTED BY THE PROGRAM IS 0.877

LOSS DATA

| LPHOT | STKX | FLTRK | ATILL | ERAIN | STKRS | RTIOK | STWTL | CNSTL | ALSPX | RTIIF |
|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0     | 0.00 | 0.00  | 1.00  | 0.00  | 0.00  | 1.00  | 1.00  | 0.10  | 0.00  | 0.00  |

UNIT HYDROGRAPH DATA

TC= 11.29 R= 11.29 RTA= 0

STRIN= 6.00 RECESION DATA RTIOR= 1.00  
 UNIT HYDROGRAPH 67 END-OF-PERIOD ORDINATES, LAG= 10.38 HOURS, CP= 0.57 VOL= 1.00  
 3. 11. 23. 37. 52. 67. 82. 94. 103. 108.  
 10. 105. 97. 89. 81. 75. 68. 63. 57. 52.  
 4. 44. 40. 37. 34. 31. 28. 26. 24. 22.  
 20. 18. 17. 15. 14. 13. 12. 11. 10. 9.  
 8. 7. 6. 5. 4. 3. 2. 1. 0. 0.  
 3. 3. 3. 3. 2. 2. 2. 2. 2. 2.  
 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.

MC.DA HR.MN PERIOD RAIN EXCS LOSS COMP G MC.DA HR.MN PERIOD RAIN EXCS LOSS COMP G  
 SUM 19.46 15.70 3.76 30587.  
 ( 494.)( 359.)( 95.)( 866.13)

\*\*\*\*\*  
 CHANNEL ROUTE TARD AREA 2  
 INSTAG ICCP 1  
 IECOS ITAFE JPLT JFRT INAME ISTAGE I-UTO  
 0 0 0 0 1 0  
 ALL PLANS HAVE SAME  
 ROUTING DATA  
 GLOSS CLOSS AVG ILES ISAME IORT ICOMP LSTR  
 0.0 0.000 0.00 1 1 0 0  
 NSTPS NSTIL LAG ANSKK X TSK STORA ISFRAT  
 1 0 0 0.000 0.000 -1. 0

NORMAL DEPTH CHANNEL ROUTING

G(1) UN(2) UN(3) ELAVT ELMPX RLRTI SEL  
 0.000 0.040 0.080 822.0 850.0 40500. 0.00030  
 CROSS SECTION COORDINATES--STA+ELEV+STA+ELEV--ETC  
 100.00 850.00 300.00 840.00 300.00 850.00 400.00 840.00 400.00 850.00  
 450.00 850.00 875.00 840.00 1000.00 850.00  
 STORAGE 33.71 80.04 132.99 210.56 254.75 400.13 611.27 918.36

|         |         |         |         |         |         |          |          |          |          |
|---------|---------|---------|---------|---------|---------|----------|----------|----------|----------|
| OUTFLOW | 1832.44 | 2451.42 | 3100.30 | 3972.90 | 4844.21 | 5727.92  | 6785.30  | 7054.58  | 8989.11  |
|         | 0.00    | 26.73   | 93.57   | 202.72  | 359.23  | 568.38   | 872.87   | 1303.17  | 1873.91  |
| STAGE   | 3556.07 | 4719.23 | 6128.48 | 7876.05 | 9929.15 | 12269.26 | 14900.63 | 17829.64 | 21063.76 |
|         | 022.00  | 823.47  | 824.95  | 826.42  | 827.89  | 829.37   | 830.84   | 832.32   | 833.79   |
|         | 836.74  | 838.21  | 839.68  | 841.16  | 842.63  | 844.10   | 845.58   | 847.05   | 848.53   |
| FLOW    | 0.00    | 26.73   | 93.57   | 202.72  | 359.23  | 568.38   | 872.87   | 1303.17  | 1873.91  |
|         | 3556.07 | 4719.23 | 6128.48 | 7876.05 | 9929.15 | 12269.26 | 14900.63 | 17829.64 | 21063.76 |

MAXIMUM STAGE IS 026.6

MAXIMUM STAGE IS 028.7

MAXIMUM STAGE IS 029.5

MAXIMUM STAGE IS 030.2

MAXIMUM STAGE IS 031.2

MAXIMUM STAGE IS 031.9

MAXIMUM STAGE IS 026.6

MAXIMUM STAGE IS 028.7

MAXIMUM STAGE IS 029.5

MAXIMUM STAGE IS 030.2

MAXIMUM STAGE IS 031.2

MAXIMUM STAGE IS 031.9

MAXIMUM STAGE IS 026.6

MAXIMUM STAGE IS 028.7

MAXIMUM STAGE IS 029.5

MAXIMUM STAGE IS 030.2

MAXIMUM STAGE IS 031.2

MAXIMUM STAGE IS 031.9

\*\*\*\*\*

SUB-AREA RUN FF CONSULTATION

\*\*\*\*\*

SUB AREA 2 RUNOFF  
 ISTAQ 1  
 ICON 0  
 JPLT 0  
 JPRT 0  
 INAME 1  
 ISTAGE 0  
 I AUTO 0

HYDROGRAPH DATA  
 INYD 1  
 IUNG 0  
 TAREA 18.11  
 SNAP 0.00  
 TRSDA 152.10  
 TRSEC 0.00  
 RATIO 0.000  
 ISNOW 0  
 ISAME 1  
 LOCAL 0

PRECIP DATA  
 SPFC FMS  
 0.00 18.50  
 R12 R24  
 97.00 102.00  
 R48 R72  
 120.00 0.00  
 R96  
 C.00

TRSEC COMPUTED BY THE PROGRAM IS 0.877

LOSS DATA  
 LROPT STRK DLTK RTGL ERIN STRKS RTIUK STRL CNSTL ALSPX RTI\*F  
 0.00 0.00 1.00 0.00 0.00 1.00 1.00 0.10 0.00 0.00

UNIT HYDROGRAPH DATA  
 TC= 7.00 R= 7.00 NTA= 0

RECESSION DATA  
 START= 30.00 ORCSN= 30.00 RTIUK= 1.00

UNIT HYDROGRAPH 40 END-OF-PERIOD COORDINATES, LA= 7.10 HOURS, CP= 0.56 VOL= 1.0  
 45. 105. 555. 525. 7.0 85. 925. 535. 274. 241. 756.  
 600. 515. 455. 41. 353. 311. 274. 241. 212.  
 107. 145. 12. 112. 99. 87. 77. 60.  
 52. 41. 36. 32. 28. 24. 22. 19.  
 15. 11. 10. 9. 8.  
 RAIN EXCS LOSS COMP N NO.DA PERIOD RAIN EXCS LOSS COMP C  
 SUM 19.40 15.90 3.40 188974.  
 ( 454. ) ( 406. ) ( 88. ) ( 5351.14 )

\*\*\*\*\*

SUB-AREA RUNOFF COMPUTATION

SUB AREA 3 RUNOFF  
 ISTAG 3  
 ICOMP 0  
 JPLT 0  
 JPRT 0  
 INAME 1  
 ISTAGE 0  
 I AUTO 0

HYDROGRAPH DATA  
 INYD 1  
 IUNG 0  
 TAREA 11.03  
 SNAP 0.00  
 TRSDA 152.10  
 TRSEC 0.00  
 RATIO 0.000  
 ISNOW 0  
 ISAME 1  
 LOCAL 0

PRECIP DATA  
 SPFC FMS  
 0.00 11.50  
 R12 R24  
 97.00 102.00  
 R48 R72  
 120.00 0.00  
 R96  
 C.00



10



10



10



100

10

1992

1998

2000

Figure 1

1

# NORMAL DEPTH CHANNEL ROUTING

GN(1) GN(2) GN(3) ELWYT LLMAX RLATH SEL  
 1.0000 0.0000 0.0000 0.0000 710.0 46000.0 0.00300

CROSS SECTION COORDINATES--STATION ELEVATION--ETC  
 1.0000 710.00 130.00 0.00 150.00 0.00 0.00  
 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

|         |          |          |           |          |           |           |           |          |           |
|---------|----------|----------|-----------|----------|-----------|-----------|-----------|----------|-----------|
| STORAGE | 0.00     | 180.29   | 614.21    | 1277.76  | 2174.47   | 3155.98   | 4150.29   | 5157.39  | 6177.29   |
|         | 6222.4   | 5315.7   | 10384.55  | 11455.52 | 12550.13  | 13657.11  | 14768.13  | 15889.21 | 17020.35  |
| OUTFLOW | 0.00     | 315.21   | 1543.42   | 4110.47  | 6622.76   | 15975.29  | 25051.18  | 35713.49 | 47865.05  |
|         | 70350.67 | 92591.11 | 110117.97 | 120007.3 | 140820.70 | 169964.06 | 192250.75 | 21565.19 | 240188.91 |
| STAGE   | 0.00     | 686.50   | 687.63    | 688.95   | 690.26    | 691.58    | 692.89    | 694.21   | 695.53    |
|         | 697.1    | 699.47   | 701.79    | 704.10   | 706.42    | 708.74    | 711.05    | 713.37   | 715.68    |
| FLUX    | 0.00     | 315.21   | 1543.42   | 4110.47  | 6622.76   | 15975.29  | 25051.18  | 35713.49 | 47865.05  |
|         | 70350.67 | 92591.11 | 110117.97 | 120007.3 | 140820.70 | 169964.06 | 192250.75 | 21565.19 | 240188.91 |

MAXIMUM STAGE IS 695.5

MAXIMUM STAGE IS 699.7

MAXIMUM STAGE IS 690.2

MAXIMUM STAGE IS 690.6

MAXIMUM STAGE IS 691.2

MAXIMUM STAGE IS 691.1

MAXIMUM STAGE IS 690.5

MAXIMUM STAGE IS 689.7

MAXIMUM STAGE IS 690.2

MAXIMUM STAGE IS 690.6

MAXIMUM STAGE IS 691.2

MAXIMUM STAGE IS 691.0

MAXIMUM STAGE IS 698.3  
 MAXIMUM STAGE IS 689.7  
 MAXIMUM STAGE IS 690.2  
 MAXIMUM STAGE IS 690.6  
 MAXIMUM STAGE IS 691.2  
 MAXIMUM STAGE IS 691.8

\*\*\*\*\*

SUB-AREA RUNOFF COMPUTATION

SUB AREA 4 PUNOFF  
 ISTAT 4  
 ICOMP 0  
 IECON 0  
 ITAPE 0  
 JFLT 0  
 JFRT 0  
 INAME 1  
 ISTAGE 0  
 IAUTO 0

IMYCG 1  
 IUSC 0  
 TAREA 17.57  
 SNAP 0.00  
 TRSDA 122.10  
 TRSFC 0.00  
 RATIO 0.000  
 ISNOW 0  
 ISAME 1  
 LOCAL 0

HYDROGRAPH DATA  
 SNAP TRSDA TRSFC  
 0.00 122.10 0.00

PRECIP DATA

LOSS DATA

LPROT STAKK ALTPA RTIOL LRAIN STAKS RTIOL STRTL CASTL ALSMX RTIIF  
 0.00 0.00 1.00 0.00 1.00 1.00 0.00 0.00 0.00 0.00

UNIT HYDROGRAPH DATA  
 TCE 0.73 RE 0.73 NIAE 0

RECESSION DATA

STRTL 0.000  
 GRCSIE 34.00  
 PTIME 1.00

UNIT HYDROGRAPH ST END-OF-PERIOD COORDINATES LAG= 7.98 HOURS, CP= 0.57 VOL= 1.00  
 35. 124. 250. 325. 547. 670. 768. 815. 802. 736.  
 620. 505. 405. 415. 370. 330. 294. 262. 234.  
 200. 166. 148. 136. 117. 105. 93. 83. 74.  
 59. 53. 47. 40. 37. 33. 30. 26. 24.  
 21. 19. 15. 13. 12. 11. 9. 8. 7.

P.D.A. H.R.M.A PERIOD RAIN EXCS LOSS COMF C H.C.D.A H.R.M.A PERIOD RAIN EXCS LOSS COMP Q  
 SUR 1.44 15.70 3.76 170062.

( 494. ) ( 359. ) ( 95. ) ( 5042.15 )

\*\*\*\*\*

SUB-AREA RUNOFF COMPLETION

SUB AREA 5 RUNOFF  
ISTAG 5  
ICOMP 0  
IECON 0  
ITYPE 0  
JFLT 0  
JFRT 0  
INAME 1  
ISTAGE C  
JAUTO 0

HYDROGRAPH DATA  
SMAP TRSDA TRSPC  
0.00 19.65 0.00 152.10 0.00 0.000  
RATIO ISNOW ISAME LOCAL  
0 0 1 C

PRECIP DATA  
R12 R24 R48 R72 R96  
0.00 18.51 25.01 97.00 135.00 120.00 0.00 0.00

LOSS DATA

LRGT STRK BLTR FTIOL ERAIN STRKS RTICK STRTL CNSTL ALSPX RTIMP  
0.00 0.00 0.00 1.00 0.00 0.00 1.00 1.00 0.10 0.00 0.10

UNIT HYDROGRAPH DATA  
TC= 10.10 R= 10.10 AT= C

RECESSION DATA

STRTC= 40.00 GRCSDE= 41.00 RTIOP= 1.00

UNIT HYDROGRAPH 54 END-OF-PERIOD ORIGINATES LAGE 7.22 HOURS CFE= 0.57 VOL= 1.10  
20. 90. 200. 317. 445. 571. 677. 752. 794. 798.  
134. 263. 619. 560. 518. 460. 416. 377. 341. 309.  
230. 230. 200. 160. 171. 155. 140. 120. 115.  
14. 34. 77. 70. 63. 57. 52. 47. 43.  
34. 35. 29. 26. 24. 21. 19. 17. 16.  
14. 12. 11. 10. 9. 8. 7. 6.

END-OF-PERIOD FLOW

P.O.DA HR.MN PERIOD RAIN EXCS LOSS C.M.P. Q P.O.DA HR.MN PERIOD RAIN EXCS LOSS COMP Q  
SUM 19.46 15.70 3.76 200419.  
( 494. ) ( 359. ) ( 95. ) ( 5042.15 )

\*\*\*\*\*

COMBINE HYDROGRAPHS

COMBINE 5 HYDROGRAPHS AT 5

ISTAG ICVAL IECON ITYPE JFLT JFRT INAME ISTAGE JAUTO



|                  |       |
|------------------|-------|
| MAXIMUM STAGE IS | 700.7 |
| MAXIMUM STAGE IS | 694.8 |
| MAXIMUM STAGE IS | 695.7 |
| MAXIMUM STAGE IS | 696.7 |
| MAXIMUM STAGE IS | 697.8 |
| MAXIMUM STAGE IS | 696.4 |
| MAXIMUM STAGE IS | 700.7 |
| MAXIMUM STAGE IS | 692.2 |
| MAXIMUM STAGE IS | 695.7 |
| MAXIMUM STAGE IS | 690.1 |
| MAXIMUM STAGE IS | 697.1 |
| MAXIMUM STAGE IS | 695.4 |
| MAXIMUM STAGE IS | 700.7 |

[illegible]

## SUB-AREA RUOFF CONTRIBUTION

[illegible]

| GROUP | STARK | WTRK | ATCL | TRAP | STKS | ETWK | STRTL | CVSTL | ALSMX | FTYF |
|-------|-------|------|------|------|------|------|-------|-------|-------|------|
|       | 6.00  | 6.00 | 1.00 | 6.00 | 6.00 | 1.00 | 1.00  | 6.10  | 6.00  | 6.00 |



[illegible]

\*\*\*\*\*

SUB-AREA RUNOFF COMULATION

SUB AREA 7 RUNOFF  
ISTAG 7  
ICOFF C  
IECON 0  
ITIME 0  
JFLT 0  
JFRT 0  
INAME 1  
ISTAGE 0  
I-UTO 0

HYDROGRAPH DATA  
IPYDG 1  
TAREA C  
TAREA 17.05  
SNAF 0.00  
TRSDA 152.10  
TKSPC 0.00  
RATIO 0.00C  
ISNOW C  
ISAME 1  
LOCAL 0

PRECIP DATA  
SPFE FMS  
0.00 1.50  
R6 R12 R24 R48 R72 R96  
0.00 0.50 0.50 1.50 120.00 0.00 0.00

TRSPC COMPUTED BY THE PROGRAM IS 0.877

LOSS DATA  
LFOFT STRKM DLTSM RTIOL ERATM STRKS RTIOL STRTL CNSTL ALSPX RTIWF  
0.00 0.00 1.00 1.00 0.00 1.00 1.00 0.10 0.00 0.00

UNIT HYDROGRAPH DATA  
TC= 0.55 RE 0.55 VTA= 0

RECESSION DATA  
STPTE= 34.00 GRCSN= 34.00 RTIOL= 1.00

UNIT HYDROGRAPH DO ENL-OF-PERIOD (ROTATES, LAG= 7.00 HOURS, CPE= 0.57 VOL= 1.00  
34. 128. 258. 407. 561. 692. 779. 819. 755. 721.  
541. 570. 577. 451. 401. 357. 318. 283. 251. 224.  
177. 157. 140. 124. 111. 98. 88. 78. 69.  
55. 49. 43. 39. 34. 31. 27. 24. 21.  
17. 15. 13. 12. 11. 9. 6. 7. 7.

NO. DA HP. IN PERIOD RAIN LXCS LOSS END-OF-PICTED FLU. NO. DA PR. MP PERIOD RAIN EXCS LOSS COMP C  
SUM 17.46 15.70 3.76 174869.  
( 494. ) ( 359. ) ( 95. ) ( 4951.73 )

\*\*\*\*\*

SUB-AREA RUNOFF COMULATION

SUB AREA 5 RUNOFF  
ISTAG 5  
ICOFF C  
IECON 0  
ITIME 0  
JFLT 0  
JFRT 0  
INAME 1  
ISTAGE 0  
I-UTO 0

HYDROGRAPH DATA



| CH(1)  | GN(2)  | GN(3)  | ELNVT | ELMAX | RLNTH   | SEL    | STOR | ISPRAT |
|--------|--------|--------|-------|-------|---------|--------|------|--------|
| 0.0800 | 0.0800 | 0.0800 | 565.0 | 600.0 | 44750.0 | 0.0000 | -1.  | 0      |

NORMAL DEPTH CHANNEL ROUTING

CROSS SECTION COORDINATES--STA/ELEV/STA/ELEV--ETC

|         |          |          |          |         |          |          |           |           |           |
|---------|----------|----------|----------|---------|----------|----------|-----------|-----------|-----------|
| 100.00  | 6.0.00   | 2.0.00   | 590.00   | 350.00  | 500.00   | 500.00   | 565.00    | 710.00    | 565.00    |
| 800.00  | 5.0.00   | 800.00   | 500.00   | 910.00  | 800.00   |          |           |           |           |
| STORAGE | 0.00     | 407.52   | 873.14   | 1396.05 | 1970.66  | 2618.57  | 3316.58   | 4072.68   | 4886.88   |
|         | 670.00   | 7725.47  | 0611.06  | 9960.57 | 11109.79 | 12468.36 | 13799.21  | 15182.34  | 16617.77  |
| OUTFLOW | 0.00     | 560.74   | 1836.22  | 3730.04 | 6232.67  | 9355.65  | 13119.19  | 17547.56  | 22667.09  |
|         | 57141.91 | 45040.11 | 54939.71 | 6504.55 | 75972.00 | 87776.97 | 100367.95 | 113772.08 | 127989.44 |
| STAGE   | 505.00   | 560.04   | 560.04   | 570.50  | 572.57   | 574.21   | 576.05    | 577.89    | 579.74    |
|         | 505.02   | 505.20   | 507.10   | 508.95  | 509.79   | 509.63   | 509.47    | 509.31    | 509.16    |
| FLOW    | 0.00     | 500.74   | 1036.22  | 3730.04 | 6232.67  | 9355.65  | 13119.19  | 17547.56  | 22667.09  |
|         | 57141.91 | 45040.11 | 54939.71 | 6504.55 | 75972.00 | 87776.97 | 100367.95 | 113772.08 | 127989.44 |

- MAXIMUM STAGE IS 573.9
- MAXIMUM STAGE IS 578.4
- MAXIMUM STAGE IS 500.1
- MAXIMUM STAGE IS 501.6
- MAXIMUM STAGE IS 504.0
- MAXIMUM STAGE IS 500.2
- MAXIMUM STAGE IS 573.9
- MAXIMUM STAGE IS 570.4
- MAXIMUM STAGE IS 500.1
- MAXIMUM STAGE IS 501.6
- MAXIMUM STAGE IS 504.0
- MAXIMUM STAGE IS 500.2



| PERIOD | PERIOD | WAIN      | EXCS      | LOSS     | COMP S   | W.O.D.A | PERIOD | WAIN | EXCS | LOSS | COMP C |
|--------|--------|-----------|-----------|----------|----------|---------|--------|------|------|------|--------|
| SUM    |        | 19.46     | 15.70     | 3.76     | 12030.00 |         |        |      |      |      |        |
|        |        | ( 494.0 ) | ( 349.0 ) | ( 95.0 ) | 3399.43  |         |        |      |      |      |        |

[illegible]

## SUB-AREA RUNOFF COMPUTATION

| SUB AREA | IC | RUNOFF | ICOMP | IECOV | ITAVE | JFLT | JFRT | INAME | ISTAGE | IUTO |
|----------|----|--------|-------|-------|-------|------|------|-------|--------|------|
|          |    | 10     | C     | 0     | C     | 0    | 0    | 1     | C      | 0    |

[illegible]

| SPFL | PMS   | R*    | R12   | UNIT | R72  | R96  |
|------|-------|-------|-------|------|------|------|
| 0.00 | 12.50 | 25.00 | 47.50 | 1.50 | 6.00 | 6.00 |

198-1 ST. ANNE'S ISLAND

[illegible]

```
UNIT HYDRO'GRAPHIC DATA
TC= 13.12 R= 13.12 VA= (
```

[illegible]

| UNIT | YDR | TRAP | % EXT | % PER | % DI | TFU | LFU | PLWS | CB  | LSW | WQ | 1 |
|------|-----|------|-------|-------|------|-----|-----|------|-----|-----|----|---|
| 10   | 27  | 75   | 120   | 19    | 223  | 270 | 329 | 370  | 404 |     |    |   |
| 25   | 437 | 435  | 414   | 34    | 350  | 350 | 360 | 375  | 203 |     |    |   |
| 40   | 465 | 459  | 494   | 175   | 160  | 154 | 143 | 170  | 122 |     |    |   |
| 55   | 113 | 77   | 90    | 4     | 66   | 60  | 67  | 60   | 57  |     |    |   |
| 70   | 49  | 45   | 42    | 5     | 36   | 33  | 31  | 39   | 27  |     |    |   |
| 85   | 23  | 21   | 20    | 12    | 17   | 10  | 14  | 13   | 12  |     |    |   |
| 100  | 11  | 9    | 9     | 1     | 6    | 7   | 7   | 6    | 6   |     |    |   |
| 115  | 5   | 5    | 4     | 4     | 4    | 3   | 3   | 3    | 3   |     |    |   |

| C | W.D.A. | R.P.S. | RENTED | RATE | TAXES | LOSS | (CAP) | END-OF-PERIOD FLOW | A.C.D.A. | P.R.M'S | FERTILIZER | MAIN   | FACS   | LOSS  | COSTS G  |
|---|--------|--------|--------|------|-------|------|-------|--------------------|----------|---------|------------|--------|--------|-------|----------|
|   |        |        |        |      |       |      |       |                    |          |         | SUM        | 19.46  | 15.70  | 3.76  | 13862.   |
|   |        |        |        |      |       |      |       |                    |          |         |            | (454.) | (359.) | (95.) | (532.17) |

[illegible]

## COMBINE HYDROGRAPHS

COMBINE 3 HYDROGRAPHS AT 6  
ISTAG 10.0 P 3

| IECON | ITAPE | JPLY | JFRT | INAME | ISTAGE | IAUTO |
|-------|-------|------|------|-------|--------|-------|
| 0     | 0     | 0    | 0    | 1     | C      | 0     |

[illegible]

## HYDROGRAPH ROUTING

CHANNEL ROUTE THRU AREA 11  
ISTAG ICOMP  
/ 1

| IECON | ITAPE | JPLT | JFRT | INAME | ISTAGE | IAUTO |
|-------|-------|------|------|-------|--------|-------|
| 0     | 0     | 0    | 0    | 1     | 0      | 0     |

ALL FLATS HAVE SAME  
ROUTING DATA

|              | BLOSS | CLOSS | AVG  | IRES | ISAME | LOST | JMP | LSTR |
|--------------|-------|-------|------|------|-------|------|-----|------|
| ROUTING DATA |       |       |      |      |       |      |     |      |
|              | 6.0   | 0.000 | 0.00 | 1    | 1     | 0    | 0   | 0    |

| TESTS | ASTOL | LAD | AMSK  | X     | TSK   | STREA | ISPHAT |
|-------|-------|-----|-------|-------|-------|-------|--------|
| 1     | U     | 0   | 0.000 | 0.000 | 0.000 | -1.   | 0      |

James L. ... ..

| GN(1)  | GN(2)  | GN(3)  | ELNVT  | ELMFA  | RLNTP  | SFL    |
|--------|--------|--------|--------|--------|--------|--------|
| 0.0000 | 0.0420 | 0.0200 | 0.14.0 | 0.00.0 | 0.00.0 | 0.00.0 |

CROSS SECTION-- CORROD' AT S--SYNTHLEV'S J&J L&V--

[illegible]

| ST. NO. | DATE     | AMOUNT  | ST. NO. | DATE     | AMOUNT  |
|---------|----------|---------|---------|----------|---------|
| 1       | 10/1/01  | 100.00  | 1       | 10/1/01  | 100.00  |
| 2       | 10/2/01  | 200.00  | 2       | 10/2/01  | 200.00  |
| 3       | 10/3/01  | 300.00  | 3       | 10/3/01  | 300.00  |
| 4       | 10/4/01  | 400.00  | 4       | 10/4/01  | 400.00  |
| 5       | 10/5/01  | 500.00  | 5       | 10/5/01  | 500.00  |
| 6       | 10/6/01  | 600.00  | 6       | 10/6/01  | 600.00  |
| 7       | 10/7/01  | 700.00  | 7       | 10/7/01  | 700.00  |
| 8       | 10/8/01  | 800.00  | 8       | 10/8/01  | 800.00  |
| 9       | 10/9/01  | 900.00  | 9       | 10/9/01  | 900.00  |
| 10      | 10/10/01 | 1000.00 | 10      | 10/10/01 | 1000.00 |
| 11      | 10/11/01 | 1100.00 | 11      | 10/11/01 | 1100.00 |
| 12      | 10/12/01 | 1200.00 | 12      | 10/12/01 | 1200.00 |
| 13      | 10/13/01 | 1300.00 | 13      | 10/13/01 | 1300.00 |
| 14      | 10/14/01 | 1400.00 | 14      | 10/14/01 | 1400.00 |
| 15      | 10/15/01 | 1500.00 | 15      | 10/15/01 | 1500.00 |
| 16      | 10/16/01 | 1600.00 | 16      | 10/16/01 | 1600.00 |
| 17      | 10/17/01 | 1700.00 | 17      | 10/17/01 | 1700.00 |
| 18      | 10/18/01 | 1800.00 | 18      | 10/18/01 | 1800.00 |
| 19      | 10/19/01 | 1900.00 | 19      | 10/19/01 | 1900.00 |
| 20      | 10/20/01 | 2000.00 | 20      | 10/20/01 | 2000.00 |
| 21      | 10/21/01 | 2100.00 | 21      | 10/21/01 | 2100.00 |
| 22      | 10/22/01 | 2200.00 | 22      | 10/22/01 | 2200.00 |
| 23      | 10/23/01 | 2300.00 | 23      | 10/23/01 | 2300.00 |
| 24      | 10/24/01 | 2400.00 | 24      | 10/24/01 | 2400.00 |
| 25      | 10/25/01 | 2500.00 | 25      | 10/25/01 | 2500.00 |
| 26      | 10/26/01 | 2600.00 | 26      | 10/26/01 | 2600.00 |
| 27      | 10/27/01 | 2700.00 | 27      | 10/27/01 | 2700.00 |
| 28      | 10/28/01 | 2800.00 | 28      | 10/28/01 | 2800.00 |
| 29      | 10/29/01 | 2900.00 | 29      | 10/29/01 | 2900.00 |
| 30      | 10/30/01 | 3000.00 | 30      | 10/30/01 | 3000.00 |
| 31      | 10/31/01 | 3100.00 | 31      | 10/31/01 | 3100.00 |
| 32      | 10/32/01 | 3200.00 | 32      | 10/32/01 | 3200.00 |
| 33      | 10/33/01 | 3300.00 | 33      | 10/33/01 | 3300.00 |
| 34      | 10/34/01 | 3400.00 | 34      | 10/34/01 | 3400.00 |
| 35      | 10/35/01 | 3500.00 | 35      | 10/35/01 | 3500.00 |
| 36      | 10/36/01 | 3600.00 | 36      | 10/36/01 | 3600.00 |
| 37      | 10/37/01 | 3700.00 | 37      | 10/37/01 | 3700.00 |
| 38      | 10/38/01 | 3800.00 | 38      | 10/38/01 | 3800.00 |
| 39      | 10/39/01 | 3900.00 | 39      | 10/39/01 | 3900.00 |
| 40      | 10/40/01 | 4000.00 | 40      | 10/40/01 | 4000.00 |
| 41      | 10/41/01 | 4100.00 | 41      | 10/41/01 | 4100.00 |
| 42      | 10/42/01 | 4200.00 | 42      | 10/42/01 | 4200.00 |
| 43      | 10/43/01 | 4300.00 | 43      | 10/43/01 | 4300.00 |
| 44      | 10/44/01 | 4400.00 | 44      | 10/44/01 | 4400.00 |
| 45      | 10/45/01 | 4500.00 | 45      | 10/45/01 | 4500.00 |
| 46      | 10/46/01 | 4600.00 | 46      | 10/46/01 | 4600.00 |
| 47      | 10/47/01 | 4700.00 | 47      | 10/47/01 | 4700.00 |
| 48      | 10/48/01 | 4800.00 | 48      | 10/48/01 | 4800.00 |
| 49      | 10/49/01 | 4900.00 | 49      | 10/49/01 | 4900.00 |
| 50      | 10/50/01 | 5000.00 | 50      | 10/50/01 | 5000.00 |
| 51      | 10/51/01 | 5100.00 | 51      | 10/51/01 | 5100.00 |
| 52      | 10/52/01 | 5200.00 | 52      | 10/52/01 | 5200.00 |
| 53      | 10/53/01 | 5300.00 | 53      | 10/53/01 | 5300.00 |

| CUFLU    | 156.5    | 572.15    | 1358.71 | 4124.25  | 6234.25  | 859.94  | 12813.69 |
|----------|----------|-----------|---------|----------|----------|---------|----------|
| 62672.00 | 62672.00 | 256256.50 | 92164.5 | 58274.01 | 12270.34 | 2134.41 | 7750.72  |

| STAGE  | 514.0  | 514.04 | 515.0  | 516.55 | 517.51 | 518.21 | 519.05 | 519.89 | 520.74 |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 506.40 | 506.56 | 506.62 | 506.68 | 506.74 | 506.80 | 506.86 | 506.92 | 506.98 | 507.04 |

| PL       | 060     | 070    | 080    | 090    | 100    |
|----------|---------|--------|--------|--------|--------|
| 156.91   | 592.1   | 138.7  | 2916.0 | 4124.2 | 6234.2 |
| 22026.00 | 55052.4 | 2219.4 | 2916.0 | 4124.2 | 6234.2 |
| 22026.00 | 2652.3  | 2219.4 | 2916.0 | 4124.2 | 6234.2 |
| 12813.65 |         |        |        | 2219.4 | 2219.4 |
| 12813.65 |         |        |        | 2219.4 | 2219.4 |

# ARTICLE 1



|                      |       |         |       |        |                       |       |       |       |       |
|----------------------|-------|---------|-------|--------|-----------------------|-------|-------|-------|-------|
| LKOPT                | STRKE | DLTKR   | RTICL | ERAIN  | LOSS DATA             | STRTL | CNSTL | ALSMX | RTIMP |
|                      | 0.00  | 0.00    | 1.00  | 0.00   | STKRS 0.00 RTION 1.00 | 1.00  | 0.10  | 0.00  | 0.00  |
| UNIT HYDROGRAPH DATA |       |         |       |        |                       |       |       |       |       |
| TC= 2.74             |       | R= 2.74 |       | NTA= C |                       |       |       |       |       |

```

RECESSION DATE/
STRIG= 8.00 QRCN= 8.00 RTOR= 1.00

```

| UNIT | HYDR. GRADE | 10   | END-OF-PERIOD | ADJUSTED | LAGE | 2.58 | HOURS | CP | 0.58 | VOL | 1.00 |
|------|-------------|------|---------------|----------|------|------|-------|----|------|-----|------|
| 124. | 404.        | 557. | 408.          | 325.     | 225. | 156. |       |    | 108. | 75. | 52.  |
| 36.  | 25.         | 17.  | 12.           | 1.       | 6.   |      |       |    |      |     |      |

[illegible]

5-41661-10Y11 Ek17w, J

[illegible][illegible]

REVISED EDITION

| ROUTE      | TRUCK   | DATE          | ESTAGE   | IC   | RECEP   | DATE          | INSTR   | INSTR   | ESTAGE   | IC   | RECEP   |
|------------|---------|---------------|----------|------|---------|---------------|---------|---------|----------|------|---------|
| ROUTE 1000 | TRUCK 2 | DATE 10-10-10 | ESTAGE 1 | IC 1 | RECEP 1 | DATE 10-10-10 | INSTR 1 | INSTR 1 | ESTAGE 1 | IC 1 | RECEP 1 |

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

[illegible]

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

|           |    |     |     |      |      |      |       |
|-----------|----|-----|-----|------|------|------|-------|
| CAPACITY= | 6. | 11. | 38. | 141. | 248. | 616. | 1126. |
|-----------|----|-----|-----|------|------|------|-------|

|            |      |      |      |      |      |      |
|------------|------|------|------|------|------|------|
| LEON, H. = | 515. | 514. | 517. | 528. | 525. | 526. |
|------------|------|------|------|------|------|------|

CHEL SPWD C GW EXFW ELEV CUGL CAREA EXFL  
514.0 142.0 3.2 1.5 0.0 0.0 0.0

DAM DATA  
TUFEL CUGL EXFD DAM-ID  
515.0 2.6 1.5 1000.

DAM LEACH DATA  
BR-ID 2  
70. 1.00 505.40 1.00 514.00 516.00

BEGIN DAM FAILURE AT 44.00 HOURS

PEAK OUTFLOW IS 11181. AT TIME 52.00 HOURS

BEGIN DAM FAILURE AT 41.00 HOURS

PEAK OUTFLOW IS 25075. AT TIME 51.00 HOURS

BEGIN DAM FAILURE AT 40.00 HOURS

PEAK OUTFLOW IS 3399. AT TIME 51.00 HOURS

BEGIN DAM FAILURE AT 39.00 HOURS

PEAK OUTFLOW IS 50752. AT TIME 51.00 HOURS

BEGIN DAM FAILURE AT 36.00 HOURS

PEAK OUTFLOW IS 40239. AT TIME 50.00 HOURS

BEGIN DAM FAILURE AT 35.00 HOURS

PEAK OUTFLOW IS 62015. AT TIME 50.00 HOURS

DAM LEACH DATA  
BR-ID 2  
14. 1.00 505.40 1.00 514.00 516.00

BEGIN DAM FAILURE AT 44.00 HOURS

PEAK OUTFLOW IS 11182. AT TIME 52.00 HOURS

BEGIN DAM FAILURE AT 41.00 HOURS

PEAK OUTFLOW IS 25080. AT TIME 51.00 HOURS

BEGIN DAM FAILURE AT 40.00 HOURS

PEAK OUTFLOW IS 3399. AT TIME 51.00 HOURS

TEST DATA FAILURE AT 39.00 HOURS  
 TEST DATA IS 30.25. AT TIME 51.00 HOURS  
 TEST DATA FAILURE AT 39.00 HOURS  
 TEST DATA IS 49.25. AT TIME 50.00 HOURS  
 TEST DATA FAILURE AT 39.00 HOURS  
 TEST DATA IS 60.25. AT TIME 50.00 HOURS

DAM BREACH DATA  
 Z ELPM 1FAIL WSEL FAILED  
 1.00 505.40 1.00 514.00 516.00

BRNID  
 40.

TEST DATA FAILURE AT 44.00 HOURS  
 TEST DATA IS 11.75. AT TIME 52.00 HOURS  
 TEST DATA FAILURE AT 44.00 HOURS

TEST DATA IS 20.00. AT TIME 51.00 HOURS  
 TEST DATA FAILURE AT 44.00 HOURS  
 TEST DATA IS 30.25. AT TIME 51.00 HOURS

TEST DATA FAILURE AT 39.00 HOURS  
 TEST DATA IS 40.00. AT TIME 51.00 HOURS  
 TEST DATA FAILURE AT 39.00 HOURS

TEST DATA IS 50.00. AT TIME 50.00 HOURS  
 TEST DATA FAILURE AT 39.00 HOURS  
 TEST DATA IS 60.25. AT TIME 50.00 HOURS

SUB-AREA RU OFF COMPLETION \*\*\*\*\*

TEST DATA IS 12.00. AT TIME 51.00 HOURS  
 TEST DATA FAILURE AT 39.00 HOURS  
 TEST DATA IS 20.00. AT TIME 51.00 HOURS  
 TEST DATA FAILURE AT 44.00 HOURS  
 TEST DATA IS 30.25. AT TIME 51.00 HOURS  
 TEST DATA FAILURE AT 39.00 HOURS  
 TEST DATA IS 40.00. AT TIME 51.00 HOURS  
 TEST DATA FAILURE AT 39.00 HOURS  
 TEST DATA IS 50.00. AT TIME 50.00 HOURS  
 TEST DATA FAILURE AT 39.00 HOURS  
 TEST DATA IS 60.25. AT TIME 50.00 HOURS

TRSPC COMPLETED BY THE PROGRAM IS 0.877

| LCSS DATA |       |       |       |       |       |       |       |       |       |       |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| LCOPT     | STRKX | CLTRK | RTICL | LRADM | STRKS | RTLOK | STRIL | CRSIL | ALSMX | RTIPE |
| 0.00      | 0.00  | 0.00  | 1.00  | 0.00  | 0.00  | 1.00  | 1.00  | 0.10  | 0.00  | 0.00  |

UNIT HYDROGRAPH DATA  
TC = 1.13 R = 1.13 NTA = 0

```

      RECESSIO, DAT,
      STRIG= 2.00, GRCSN= 2.00 RTION= 1.00

```

U·IT HYDROGRAPH 2 END-OF-PERIOD COORDINATES, LAT= 1.67 HOURS, CP= 0.53 VOL= 1.10  
195. 114. 46. 7. 3.

| M.O.D.A. | PERIOD | PAY | EXCS | L.SS | CUT G | END-OF-PERIOD FLOW | HR.MD. | PERIOD | RAIN    | EXCS    | LOSS   | COMP Q    |
|----------|--------|-----|------|------|-------|--------------------|--------|--------|---------|---------|--------|-----------|
|          |        |     |      |      |       |                    |        | SUM    | 19.40   | 15.70   | 3.76   | 10584.    |
|          |        |     |      |      |       |                    |        |        | ( 444.) | ( 359.) | ( 95.) | ( 295.71) |

收  
收  
收  
收  
收  
收  
收  
  
★  
★  
★  
★  
★  
★  
★  
★

收  
收  
收  
收  
收  
收  
收  
收

收  
收  
收  
收  
收  
收  
收  
收

收  
收  
收  
收  
收  
收  
收  
收

COMPINE YD-6, GHAITS

| COUNTRY & PHOTOGRAPHS OF<br>ISLAND | RECORDED | JULY | AUGUST | SEPT. | OCTOBER |
|------------------------------------|----------|------|--------|-------|---------|
|                                    | 1        | 0    | 1      | 0     | 0       |

|   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |     |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|
| 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 |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|

• YLF 0.256 • 11111111

| ROUTE | VER | PAR | AT | TIME | DATE | TIME | 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 |
|-------|-----|-----|----|------|------|------|-------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|
| ROUTE | VER | PAR | AT | TIME | DATE | TIME | 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 |

ALL DATA IN THE DATA  
ROUTING DATA

[illegible]

STAGE 490.30 495.00 495.00 495.00 497.00 500.00 503.50 505.00 510.00  
 FLO. 0.00 700.00 1900.00 3500.00 5500.00 6550.00 8000.00 10000.00 13000.00  
 CAPACITY= 0. 90. 175. 265. 420. 500. 504. 510. 518.  
 ELEVATION= 490. 495. 495. 497. 497. 500. 504. 510. 518.

CREL SP-ID CQCL EXFL CAREA EXFL  
 490.3 0.0 0.0 0.0 0.0 0.0

DAM DATA  
 TCFL CQCL EXFL DAMWID  
 491.1 2.0 1.5 0.

PEAK OUTFLOW IS 11134. AT TIME 52.00 HOURS  
 PEAK OUTFLOW IS 23591. AT TIME 51.00 HOURS  
 PEAK OUTFLOW IS 31259. AT TIME 51.00 HOURS  
 PEAK OUTFLOW IS 30727. AT TIME 51.00 HOURS  
 PEAK OUTFLOW IS 49725. AT TIME 51.00 HOURS  
 PEAK OUTFLOW IS 62514. AT TIME 51.00 HOURS  
 PEAK OUTFLOW IS 11150. AT TIME 51.00 HOURS  
 PEAK OUTFLOW IS 20592. AT TIME 51.00 HOURS  
 PEAK OUTFLOW IS 31247. AT TIME 51.00 HOURS  
 PEAK OUTFLOW IS 31720. AT TIME 51.00 HOURS  
 PEAK OUTFLOW IS 49721. AT TIME 51.00 HOURS  
 PEAK OUTFLOW IS 62071. AT TIME 51.00 HOURS  
 PEAK OUTFLOW IS 11153. AT TIME 51.00 HOURS  
 PEAK OUTFLOW IS 20590. AT TIME 51.00 HOURS  
 PEAK OUTFLOW IS 31236. AT TIME 51.00 HOURS  
 PEAK OUTFLOW IS 30730. AT TIME 51.00 HOURS  
 PEAK OUTFLOW IS 49714. AT TIME 51.00 HOURS

PEAK OUTFLUX IS 6401%. AT TIME 51.00 HOURS

\*\*\*\*\*

\*\*\*\*\*

\*\*\*\*\*

\*\*\*\*\*

\*\*\*\*\*

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

| OPERATION      | STATION | AREA   | PLAN | RATIOS APPLIED TO FLOWS |         |         |         |         |         |
|----------------|---------|--------|------|-------------------------|---------|---------|---------|---------|---------|
|                |         |        |      | RATIO 1                 | RATIO 2 | RATIO 3 | RATIO 4 | RATIO 5 | RATIO 6 |
| HYDROGRAPH AT  | 1       | 3.02   | 1    | 301.                    | 512.    | 753.    | 904.    | 1205.   | 1506.   |
|                | (       | 7.82)  | (    | 1.53)                   | 17.06)  | 21.32)  | 25.59)  | 34.12)  | 42.65)  |
|                | 2       | 301.   | 2    | 301.                    | 612.    | 753.    | 904.    | 1205.   | 1506.   |
|                | (       | 8.53)  | (    | 1.53)                   | 17.06)  | 21.32)  | 25.59)  | 34.12)  | 42.65)  |
|                | 3       | 301.   | 3    | 301.                    | 612.    | 753.    | 904.    | 1205.   | 1506.   |
| ROUTED T.      | (       | 7.82)  | (    | 1.53)                   | 17.06)  | 21.32)  | 25.59)  | 34.12)  | 42.65)  |
|                | 1       | 3.02   | 1    | 220.                    | 472.    | 599.    | 730.    | 968.    | 1153.   |
|                | (       | 7.82)  | (    | 1.22)                   | 13.37)  | 16.90)  | 20.68)  | 27.42)  | 33.78)  |
|                | 2       | 301.   | 2    | 220.                    | 472.    | 599.    | 730.    | 968.    | 1153.   |
|                | (       | 7.82)  | (    | 1.22)                   | 13.37)  | 16.90)  | 20.68)  | 27.42)  | 33.78)  |
| YORK FALLS AT  | 1       | 10.11  | 1    | 2450.                   | 472.    | 599.    | 730.    | 968.    | 1153.   |
|                | (       | 46.70) | (    | 67.30)                  | 13.37)  | 16.90)  | 20.68)  | 27.42)  | 33.78)  |
|                | 2       | 10.11  | 2    | 2450.                   | 472.    | 599.    | 730.    | 968.    | 1153.   |
|                | (       | 46.70) | (    | 67.30)                  | 13.37)  | 16.90)  | 20.68)  | 27.42)  | 33.78)  |
|                | 3       | 10.11  | 3    | 2450.                   | 472.    | 599.    | 730.    | 968.    | 1153.   |
| TUPA FALLS AT  | 1       | 11.03  | 1    | 1230.                   | 240.    | 310.    | 380.    | 490.    | 610.    |
|                | (       | 50.12) | (    | 34.84)                  | 9.97)   | 12.69)  | 15.81)  | 20.21)  | 25.11)  |
|                | 2       | 11.03  | 2    | 1230.                   | 240.    | 310.    | 380.    | 490.    | 610.    |
|                | (       | 50.12) | (    | 34.84)                  | 9.97)   | 12.69)  | 15.81)  | 20.21)  | 25.11)  |
|                | 3       | 11.03  | 3    | 1230.                   | 240.    | 310.    | 380.    | 490.    | 610.    |
| S. C. BELLEVUE | 1       | 32.76  | 1    | 3715.                   | 740.    | 925.    | 1121.   | 1465.   | 1874.   |
|                | (       | 14.05) | (    | 14.97)                  | 10.25)  | 12.69)  | 15.81)  | 20.21)  | 25.11)  |
|                | 2       | 32.76  | 2    | 3715.                   | 740.    | 925.    | 1121.   | 1465.   | 1874.   |
|                | (       | 14.05) | (    | 14.97)                  | 10.25)  | 12.69)  | 15.81)  | 20.21)  | 25.11)  |
|                | 3       | 32.76  | 3    | 3715.                   | 740.    | 925.    | 1121.   | 1465.   | 1874.   |
| ROUTED T.      | (       | 14.05) | (    | 14.97)                  | 10.25)  | 12.69)  | 15.81)  | 20.21)  | 25.11)  |
|                | 1       | 32.76  | 1    | 1153.                   | 660.    | 831.    | 1035.   | 1409.   | 1775.   |
|                | (       | 14.05) | (    | 86.03)                  | 17.44)  | 21.90)  | 27.42)  | 35.78)  | 44.67)  |
|                | 2       | 32.76  | 2    | 1153.                   | 660.    | 831.    | 1035.   | 1409.   | 1775.   |
|                | (       | 14.05) | (    | 86.03)                  | 17.44)  | 21.90)  | 27.42)  | 35.78)  | 44.67)  |

## HYDROGRAPH AT

17.37  
( 44.59)

5 5153. 6620. 5331. 10345. 14049. 17759.  
( 69.29) ( 187.47) ( 235.90) ( 242.95) ( 397.83) ( 502.87) (

1 2170. 4340. 5424. 6509. 8679. 10849.  
( 61.44) ( 122.88) ( 153.60) ( 184.33) ( 245.77) ( 307.21) (

2 2170. 4340. 5424. 6509. 8679. 10849.  
( 61.44) ( 122.88) ( 153.60) ( 184.33) ( 245.77) ( 307.21) (

3 2170. 4340. 5424. 6509. 8679. 10849.  
( 61.44) ( 122.88) ( 153.60) ( 184.33) ( 245.77) ( 307.21) (

## HYDROGRAPH AT

15.65  
( 50.59)

1 2173. 4346. 5433. 6519. 8692. 10865.  
( 61.53) ( 123.07) ( 153.83) ( 184.60) ( 246.13) ( 307.66) (

2 2173. 4346. 5433. 6519. 8692. 10865.  
( 61.53) ( 123.07) ( 153.83) ( 184.60) ( 246.13) ( 307.66) (

3 2173. 4346. 5433. 6519. 8692. 10865.  
( 61.53) ( 123.07) ( 153.83) ( 184.60) ( 246.13) ( 307.66) (

## 3 COMBINED

69.70  
( 120.75)

1 7220. 14935. 18771. 22929. 31028. 39133.  
( 214.63) ( 422.56) ( 531.54) ( 649.29) ( 878.62) ( 1108.11) (

2 7226. 14935. 18771. 22929. 31028. 39133.  
( 214.63) ( 422.56) ( 531.54) ( 649.29) ( 878.62) ( 1108.11) (

3 7226. 14935. 18771. 22929. 31028. 39133.  
( 214.63) ( 422.56) ( 531.54) ( 649.29) ( 878.62) ( 1108.11) (

## ROUTED T

69.78  
( 120.83)

1 7245. 14914. 18722. 22839. 31554. 39152.  
( 215.16) ( 422.52) ( 531.16) ( 646.72) ( 876.52) ( 1106.69) (

2 7245. 14914. 18722. 22839. 31554. 39152.  
( 215.16) ( 422.52) ( 531.16) ( 646.72) ( 876.52) ( 1106.69) (

3 7245. 14914. 18722. 22839. 31554. 39152.  
( 215.16) ( 422.52) ( 531.16) ( 646.72) ( 876.52) ( 1106.69) (

## HYDROGRAPH AT

72.16  
( 82.11)

1 523. 1045. 1310. 1522. 2090. 2613.  
( 14.80) ( 29.59) ( 36.97) ( 44.39) ( 59.19) ( 73.98) (

2 523. 1045. 1310. 1522. 2090. 2613.  
( 14.80) ( 29.59) ( 36.97) ( 44.39) ( 59.19) ( 73.98) (

3 523. 1045. 1310. 1522. 2090. 2613.  
( 14.80) ( 29.59) ( 36.97) ( 44.39) ( 59.19) ( 73.98) (

## 2 COMBINED

72.94  
( 120.91)

1 7273. 15032. 19055. 23972. 32488. 41000.  
( 216.44) ( 442.65) ( 556.56) ( 678.80) ( 915.97) ( 1161.00) (

2 7273. 15032. 19055. 23972. 32488. 41000.  
( 216.44) ( 442.65) ( 556.56) ( 678.80) ( 915.97) ( 1161.00) (

3 7273. 15032. 19055. 23972. 32488. 41000.  
( 216.44) ( 442.65) ( 556.56) ( 678.80) ( 915.97) ( 1161.00) (

## ROUTED T

72.94  
( 120.91)

1 7295. 15130. 19139. 23121. 31126. 39100.  
( 216.56) ( 442.62) ( 557.12) ( 680.41) ( 923.10) ( 1167.77) (

2 7295. 15130. 19139. 23121. 31126. 39100.  
( 216.56) ( 442.62) ( 557.12) ( 680.41) ( 923.10) ( 1167.77) (

3 7295. 15130. 19139. 23121. 31126. 39100.  
( 216.56) ( 442.62) ( 557.12) ( 680.41) ( 923.10) ( 1167.77) (

|               |   |                     |   |         |         |         |          |          |          |
|---------------|---|---------------------|---|---------|---------|---------|----------|----------|----------|
| HYDROGRAPH AT | 7 | 17.05<br>( 44.16)   | 1 | 2166.   | 4333.   | 5416.   | 6499.    | 8666.    | 10832.   |
|               |   |                     | ( | 61.35)  | 122.70) | 153.37) | 164.04)  | 245.39)  | 306.74)  |
|               |   |                     | 2 | 2166.   | 4333.   | 5416.   | 6499.    | 8666.    | 10832.   |
|               |   |                     | ( | 61.35)  | 122.70) | 153.37) | 164.04)  | 245.39)  | 306.74)  |
|               |   |                     | 3 | 2166.   | 4333.   | 5416.   | 6499.    | 8666.    | 10832.   |
| HYDROGRAPH AT | 9 | 6.00<br>( 15.53)    | 1 | 942.    | 1665.   | 2356.   | 2827.    | 3769.    | 4712.    |
|               |   |                     | ( | 26.68)  | 53.37)  | 66.71)  | 80.05)   | 106.73)  | 133.42)  |
|               |   |                     | 2 | 942.    | 1665.   | 2356.   | 2827.    | 3769.    | 4712.    |
|               |   |                     | ( | 26.68)  | 53.37)  | 66.71)  | 80.05)   | 106.73)  | 133.42)  |
|               |   |                     | 3 | 942.    | 1665.   | 2356.   | 2827.    | 3769.    | 4712.    |
| 3 COMBINED    | 5 | 95.59<br>( 246.61)  | 1 | 9717.   | 20127.  | 25355.  | 30799.   | 41452.   | 51994.   |
|               |   |                     | ( | 275.14) | 569.92) | 717.98) | 872.12)  | 1173.79) | 1472.29) |
|               |   |                     | 2 | 9717.   | 20127.  | 25355.  | 30799.   | 41452.   | 51994.   |
|               |   |                     | ( | 275.14) | 569.92) | 717.98) | 872.12)  | 1173.79) | 1472.29) |
|               |   |                     | 3 | 9717.   | 20127.  | 25355.  | 30799.   | 41452.   | 51994.   |
| ROUTED T      | 6 | 95.59<br>( 246.61)  | 1 | 8878.   | 18809.  | 24015.  | 29337.   | 39888.   | 50256.   |
|               |   |                     | ( | 251.40) | 534.32) | 680.02) | 830.72)  | 1129.51) | 1423.10) |
|               |   |                     | 2 | 8878.   | 18809.  | 24015.  | 29337.   | 39888.   | 50256.   |
|               |   |                     | ( | 251.40) | 534.32) | 680.02) | 830.72)  | 1129.51) | 1423.10) |
|               |   |                     | 3 | 8878.   | 18809.  | 24015.  | 29337.   | 39888.   | 50256.   |
| HYDROGRAPH AT | 1 | 11.70<br>( 30.50)   | 1 | 1456.   | 2912.   | 3640.   | 4368.    | 5824.    | 7281.    |
|               |   |                     | ( | 41.23)  | 82.46)  | 103.03) | 123.70)  | 164.93)  | 206.16)  |
|               |   |                     | 2 | 1456.   | 2912.   | 3640.   | 4368.    | 5824.    | 7281.    |
|               |   |                     | ( | 41.23)  | 82.46)  | 103.03) | 123.70)  | 164.93)  | 206.16)  |
|               |   |                     | 3 | 1456.   | 2912.   | 3640.   | 4368.    | 5824.    | 7281.    |
| HYDROGRAPH AT | 1 | 13.90<br>( 36.00)   | 1 | 1228.   | 2455.   | 3069.   | 3683.    | 4910.    | 6138.    |
|               |   |                     | ( | 34.76)  | 69.52)  | 86.50)  | 104.28)  | 135.04)  | 173.80)  |
|               |   |                     | 2 | 1228.   | 2455.   | 3069.   | 3683.    | 4910.    | 6138.    |
|               |   |                     | ( | 34.76)  | 69.52)  | 86.50)  | 104.28)  | 135.04)  | 173.80)  |
|               |   |                     | 3 | 1228.   | 2455.   | 3069.   | 3683.    | 4910.    | 6138.    |
| 3 COMBINED    | 1 | 121.59<br>( 314.01) | 1 | 11117.  | 23511.  | 29244.  | 36562.   | 49630.   | 62424.   |
|               |   |                     | ( | 314.00) | 635.74) | 792.09) | 1005.32) | 1305.37) | 1707.93) |
|               |   |                     | 2 | 11117.  | 23511.  | 29244.  | 36562.   | 49630.   | 62424.   |
|               |   |                     | ( | 314.00) | 635.74) | 792.09) | 1005.32) | 1305.37) | 1707.93) |
|               |   |                     | 3 | 11117.  | 23511.  | 29244.  | 36562.   | 49630.   | 62424.   |
| ROUTED T      | 2 | 121.59<br>( 314.01) | 1 | 11194.  | 23554.  | 29284.  | 36448.   | 49466.   | 62315.   |
|               |   |                     | ( | 314.00) | 635.74) | 792.09) | 1005.32) | 1305.37) | 1707.93) |
|               |   |                     | 2 | 11194.  | 23554.  | 29284.  | 36448.   | 49466.   | 62315.   |
|               |   |                     | ( | 314.00) | 635.74) | 792.09) | 1005.32) | 1305.37) | 1707.93) |
|               |   |                     | 3 | 11194.  | 23554.  | 29284.  | 36448.   | 49466.   | 62315.   |

( 516.51 )

HYDROGRAPH. AT

11 6-05  
( 10-48)

COMBINE

7 125.64  
( 325.40)

ROUTED TO:

7 125.66  
( 325.40)

FOR: ismail at

12, ( 1.03  
2.57)

031 (AM-5)

120.67  
( 328.67)

ACCEPTED

120.47  
( 300 (2)

| RATIO | MAXIMUM<br>FLOW/CFS | MAXIMUM<br>STAGE/FT | TIME<br>HOURS |
|-------|---------------------|---------------------|---------------|
| C.20  | 220.                | 826.6               | 55.00         |
| C.40  | 472.                | 828.7               | 54.00         |
| C.50  | 599.                | 829.5               | 53.00         |
| C.60  | 730.                | 830.2               | 53.00         |
| C.80  | 968.                | 831.2               | 53.00         |
| 1.00  | 1193.               | 831.9               | 54.00         |

# PLAN 2 STATION 2

| RATIO | MAXIMUM<br>FLOW/CFS | MAXIMUM<br>STAGE/FT | TIME<br>HOURS |
|-------|---------------------|---------------------|---------------|
| C.20  | 220.                | 826.6               | 55.00         |
| C.40  | 472.                | 828.7               | 54.00         |
| C.50  | 599.                | 829.5               | 53.00         |
| C.60  | 730.                | 830.2               | 53.00         |
| C.80  | 968.                | 831.2               | 53.00         |
| 1.00  | 1193.               | 831.9               | 54.00         |

# PLAN 3 STATION 3

| RATIO | MAXIMUM<br>FLOW/CFS | MAXIMUM<br>STAGE/FT | TIME<br>HOURS |
|-------|---------------------|---------------------|---------------|
| C.20  | 460.                | 828.0               | 55.00         |
| C.40  | 472.                | 828.7               | 54.00         |
| C.50  | 599.                | 829.5               | 53.00         |
| C.60  | 730.                | 830.2               | 53.00         |
| C.80  | 968.                | 831.2               | 53.00         |
| 1.00  | 1193.               | 831.9               | 54.00         |

# PLAN 1 STATION 3

| RATIO | MAXIMUM<br>FLOW/CFS | MAXIMUM<br>STAGE/FT | TIME<br>HOURS |
|-------|---------------------|---------------------|---------------|
| C.20  | 3153.               | 688.5               | 50.00         |
| C.40  | 6620.               | 689.7               | 50.00         |
| C.50  | 8231.               | 690.2               | 50.00         |
| C.60  | 10345.              | 690.6               | 49.00         |
| C.80  | 14349.              | 691.2               | 49.00         |
| 1.00  | 17759.              | 691.8               | 49.00         |

# PLAN 4 STATION 3

| RATIO | MAXIMUM<br>FLOW/CFS | MAXIMUM<br>STAGE/FT | TIME<br>HOURS |
|-------|---------------------|---------------------|---------------|
| C.20  | 3153.               | 688.5               | 50.00         |

|       |                     |                     |               |
|-------|---------------------|---------------------|---------------|
| RATIO | MAXIMUM<br>FLOW/CFS | MAXIMUM<br>STAGE/FT | TIME<br>HOURS |
| 0.40  | 660.                | 689.7               | 50.00         |
| 0.50  | 831.                | 690.2               | 50.00         |
| 0.60  | 10345.              | 690.6               | 49.00         |
| 0.80  | 14049.              | 691.2               | 49.00         |
| 1.00  | 17759.              | 691.8               | 49.00         |

# PLAN 3 STATION 3

|       |                     |                     |               |
|-------|---------------------|---------------------|---------------|
| RATIO | MAXIMUM<br>FLOW/CFS | MAXIMUM<br>STAGE/FT | TIME<br>HOURS |
| 0.20  | 3153.               | 688.5               | 50.00         |
| 0.40  | 6420.               | 689.7               | 50.00         |
| 0.50  | 8331.               | 690.2               | 50.00         |
| 0.60  | 10345.              | 690.6               | 49.00         |
| 0.80  | 14049.              | 691.2               | 49.00         |
| 1.00  | 17759.              | 691.8               | 49.00         |

# PLAN 1 STATION 4

|       |                     |                     |               |
|-------|---------------------|---------------------|---------------|
| RATIO | MAXIMUM<br>FLOW/CFS | MAXIMUM<br>STAGE/FT | TIME<br>HOURS |
| 0.20  | 7245.               | 692.8               | 49.00         |
| 0.40  | 14914.              | 695.7               | 49.00         |
| 0.50  | 18722.              | 696.7               | 49.00         |
| 0.60  | 22339.              | 697.8               | 49.00         |
| 0.80  | 30954.              | 699.4               | 49.00         |
| 1.00  | 39562.              | 700.7               | 49.00         |

# PLAN 2 STATION 4

|       |                     |                     |               |
|-------|---------------------|---------------------|---------------|
| RATIO | MAXIMUM<br>FLOW/CFS | MAXIMUM<br>STAGE/FT | TIME<br>HOURS |
| 0.20  | 7245.               | 692.8               | 49.00         |
| 0.40  | 14914.              | 695.7               | 49.00         |
| 0.50  | 18722.              | 696.7               | 49.00         |
| 0.60  | 22339.              | 697.8               | 49.00         |
| 0.80  | 30954.              | 699.4               | 49.00         |
| 1.00  | 39562.              | 700.7               | 49.00         |

# PLAN 3 STATION 4

|       |                     |                     |               |
|-------|---------------------|---------------------|---------------|
| RATIO | MAXIMUM<br>FLOW/CFS | MAXIMUM<br>STAGE/FT | TIME<br>HOURS |
| 0.20  | 7245.               | 692.8               | 49.00         |
| 0.40  | 14914.              | 695.7               | 49.00         |
| 0.50  | 18722.              | 696.7               | 49.00         |
| 0.60  | 22339.              | 697.8               | 49.00         |
| 0.80  | 30954.              | 699.4               | 49.00         |
| 1.00  | 39562.              | 700.7               | 49.00         |

PLAN 1 STATION 5

| RATIO | MAXIMUM<br>FLOW, CFS | MAXIMUM<br>STAGE, FT | TIME<br>HOURS |
|-------|----------------------|----------------------|---------------|
| 1.20  | 7495.                | 603.0                | 50.00         |
| 0.40  | 15130.               | 606.6                | 50.00         |
| 0.50  | 19139.               | 608.1                | 50.00         |
| 0.60  | 23181.               | 609.4                | 50.00         |
| 0.80  | 31186.               | 611.8                | 50.00         |
| 1.00  | 39116.               | 613.7                | 50.00         |

PLAN 2 STATION 5

| RATIO | MAXIMUM<br>FLOW, CFS | MAXIMUM<br>STAGE, FT | TIME<br>HOURS |
|-------|----------------------|----------------------|---------------|
| 1.20  | 7495.                | 603.0                | 50.00         |
| 0.40  | 15130.               | 606.6                | 50.00         |
| 0.50  | 19139.               | 608.1                | 50.00         |
| 0.60  | 23181.               | 609.4                | 50.00         |
| 0.80  | 31186.               | 611.8                | 50.00         |
| 1.00  | 39116.               | 613.7                | 50.00         |

PLAN 3 STATION 5

| RATIO | MAXIMUM<br>FLOW, CFS | MAXIMUM<br>STAGE, FT | TIME<br>HOURS |
|-------|----------------------|----------------------|---------------|
| 1.20  | 7495.                | 603.0                | 50.00         |
| 0.40  | 15130.               | 606.6                | 50.00         |
| 0.50  | 19139.               | 608.1                | 50.00         |
| 0.60  | 23181.               | 609.4                | 50.00         |
| 0.80  | 31186.               | 611.8                | 50.00         |
| 1.00  | 39116.               | 613.7                | 50.00         |

PLAN 4 STATION 6

| RATIO | MAXIMUM<br>FLOW, CFS | MAXIMUM<br>STAGE, FT | TIME<br>HOURS |
|-------|----------------------|----------------------|---------------|
| 1.20  | 7495.                | 573.9                | 50.00         |
| 0.40  | 15130.               | 578.4                | 51.00         |
| 0.50  | 19139.               | 580.1                | 51.00         |
| 0.60  | 23181.               | 581.6                | 51.00         |
| 0.80  | 31186.               | 584.9                | 50.00         |
| 1.00  | 39116.               | 586.2                | 50.00         |

PLAN 5 STATION 6

| RATIO | MAXIMUM<br>FLOW, CFS | MAXIMUM<br>STAGE, FT | TIME<br>HOURS |
|-------|----------------------|----------------------|---------------|
| 1.20  | 7495.                | 573.9                | 50.00         |
| 0.40  | 15130.               | 578.4                | 51.00         |
| 0.50  | 19139.               | 580.1                | 51.00         |
| 0.60  | 23181.               | 581.6                | 51.00         |
| 0.80  | 31186.               | 584.9                | 50.00         |
| 1.00  | 39116.               | 586.2                | 50.00         |

|      |        |       |       |
|------|--------|-------|-------|
| 0.20 | 8878.  | 573.9 | 52.00 |
| 0.40 | 18679. | 578.4 | 51.00 |
| 0.50 | 24015. | 580.1 | 51.00 |
| 0.60 | 29337. | 581.6 | 51.00 |
| 0.80 | 39228. | 584.0 | 50.00 |
| 1.00 | 50256. | 586.2 | 50.00 |

PLAN 3 STATION 6

| RATIO | MAXIMUM<br>FLOW CFS | MAXIMUM<br>STAGE FT | TIME<br>HOURS |
|-------|---------------------|---------------------|---------------|
| 0.20  | 8878.               | 573.9               | 52.00         |
| 0.40  | 18679.              | 578.4               | 51.00         |
| 0.50  | 24015.              | 580.1               | 51.00         |
| 0.60  | 29337.              | 581.6               | 51.00         |
| 0.80  | 39228.              | 584.0               | 50.00         |
| 1.00  | 50256.              | 586.2               | 50.00         |

PLAN 1 STATION 7

| RATIO | MAXIMUM<br>FLOW CFS | MAXIMUM<br>STAGE FT | TIME<br>HOURS |
|-------|---------------------|---------------------|---------------|
| 0.20  | 11094.              | 520.4               | 52.00         |
| 0.40  | 22519.              | 522.5               | 51.00         |
| 0.50  | 29337.              | 523.4               | 51.00         |
| 0.60  | 35440.              | 524.2               | 51.00         |
| 0.80  | 49466.              | 525.7               | 50.00         |
| 1.00  | 62315.              | 527.0               | 50.00         |

PLAN 2 STATION 7

| RATIO | MAXIMUM<br>FLOW CFS | MAXIMUM<br>STAGE FT | TIME<br>HOURS |
|-------|---------------------|---------------------|---------------|
| 0.20  | 11094.              | 520.4               | 52.00         |
| 0.40  | 22519.              | 522.5               | 51.00         |
| 0.50  | 29337.              | 523.4               | 51.00         |
| 0.60  | 35440.              | 524.2               | 51.00         |
| 0.80  | 49466.              | 525.7               | 50.00         |
| 1.00  | 62315.              | 527.0               | 50.00         |

PLAN 3 STATION 7

| RATIO | MAXIMUM<br>FLOW CFS | MAXIMUM<br>STAGE FT | TIME<br>HOURS |
|-------|---------------------|---------------------|---------------|
| 0.20  | 11094.              | 520.4               | 52.00         |
| 0.40  | 22519.              | 522.5               | 51.00         |
| 0.50  | 29337.              | 523.4               | 51.00         |
| 0.60  | 35440.              | 524.2               | 51.00         |
| 0.80  | 49466.              | 525.7               | 50.00         |
| 1.00  | 62315.              | 527.0               | 50.00         |

1.00 62515. 527.0 50.00  
SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....  
ELEVATION  
STORAGE  
OUTFLOW

INITIAL VALUE SHILLWAY CREST TOP OF DAM  
514.00 514.00 515.00  
36. 36. 53.  
U. C. 454.

| RATIO<br>OF<br>F.F. | MAXIMUM<br>RESERVOIR<br>W.S. ELEV | MAXIMUM<br>DEPTH<br>OVER DAM | MAXIMUM<br>STORAGE<br>A.C.-FT | MAXIMUM<br>OUTFLOW<br>CFS | DURATION<br>OVER TOP<br>HOURS | TIME OF<br>MAX CUTFLOW<br>HOURS | TIME OF<br>FAILURE<br>HOURS |
|---------------------|-----------------------------------|------------------------------|-------------------------------|---------------------------|-------------------------------|---------------------------------|-----------------------------|
| 0.20                | 516.00                            | 1.00                         | 73.                           | 11101.                    | 29.42                         | 52.00                           | 44.00                       |
| 0.40                | 517.49                            | 2.49                         | 124.                          | 23675.                    | 44.24                         | 51.00                           | 41.00                       |
| 0.50                | 518.10                            | 3.10                         | 144.                          | 30099.                    | 49.26                         | 51.00                           | 40.00                       |
| 0.60                | 518.82                            | 3.82                         | 164.                          | 36732.                    | 51.85                         | 51.00                           | 39.00                       |
| 0.80                | 519.97                            | 4.97                         | 240.                          | 49639.                    | 54.86                         | 50.00                           | 38.00                       |
| 1.00                | 521.00                            | 6.00                         | 315.                          | 62815.                    | 53.70                         | 50.00                           | 33.00                       |

PLAN 2 .....  
ELEVATION  
STORAGE  
OUTFLOW

INITIAL VALUE SHILLWAY CREST TOP OF DAM  
514.00 514.00 515.00  
36. 36. 53.  
U. C. 454.

| RATIO<br>OF<br>F.F. | MAXIMUM<br>RESERVOIR<br>W.S. ELEV | MAXIMUM<br>DEPTH<br>OVER DAM | MAXIMUM<br>STORAGE<br>A.C.-FT | MAXIMUM<br>OUTFLOW<br>CFS | DURATION<br>OVER TOP<br>HOURS | TIME OF<br>MAX CUTFLOW<br>HOURS | TIME OF<br>FAILURE<br>HOURS |
|---------------------|-----------------------------------|------------------------------|-------------------------------|---------------------------|-------------------------------|---------------------------------|-----------------------------|
| 0.20                | 516.00                            | 1.00                         | 73.                           | 11102.                    | 16.54                         | 54.00                           | 44.00                       |
| 0.40                | 517.51                            | 2.51                         | 125.                          | 23682.                    | 34.60                         | 51.00                           | 41.00                       |
| 0.50                | 518.12                            | 3.12                         | 145.                          | 30065.                    | 39.58                         | 51.00                           | 40.00                       |
| 0.60                | 518.84                            | 3.84                         | 165.                          | 36725.                    | 42.54                         | 51.00                           | 39.00                       |
| 0.80                | 519.99                            | 4.99                         | 241.                          | 49625.                    | 46.54                         | 50.00                           | 38.00                       |
| 1.00                | 521.00                            | 6.00                         | 316.                          | 62819.                    | 44.40                         | 50.00                           | 33.00                       |

PLAN 3 .....  
ELEVATION  
STORAGE  
OUTFLOW

INITIAL VALUE SHILLWAY CREST TOP OF DAM  
514.00 514.00 515.00  
36. 36. 53.  
U. C. 454.

| RATIO<br>OF<br>F.F. | MAXIMUM<br>RESERVOIR<br>W.S. ELEV | MAXIMUM<br>DEPTH<br>OVER DAM | MAXIMUM<br>STORAGE<br>A.C.-FT | MAXIMUM<br>OUTFLOW<br>CFS | DURATION<br>OVER TOP<br>HOURS | TIME OF<br>MAX CUTFLOW<br>HOURS | TIME OF<br>FAILURE<br>HOURS |
|---------------------|-----------------------------------|------------------------------|-------------------------------|---------------------------|-------------------------------|---------------------------------|-----------------------------|
| 0.20                | 516.00                            | 1.00                         | 73.                           | 11175.                    | 36.00                         | 54.00                           | 44.00                       |
| 0.40                | 517.54                            | 2.54                         | 126.                          | 23699.                    | 50.00                         | 51.00                           | 41.00                       |
| 0.50                | 518.15                            | 3.15                         | 146.                          | 30112.                    | 54.00                         | 51.00                           | 40.00                       |
| 0.60                | 518.87                            | 3.87                         | 166.                          | 36832.                    | 56.00                         | 51.00                           | 39.00                       |
| 0.80                | 519.99                            | 4.99                         | 242.                          | 49719.                    | 61.00                         | 50.00                           | 38.00                       |
| 1.00                | 521.00                            | 6.00                         | 317.                          | 62835.                    | 51.56                         | 50.00                           | 33.00                       |

# SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

| ELEVATION |          | INITIAL VALUE | SPILLWAY CREST | TOF OF DAM | TIME OF FAILURE |
|-----------|----------|---------------|----------------|------------|-----------------|
| STORAGE   | OUTFLOW  |               |                |            |                 |
| MAXIMUM   | MAXIMUM  | MAXIMUM       | MAXIMUM        | DURATION   | TIME OF FAILURE |
| RESERVOIR | DEPTH    | STORAGE       | OUTFLOW        | OVER TOP   | HOURS           |
| W.S.ELEV  | OVER DAM | AC-FT         | CFS            | HOURS      | HOURS           |
| 0.20      | 12.96    | 699.          | 11134.         | 68.00      | 52.00           |
| 0.40      | 16.68    | 1035.         | 25591.         | 73.00      | 51.00           |
| 0.50      | 18.38    | 1199.         | 30639.         | 74.00      | 51.00           |
| 0.60      | 19.89    | 1411.         | 36727.         | 74.00      | 51.00           |
| 0.80      | 22.64    | 1826.         | 49783.         | 75.00      | 51.00           |
| 1.00      | 25.34    | 2251.         | 62604.         | 88.00      | 51.00           |

PLAN 2 .....

| ELEVATION |          | INITIAL VALUE | SPILLWAY CREST | TOF OF DAM | TIME OF FAILURE |
|-----------|----------|---------------|----------------|------------|-----------------|
| STORAGE   | OUTFLOW  |               |                |            |                 |
| MAXIMUM   | MAXIMUM  | MAXIMUM       | MAXIMUM        | DURATION   | TIME OF FAILURE |
| RESERVOIR | DEPTH    | STORAGE       | OUTFLOW        | OVER TOP   | HOURS           |
| W.S.ELEV  | OVER DAM | AC-FT         | CFS            | HOURS      | HOURS           |
| 0.20      | 12.96    | 699.          | 11134.         | 68.00      | 52.00           |
| 0.40      | 16.68    | 1035.         | 25591.         | 73.00      | 51.00           |
| 0.50      | 18.38    | 1199.         | 30639.         | 74.00      | 51.00           |
| 0.60      | 19.89    | 1411.         | 36727.         | 74.00      | 51.00           |
| 0.80      | 22.64    | 1826.         | 49783.         | 75.00      | 51.00           |
| 1.00      | 25.34    | 2251.         | 62604.         | 88.00      | 51.00           |

PLAN 3 .....

| ELEVATION |          | INITIAL VALUE | SPILLWAY CREST | TOF OF DAM | TIME OF FAILURE |
|-----------|----------|---------------|----------------|------------|-----------------|
| STORAGE   | OUTFLOW  |               |                |            |                 |
| MAXIMUM   | MAXIMUM  | MAXIMUM       | MAXIMUM        | DURATION   | TIME OF FAILURE |
| RESERVOIR | DEPTH    | STORAGE       | OUTFLOW        | OVER TOP   | HOURS           |
| W.S.ELEV  | OVER DAM | AC-FT         | CFS            | HOURS      | HOURS           |
| 0.20      | 12.96    | 699.          | 11134.         | 68.00      | 52.00           |
| 0.40      | 16.68    | 1035.         | 25591.         | 73.00      | 51.00           |
| 0.50      | 18.38    | 1199.         | 30639.         | 74.00      | 51.00           |
| 0.60      | 19.89    | 1411.         | 36727.         | 74.00      | 51.00           |
| 0.80      | 22.64    | 1826.         | 49783.         | 75.00      | 51.00           |
| 1.00      | 25.34    | 2251.         | 62604.         | 88.00      | 51.00           |

APPENDIX D  
STRUCTURAL STABILITY

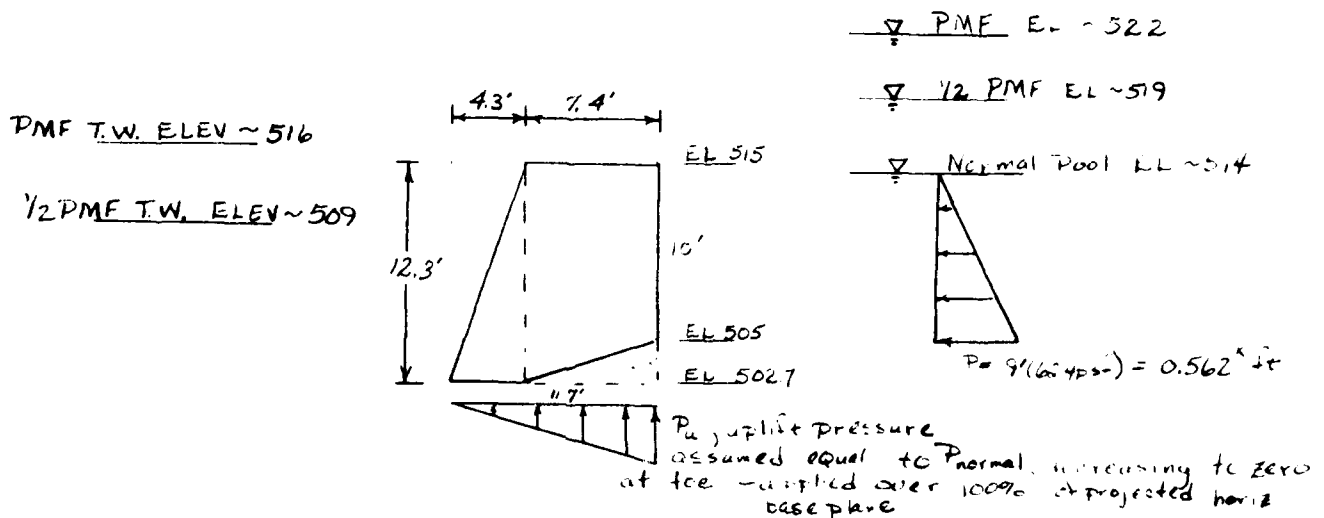


**STETSON • DALE** BANKERS TRUST BUILDING  
UTICA • NEW YORK • 13501  
TEL 315-797-5800

## DESIGN BRIEF

PROJECT NAME \_\_\_\_\_ DATE \_\_\_\_\_  
SUBJECT Antwerp Dam #2 PROJECT NO. \_\_\_\_\_  
Stability Computations DRAWN BY \_\_\_\_\_

### Assumed Section



Resisting Moment, due to weight of dam (about toe)

$$M_R = 0.15 \text{ kef} [(7.4')(12.3')(8') - (7.4')(1/2)(12.3')(9.23') + (12.3')(11.7')(1/3 \times 4.3')] 1'$$

$$M_R = 108.8 \text{ k}$$

### I. Normal Operating Conditions

#### A. Overturning

Moment due to upstream  $H_2O$

$$= 1/2 (9') (0.562 \text{ ksf}) (2.3' + 3') = 13.4 \text{ k}$$

Moment due to uplift

$$= 1/2 (11.7') (0.562 \text{ ksf}) (2/3 \times 11.7') (1') = 25.64 \text{ k}$$

Moment due to ice  $5 \text{ k} @ \text{EL } 514$ , 1' thick

$$= 5 \text{ k} (11.3') = 56.5 \text{ k}$$

$$F.S. = \frac{108.8}{13.4 + 25.64 + 56.5} = 1.14 \text{ (uplift, ice)}$$

$$F.S. = \frac{108.8}{39} = 2.8 \text{ (uplift, no ice)}$$

$$F.S. = 1.56 \text{ ice, no uplift}$$



STETSON • DALE

BANKERS TRUST BUILDING  
UTICA • NEW YORK • 13501  
TEL 315-797-5800

## DESIGN BRIEF

PROJECT NAME \_\_\_\_\_

DATE \_\_\_\_\_

SUBJECT \_\_\_\_\_

PROJECT NO. \_\_\_\_\_

DRAWN BY \_\_\_\_\_

B. Sliding  
Weight of Dam =  $0.15 \text{ kcf}(1') \left[ \frac{1}{2} (12.3')(4.3') + (7.4')(12.3') - \frac{1}{2} (2.3')(7.4') \right]$   
=  $16.3^k$

Upstream  $H_2O$  Pressure =  $\frac{1}{2} (9')(1') (0.562 \text{ ksf}) = 2.5^k$

Uplift  $(1') \frac{1}{2} (11.7') (0.562 \text{ ksf}) = 3.3^k$

Ice  $5^k$

Friction-shear method using 50psi bond/shear  
between concrete and bedrock  $\mu = 0.65$  friction  
coefficient

$$F.S._{\text{sliding}} = \frac{\mu N + \text{bond/shear}}{\text{Horiz. } H_2O + \text{Ice}}$$

$$F.S. = \frac{0.65 (16.3^k - 3.3^k) + (0.05 \text{ ksi}) (144 \text{ in}^2/\text{ft}^2) (11.7')}{2.5^k + 5^k}$$

$$= 12 \pm \quad (\text{including ice})$$

$$= 37 \pm \quad (\text{no ice})$$

**STETSON • DALE**BANKERS TRUST BUILDING  
UTICA • NEW YORK • 13501  
TEL 315-797-5800**DESIGN BRIEF**

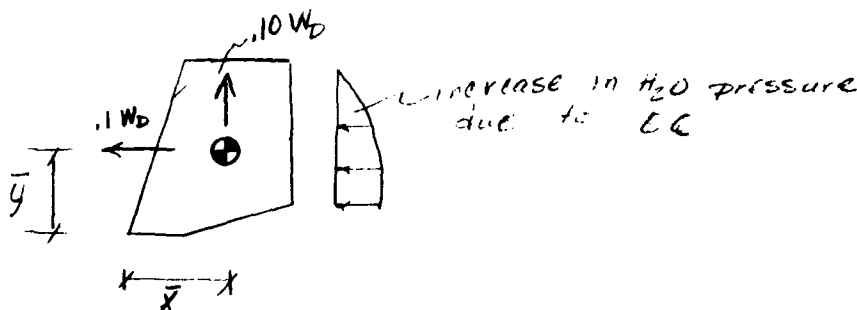
PROJECT NAME \_\_\_\_\_ DATE \_\_\_\_\_

SUBJECT \_\_\_\_\_ PROJECT NO. \_\_\_\_\_

DRAWN BY \_\_\_\_\_

**C. Possible Earthquake Effects**

Site could be considered in Zone 3 therefore a  
horiz. seismic coeff = 0.10 and a conservative  
value of 0.10 for vert. seismic coeff. were used.



$$\bar{x} = \frac{108.8^{1-k}}{16.3^k} = 6.67'$$

$$\bar{y} = \frac{[7.4(12.3)^2/2 - 1/2(2.3)(7.4)(2.3/3) + 1/2(12.3)(4.3)(\frac{12.3}{3})](.15)}{16.3^k} = 6.09'$$

Water surface @ normal pool

Total Horiz. increase in force  $V_e$  above any elev.

$$V_e = 0.726 P_e y$$

 $P_e$  = increase in  $H_2O$  pressure due to EQ $y$  = vert. dist. from reservoir surface to elev. in question

$$P_e = C \gamma w h$$

 $C = .73$  For  $y = 9'$  Fig. 222 Design of Small Dams.

$$P_e = .73 (0.10) (.0624 \text{ ksf}) (9') = 0.041 \text{ k/ft}$$

$$V_e = 0.726 (.041 \text{ k/ft}) (9') = 0.268 \text{ k}$$

 $M_e$  = total overturning moment above that elev.

$$M_e = 0.299 P_e y^2 = 0.299 (.041 \text{ k/ft}) (9')^2 = 0.993^{1-k}$$

$\therefore P_e$  is located  $\frac{.993^{1-k}}{.268^k} = 3.71'$  above Reservoir  
bottom

**STETSON • DALE**BANKERS TRUST BUILDING  
UTICA • NEW YORK • 13501  
TEL 315-797-5800**DESIGN BRIEF**

PROJECT NAME \_\_\_\_\_ DATE \_\_\_\_\_  
 SUBJECT \_\_\_\_\_ PROJECT NO. \_\_\_\_\_  
 \_\_\_\_\_ DRAWN BY \_\_\_\_\_

∴ Moment about toe due to increased  $H_2O$  pressure from EQ,  $M_E$

$$M_E = 0.268^k (2.3' + 37') = 1.61^{1-k}$$

Max. add'l overturning moment from concrete mass due to foundation movement

$$= (0.10) 16.3^k (6.67' + 6.09') = 2.08^{1-k}$$

$$F.S. = \frac{108.8^{1-k}}{13.4 + 25.64 + 56.5 + 1.61 + 20.8} = 0.92 \quad \left( \begin{array}{l} \text{EQ, Ice \& uplift} \end{array} \right)$$

$$F.S. = \frac{108.8}{39 + 1.6 + 20.8} = 1.77 \quad \left( \begin{array}{l} \text{EQ \& uplift} \\ \text{no ice} \end{array} \right)$$

D. Position of resultant from Toe,  $d = \frac{\sum M}{\sum V}$   
 in terms of base width "b"

i) Uplift, ice

$$d = \frac{(108.8^{1-k} - 95.54^{1-k})}{(16.3^k - 3.3^k)} = 1.02' = 0.09 b \quad \text{outside middle third}$$

ii) Uplift, no ice

$$d = \frac{(108.8 - 39)}{13} = 5.37' = 0.46 b$$

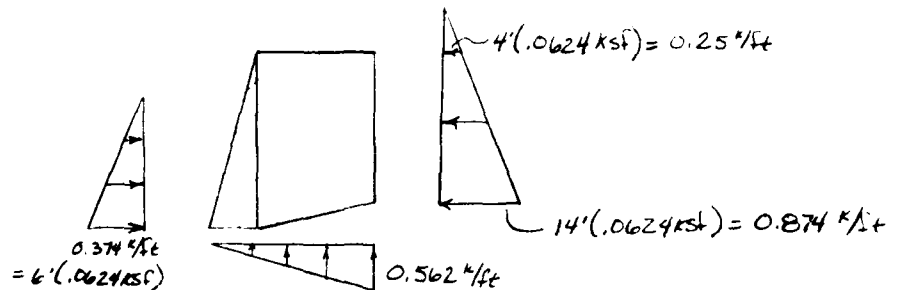
$$iii) \text{EQ, uplift no ice} \quad d = \frac{(108.8^{1-k} - 61.4^k)}{13^k - 1.63^k} = 4.17' = 0.366 b$$

**STETSON • DALE**BANKERS TRUST BUILDING  
UTICA • NEW YORK • 13501  
TEL 315-797-5800**DESIGN BRIEF**

PROJECT NAME \_\_\_\_\_ DATE \_\_\_\_\_

SUBJECT \_\_\_\_\_ PROJECT NO. \_\_\_\_\_

DRAWN BY \_\_\_\_\_

II 1/2 PMF

Assume uplift pressure does not  
have time to increase over short time  
frame of flood, therefore same as normal  
conditions.

Note: small vertical component of downstream H<sub>2</sub>O neglected

**A. Overturning**

$$\begin{aligned} \text{Moment due to upstream H}_2\text{O} \\ = 0.25 \text{ ksf} (10') (5' + 2.3') + 0.624 \text{ ksf} \left( \frac{10'}{2} \right) \left( \frac{10'}{3} + 2.3' \right) = 35.8 \text{ k-ft} \\ \text{Resisting moment due to tailwater} \\ = 0.374 \text{ ksf} \left( 6\frac{1}{2}' \right) \left( \frac{6\frac{1}{2}'}{3} \right) = 2.24 \text{ k-ft} \end{aligned}$$

$$F.S. = \frac{108.8 + 2.2}{35.8 + 25.6} = 1.8 \text{ (full uplift)}$$

**B. Sliding**

$$\begin{aligned} \text{Upstream H}_2\text{O force} &= (0.25 + 0.874) \text{ ksf} \left( \frac{10'}{2} \right) = 5.62 \text{ k} \\ \text{Downstream H}_2\text{O force} &= 3' (0.374 \text{ ksf}) = 1.12 \text{ k} \end{aligned}$$

$$F.S. = \frac{0.65(163 - 3.3) + (0.05 \text{ ksi}) \left( \frac{144 \text{ in}^2}{144} \right) (11.7') + 1.12 \text{ k}}{5.62 \text{ k}} = \frac{92.7 + 1.12}{5.62} = 16.7$$

**C. Position of Resultant (full uplift)**

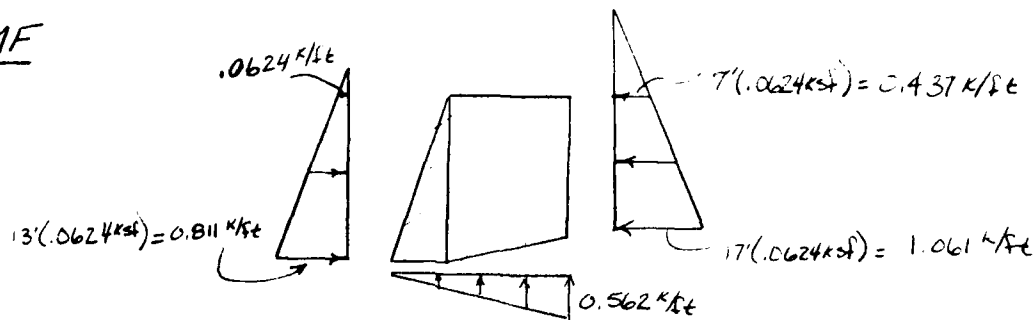
$$d = \frac{(111 - 6.4)}{13} = 3.82' = 0.33 b$$

**STETSON • DALE**BANKERS TRUST BUILDING  
UTICA • NEW YORK • 13501  
TEL 315-797-5800**DESIGN BRIEF**

PROJECT NAME \_\_\_\_\_ DATE \_\_\_\_\_

SUBJECT \_\_\_\_\_ PROJECT NO. \_\_\_\_\_

DRAWN BY \_\_\_\_\_

III HMF**A. Overturning**

$$\text{Moment due to upstream } H_2O \\ = (0.624 \text{ k/ft}) \left( \frac{10'}{2} \right) (3.33' + 2.3') + (0.437 \text{ k/ft}) (10') (5' + 2.3') = 49.5' \cdot k$$

$$\text{Resisting moment due to tailwater} \\ = (0.624 \text{ k/ft}) \left( \frac{12'}{2} \right) + 12' (0.624 \text{ k/ft}) \left( \frac{12'}{2} \right) \left( \frac{12'}{3} \right) = 22.5' \cdot k$$

$$F.S. = \frac{108.8 + 22.5}{49.5 + 25.6} = 1.75 \quad (\text{full uplift})$$

**B. Sliding**

$$\text{Upstream } H_2O \text{ Force} = 10' / 2 (1.061 + 0.437) \text{ k/ft} = 7.5 \text{ k}$$

$$\text{Downstream } H_2O \text{ Force} = 12' / 2 (0.624 + 0.811) \text{ k/ft} = 5.25 \text{ k}$$

$$F.S. = \frac{92.7 \text{ k} + 5.25 \text{ k}}{7.5 \text{ k}} = 13 \pm$$

**C. Position of Resultant (full uplift)**

$$d = \frac{(131.3 - 75.1)}{13} = 4.3' = 0.37 b$$

APPENDIX E

REFERENCES

## APPENDIX

### REFERENCES

1. Department of the Army, Office of the Chief of Engineers. National Program of Investigation of Dams; Appendix D: Recommended Guidelines for Safety Inspection of Dams, 1976
2. U.S. Nuclear Regulatory Commission: Design Basis Floods for Nuclear Power Plants, Regulating Guide 1.59, Revision 2, August 1977
3. Linsley and Franzini: Water Resources Engineering, Second Edition, McGraw-Hill (1972)
4. W. Viessman, Jr., J. Knapp, G. Lewis, 1977, 2nd Edition, Introduction to Hydrology
5. Ven Te Chow: Handbook of Applied Hydrology, McGraw-Hill, 1964
6. The Hydrologic Engineering Center: Computer Program 723-X6-L2010, HEC-1 Flood Hydrograph Package, User's Manual, Corps of Engineers, U.S. Army, 609 Second Street, Davis, California 95616, January 1973
7. R. C Haven - Saturation of Existing Earth Dams, USBR Technical Memorandum 389, Pages 94-103 (1934)
8. James C. Duane: Report to the Aqueduct Commission 1887-1895 (1895)
9. Soil Conservation Service (Engineering Division): Urban Hydrology for Small Watersheds, Technical Release No. 55, U.S. Department of Agriculture, January 1975
10. H.W. King, E.F. Brater: Handbook of Hydraulics, McGraw-Hill, 5th Edition, 1963
11. Ven Te Chow: Open Channel Hydraulics, McGraw-Hill, 1959
12. Bureau of Reclamation, United States Department of the Interior, Design of Small Dams: A Water Resources Technical Publication, Third Printing, 1965
13. J.T. Riedel, J.F. Appleby and R.W. Schloemer: Hydrometeorological Report No. 33, U.S. Department of Commerce, U.S. Department of Army, Corps of Engineers, Washington, D.C., April 1956. Available from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C.
14. "Permeability Pore Pressure, and Uplift in Gravity Dams", by Roy W. Carlson, Transactions ASCE, Volume 122, 1957

15. The University of the State of New York - The State Education Department - State Museum and Science Service - Geological Survey: Geological Map of New York (1961)
16. Y.W. Isachsen and W.G. McKendree, 1977, Preliminary Brittle Structures Map of New York, Adirondack Sheet: New York State Museum Map and Chart Series No. 31A
17. Eastern New York River Basins, Black and St. Lawrence River Basins, 1970: United States Department of Agriculture, Appendix A
18. C.H. Smythe and A.F. Buddington, 1926, Geology of the Lake Bonaparte Quadrangle: New York State Museum Bull. 269, Page 106
19. A.F. Buddington, 1934, Geology and Mineral Resources of the Hammond, Antwerp and Lowville Quadrangles: New York State Museum Bull. 296, Page 251

DATE  
FILMED  
-8

