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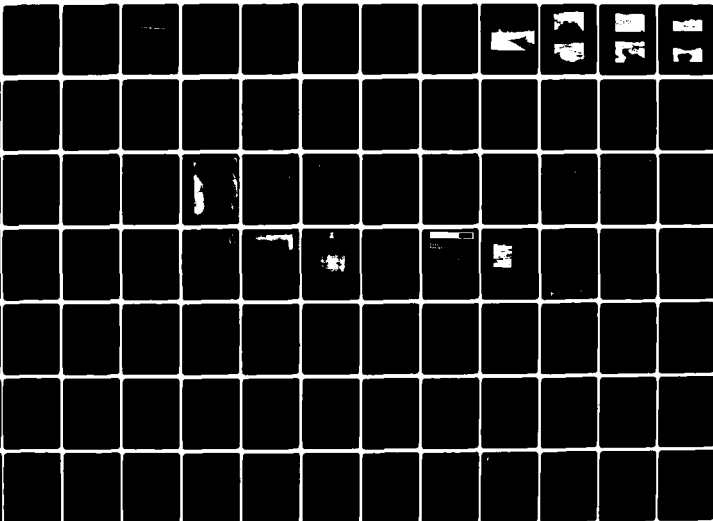
NEW YORK STATE DEPT OF ENVIRONMENTAL CONSERVATION ALBANY F/6 13/13  
NATIONAL DAM SAFETY PROGRAM. LAKE GEORGE OUTLET DAM (INVENTORY --ETC(U)  
AUG 80 J B STETSON DACW51-79-C-0001

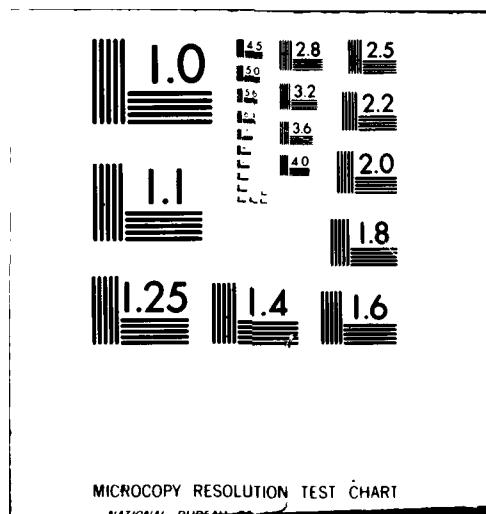
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| 7. AUTHOR(s)<br>John B. Stetson                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                     | 6. PERFORMING ORG. REPORT NUMBER                                                               |
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| 20. ABSTRACT (Continue on reverse side if necessary and identify by block number)<br><br>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.<br><br>The examination of documents and visual inspection of the dam and appurtenant structures did not reveal conditions which constitute an immediate hazard to human life or property. The dam, however, has a number of problem areas which should be investigated further. |                                     |                                                                                                |

The structural stability analysis indicates unsatisfactory stability for the dam when subjected to forces which could occur during winter operations (including ice loading), the Probable Maximum Flood (PMF), and 1/2 PMF events.

A structural stability investigation of the dam should be started within 6 months to determine the effect of the dam's steel bar anchor system and the uplift forces acting on the base of the dam. Remedial measures should be completed within 2 years to increase the structural stability of the facility to meet the Corps of Engineers screening criteria.

The hydrologic/hydraulic analysis establishes the spillway capacity as 46% of the Probable Maximum Flood (PMF) with the sluice gates open and 30% of the PMF if the gates remain closed throughout the storm. The dam will be overtopped by 2.72 feet by the PMF with the gates closed or 2.55 feet with the gates opened. However, the spillway is capable of passing the 1/2 PMF under either of these two conditions without the dam being overtopped. Therefore, the spillway is assessed as inadequate according to the Corps of Engineers screening criteria.

The following measures should be completed within one year:

1. A warning system should be provided to alert persons that flow in the receiving stream will be increased, when the control gates are opened.
2. A flood warning and emergency evacuation plan should be developed and implemented to alert the public should conditions occur which could result in failure of the dam.
3. A formalized inspection program should be initiated to develop data on conditions and maintenance operations at the facility.

LAKE CHAMPLAIN RIVER BASIN

6 National Dam Safety Program.

LAKE GEORGE OUTLET DAM

(Inventory Number NY 234)

ESSEX COUNTY,

NEW YORK.

~~INVENTORY NO NY 230~~

PHASE I INSPECTION REPORT  
NATIONAL DAM SAFETY PROGRAM

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John B. St. John



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NEW YORK DISTRICT CORPS OF ENGINEERS

JULY 1980

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## **PREFACE**

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

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PHASE I REPORT  
NATIONAL DAM SAFETY PROGRAM

Name of Dam Lake George Dam, NY230  
State Located New York  
County Located Essex  
Stream Ticonderoga Creek  
Date of Inspection April 22, 1980

ASSESSMENT OF  
GENERAL CONDITIONS

↙ The examination of documents and visual inspection of the dam and appurtenant structures did not reveal conditions which constitute an immediate hazard to human life or property. The dam, however, has a number of problem areas which should be investigated further.

The structural stability analysis indicates unsatisfactory stability for the dam when subjected to forces which could occur during winter operations (including ice loading), the Probable Maximum Flood (PMF), and 1/2 PMF events.

A structural stability investigation of the dam should be started within 6 months to determine the effect of the dam's steel bar anchor system and the uplift forces acting on the base of the dam. Remedial measures should be completed within 2 years to increase the structural stability of the facility to meet the Corps of Engineers screening criteria.

The hydrologic/hydraulic analysis establishes the spillway capacity as 46% of the Probable Maximum Flood (PMF) with the sluice gates open and 30% of the PMF if the gates remain closed throughout the storm. The dam will be overtopped by 2.72 feet by the PMF with the gates closed or 2.55 feet with the gates opened. However, the spillway is capable of passing the 1/2 PMF under either of these two conditions without the dam being overtopped. Therefore, the spillway is assessed as inadequate according to the Corps of Engineers screening criteria.

The following measures should be completed within one year: ↗

1. A warning system should be provided to alert persons that flow in the receiving stream will be increased, when the control gates are opened.
2. A flood warning and emergency evacuation plan should be developed and implemented to alert the public should conditions occur which could result in failure of the dam.

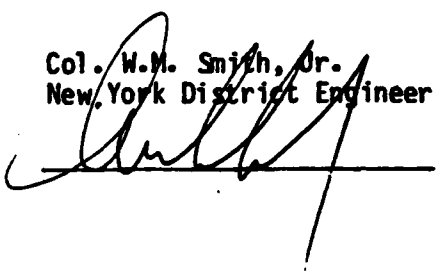
3. A formalized inspection program should be initiated to develop data on conditions and maintenance operations at the facility.

Dale Engineering Company

  
John B. Stetson, President

Approved By:  
Date: 8/28/80

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





1. Overview of Lake George Outlet Dam.



2. South abutment control gates.



3. North abutment control gate.



4. Upstream face of Dam from south abutment.



5. Downstream channel.



6. Railroad bridge 100 feet above dam.



7. Highway bridge 500 feet above Dam.

PHASE I INSPECTION REPORT  
NATIONAL DAM SAFETY PROGRAM  
NAME OF DAM - LAKE GEORGE OUTLET DAM ID# - NY 230

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 Dale Engineering Company and The New York State Department of Environmental Conservation.

b. Purpose of Inspection

The purpose of this inspection is to evaluate the existing condition of the Lake George Outlet Dam and appurtenant structures, owned by the New York State Department of Environmental Conservation, and to determine if the dam constitutes a hazard to human life or property and to transmit findings to the State of New York.

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

The Lake George Outlet Dam is located in the Village of Ticonderoga, approximately 500 feet downstream from the Alexandria Avenue Bridge near the southern boundary of the village. The dam is a concrete and masonry gravity structure approximately 110 feet long with a maximum height of approximately 8 feet. Control gate structures are located on both the north and south abutments of the dam. The south abutment control structure consists of two electrically operated sluice gates, one 8 feet wide by 7 feet high and one 10 feet wide by 7 feet high. The north abutment control structure consists of a single electrically operated sluice gate 10 feet wide by 7 feet high. The principal spillway section of the dam is located between the two control gate structures and is approximately 59 feet wide with a top

width of 5 feet, 10 inches. A walkway traverses the entire structure allowing access across the dam during all but extreme high level flows. The dam is situated on bedrock which is visible both at the downstream face of the spillway section and at the upstream face of the dam when viewed through the water. The dam was formerly used as a source of power for mills owned by the International Paper Company. These mills have been demolished and only the foundation walls and floor slabs now remain at the site.

b. Location

The Lake George Outlet Dam is located in the Village of Ticonderoga, Town of Ticonderoga, Essex County, New York.

c. Size Classification

The maximum height of the dam is approximately 8 feet. The storage volume of the impoundment is approximately 2,185,000 acre feet. Therefore, the dam is in the Large Size Classification as defined by the Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification

Ticonderoga Creek, the receiving stream from the impoundment, flows through the center of the Village of Ticonderoga. Numerous structures are located along the banks of the creek. The creek is also used for recreational purposes such as fishing, swimming and sunbathing. 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 New York State Department of Environmental Conservation.

Contact: Regional Director  
New York State Department of  
Environmental Conservation  
Box 220  
Warrensburg, New York 12885  
Telephone: 518-623-3671

f. Purpose of the Dam

The dam is used to regulate the level of Lake George for recreational and environmental purposes.

g. Design and Construction History

The construction plans included in this report indicate that the dam was reconstructed in 1974. This reconstruction consisted of the removal and replacement of the sluice gates on both the north and

south abutments and the placement of a concrete overlay on the upstream face of the main spillway. This reconstruction program also provided for the blockage of the existing penstocks which formerly fed the paper mill power systems. Earlier inspection reports also included in this report indicate that the masonry dam was originally constructed in 1904 as a source of power for the International Paper Company mills located along the banks of the Ticonderoga Creek. A later report dated July 31, 1920 indicates 1803 as the date of original construction of an earlier dam at this site.

#### h. Normal Operational Procedures

The facility is operated by the New York State Department of Environmental Conservation. The facility is used to control the level of Lake George by manipulating the sluice gates at the structure. The normal controlled level of Lake George is 3.5 feet on the gauge at Rogers Rock State Park. The "0" reading on the gauge is equivalent to an elevation of 315.93 feet above sea level on the USGS datum.

### 1.3 PERTINENT DATA

#### a. Drainage Area

The drainage area of the Lake George Outlet Dam is 231 square miles.

#### b. Discharge at Dam Site

##### Peak Recorded Discharges:

|                |           |
|----------------|-----------|
| March 17, 1977 | 1370 cfs* |
| April 9, 1936  | 1470 cfs  |

##### Computed Discharges:

|                                      |                                       |
|--------------------------------------|---------------------------------------|
| Spillway, Top of Dam (Gates Closed)  | 1665 cfs                              |
| Spillway, Top of Dam (Gates Open)    | 3250 cfs                              |
| Gated Drawdown (3 Gates Open 5 Feet) | 930 cfs (Water Surface @ Elev. 319.6) |

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

|                                 |       |
|---------------------------------|-------|
| Top of Dam                      | 323.0 |
| Spillway Crest                  | 319.6 |
| Stream Bed at Centerline of Dam | 311.6 |

#### d. Reservoir

|                       |             |
|-----------------------|-------------|
| Length of Normal Pool | 169,000+ FT |
|-----------------------|-------------|

\*Measured at USGS Gage 04279000, 1/2 mile downstream of dam.

e. Storage

|             |           |           |
|-------------|-----------|-----------|
| Top of Dam  | 2,279,000 | Acre Feet |
| Normal Pool | 2,185,000 | Acre Feet |

f. Reservoir Area

|               |        |      |
|---------------|--------|------|
| Top of Dam    | 29,000 | Acre |
| Spillway Pool | 29,000 | Acre |

g. Dam

Type - Masonry & Concrete Gravity.  
Length - 110 Feet.  
Height - 8 Feet.  
Freeboard Between Normal Reservoir and Top of Dam - 3.4 Feet.  
Top Width - 5 Feet, 10 Inches (Measured).  
Side Slopes - Upstream - 1 Horizontal, 12 Vertical; Downstream -  
1 Horizontal, 4 Vertical.  
Zoning - N/A.  
Impervious Core - N/A.  
Grout Curtain - N/A.

h. Spillway

Type - Broad Crested.  
Length - 59 Feet.  
Crest Elevation - 319.6  
Gates - None.  
U/S Channel - Impoundment.  
D/S Channel - Natural Rock.

i. Regulating Outlets

2 gates, 10 feet wide x 7 feet high; 1 gate, 8 feet wide x 7 feet high.

## SECTION 2 - ENGINEERING DATA

### 2.1 GEOTECHNICAL DATA

No records of subsurface investigations performed for this structure were available. Former inspection reports for the dam indicate that the dam is founded on bedrock. The visual inspection confirms this statement.

### 2.2 DESIGN RECORDS

No records were available from the original design of the dam. A complete set of Construction Drawings for the 1974 reconstruction of the sluice gates is included in the report. See Figure 2 through 17.

### 2.3 CONSTRUCTION RECORDS

No information was available concerning the original construction of the dam.

### 2.4 OPERATION RECORDS

Records concerning the operation of the dam are kept by the New York State Department of Environmental Conservation in Warrensburg. These records relate basically to lake levels and sluice gate openings which were maintained during the record period.

### 2.5 EVALUATION OF DATA

The data presented in this report was obtained from the Department of Environmental Conservation files. The information available appears to be reliable and adequate for the Phase I inspection purposes.

## SECTION 3 - VISUAL INSPECTION

### 3.1 FINDINGS

#### a. General

The Lake George Outlet Dam was inspected on April 22, 1980. The Dale Engineering Company Inspection Team was accompanied on the inspection by Charles W. Glass, Engineering Technician for the Department of Environmental Conservation, Region 5 in Warrensburg, New York.

#### b. Dam

At the time of the inspection, all of the sluice gates controlling the outflow from the impoundment were in the full open position. The water level in the impoundment was 11 inches below the top of the principal spillway. This condition allowed visual inspection of the downstream face of the spillway section. However, flow through the sluice gate channels obscured the concrete walls in these areas from view. There was no sign of seepage through the masonry face of the principal spillway. The concrete work in general appeared to be in excellent condition. Visual observation did not disclose physical displacement of the alignment of the structure and there was no visual evidence of structural instability.

#### c. Appurtenant Structures

Both the north and south abutments of the dam were formerly the site of mills of the International Paper Company. The remains of these mills are still evident on the site. Masonry walls on both sides of the downstream channel were formerly a part of the mill structures. A concrete floor slab is presently visible on the north abutment of the dam. The void below this concrete slab has been filled with debris from the demolition of the mill buildings. The masonry walls along the channel are in satisfactory condition so as not to present a hazard from erosion due to flow in the outlet channel.

#### d. Control Outlet

The outlet of the impoundment is controlled by manipulation of the sluice gates located on both the north and south abutments. These sluice gates are electrically operated and were the major portion of the 1974 reconstruction of the dam. The inlet of the sluice gates are equipped with trash racks to prevent floatable material from being lodged in the sluice gate opening. The sluice gates are presently in operating condition.

#### e. Reservoir Area

Lake George extends approximately 32 miles to the south of the Lake George Outlet Dam. The lake is used extensively for recreational

purposes. The shore of the lake slopes steeply to elevations of over 2200 feet. The lake reaches depths of approximately 175 feet along the east shore. There are no known areas of bank instability along the impoundment.

f. Downstream Channel

The downstream channel of the Ticonderoga Creek is formed in bedrock. No evidence of recent erosion was noted in the channel.

3.2 EVALUATION

The visual inspection revealed that the dam is generally in good condition. The sluice gate structures are in excellent operating condition and the concrete surfaces are similarly in good condition. No deformation of the alignment of the structures was noted in the visual inspection.

## SECTION 4 - OPERATIONAL PROCEDURES

### 4.1 PROCEDURES

The normal operating procedure for this structure is to control the water level in Lake George for recreational and environmental purposes. The sluice gates at the structure are used to regulate the level of the impoundment. Water level readings are made at the gauge at the Rogers Rock Campsite and are relayed to the regional headquarters for the Department of Environmental Conservation at Warrensburg. The gauge readings are interpreted and directions are given to the operator in the Village of Ticonderoga who operates the gates. The procedures for regulating the level is set forth in Section 38, Chapter 1035, Laws of 1957, as amended of the Navigation Law. (See copy of the law on last page of Appendix B.)

### 4.2 MAINTENANCE OF THE DAM

Maintenance and operation of the dam is controlled by the New York State Department of Environmental Conservation. Visits are made to the site to check on the conditions of the facilities and to operate the sluice gates.

### 4.3 MAINTENANCE OF OPERATING FACILITIES

The gates controlling the flow are presently in excellent operating condition and are checked at least once a month by the New York State Department of Environmental Conservation.

### 4.4 DESCRIPTION OF WARNING SYSTEM

No warning system is in effect at present.

### 4.5 EVALUATION

The dam and appurtenances are inspected at regular intervals by the New York State Department of Environmental Conservation. The facilities are in excellent condition and there is no evidence of deterioration caused by lack of maintenance.

A formalized inspection program should be initiated to develop data regarding the physical conditions of the facility and to document the various maintenance operations which are undertaken at the dam.

A warning system should be installed to alert persons who may be in the creek channel when the control gates are to be opened. Presently, the operator of the gates must visually determine if persons are in the channel and warn them individually when the gates are to be opened.

Because the dam is in the high hazard classification a flood warning and emergency evacuation plan should be implemented to alert the public, should conditions occur which could result in failure of the dam.

## SECTION 5 - HYDROLOGIC/HYDRAULIC

### 5.1 DRAINAGE AREA CHARACTERISTICS

The Lake George Outlet Dam is located in the south-east corner of Essex County in Ticonderoga, New York. The dam has a drainage area of 231.4 square miles, which is characterized by mountains rising steeply from the lake valley. The reservoir has a surface area of approximately 29,000 acres and outlets into Ticonderoga Creek, which flows in a northerly then easterly direction through Ticonderoga to Lake Champlain.

### 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. This has been assessed through the evaluation of the Probable Maximum Flood (PMF) for the watershed and the subsequent routing of the flood through the reservoir and 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 of run-off of a specific location that is considered reasonably possible for a particular drainage area. Since the dam is in the Large Dam Category and is a High Hazard, the Recommended Guidelines for Safety Inspection of Dams (Ref. 1) require that the spillway be capable of passing 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. In the event that the dam could not pass the Probable Maximum Flood without overtopping, additional analyses are to be performed on potential dam failures if the dam is designated as a High Hazard Classification. This process was done with the concept that if the dam was unable to satisfy this criteria, further refined hydrologic investigations would be required.

The dam is equipped with three sluice gated outlets which are normally operated electrically, but can be manually operated. The New York State Department of Conservation controls the operation of these gates and is required by law to open these gates when the water elevation in the main portion of the lake corresponds to approximately four inches above the spillway elevation. Due to the flow restriction of Alexandria Avenue Bridge under high flows, the water elevation just upstream of the dam may be half a foot or more below the water surface in the main portion of the lake. Two cases were considered in the hydraulic analysis of the spillway capacity. One case assumed the water surface to initially be at the top of spillway elevation and the sluice gates to open when the water surface raised

slightly above this elevation. The second modelled case assumed the sluice gates to remain closed throughout the flood event.

The U.S. Army Corps of Engineers' Hydrologic Engineering Center's Computer Program HEC-1 DB using the Modified Puls Method of flood routing was used to evaluate the dam, spillway capacity, and downstream hazard.

Unit hydrographs were defined by Snyder coefficients,  $C_t$  and  $C_p$ . Snyder's  $C_t$  was estimated to be 1.5 for the steeply sloped drainage area and  $C_p$  was estimated to be 0.625. The drainage area was divided into sub-areas to model the variability in hydrologic characteristics within the drainage basin. Due to the length of Lake George, the hydrographs from the sub-basins draining into the lake were lagged to reflect the travel time through the lake. Run-off, routing and flood hydrograph combining was then performed to obtain the inflow into the reservoir.

The Probable Maximum Precipitation (PMP) was 17.5 inches according to Hydrometeorological Report (HMR #33) for a 24-hour duration storm, 200 square mile basin, while loss rates were set at 1.0 inch initial abstraction and 0.1 inches/hour continuous loss rate. The loss rate function yielded 80 percent run-off from the PMF. The peak for the PMF inflow hydrograph was 279,480 cfs and the 1/2 PMF inflow peak was 139,737 cfs. The large storage capacity of the reservoir reduced these peak flows to 5,624 cfs for the PMF and 1,540 cfs for the 1/2 PMF, for the condition with all gates closed. The peak discharge flows for the condition with the gates open were 6,996 cfs for the PMF and 2,932 cfs for the 1/2 PMF.

### 5.3 SPILLWAY CAPACITY

Under normal operation, water either spills over the central portion of the dam or is wasted through one or more of the the sluice gates. However, for higher flows, water may also spill over the sluice gate abutment sections before the dam abutment walls are overtopped. The central section of the dam is approximately 60 feet in length and acts like a broad-crested weir. Weir coefficients ranging from 2.5 to 3.1 over the heads encountered in routing the PMF were assigned to this section for the spillway rating curve development. For the PMF evaluation, the analysis was performed both with all sluice gates in the closed position, and with all gates opened. Weir coefficients of 2.64 were used for the sluice gate abutment sections and 3.32 for flow over the top of the sluice gates. Discharges through the open gates were taken from an actual rating curve obtained from the Department of Environmental Conservation's Warrensburg office. The total discharge capacity of the structure at the top of dam elevation is 1,665 cfs with the gates closed and 3250 cfs with gates opened.

DISCHARGE CAPACITY  
(WITH GATES CLOSED)

| <u>Flood</u> | <u>Peak Discharge</u> | <u>Capacity as % of Flood Discharge</u> |
|--------------|-----------------------|-----------------------------------------|
| PMF          | 5,624 cfs             | 30%                                     |
| 1/2 PMF      | 1,540 cfs             | 108%                                    |

DISCHARGE CAPACITY  
(WITH GATES FULLY OPENED)

| <u>Flood</u> | <u>Peak Discharge</u> | <u>Capacity as % of Flood Discharge</u> |
|--------------|-----------------------|-----------------------------------------|
| PMF          | 6,996 cfs             | 46%                                     |
| 1/2 PMF      | 2,932 cfs             | 111%                                    |

#### 5.4 RESERVOIR CAPACITY

The reservoir storage capacity was estimated from USGS mapping and the New York State Department of Environmental Conservation Educational Leaflet on Lake George.

The resulting estimates of the reservoir storage capacity are shown below:

|                |                     |
|----------------|---------------------|
| Top of Dam     | 2,279,000 Acre Feet |
| Spillway Crest | 2,185,000 Acre Feet |

#### 5.5 FLOODS OF RECORD

The maximum recorded discharge at the dam site was 1470 cfs on April 9, 1936 (Ref. 18). This occurred during operation of the previous dam and gate structures. The maximum recorded discharge during the operation of the present structure was 1370 cfs on March 17, 1977 (Ref. 19). This discharge was measured at the La Chute U.S.G.S. gage approximately 2,800 feet downstream from the dam. Due to the regulating capability of the outlet gates and the large storage capacity of the lake, the peak discharge from any storm is very much influenced by the initial lake level and the operation of the gates.

#### 5.6 OVERTOPPING POTENTIAL

The HEC-1 DB analysis indicates that the dam will be overtopped as follows:

(WITH GATES CLOSED)

| <u>Flood</u> | <u>Maximum Depth Over Dam</u> |
|--------------|-------------------------------|
| PMF          | 2.72 Feet                     |
| 1/2 PMF      | 0 Feet                        |

(WITH GATES OPENED)

| <u>Flood</u> | <u>Maximum Depth Over Dam</u> |
|--------------|-------------------------------|
| PMF          | 2.55 Feet                     |
| 1/2 PMF      | 0 Feet                        |

Under normal operating conditions the gates would be opened under high flows to control the lake level and discharge.

It should also be noted that historical evidence indicates that the Alexandria Avenue bridge opening acts as a flow restriction under high flows. Therefore, the water elevation in the main portion of the lake would be higher than the water elevation of the portion just upstream of the dam. This condition would further utilize the lakes natural storage capacity and reduce the peak discharges from large floods somewhat. The analysis of the effect of the Alexandria Avenue bridge was not within the scope of this investigation. Any additional hydrologic and hydraulic investigations of the Lake George Outlet Dam should incorporate the effect of the Alexandria Avenue bridge on the attenuation of the studied floods.

#### 5.7 EVALUATION

The hydrologic/hydraulic analysis establishes the spillway capacity as 46% of the Probable Maximum Flood (PMF) with the sluice gates open and 30% of the PMF if the gates remain closed throughout the storm. The dam will be overtopped by 2.72 feet by the PMF with the gates closed or 2.55 feet with the gates opened. However, the spillway is capable of passing the 1/2 PMF under either of these two conditions without the dam being overtopped. Therefore, the spillway is assessed as inadequate according to the Corps of Engineers screening criteria.

## SECTION 6 - STRUCTURAL STABILITY

### 6.1 EVALUATION OF STRUCTURAL STABILITY

#### a. Visual Observations

The Lake George Outlet Dam is a masonry and concrete structure sited on a natural rock ledge along the stream outlet from Lake George into Lake Champlain. Foundation bedrock is exposed at and below the downstream toe of the dam.

This dam, constructed in 1903 of masonry, had renovations performed in 1974 which included rebuilding of the northerly and southerly abutment sections, new sluice gates for the abutment sections, and a poured concrete refacing of the dam's upstream side.

At the time of the inspection, the sluice gates were open and discharging, with the level of the upstream impoundment approximately one foot below the crest of the spillway section. The condition of the visible new concrete work is good to excellent, and the downstream masonry face of the dam is fairly good although deterioration of some mortar joints is occurring. No evidence of structural instability was noted. No indication of underdam seepage was apparent although the dam's downstream face was damp from what was believed to be spray from the turbulent discharge through the sluice gates, a condition which would tend to mask a low rate of seepage.

The downstream channel area adjacent to the dam is defined by rock and by sections of now-abandoned masonry walls founded on the area's bedrock. Presumably, the masonry construction represents the remains of mill buildings previously located at this site. Varying degrees of deterioration have affected this masonry but it appears stable without threat to the downstream channel.

A plate girder bridge for a now-abandoned section of railroad crosses the dam's impounding area a short distance upstream. The foundation for the center span (reservoir) piers supporting this bridge consist of timber cribbing placed on stones. Deterioration of the timber was observed.

#### b. Geology and Seismic Stability

Geologically, the dam site is located near the eastern boundary of the Adirondack Province and about one mile from the southwest corner of the Champlain Section of the Valley and Ridge Province.

The dam's foundation and abutments are sited in bedrock. Bedrock is granitic to syenitic gneiss, and rated as a hard, durable, dense, resistant and impermeable material. Weathering is very minor. Structurally, rock foliation is from approximately horizontal to an

orientation of N8°W with a dip of 10°NE. Three prominent joint sets are present as follows:

| <u>Set</u> | <u>Strike</u> | <u>Dip</u> | <u>Spacing</u>    |
|------------|---------------|------------|-------------------|
| 1          | N10E          | 50-60W     | 2'-4'             |
| 2          | N82E          | 90°        | 3'-6'; 40" common |
| 3          | N72W          | 90°        | 1"-4"             |

With the dam axis having a northeast - southwest orientation, joint Set 1 is almost parallel to the dam face and dips steeply downstream. Sets 2 and 3 strike at a high angle to the dam. Foliation is either horizontal or dips at a low angle into the dam. This combination of foliation and joints presents the possibility that hydraulic action and frost wedging could remove blocks of rock from the outcrop apron at the toe of the dam. Open joints at the toe were observed during the inspection.

Several faults are located in the vicinity of the dam but none are known to cross the site. (See Geologic Map, Figure 21.) The area is located within Zone 2 of the Seismic Probability Map but does have the potential of a Zone 3 Designation.

Information on some of the larger earthquakes for the area is tabulated below:

| <u>Date</u> | <u>Intensity<br/>Modified Mercalli</u> | <u>Location<br/>Relative to Dam</u> |
|-------------|----------------------------------------|-------------------------------------|
| 1851        | III                                    | 12 mi. NNE                          |
| 1855        | IV                                     | 32 mi. SW                           |
| 1867        | VII                                    | 24 mi. NE                           |
| 1916        | V                                      | 16 mi. SW                           |
| 1931        | VII                                    | 32 mi. SW                           |
| 1946        | III                                    | 16 mi. W                            |
| 1962        | V                                      | 19 mi. N                            |

Many earthquakes of lesser intensity are known to have occurred in this region according to the New York State Geologic Survey although none have been in the immediate vicinity of the dam.

#### c. Stability Evaluation

Design drawings available for review show plan alignment and the cross-section for the dam spillway but do not include information on the properties of the dam and foundation materials, nor stability analysis. As part of the present study, stability evaluations have been performed for the dam spillway section. Actual properties of the dam's construction materials and foundations were not determined as part of this study; where information on properties was necessary for computations but lacking, assumptions felt to be practical were made. The stability computations assumed a structural cross-section

based on dimensions indicated by the plans included in this report. It should be considered that, in areas where deterioration has occurred, section dimensions would be less than indicated by the plans, with some adverse effect on the structural strength expected. The analysis also assumed the dam section to be monolithic, possessing necessary internal resistance to shear and bending occurring as a result of loading.

The results of the stability computations are summarized in the table following this page. The stability analyses are presented in Appendix D.

The engineering studies indicate satisfactory stability against overturning and sliding effects for the dam subject to forces possible during normal summer-type operation (no ice loading). Satisfactory stability is also indicated where seismic effects are imposed onto the normal summer operating condition. The analysis indicates unsatisfactory stability against overturning for the dam subject to forces including ice loading possible during winter operations, according to the Recommended Guidelines for Safety Inspection of Dams (i.e., where the resultant of forces acting on the dam is located outside the middle third of the base, tensile stresses would develop in the dam section, a condition which is structurally undesirable.)

For the 1/2 PMF and PMF conditions, unsatisfactory stability is indicated. Lateral water pressures were calculated from the computed water surface elevations.

Critical to the analysis and resulting indication of stability are the items of uplift water pressure acting on the base of the dam and the relative permeability of the site's foundation rock. For the "normal operating conditions" case, the analysis uplift force was based on a full headwater hydrostatic pressure acting on the dam's upstream corner and a full tailwater hydrostatic pressure acting on the dam's downstream corner. Uplift pressures were assumed to vary linearly between the dam's upstream and downstream corners, and to act upon 100 percent of the dam base. The resulting uplift force represents a condition that is significant to indications of instability.

Uplift as computed for the normal operating condition was also assigned to the flood conditions studied, assuming that uplift pressures would not increase significantly over a relatively short flood stage time period because of an expected low foundation rock permeability. With this assumption for uplift, the winter operating condition represents a loading combination more critical to dam stability than the 1/2 PMF and PMF flood conditions because of the significant effect of ice forces.

# RESULTS OF STABILITY COMPUTATIONS

| <u>Loading Condition</u>                                                                                                                                      | <u>Factor of Safety*</u><br><u>Overturning</u> <u>Sliding**</u> | <u>Location of Resultant</u><br><u>Passing through Base***</u> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|----------------------------------------------------------------|
| (1) Water level at spillway elevation, uplift on base (no ice).                                                                                               | 2.2      42                                                     | 0.40b                                                          |
| (2) Water level at spillway elevation, uplift on base plus 7.5 kip per lineal foot ice load acting.                                                           | 0.46      6+ <sub>-</sub>                                       | Outside of base because overturning FS < 1                     |
| (3) Winter water level approximately one foot below spillway elevation, 5 kip per lineal foot ice load acting (approximately one foot thick), uplift on base. | 0.71      9+ <sub>-</sub>                                       | Outside of base                                                |
| (4) Water elevations against upstream face and downstream face based on 1/2 PMF levels, uplift acting on base as computed for normal operating condition.     | 1.49      17+ <sub>-</sub>                                      | 0.24 b                                                         |
| (5) Water elevations against upstream face and downstream face based on PMF levels, uplift acting on base as computed for normal operating condition.         | 1.17      12+ <sub>-</sub>                                      | 0.11 b                                                         |
| (6) Water level at spillway elevation, uplift on base, seismic effect applicable to Zone 2.                                                                   | 1.88      33                                                    | 0.34b                                                          |

\* These factors of safety indicate the ratio of moments resisting overturning to those moments causing overturning, and the ratio of forces resisting sliding to those causing sliding.

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

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

Design information applicable to the 1974 renovation indicates steel dowels (5/8 inch bars) were embedded into the foundation rock within the heel section of the dam. Anchoring at this location increases the dam's resistance to overturning. However, a preliminary analysis indicates that the additional resistance necessary to achieve satisfactory stability under the winter operations loading condition would not be provided by the dowels.

Further studies are required for this dam to evaluate factors critical to its stability, including the presence of uplift, anticipating that it will be necessary to develop measures for improving the stability. A future study should include investigation of the dam's foundation rock to evaluate the rock jointing described under part 6.1.b. of this report. It is also recommended that the studies extend to the railroad bridge behind the dam, evaluating the stability of that structure and its foundations if subject to flood conditions, as a prelude to considering the impact its collapse could have on the dam.

## SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

### 7.1 DAM ASSESSMENT

#### a. Safety

This Phase I inspection of the Lake George Dam did not indicate conditions which constitute an immediate hazard to human life or property.

The hydrologic/hydraulic analysis establishes the spillway capacity as 46% of the Probable Maximum Flood (PMF) with the sluice gates open and 30% of the PMF if the gates remain closed throughout the storm. However, the spillway is capable of passing the 1/2 PMF without the dam being overtopped under either of these two conditions. Therefore, the spillway is assessed as inadequate.

The following specific safety assessments are based on the Phase I Visual Examination, Analysis of Hydrology and Hydraulics, and Structural Stability.

1. The stability analysis indicates unsatisfactory stability against overturning for the dam when subjected to forces which could occur during winter operations (including ice loading), the Probable Maximum Flood (PMF), and 1/2 PMF events.
2. Normal operation of the facility requires that sluice gates be opened to maintain the optimum level in Lake George. Increased flow in the receiving stream caused by opening of the sluice gates presents a danger to persons using the stream for recreational purposes.
3. No warning system is in effect to alert the public, should conditions occur which could result in failure of the dam.

#### b. Adequacy of Information

The information available is adequate for the Phase I investigation.

#### c. Urgency

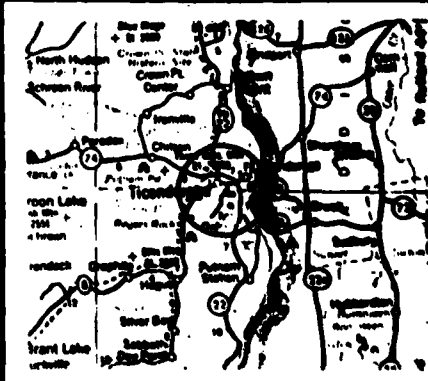
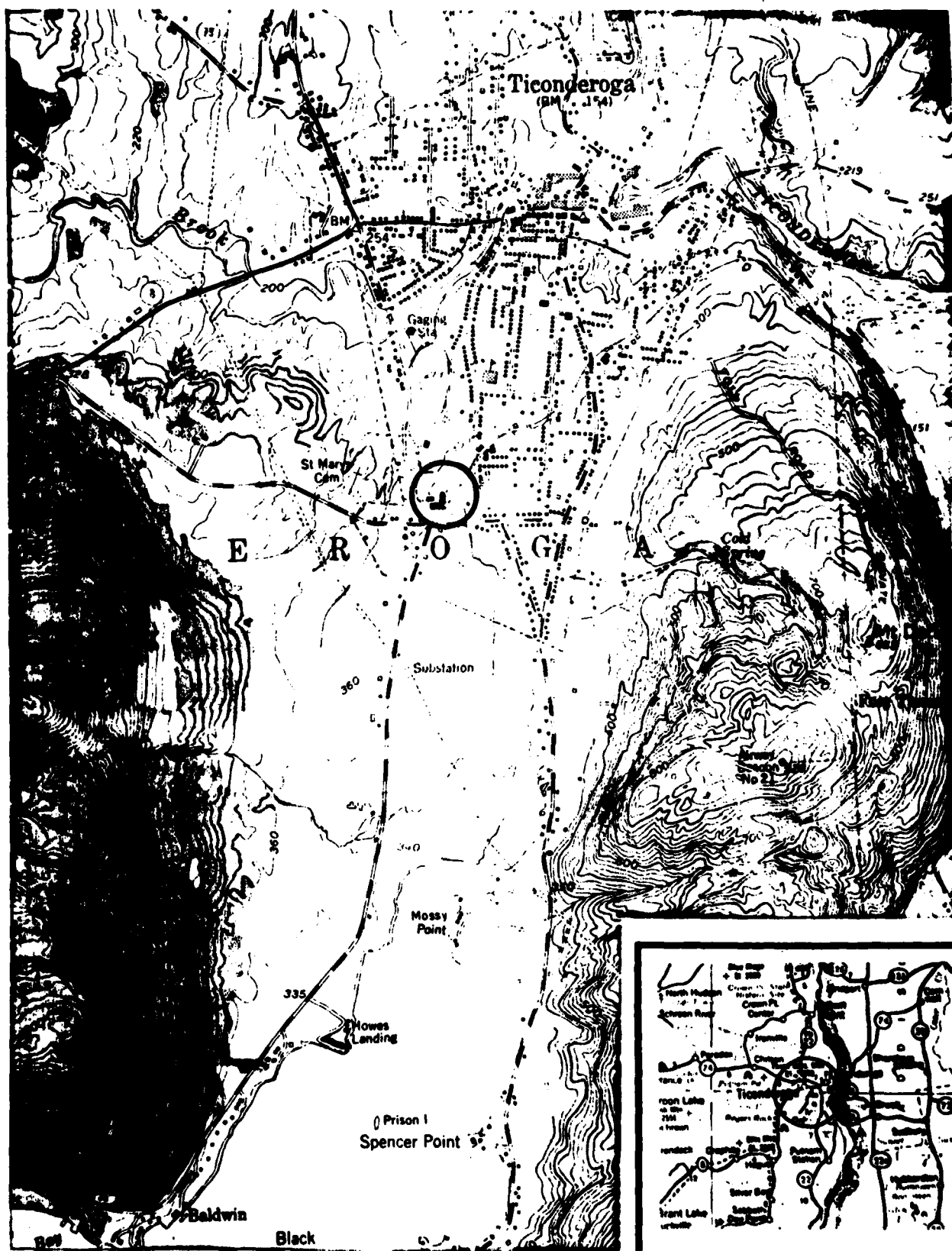
The structural stability investigations should be commenced within 6 months and remedial work necessary to improve the stability should be completed within two years. The remaining items should be attended to within one year.

#### d. Need for Additional Investigation

Further investigations relative to the structural stability of the facility should be performed to determine appropriate remedial measures necessary to provide stability under the load conditions set forth in the "Recommended Standards for Safety Inspection of Dams."

## 7.2 RECOMMENDED MEASURES

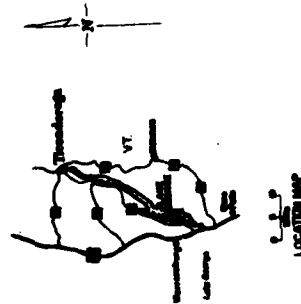
1. A structural stability analysis of the dam should be conducted to determine the effect of the dam's steel bar anchor system and the uplift forces acting on the base of the dam. Remedial measures should be taken to increase the structural stability of the facility to meet the Corps of Engineers Screening Criteria.
2. A warning system should be provided to alert persons that flow in the receiving stream will be increased, when the control gates are opened.
3. A flood warning and emergency evacuation plan should be implemented to alert the public, should conditions occur which could result in failure of the dam.
4. A formalized inspection system should be initiated to develop data on conditions and maintenance operations at the facility.



**VICINITY MAP**

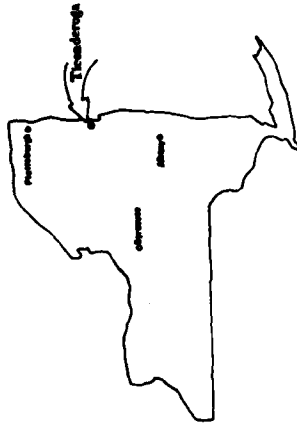
# LAKE GEORGE GATE INSTALLATION

TICONDEROGA, ESSEX CO. NEW YORK



## List of Drawings

| Drawing No. | Title                          |
|-------------|--------------------------------|
| 1           | TITLE SHEET                    |
| 2           | SITE PLAN & ELECTRICAL DETAILS |
| 3           | CONCRETE DETAILS               |
| 4           | SLIDE GATE DETAILS             |
| 5           | TRASH RACK & CONCRETE DETAILS  |



|                                        |                                                                                                                                                                                                |
|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| APPROVED BY<br><br>J. J. J.<br>3/28/78 | STATE OF NEW YORK<br>DEPARTMENT OF ENVIRONMENTAL CONSERVATION<br>DIVISION OF STREAMS AND FISH SERVICES<br>LAKE GEORGE GATE INSTALLATION<br>NEW YORK<br>ESSEX CO.<br>TICONDEROGA<br>TITLE SHEET |
|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

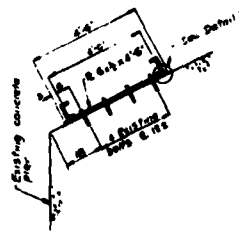
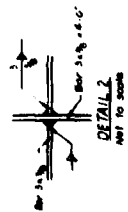
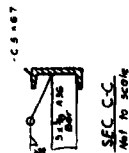
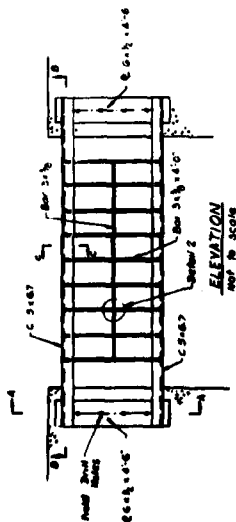
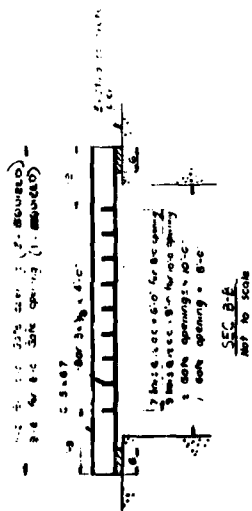
FIGURE 2



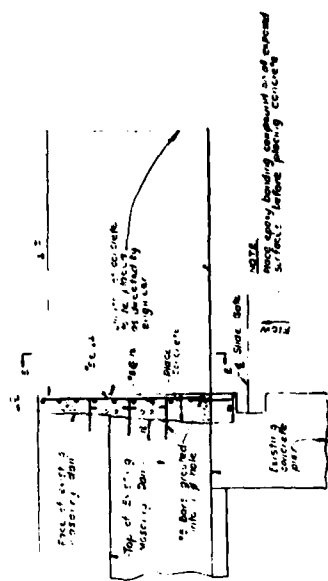




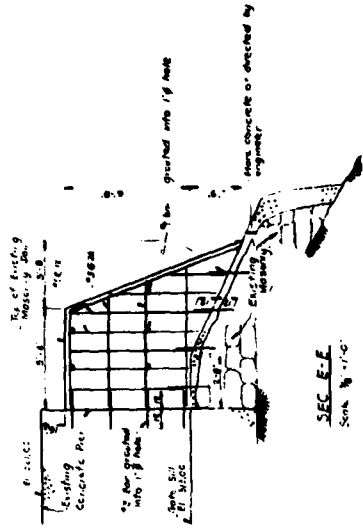
# TRASH RACK DETAILS



NOTE: 1. Existing concrete to be removed and replaced with new concrete.  
2. Existing concrete to be removed and replaced with new concrete.  
3. All steel to be painted after fabrication.



## PLAN NORTH GATE ABUTMENT

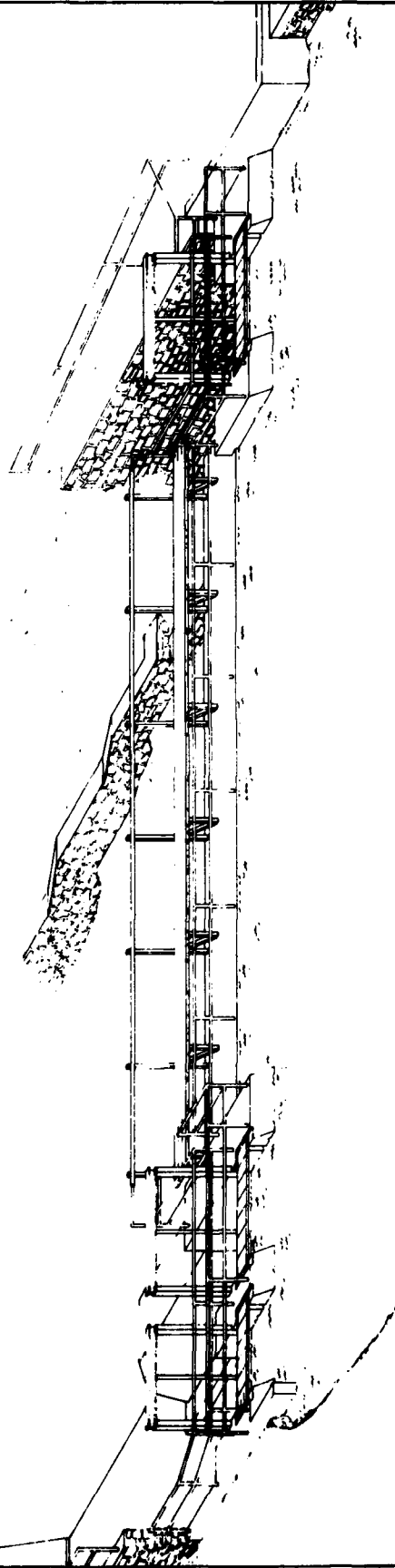
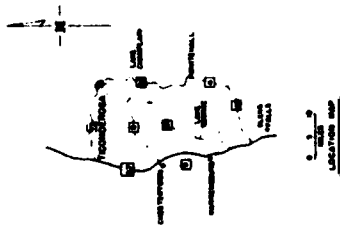


|                                 |                   |
|---------------------------------|-------------------|
| STATE OF NEW YORK               | DATE: 10/1/10     |
| DEPARTMENT OF TRANSPORTATION    | PROJECT: 10/1/10  |
| SECTION: 10/1/10                | SCALE: 1/2"=1'-0" |
| LAKE GEORGE GATE INSTALLATION   | NO. 10/1/10       |
| TRASH RACK AND CONCRETE DETAILS | 10/1/10           |

FIGURE 6

# LAKE GEORGE OUTLET GATES

TICONDEROGA, ESSEX CO. NEW YORK



## INDEX

- NP1 TITLE SHEET
- NP2 SITE PLAN & WALL DETAILS
- NP3 NORTH GATE ABUTMENT
- NP3A FIELD CHANGE NORTH ABUTMENT
- NP4 SOUTH GATE ABUTMENT
- NP4A FIELD CHANGE SOUTH ABUTMENT
- NP5 WEST WALL & ELECTRICAL
- NP6 ROCK EXCAVATION & ABUTMENT DETAILS
- NP7 MISCELLANEOUS METAL
- NP8 MISCELLANEOUS METAL
- NP9 SLIDE GATE DETAILS

|                                             |           |
|---------------------------------------------|-----------|
| STATE OF NEW YORK                           |           |
| DEPARTMENT OF ENVIRONMENTAL CONSERVATION    |           |
| DIVISION OF OPERATIONS AND SUPPORT SERVICES |           |
| LAKE GEORGE OUTLET GATES                    | ESSEX CO. |
| TICONDEROGA                                 | NEW YORK  |
| TITLE SHEET                                 |           |
| SHEET NO. 1                                 |           |

234C-808 L. Chomley

FIGURE 7



## FIGURE 8



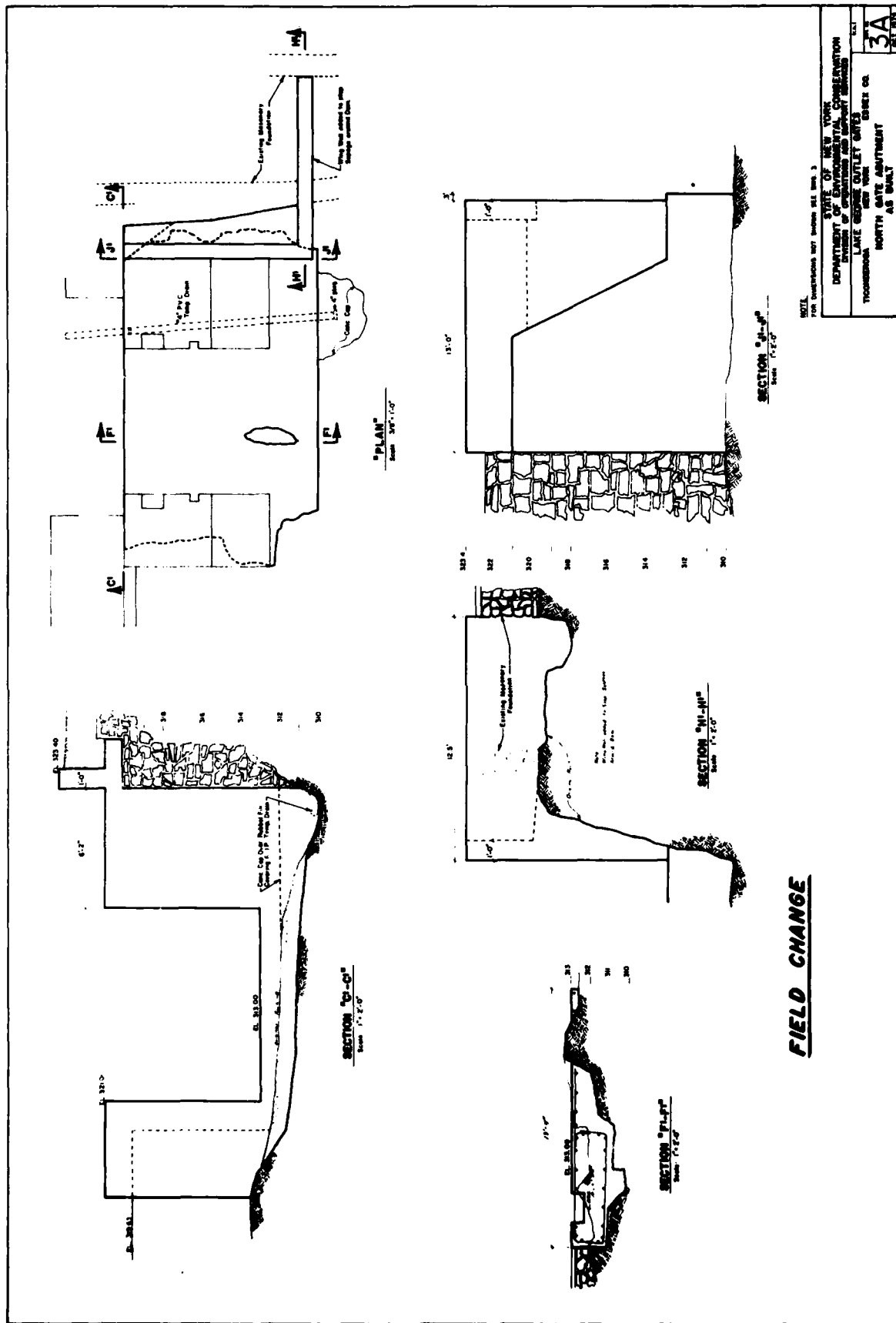


FIGURE 10



## FIGURE 11

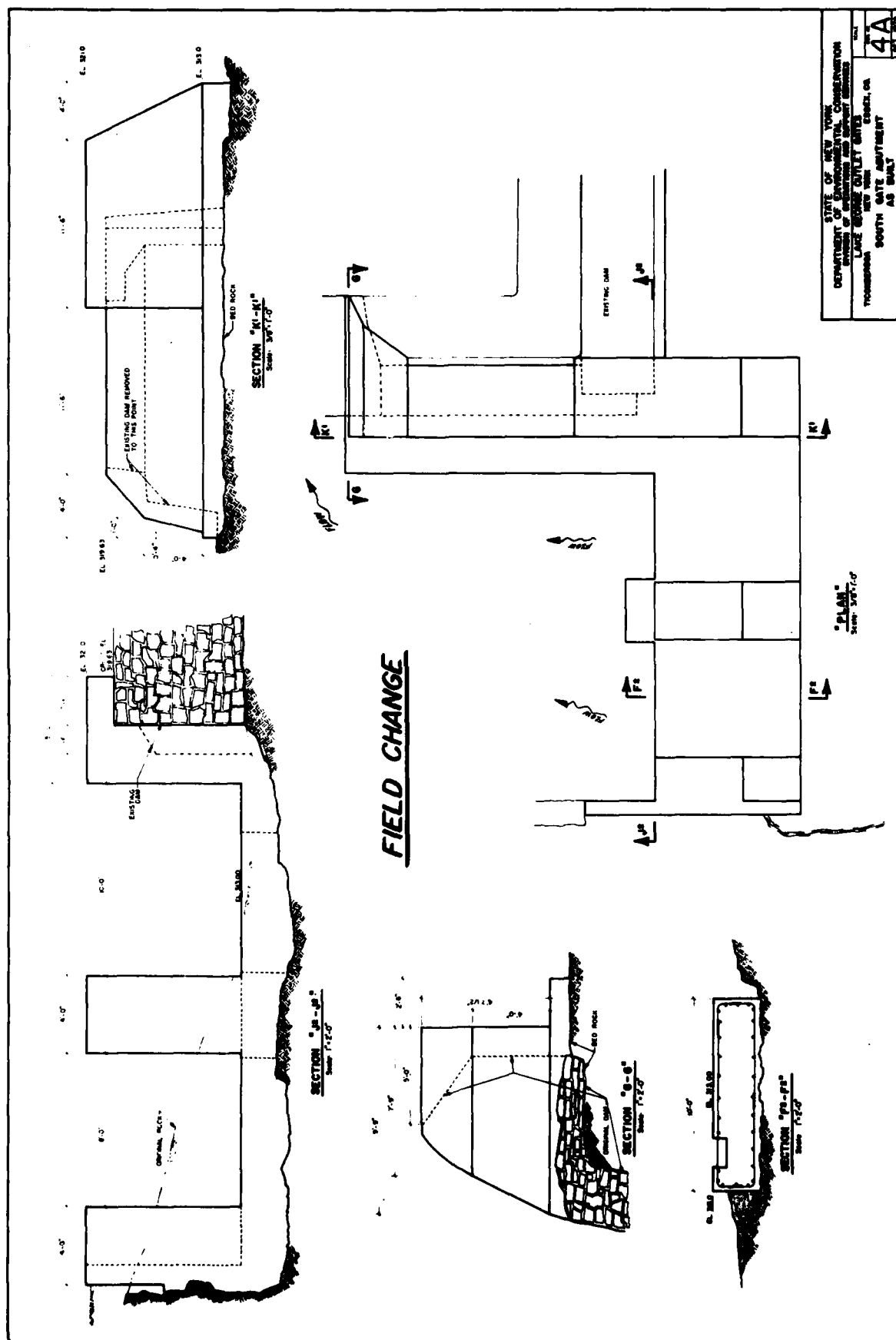
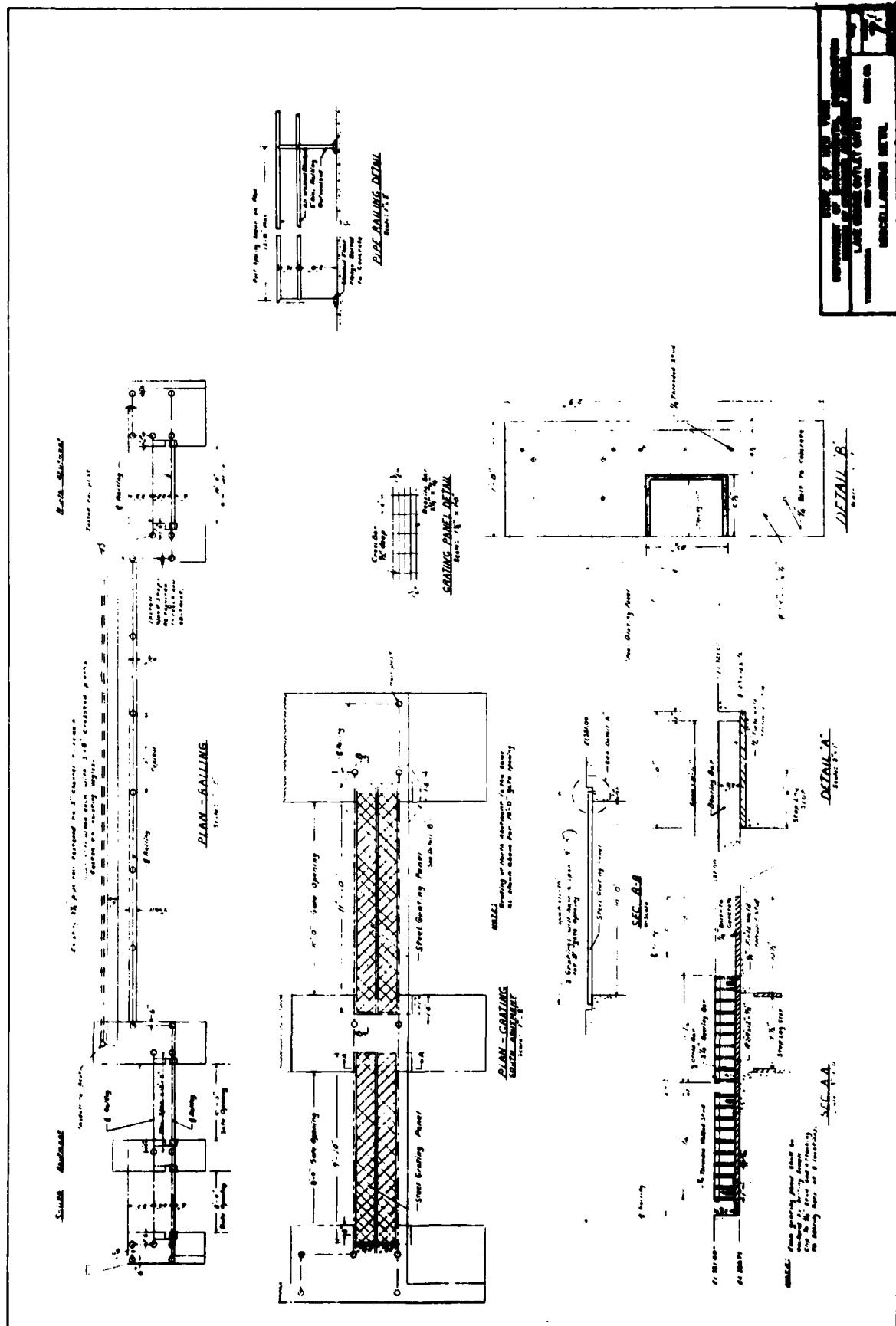


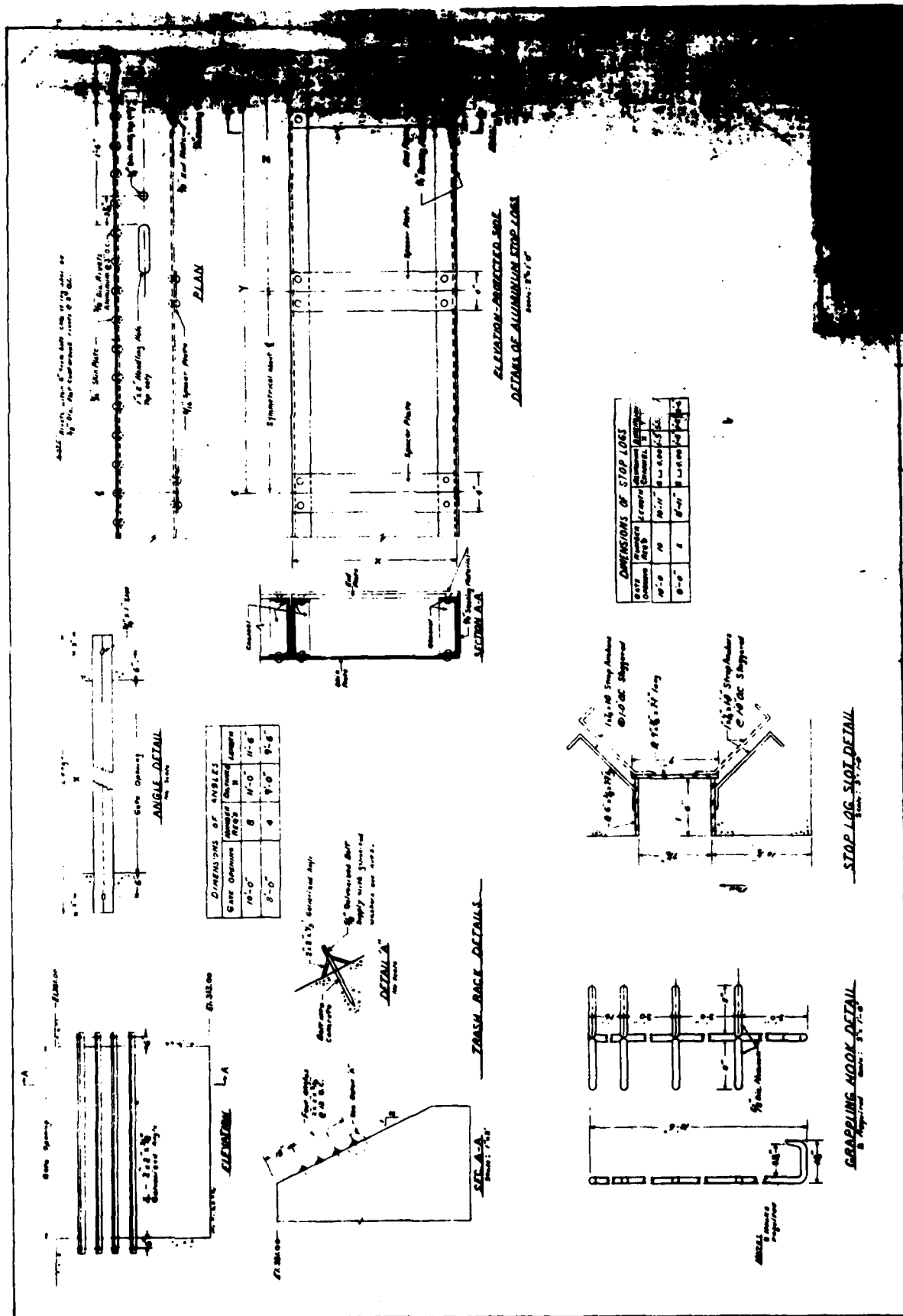
**FIGURE 12**



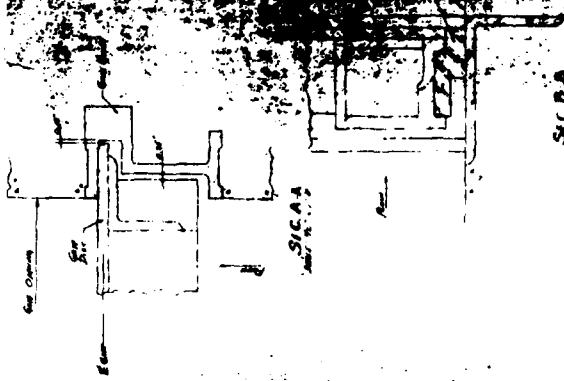
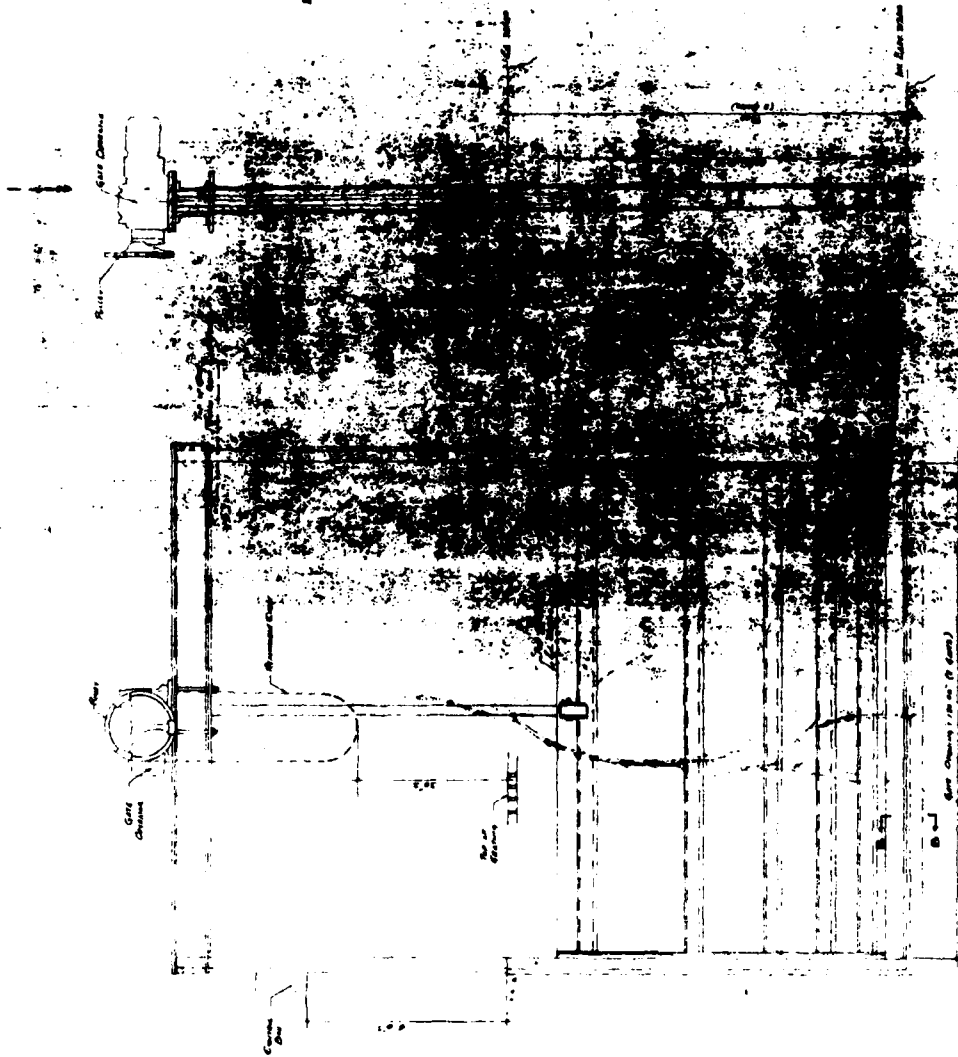




## FIGURE 13



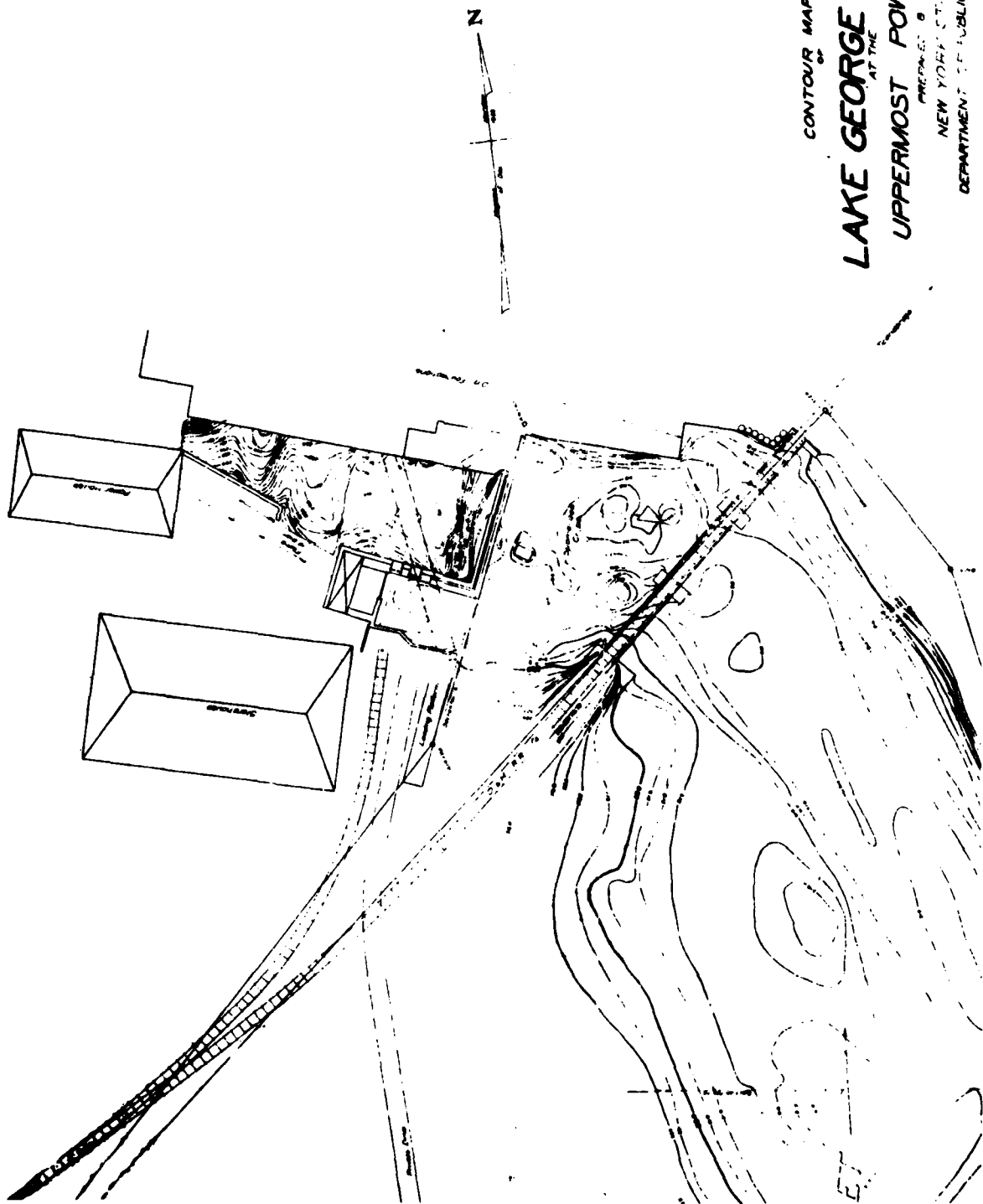
## FIGURE 18



Notes:  
 1) The drawing shows the gate in the open position.  
 2) The drawing shows the gate in the closed position.  
 3) The drawing shows the gate in the open position.  
 4) The drawing shows the gate in the closed position.

|             |                          |
|-------------|--------------------------|
| DATE        | 10/10/55                 |
| BY          | W. J. B. B.              |
| CHECKED BY  | W. J. B. B.              |
| APPROVED BY | W. J. B. B.              |
| PROJECT     | LAKE GEORGE OUTLET GATES |
| SHEET       | 9                        |

FIGURE 17



CONTOUR MAP  
OF  
**LAKE GEORGE OUTLET**  
AT THE  
**UPPERMOST POWER DAM**  
PREPARED BY  
NEW YORK STATE  
DEPARTMENT OF PUBLIC WORKS

**FIGURE 18**

# EDUCATIONAL LEAFLET

DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT  
NATIONAL SYSTEM OF PUBLIC LANDS



This material is reprinted from the  
Department's official magazine—  
**THE CONSERVATIONIST**

## Lake George

### Physical Characteristics

Area Approximately: 28,200 acres  
Elevation: 322 feet  
Maximum Depth: 187 feet  
Length: 32 miles  
Maximum Width: 3 miles

### Fish Present

Lake Trout  
Landlocked Salmon  
Rainbow Trout  
Brown Trout (Rare)  
Cisco  
Smallmouth Bass  
Largemouth Bass  
Northern Pike  
Chain Pickerel  
Yellow Perch  
Bullhead  
Sunfish  
Rock Bass  
Suckers  
Various Minnows  
Black Crappie  
Rainbow Smelt

### Hunting in Vicinity

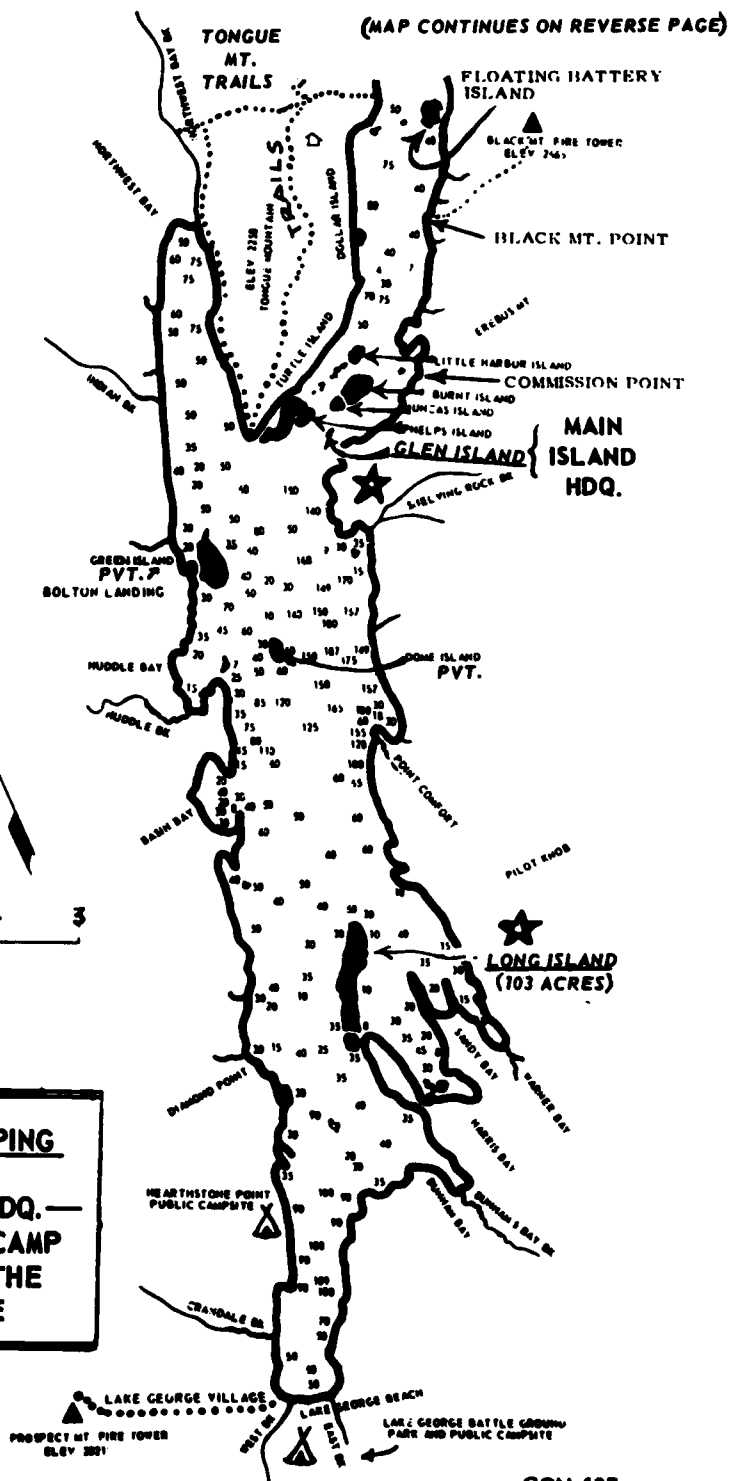
Deer  
Ruffed Grouse  
Snowshoe Hare  
Bear

### Fur Bearers

|         |          |
|---------|----------|
| Beaver  | Fisher   |
| Otter   | Red Fox  |
| Mink    | Gray Fox |
| Muskrat | Coyote   |
| Bobcat  | Weasel   |



**ISLAND CAMPING**  
★ DEP'T. HDQ.—  
GET ISLAND CAMP  
PERMITS AT THE  
NEAREST ONE



CON-187

FIGURE 19



### LAKE GEORGE ISLANDS

At Lake George there are 47 State-owned islands available for camping. Permits must be obtained for camping on them regardless of the length of stay. Permits are available at three Department headquarters; on Long Island for the southerly part of the Lake, Glen Island for the central part, and Narrow Island at Huletts Landing for the northerly part. The Glen Island and Long Island headquarters can be reached by telephone. Bolton NH 4-9696 is the number for Glen Island and Kattskill Bay NL 6-9426 for Long Island. The telephone number at Narrow Island headquarters is Clemons 2341.

There are 11 State-owned islands used exclusively for picnicking. Picnic areas are also available at the southern end of Long Island, Commission Point and at Black Mt. Point.

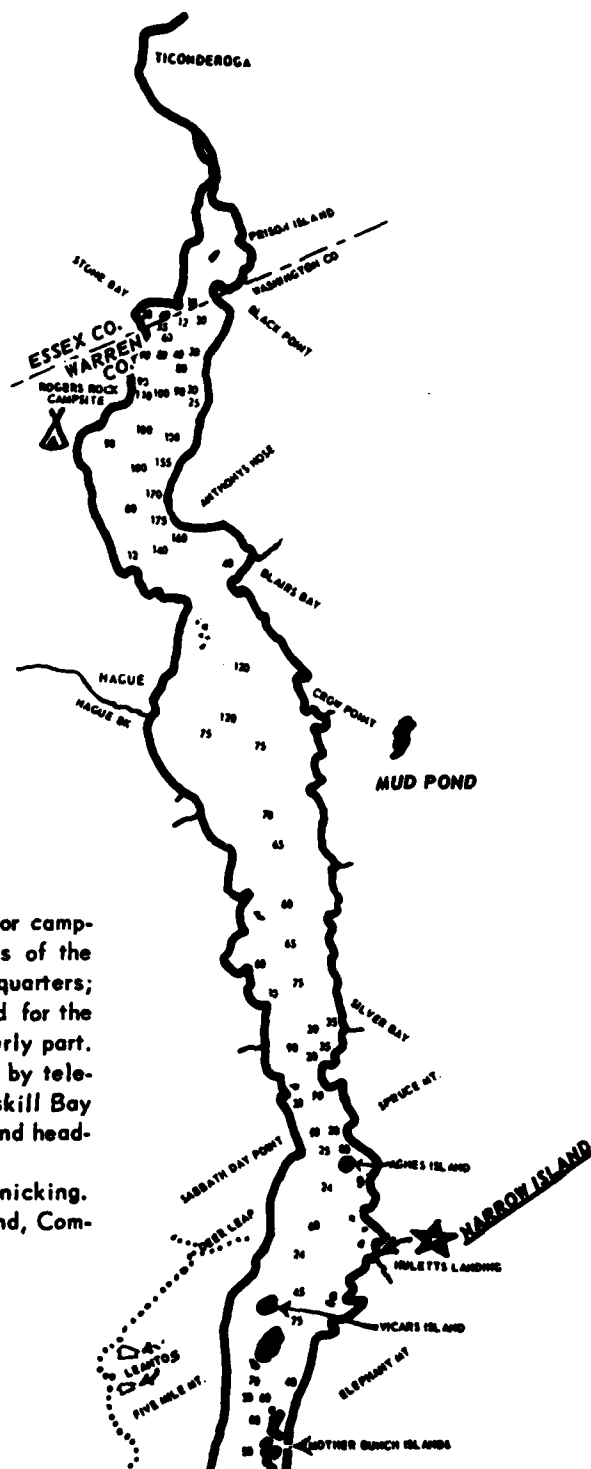
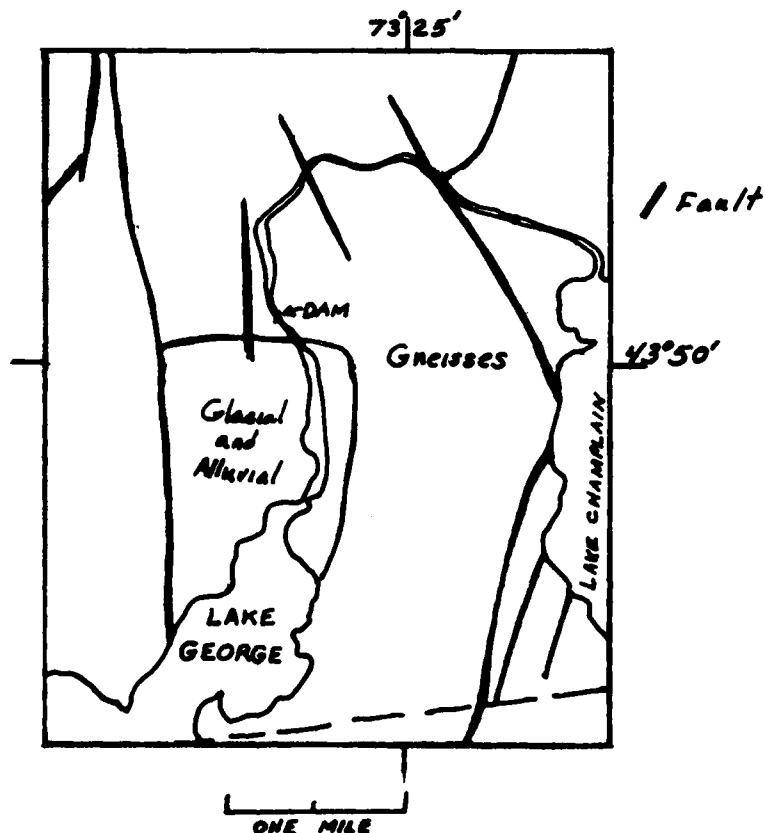


FIGURE 20



GEOLOGIC MAP



STETSON • DALE

DATE

5-29-80

DRAWN

D.M.E.

NO.

2999

APP.

FIGURE 21

APPENDIX A  
FIELD INSPECTION REPORT

CHECK LIST  
VISUAL INSPECTION

PHASE 1

Name Dam Lake George Outlet County Essex State New York ID # NY 230  
 Type of Dam Masonry Hazard Category High  
 Date(s) Inspection April 22, 1980 Weather Sunny Temperature 50's

Pool Elevation at Time of Inspection 318.7 + M.S.L. Tailwater at Time of Inspection Not applicable

Inspection Personnel:

|                        |                                          |
|------------------------|------------------------------------------|
| <u>J. A. Gomez</u>     | <u>Dale Engineering Company</u>          |
| <u>F. W. Byszewski</u> | <u>Dale Engineering Company</u>          |
| <u>D. F. McCarthy</u>  | <u>Dale Engineering Company</u>          |
| <u>H. Muskatt</u>      | <u>Dale Engineering Company</u>          |
| <u>C. W. Glass</u>     | <u>N.Y.S.D.E.C. - Warrensburg Office</u> |

J. A. Gomez Recorder

CONCRETE/MASONRY DAMS

| VISUAL EXAMINATION OF                      | OBSERVATIONS                                                                                                                                                                                                      | REMARKS OR RECOMMENDATIONS                           |
|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|
| ANY NOTICEABLE SEEPAGE                     | None observed                                                                                                                                                                                                     |                                                      |
| STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS | Main dam to abutment wall junctions in good condition due to 1974 construction.                                                                                                                                   | Structure ties into walls lining downstream channel. |
| DRAINS                                     | None observed                                                                                                                                                                                                     |                                                      |
| WATER PASSAGES                             | Reputedly there are several conduits, which are no longer in use, that pass underneath the old mill. The outlet of one such passage was observed downstream of the dam, near dam B; outlet walls were collapsing. |                                                      |
| FOUNDATION                                 | Founded on rock-gneiss, which is quite durable as is evidenced by the little weathering observed of the rock just downstream of the dam.                                                                          |                                                      |

CONCRETE/MASONRY DAMS

| VISUAL EXAMINATION OF               | OBSERVATIONS                                                                                                                                                                                             | REMARKS OR RECOMMENDATIONS                                                                                                              |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| SURFACE CRACKS<br>CONCRETE SURFACES | Missing some pointing on downstream side of masonry dam. Concrete surfaces generally in good condition due to 1974 refurbishing. Some minor cracks observed on top surface of middle (spillway) section. | Three gates and their abutments were built in August, 1974. At this time, the upstream face of the masonry dam was faced with concrete. |
| STRUCTURAL CRACKING                 | None observed                                                                                                                                                                                            |                                                                                                                                         |
| VERTICAL & HORIZONTAL<br>ALIGNMENT  | No anomalies observed                                                                                                                                                                                    |                                                                                                                                         |
| MONOLITH JOINTS                     | No anomalies observed                                                                                                                                                                                    |                                                                                                                                         |
| CONSTRUCTION JOINTS                 | No significant deterioration at construction joints observed.                                                                                                                                            |                                                                                                                                         |
| STAFF GAGE OF RECORDER              | Not applicable                                                                                                                                                                                           |                                                                                                                                         |

EMBANKMENT

| VISUAL EXAMINATION OF                                  | OBSERVATIONS   | REMARKS OR RECOMMENDATIONS                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------------------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SURFACE CRACKS                                         | Not applicable | Area on either side of dam was at one time occupied by a mill. Floor slabs and foundation walls are about all that remains of mill. Large concrete slab on north side of dam. Most of old mill's basement filled with debris. Some subsidence of the ground has occurred in the area where the mill occupied, especially on the north side of the dam. On the downstream end of the slab north of the dam, there is a hole that exposed a void about 3 - 4 feet high. |
| UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE      | Not applicable |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES | Not applicable |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST         | Not applicable |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| RIPRAP FAILURES                                        | Not applicable |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

EMBANKMENT

| VISUAL EXAMINATION OF                                       | OBSERVATIONS   | REMARKS OR RECOMMENDATIONS |
|-------------------------------------------------------------|----------------|----------------------------|
|                                                             |                |                            |
| JUNCTION OF EMBANKMENT<br>AND ABUTMENT, SPILLWAY<br>AND DAM | Not applicable |                            |
| ANY NOTICEABLE SEEPAGE                                      | Not applicable |                            |
| STAFF GAGE AND RECORDER                                     | Not applicable |                            |
| DRAINS                                                      | Not applicable |                            |

UNGATED SPILLWAY

| VISUAL EXAMINATION OF | OBSERVATIONS                                                                                                                        | REMARKS OR RECOMMENDATIONS                                                                                                                                       |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CONCRETE WEIR         | Broad-crested weir flow over middle section of dam evidenced by rusting of bottoms of handrails on this section.                    |                                                                                                                                                                  |
| APPROACH CHANNEL      | Lake George                                                                                                                         | Two possible upstream flow constrictions. R.R. bridge just upstream, spanning about 155 feet across water. Bottom chord at approximate elevation 322.5.          |
| DISCHARGE CHANNEL     | Discharges into Ticonderoga Creek. Just downstream of dam, creek is lined with masonry walls (old walls of mill) and is very steep. | Alexandria Avenue Bridge. Arched opening - 50 feet wide, 12.5 feet from top of opening to water elevation, 4 feet 8 inches from top of opening to top of bridge. |
| BRIDGE AND PIERS      | Not applicable                                                                                                                      |                                                                                                                                                                  |

GATED SPILLWAY

| VISUAL EXAMINATION OF            | OBSERVATIONS                                                                                                                                        | REMARKS OR RECOMMENDATIONS                                                                            |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| CONCRETE SILL                    | Built in 1974                                                                                                                                       |                                                                                                       |
| APPROACH CHANNEL                 | Lake George                                                                                                                                         |                                                                                                       |
| DISCHARGE CHANNEL                | Ticonderoga Creek                                                                                                                                   |                                                                                                       |
| BRIDGE AND PIERS                 | Gate abutments in good condition,<br>built in 1974.                                                                                                 |                                                                                                       |
| GATES AND OPERATION<br>EQUIPMENT | Three aluminum gates (two 10 feet wide,<br>one 8 feet wide), electrically operated.<br>Used in spring and to discharge run-off<br>from heavy rains. | Electrical conduit for north gates<br>passes 18 inches above the crest<br>of the main dam (spillway). |

OUTLET WORKS

| VISUAL EXAMINATION OF                                              | OBSERVATIONS   | REMARKS OR RECOMMENDATIONS |
|--------------------------------------------------------------------|----------------|----------------------------|
| CRACKING AND SPALLING<br>OF CONCRETE SURFACES<br>IN OUTLET CONDUIT | Not applicable |                            |
| INTAKE STRUCTURE                                                   | Not applicable |                            |
| OUTLET STRUCTURE                                                   | Not applicable |                            |
| OUTLET CHANNEL                                                     | Not applicable |                            |
| EMERGENCY GATE                                                     | Not applicable |                            |

DOWNSTREAM CHANNEL

| VISUAL EXAMINATION OF                         | OBSERVATIONS                                                                                                                                                              | REMARKS OR RECOMMENDATIONS |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| CONDITION<br>(OBSTRUCTIONS,<br>DEBRIS, ETC.)  | Stream is pretty clear to Trout Brook.<br>Channel is lined with masonry walls<br>(old mill walls) just downstream of<br>dam.                                              |                            |
| SLOPES                                        | Steep                                                                                                                                                                     |                            |
| APPROXIMATE NO.<br>OF HOMES AND<br>POPULATION | Two trailers approximately 8 feet<br>above the stream just below Dam B. A<br>number of homes are in the vicinity of<br>the confluence with Trout Brook and<br>downstream. |                            |
|                                               |                                                                                                                                                                           |                            |
|                                               |                                                                                                                                                                           |                            |

**INSTRUMENTATION**

| <b>VISUAL EXAMINATION OF</b> | <b>OBSERVATIONS</b> | <b>REMARKS OR RECOMMENDATIONS</b> |
|------------------------------|---------------------|-----------------------------------|
| <b>MONUMENTATION/SURVEYS</b> | None observed       |                                   |
| <b>OBSERVATION WELLS</b>     | Not applicable      |                                   |
| <b>WEIRS</b>                 | Not applicable      |                                   |
| <b>PIEZOMETERS</b>           | Not applicable      |                                   |
| <b>OTHER</b>                 | Not applicable      |                                   |

# RESERVOIR

| VISUAL EXAMINATION OF | OBSERVATIONS                                                             | REMARKS OR RECOMMENDATIONS |
|-----------------------|--------------------------------------------------------------------------|----------------------------|
| SLOPES                | Slopes of Lake George are quite steep due to mountains surrounding lake. |                            |
| SEDIMENTATION         | No excessive sedimentation observed in region just upstream of dam.      |                            |
|                       |                                                                          |                            |
|                       |                                                                          |                            |
|                       |                                                                          |                            |
|                       |                                                                          |                            |

**CHECK LIST**  
**ENGINEERING DATA**  
**DESIGN, CONSTRUCTION, OPERATION**  
**PHASE 1**

NAME OF DAM Lake George

ID # NY 230

| ITEM                                                                | REMARKS                                                         |
|---------------------------------------------------------------------|-----------------------------------------------------------------|
| AS-BUILT DRAWINGS                                                   | 1974 N.Y.S.D.E.C. plans                                         |
| REGIONAL VICINITY MAP                                               | U.S.G.S.                                                        |
| CONSTRUCTION HISTORY                                                | From N.Y.S.D.E.C. Dam Safety files and 1945 Legislative Report. |
| TYPICAL SECTIONS OF DAM                                             | 1974 plans                                                      |
| OUTLETS - PLAN<br>- DETAILS<br>- CONSTRAINTS<br>- DISCHARGE RATINGS | Plan and details - 1974 plans.                                  |
| RAINFALL/RESERVOIR RECORDS                                          | Lake George Legislative Committee Report, 1945.                 |

| ITEM                                                                              | REMARKS                                            |
|-----------------------------------------------------------------------------------|----------------------------------------------------|
| DESIGN REPORTS                                                                    | None available                                     |
| GEOLOGY REPORTS                                                                   | 1945 Legislative Report (General Regional Geology) |
| DESIGN COMPUTATIONS<br>HYDROLOGY & HYDRAULICS<br>DAM STABILITY<br>SEEPAGE STUDIES | None available                                     |
| MATERIALS INVESTIGATIONS<br>BORING RECORDS<br>LABORATORY<br>FIELD                 | None available                                     |
| POST-CONSTRUCTION<br>SURVEYS OF DAM                                               | 1974 plans (as-built)                              |
| BORROW SOURCES                                                                    | Not applicable                                     |

| ITEM                                                        | REMARKS                           |
|-------------------------------------------------------------|-----------------------------------|
| MONITORING SYSTEMS                                          | None known                        |
| MODIFICATIONS                                               | 1974 (latest)                     |
| HIGH POOL RECORDS                                           | U.S.G.S. gage at Roger's Rock     |
| POST CONSTRUCTION<br>ENGINEERING STUDIES<br>AND REPORTS     | None known                        |
| PRIOR ACCIDENTS OR FAILURE OF DAM<br>DESCRIPTION<br>REPORTS | None known                        |
| MAINTENANCE<br>OPERATION:<br>RECORDS                        | N.Y.S.D.E.C. - Warrensburg Office |

| ITEM                                   | REMARKS    |
|----------------------------------------|------------|
| SPILLWAY PLAN<br>SECTIONS<br>DETAILS   | 1974 plans |
| OPERATING EQUIPMENT<br>PLANS & DETAILS | 1974 plans |

**CHECK LIST**  
**HYDROLOGIC & HYDRAULIC**  
**ENGINEERING DATA**

DRAINAGE AREA CHARACTERISTICS: Lake George

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 2,185,000 ac-ft @ elev. 319.6

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): Not applicable

ELEVATION MAXIMUM DESIGN POOL: 2,279,000 ac-ft @ elev. 323 (top of dam)

ELEVATION TOP DAM: 323.5

**CREST:**

- a. Elevation 319.6
- b. Type Broad-crested
- c. Width 6 feet
- d. Length 60 feet
- e. Location Spillover Center of dam
- f. Number and Type of Gates 2 - 10 ft. x 7 ft., 1 - 8 ft. x 7 ft.

**OUTLET WORKS:**

- a. Type 3 sluice gates
- b. Location 1 - north, 2 - south
- c. Entrance Inverts 313
- d. Exit Inverts Same as Entrance
- e. Emergency Draindown Facilities 3 sluice gates

**HYDROMETEOROLOGICAL GAGES:**

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

MAXIMUM NON-DAMAGING DISCHARGE: 1470 cfs

APPENDIX B

PREVIOUS INSPECTION REPORTS/RELEVANT CORRESPONDENCE

Kolak  
4/25/74

GENERAL GUIDELINES FOR OPERATION  
OF LAKE GEORGE OUTLET

LAW

The law regulating the water surface at Lake George, dated March 27, 1957, provides a maximum water surface elevation of 4.00 feet through the year, and a minimum water surface elevation of 2.5 feet from June 1 to December 1, with due allowance for natural fluctuations or emergencies. In addition, the law states that the water surface between June 1 and September 30 is to be an average of 3.5 feet. Water surface elevations are based on the U.S.G.S. Roger Rock Gauge. The law further states that if the level of the lake rises above 4.0 that all gates shall be opened and that if the level of the lake drops below 2.5 from June 1 to December 1, all gates shall be closed.

REGULATION GUIDELINES

In order to satisfy the Legislative mandates and achieve the most desirable lake levels for all interests concerned, the following general guides are given:

1. Starting with the winter freeze-up period, try to have the lake elevation at about 2.6 by around December 15. Freeze-up generally starts about mid-December to January 1. By keeping elev. at  $2.6 \pm$  for winter period, this allows for spring thaw without requiring a large drop in the water surface. If one were to drop from say  $4.0 \pm$  to  $2.6 \pm$  while lake is frozen, there would be damage to docks around the lake. One can probably not go too low for freeze-up (say 1.8 or 2.0) because if too much shoreline is exposed damage can occur to docks and retaining walls, etc. from frost heave. Also, gate capacity may not allow for such a drawdown with normal inflow at this time of year.
2. Snow surveys are to be made in late January, February, mid-March, and late March. According to this information, provide storage and operate gates to achieve a level of  $3.5 \pm$  by May 1. The usual Spring condition will be for the lake to rise about 1.5 ft. from snowmelt and rains in this period--even with the gates discharging relatively large flows. The lake generally will fill by mid-April.
3. During May and June with lake at  $3.5 \pm$ , be alert for sudden rains which have tendency for high runoff and may cause lake to rise  $\pm 0.5$  in this period.

4. In Aug., Sept., and Oct., there is often a drawdown (from the acceptable average of 3.5  $\pm$ ) with lows usually coming near the end of Oct. This is due to lower inflows combined with evaporation losses. By conservation practice try to keep the lake up at 3.5  $\pm$  for as long as possible to allow boat owners to bring in boats during Sept., Oct. and beginning of Nov. After this period drawdown lake to winter elevation of 2.6  $\pm$  by mid-December.
5. In summary, problem areas to watch will be: (1) Spring to allow proper storage for spring runoff; (2) Late Spring and early summer when the water is high and the ground is usually wet the gates will immediately require full opening if heavy rains occur; (3) Early winter to avoid too high or too low a freeze-up elevation; (4) Conservation during summer to avoid lows during late summer and Fall.

#### GENERAL NOTES

1. The above represent general guidelines and should be refined as experience dictates or conditions change. Unusual conditions (floods, droughts, etc.) will deviate from the above and will have to be handled as best one can.
2. The mountainous character and soil of the Lake George Watershed results in a rapid runoff. The discharge capacity of the control structure is rather small in relation to the size of the lake. Therefore, the lake level responds rapidly on inflow but slowly on discharge. For example, an inch of runoff, which can occur in less than 24 hours, will raise the lake about 4.3 inches. At maximum outflow of about 1,200 cfs, it would take four or five days to lower the lake 4.3 inches providing no additional inflow occurs.
3. For drought conditions, a low flow release may be required for sewage dilution, process water, and fish life.
4. Day-to-day operation of the gates will depend primarily on (1) existing elevation of the lake; (2) rainfall measurements, (3) drainage area conditions such as saturated ground, frozen ground, high or low snow melt potential.

Kolak  
4/26/74

*See P. 178 par. 2.  
Book on Lake George*

LAKE GEORGE - GENERAL GUIDELINES FOR RECORD KEEPING

1. Receive daily lake elevation at Rogers Rock Gage - obtain 24 hr. precipitation data.
2. Plot on graph lake elev. and daily precipitation data - keep up-to-date - also plot daily gate positions.
3. When discharge records are available from U.S.G.S. plot daily discharges on above graph.

## POLICIES AND PROCEDURES MANUAL

### TITLE 9500 - WATER RESOURCE MANAGEMENT

#### CHAPTER 9590 - LAKE GEORGE WATER LEVEL MANAGEMENT

Introduction. Since 1957 New York State has had responsibility for overseeing the regulation of the water levels of Lake George. This responsibility was with Department of Transportation until 1968 when it was transferred to the Department of Environmental Conservation. During this time and until recently, the actual operation of the Lake George Outlet Gates, which control Lake George water levels, was done by International Paper Co., Ticonderoga, N.Y. who were the owners of the Outlet Dam. In March of 1974, the Department of Environmental Conservation acquired ownership of the dam and took over the actual operation of the Outlet Gates. The lake level is regulated according to the applicable section of the Navigation Law. The outlet dam was reconstructed in the summer of 1974 by the Department of Environmental Conservation. In 1976 further work is planned to complete the modernization of the outlet gates.

9590.1 - Authority. Section 38, Chapter 1035, Laws of 1957, as amended, of the Navigation Law.

1. The law regulating the water surface at Lake George, dated March 27, 1957, provides for a maximum water surface elevation of 4.00 feet through the year, and a minimum water surface elevation of 2.5 feet from June 1 to December 1, with due allowance for natural fluctuations or emergencies. In addition, the law states that the water surface between June 1 and September 30 is to be an average of 3.5 feet. Water surface elevations are based on the U.S.G.S. Rogers Rock Gauge. The law further states that if the level of the lake rises above 4.0 that all

gates shall be opened and that if the level of the lake drops below 2.5 from June 1 to December 1, all gates shall be closed.

9590.2 - Objective.

1. To regulate the water level of Lake George as nearly as possible in accordance with the prescribed law and maintain the most desirable lake levels and flow releases for all concerned interests.

2. To set forth duties and responsibilities of Departmental units regarding regulation of the water levels of Lake George.

9590.3 - Policy.

1. Regulation guidelines will be established and revised as necessary for obtaining as nearly as possible the lake levels as prescribed by law and for the best interests of all concerned parties.

2. Adequate records will be maintained to insure proper lake level operation and for analytical and historical purposes.

9590.4 - Procedures.

1. Guidelines for Lake Regulation

a. Starting with the winter freeze-up period (December 15) the lake elevation will generally be kept on the low side (2.8  $\pm$ ).

b. Snow surveys are to be made in late January, February, Mid-March and late March. According to this information, provide storage and operate gates to achieve a level of 3.5  $\pm$  by May 1.

c. From May through October keep lake at 3.5  $\pm$ .

d. By mid-December have lake at lower elevation for winter period.

e. Notes:

1. The foregoing general regulation guidelines should be refined as experience dictates or conditions change. Unusual conditions (floods, droughts, etc.) may deviate from the

Guidelines and will have to be handled as best one can.

2. Day-to-day operation of the gates will depend primarily on (1) existing elevation of the lake; (2) drainage area conditions such as saturated ground, frozen ground, high or low snow melt potential; (3) rainfall data.

2. Responsibilities for Lake Regulation

a. Lake George Field Office, Lake George, N.Y.

1. Obtains and receives all data, makes studies, keeps all records, and makes recommendations for operation and maintenance of gates and dam at Lake George outlet.

2. Reviews and revises lake regulation guidelines as necessary.

3. Directs and supervises snow surveys.

b. Bureau of Facilities and Construction Management, Hydraulics Section

1. Reviews work and guidelines established by Lake George Office and lends technical assistance when necessary.

c. Warrensburg District Office

1. Furnishes men and equipment to operate and maintain gates and dam as directed by Lake George office.

2. Furnishes men and equipment to make snow surveys under direction of Lake George office.

3. Procedures for Record Keeping, Lake George Office

a. Receives from gauge reader (Mr. Cook) daily lake elevation at Rogers Rock.

b. Plots daily lake elevation and daily gate position.

c. Receives and plots daily precepitation data from U. S. Weather Bureau.

6/2/75

- d. Plots daily discharge records from U.S.G.S.
- e. Plots above data as nearly as possible on same graph and makes as clear as possible relationship of above data.

Lake George  
No. 808

STATE OF NEW YORK  
DEPARTMENT OF  
**State Engineer and Surveyor**  
ALBANY

## Report of a Structure Impounding Water

To assist in carrying out the provisions of Section 22 of the Conservation Law, being Chapter LXV of the Consolidated Laws of New York State, relating to safeguarding life and property and the erection, reconstruction, or maintenance of structures for impounding water, owners of such structures are requested to fill out as completely as possible this report form for each such dam or reservoir owned within the State of New York for which no plans or reports relative thereto are on file in this Department, and to return this report form, together with prints or photographs explanatory thereof to this department.

1. The structure is on Ticonderoga River flowing into Lake Champlain in the Town of Ticonderoga County of Essex and forms the outflow of Lake George.  
(Give exact distance and direction from a well-known bridge, dam, village main cross-roads or mouth of a stream.)

2. Is any part of the structure built upon or does its pond flood any State lands? No.

3. The name and address of the owner is International Paper Co.,  
100-E 42<sup>nd</sup> St., New York City.

4. The structure is used for diversion of the flow for power for paper mill.

5. The material of the right bank, in the direction with the current, is solid rock; at the spillway crest elevation this material has a top slope of \_\_\_\_\_ inches vertical to a foot horizontal on the center line of the structure, a vertical thickness at this elevation of \_\_\_\_\_ feet, and the top surface extends for a vertical height of \_\_\_\_\_ feet above the spillway crest.

6. The material of the left bank is solid rock; has a top slope of \_\_\_\_\_ inches to a foot horizontal, a thickness of \_\_\_\_\_ feet and a height of \_\_\_\_\_ feet.

7. The natural material of the bed on which the structure rests is (clay, sand, gravel, boulders, granite, shale, slate, limestone, etc.) solid trap rock, horizontal strata.

8. State the character of the bed and the banks in respect to the hardness, perviousness, water bearing, effect of exposure to air and to water, uniformity, etc. hard, dense impervious rock.

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

10. What is the thickness of the layers?.....

11. Are there any porous seams or fissures? No.

12. The watershed at the above structure and draining into the pond formed thereby is 183 square miles.

13. The pond area at the spillway crest elevation is 28,000 acres and the pond impounds 3.011 cubic feet of water.

14. The maximum known flow of the stream at the structure was 1340 cubic feet per second on May 3<sup>rd</sup> 1924.  
(Date)

15. Has the spillway capacity ever been exceeded by a high flow? No.

Can any possible flood flow from the pond otherwise than through the wastes noted under 17 and 18 of this report? No. If so, give the location, the length and the elevation relative to the spillway crest and the character and slopes of the ground of such possible wastes.....

16. State if any damage to life or to any buildings, roads or other property could be caused by any possible failure of the above structure. Describe the location, the character and the use of buildings below the structure which might be damaged by any failure of the structure; of roads adjacent to or crossing the stream below the structure, giving the lowest elevation of the roadway above the stream bed and giving the shape, the height and the width of stream openings; and of any embankments or steep slopes that any flood could pass over. Also indicate the character and use made of the ground below the structure.....

17. WASTES. The spillway of the above structure is 83 feet long in the clear; the waters are held at the right end by a Found. wall of building, the top of which is 3 or more feet above the spillway crest, and has a top width of 2 feet; and at the left end by a Retaining wall, the top of which is 15 feet above the spillway crest, and has a top width of 2 feet.

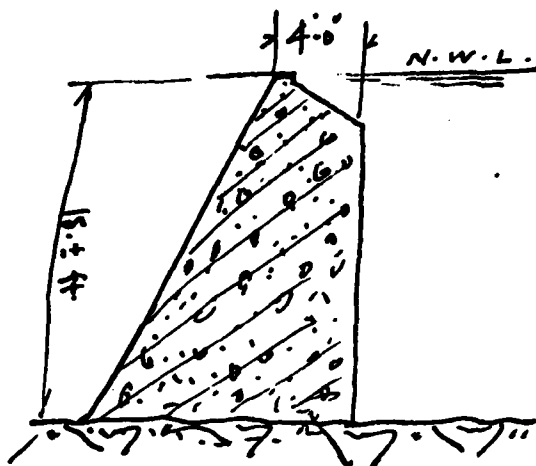
18. There is also for flood discharge a pipe none inches inside diameter and the bottom is 6 feet below the spillway crest; and a (sluice, gate outlet) 6 feet wide in the clear by 9 feet high, and the bottom is 9 feet below the spillway crest.

19. APRON. Below the spillway there is an apron built of no apron built  
(Material)  
feet wide and \_\_\_\_\_ feet thick. The downstream side of the apron has a thickness of \_\_\_\_\_ feet  
for a width of \_\_\_\_\_ feet.

20. Has the structure any weaknesses which are liable to cause its failure in high flows? No.

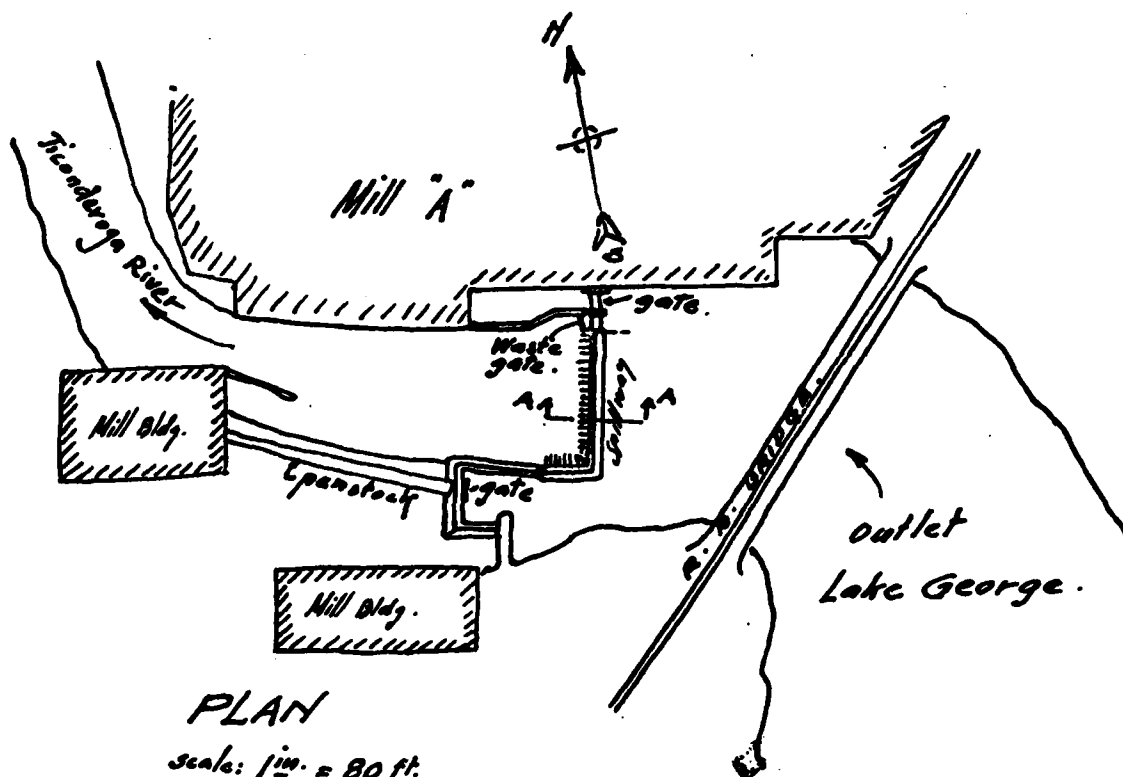
21. SKETCHES. On the back of this report make a sketch to scale for each different cross-section of the above structure at the greatest depth; giving the height and the depth from the surface of the foundation, the bottom width, the top width (for a concrete or masonry spillway at two feet below the crest), the elevation of the top in reference to the spillway crest, the length of the section, and the material of which the section is constructed; on the spillway section show a cross section of the apron, giving its width, thickness and material, and show the abutment or wash wall at the end of the spillway, giving its heights and thickness. Mark each section with a capital letter. Also sketch a plan; show the above sections by their top lines, giving the mark and the length of each; the openings by their horizontal dimensions; the abutments by their top width and top lengths from the upstream face of the spillway section; and outline the apron. Also sketch an elevation of each end of the structure with a cross section of the banks, giving the depth and width excavated into the banks.

22. WATER SUPPLY. The waters impounded by the above structure have (not) been used for a public water supply since \_\_\_\_\_ by \_\_\_\_\_



SECTION A-A.

$\frac{1}{8}'' = 1'-0''$



PLAN

scale:  $\frac{1}{4}'' = 80 \text{ ft.}$

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

100 East 42nd Street

(Address of signer)

International Paper Co.

(Signature)

Feb. 18th, 1925

(Date)

*A. H. White* Chief Engineer

(A person signing for owner should indicate his title or authority)

(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

# DAM REPORT

S-237 - No 808 - CH

July 31, 1942  
(Date)

CONSERVATION COMMISSION,

DIVISION OF WATERS.

GENTLEMEN:

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

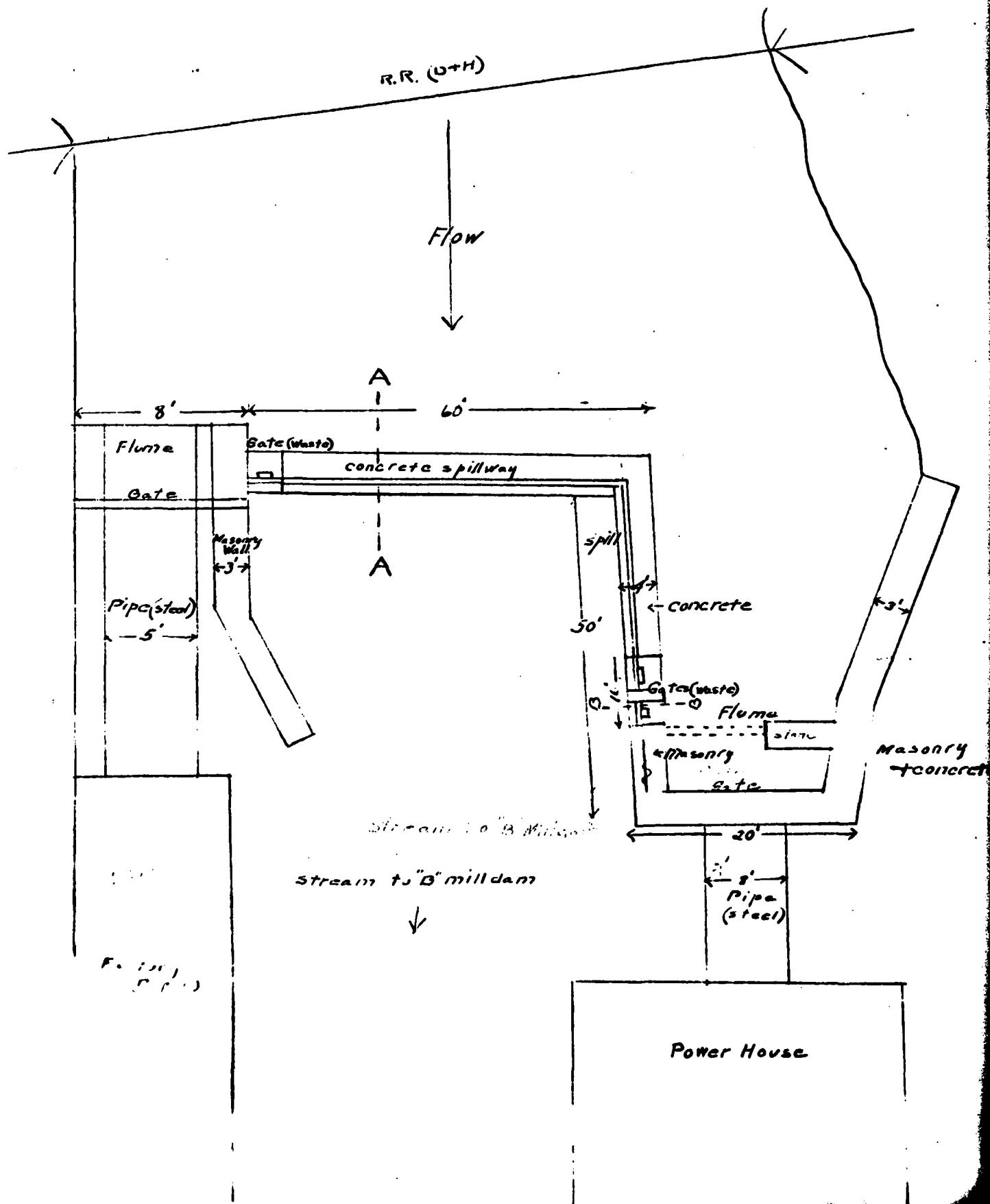
This dam is situated upon the Outlet of Lake George  
(Give name of stream)  
in the Town of Ticonderoga, Essex County,  
about 1/2  
(State distance)  
from the Village or City of Ticonderoga.  
The distance 1/2 stream from the dam, to the Palisades  
(Up or down) (Give name of nearest important stream or of a bridge)  
is about 1/2  
(State distance)

The dam is now owned by International Paper Co., Ticonderoga, N.Y.  
(Give name and address in full)  
and was built in or about the year 1823, and was extensively repaired or reconstructed during the year 1870 is used for: Water power for factory "A"

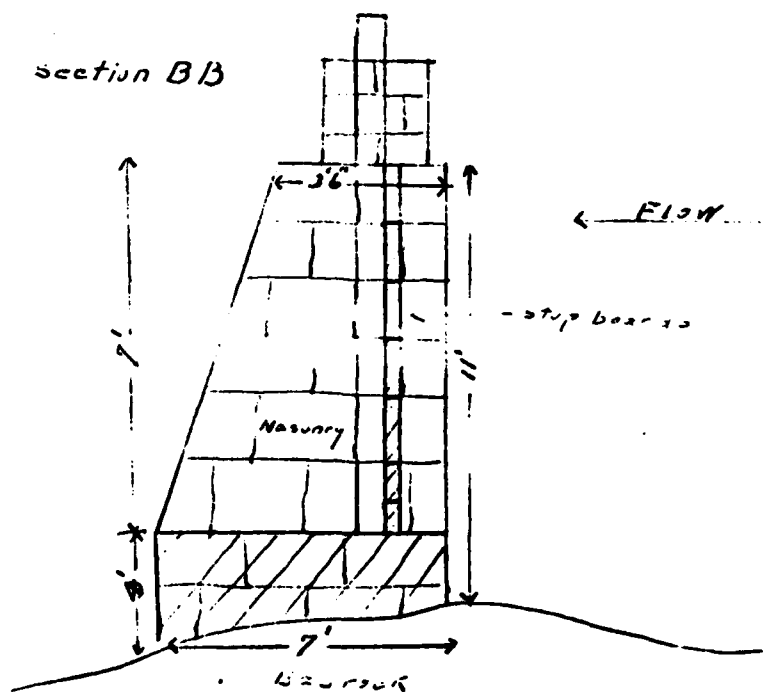
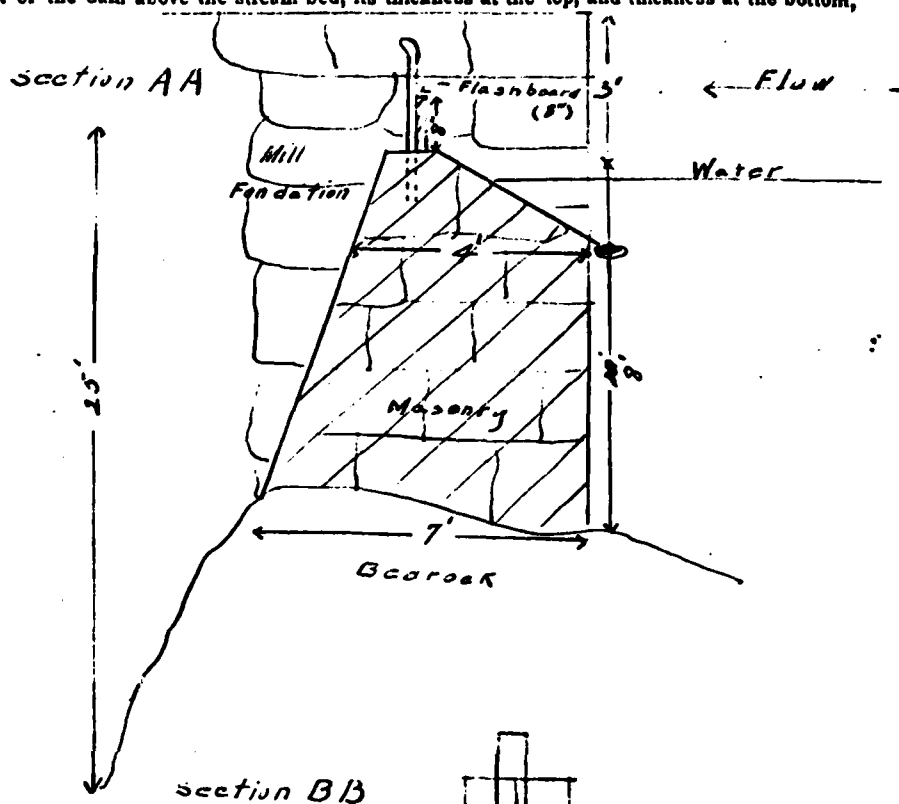
As it now stands, the spillway portion of this dam is built of Concrete & masonry  
(State whether of masonry, concrete or timber)  
and the other portions are built of Masonry  
(State whether of masonry, concrete, earth or timber with or without rock fill)

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

(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.)



(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 outline the abutment, 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.)



The total length of this dam is.....160'.....feet. The spillway or waste-weir portion, is about.....110'.....feet long, and the crest of the spillway is about.....feet below the abutment.

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 sluice 4' wide, 6' deep; one sluice 6' wide 7' deep; one spill 11' long 7' 3" below abutment; one penstock 6" dia. 4000 ft. long.*

At the time of this inspection the water level above the dam was.....ft. 20 in. below the crest of the spillway.

(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 or erosions which you may have observed.)

*Dam is in good condition; no leaks. Probably no danger would result by structure going out, unless to mills on stream below.*

Reported by.....  
(Signature)

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

.....  
(Name of place)

*Yonkers, N.Y.*

*112 x 1, 0*



*Address all communications to the Conservation Commission*

STATE OF NEW YORK  
CONSERVATION COMMISSION  
ALBANY

GEORGE E. VAN KENNEN,  
CHAIRMAN  
JAMES W. FLEMING,  
JOHN D. MOORE,  
COMMISSIONERS  
ALBERT E. HOYT,  
SECRETARY  
JOHN J. FARRELL,  
ASST. SECRETARY

IN ANSWERING PLEASE REFER  
TO FILE NUMBER \_\_\_\_\_

June 5, 1912.

Mr. Decker, Assistant Counsel,  
Conservation Commission.

Dear Sir:-

Annexed is a communication from Mr. Thomas concerning the International Paper Company at Ticonderoga. I believe this is outside our province and that the only redress for the aggrieved parties is either to obtain an injunction, or to sue the company for damages. Is this correct?

I am about to go out of town until Monday, so you can take this matter up with Deputy Commissioner Fox.

Yours respectfully,

*Alfred R. W. M. Linn*

Inspector of Docks and Dams.

McK/C.

*Mr. Decker  
to be called off the  
chain*



DEPARTMENT OF FISH AND GAME

JAMES W. FLEMING,  
COMMISSIONER

JOHN B. BURNHAM,  
DEPUTY COMMISSIONER

LLEWELLYN LEGGE,  
CHIEF GAME PROTECTOR

STATE OF NEW YORK  
CONSERVATION COMMISSION  
ALBANY

Ticonderoga, N.Y. May 27th 1912.

Conservation Commission,

Albany, N.Y.

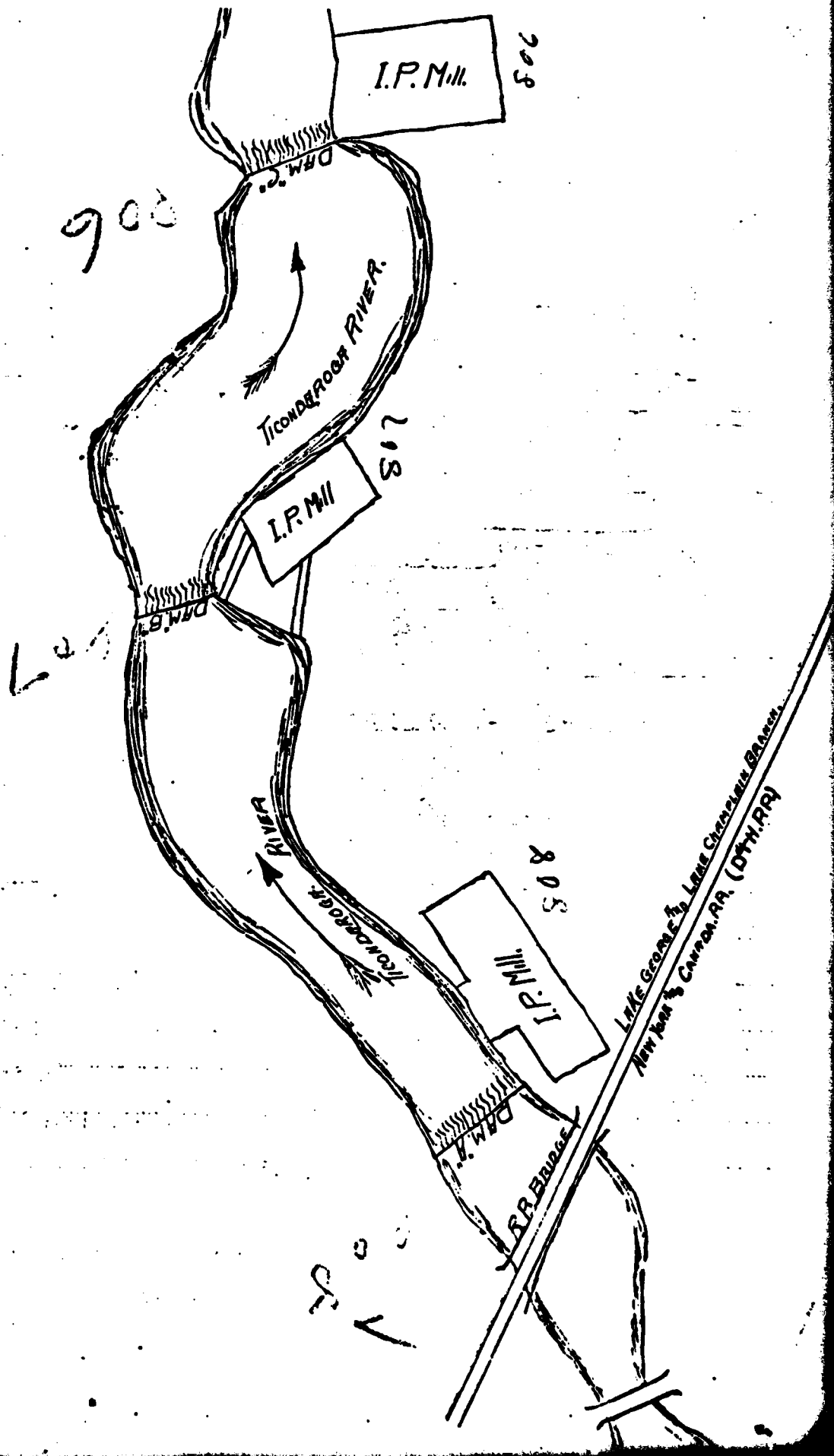
Gentlemen;

Mr. B. A. Clifton of Hague, N.Y. made a complaint to me today that the International Paper Co., of this town are using splash boards seven or eight inches wide on top of their dam at the outlet of Lake George, thereby raising the lake.

As I have had no instructions regarding this matter I am referring it to the Commission for their decision.

Respectfully yours,

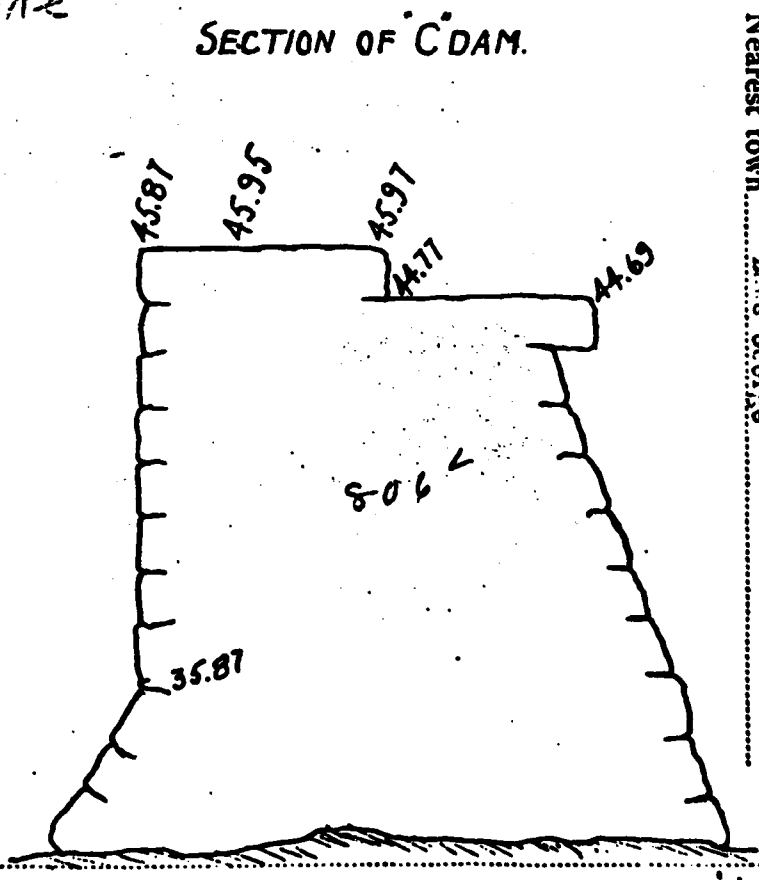
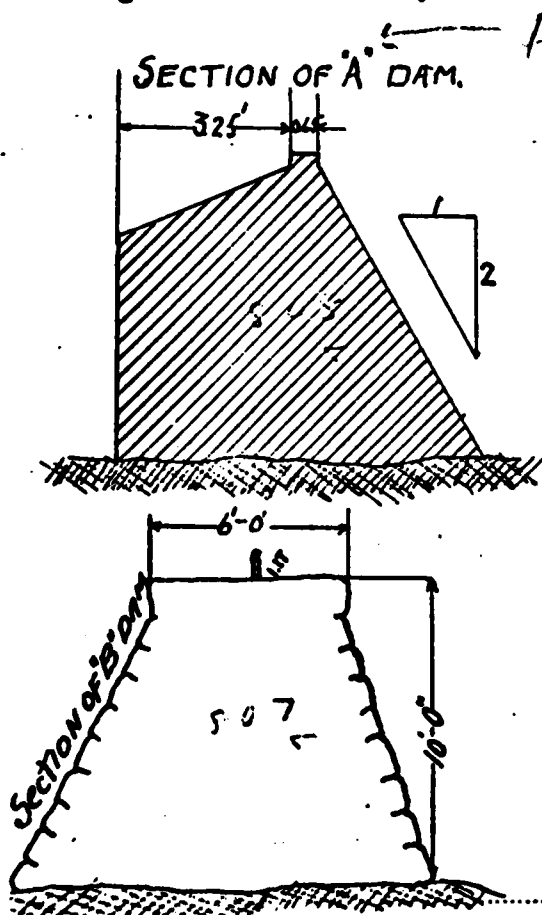
*L. Legge*  
Protector.



Fill out a form as complete as possible for each dam in your district and send to State Conservation Commission, Albany, N. Y.

1. Name and address of owners International Paper Company
2. Date of construction 1915
3. Uses of impounded water Paper for manufacturing pulp and paper.
4. Character of foundation bed Ledge
5. Material of waste spill
6. Length of waste and depth below dam
7. Total length of dam including waste "A" 83 feet; "B" 97 feet; "C" 121 feet.
8. Material of dam Masonry
9. Discharges, size and location

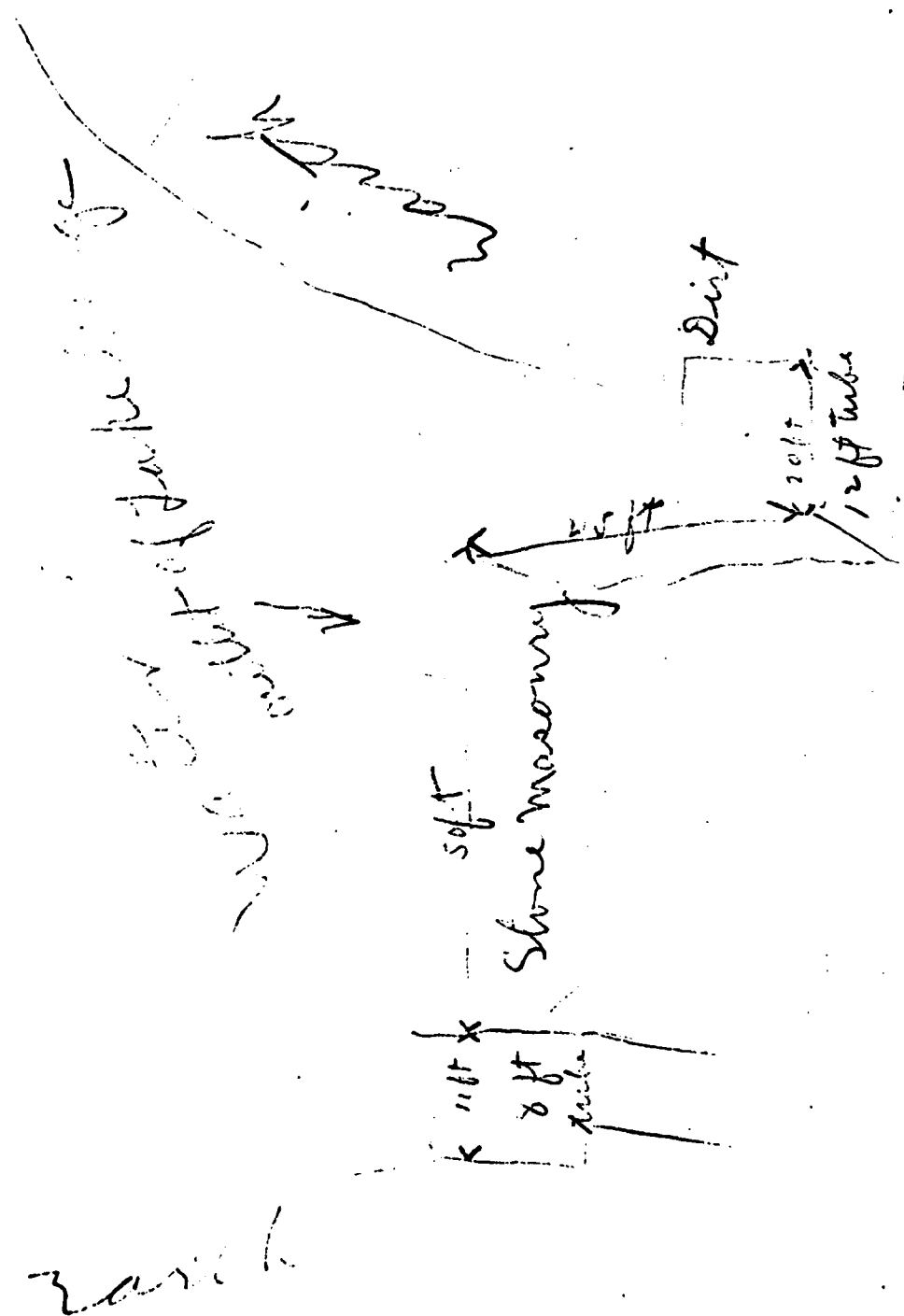
Below sketch section of waste and section of dam, with greatest heights and top thickness and bottom thickness. On opposite side sketch general plan of dam and give distance from a bridge or from a tributary stream.



(Signature, address and date.)  
 International Paper Company, Inc., 1100 Madison Ave., New York, N. Y.  
 April 24, 1915.

506-7-8  
 Wm

Train is 100 ft below R R Bridge  
" " 650 ft below Highway Bridge



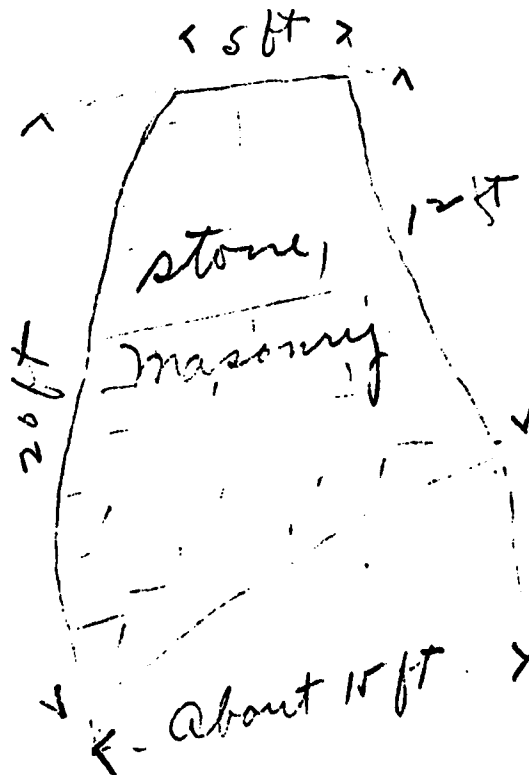
#1 on our us of river - 8-

16-30-11-3000 (16-10622)

Fill out a form as complete as possible for each dam in your district and send to State Conservation Commission, Albany, N. Y.

1. Name and address of owners. *International Paper Co 301 Broadway New York*
2. Date of construction. *1904*
3. Uses of impounded water. *Power for Buffalo Mills*
4. Character of foundation bed. *Solid Rock*
5. Material of waste spill. *masonry*
6. Length of waste and depth below dam. *3 gates 6x8 ft level with crest of dam*
7. Total length of dam including waste. *125 ft*
8. Material of dam. *stone masonry construction*
9. Discharges, size and location. *one steel tube 12 ft, one stone 6 ft*

Below sketch section of waste and section of dam, with greatest heights and top thickness and bottom thickness. On opposite side sketch general plan of dam and give distance from a bridge or from a tributary stream.



*F. J. Thomas, Pleasantville*

(Signature, address and date.)

*Jan 11 1912*

|    |     |        |         |           |     |      |
|----|-----|--------|---------|-----------|-----|------|
| 04 | 16  | 01     | 000808  | 052471    | 122 | 4    |
| RR | CTY | YR AP. | DAM NO. | INS. DATE | USE | TYPE |

### AS BUILT INSPECTION

|                                                                   |                                                                      |
|-------------------------------------------------------------------|----------------------------------------------------------------------|
| <input checked="" type="checkbox"/> Location of Sp'way and outlet | <input checked="" type="checkbox"/> Elevations                       |
| <input checked="" type="checkbox"/> Size of Sp'way and Outlet     | <input checked="" type="checkbox"/> Geometry of Non-overflow section |

### GENERAL CONDITION OF NON-OVERFLOW SECTION

|                                                      |                                                              |                                                  |
|------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------|
| <input checked="" type="checkbox"/> Settlement       | <input checked="" type="checkbox"/> Cracks                   | <input checked="" type="checkbox"/> Deflections  |
| <input checked="" type="checkbox"/> Joints           | <input checked="" type="checkbox"/> Surface of Concrete      | <input checked="" type="checkbox"/> Leakage      |
| <input checked="" type="checkbox"/> Undermining      | <input checked="" type="checkbox"/> Settlement of Embankment | <input checked="" type="checkbox"/> Crest of Dam |
| <input checked="" type="checkbox"/> Downstream Slope | <input checked="" type="checkbox"/> Upstream Slope           | <input checked="" type="checkbox"/> Toe of Slope |

### GENERAL COND. OF SP'WAY AND OUTLET WORKS

|                                                          |                                                                |                                                    |
|----------------------------------------------------------|----------------------------------------------------------------|----------------------------------------------------|
| <input checked="" type="checkbox"/> Auxiliary Spillway   | <input checked="" type="checkbox"/> Service or Concrete Sp'way | <input checked="" type="checkbox"/> Stilling Basin |
| <input checked="" type="checkbox"/> Joints               | <input checked="" type="checkbox"/> Surface of Concrete        | <input checked="" type="checkbox"/> Spillway Toe   |
| <input checked="" type="checkbox"/> Mechanical Equipment | <input checked="" type="checkbox"/> Plunge Pool                | <input checked="" type="checkbox"/> Drain          |

|                                                 |                                                  |
|-------------------------------------------------|--------------------------------------------------|
| <input checked="" type="checkbox"/> Maintenance | <input checked="" type="checkbox"/> Hazard Class |
| <input checked="" type="checkbox"/> Evaluation  | <input checked="" type="checkbox"/> Inspector    |

### COMMENTS:

Some leakage through stone masonry on non-overflow  
 Five chared controls but no serious danger to structure  
 Paper mill no longer in use

1. River Basin - Nos. 1-23 on Compilation Sheets
2. County - Nos. 1-62 Alphabetically
3. Year Approved -
4. Inspection Date - Month, Day, Year
5. Apparent use -
 

|                               |                    |
|-------------------------------|--------------------|
| 1. Fish & Wildlife Management | 4. Power           |
| 2. Recreation                 | 5. Farm            |
| 3. Water Supply               | 6. No Apparent Use |
6. Type -
  1. Earth with Aux. Service Spillway
  2. Earth with Single Conc. Spillway
  3. Earth with Single non-conc. Spillway
  4. Concrete
  5. Other
7. As-Built Inspection - Built substantially according to approved plans and specifications

#### Location of Spillway and Outlet Works

1. Appears to meet originally approved plans and specifications.
2. Not built according to plans and specifications and location appears to be detrimental to structure.
3. Not built according to plans and specifications but location does not appear to be detrimental to structure.

#### Elevations

1. Generally in accordance to approved plans and specifications as determined from visual inspection and use of hand level.
2. Not built according to plans and specifications and elevation changes appear to be detrimental to structure.
3. Not built according to plans and specifications but elevation changes do not appear to be detrimental to structure.

#### Size of Spillway and Outlet Works

1. Appears to meet originally approved plans and specifications as determined by field measurements using tape measure.
2. Not built according to plans and specifications and changes appear detrimental to structure.
3. Not built according to plans and specifications but changes do not appear detrimental to structure.

#### Geometry of Non-overflow Structures

1. Generally in accordance to originally approved plans and specifications as determined from visual inspection and use of hand level and tape measure.
2. Not built according to plans and specifications and changes appear detrimental to structure.
3. Not built according to plans and specifications but changes do not appear detrimental to structure.

#### General Conditions of Non-Overflow Section

1. Adequate - No apparent repairs needed or minor repairs which can be covered by periodic maintenance.
2. Inadequate - Items in need of major repair.

ITEM 9 For boxes listed on condition under non-overflow section.

1. Satisfactory.
2. Can be covered by periodic maintenance.
3. Unsatisfactory - Above and beyond normal maintenance.

1. Adequate - No apparent repairs needed or minor repairs which can be covered by periodic maintenance.
2. Inadequate - Items in need of major repair.

Items) For boxes listed conditions listed under spillway and outlet works.

1. Satisfactory.
2. Can be covered by periodic maintenance.
3. Unsatisfactory - Above and beyond normal maintenance.
4. Dam does not contain this feature.

#### Maintenance

1. Evidence of periodic maintenance being performed.
2. No evidence of periodic maintenance.
3. No longer a dam or dam no longer in use.

#### (S.C.S.) Hazard Classification Downstream

1. (A) Damage to agriculture and county roads.
2. (B) Damage to private and/or public property.
3. (C) Loss of life and/or property.

Evaluation - Based on Judgment and Classification in Box Nos.

#### Evaluation for Unsafe Dam

1. Unsafe - Repairable.
2. Unsafe - Not Repairable.
3. Insufficient evidence to declare unsafe.

#### RIVER BASINS

- (1) LOWER HUDSON
- (2) UPPER HUDSON
- (3) MOHAWK
- (4) LAKE CHAMPLAIN
- (5) DELAWARE
- (6) SUSQUEHANNA
- (7) CHEMUNG
- (8) OSWEGO
- (9) GENESEE
- (10) ALLEGHENY
- (11) LAKE ERIE
- (12) WESTERN LAKE ONTARIO
- (13) CENTRAL LAKE ONTARIO
- (14) EASTERN LAKE ONTARIO
- (15) SALMON RIVER
- (16) BLACK RIVER
- (17) WEST ST. LAWRENCE
- (18) EAST ST. LAWRENCE
- (19) RACQUETTE RIVER
- (20) ST. REGIS RIVER
- (21) HOUSATONIC
- (22) LONG ISLAND
- (23) OSWEGATCHIE
- (24) GRASSE

#### COUNTIES

STATE NAME: NEW YORK

STATE ABBREVIATION: NY

STATE CODE: 36

CODE COUNTY NAME

- 1 ALBANY
- 2 ALLEGANY
- 3 BROOK
- 4 BROOME
- 5 CATTARAUGUS

- 6 CAYUGA
- 7 CHAUTAUGUA
- 8 CHEMUNG
- 9 CHENANGO
- 10 CINTON

- 11 COLUMBIA
- 12 CORTLAND
- 13 DELAWARE
- 14 DUTCHESS
- 15 FRIE

- 16 ESSEX
- 17 FRANKLIN
- 18 FULTON
- 19 GENESEE
- 20 GREENE

- 21 HAMPTON
- 22 HERKIMER
- 23 JEFFERSON
- 24 KINGS
- 25 LEWIS

- 26 LIVINGSTON
- 27 MADISON
- 28 MONROE
- 29 MONTGOMERY
- 30 NASSAU

- 31 NEW YORK
- 32 NIAGARA
- 33 ONEIDA
- 34 ONONDAGA
- 35 ONTARIO

- 36 ORANGE
- 37 ORLEANS
- 38 OSWEGO
- 39 OTSEGO
- 40 PUTNAM

- 41 QUEENS
- 42 RENSSELAER
- 43 RICHMOND
- 44 ROCKLAND
- 45 ST LAWRENCE

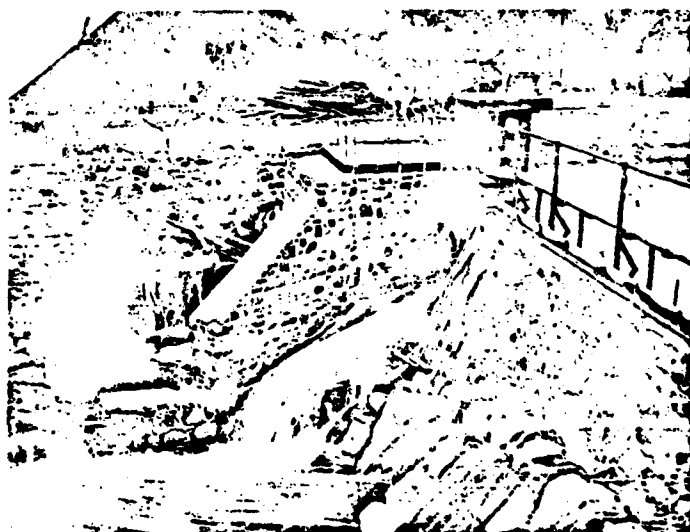
- 46 SARATOGA
- 47 SCHENECTADY
- 48 SCHOMARIE
- 49 SCHUYLER
- 50 SENECA

- 51 STEUBEN
- 52 SUFFOLK
- 53 SULLIVAN
- 54 TIUGA
- 55 TOMPKINS

- 56 ULSTER
- 57 WARREN
- 58 WASHINGTON
- 59 WAYNE
- 60 WESTCHESTER

- 61 WYOMING
- 62 YATES

CLASSIFICATION  
CORPS. ENGR  
(II)  
(II)  
(I)



5-24-71

9590.1 - Authority. Section 38, Chapter 1035, Laws of 1957, as amended, of the Navigation Law.

1. The law regulating the water surface at Lake George, dated March 27, 1957, provides for a maximum water surface elevation of 4.00 feet through the year, and a minimum water surface elevation of 2.5 feet from June 1 to December 1, with due allowance for natural fluctuations or emergencies. In addition, the law states that the water surface between June 1 and September 30 is to be an average of 3.5 feet. Water surface elevations are based on the U.S.G.S. Rogers Rock Gauge. The law further states that if the level of the lake rises above 4.0 that all gates shall be opened and that if the level of the lake drops below 2.5 from June 1 to December 1, all gates shall be closed.

AD-A090 941

NEW YORK STATE DEPT OF ENVIRONMENTAL CONSERVATION ALBANY F/6 13/13  
NATIONAL DAM SAFETY PROGRAM. LAKE GEORGE OUTLET DAM (INVENTORY --ETC(U)  
AUG 80 J B STETSON DACW51-79-C-0001

NL

UNCLASSIFIED

2 of 2

AD-A090 941



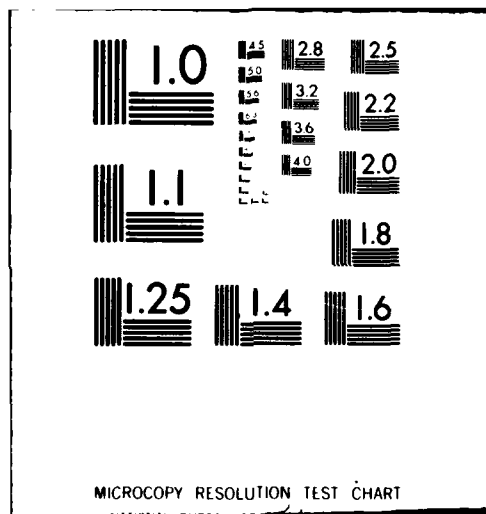
END

DATE

FORMED

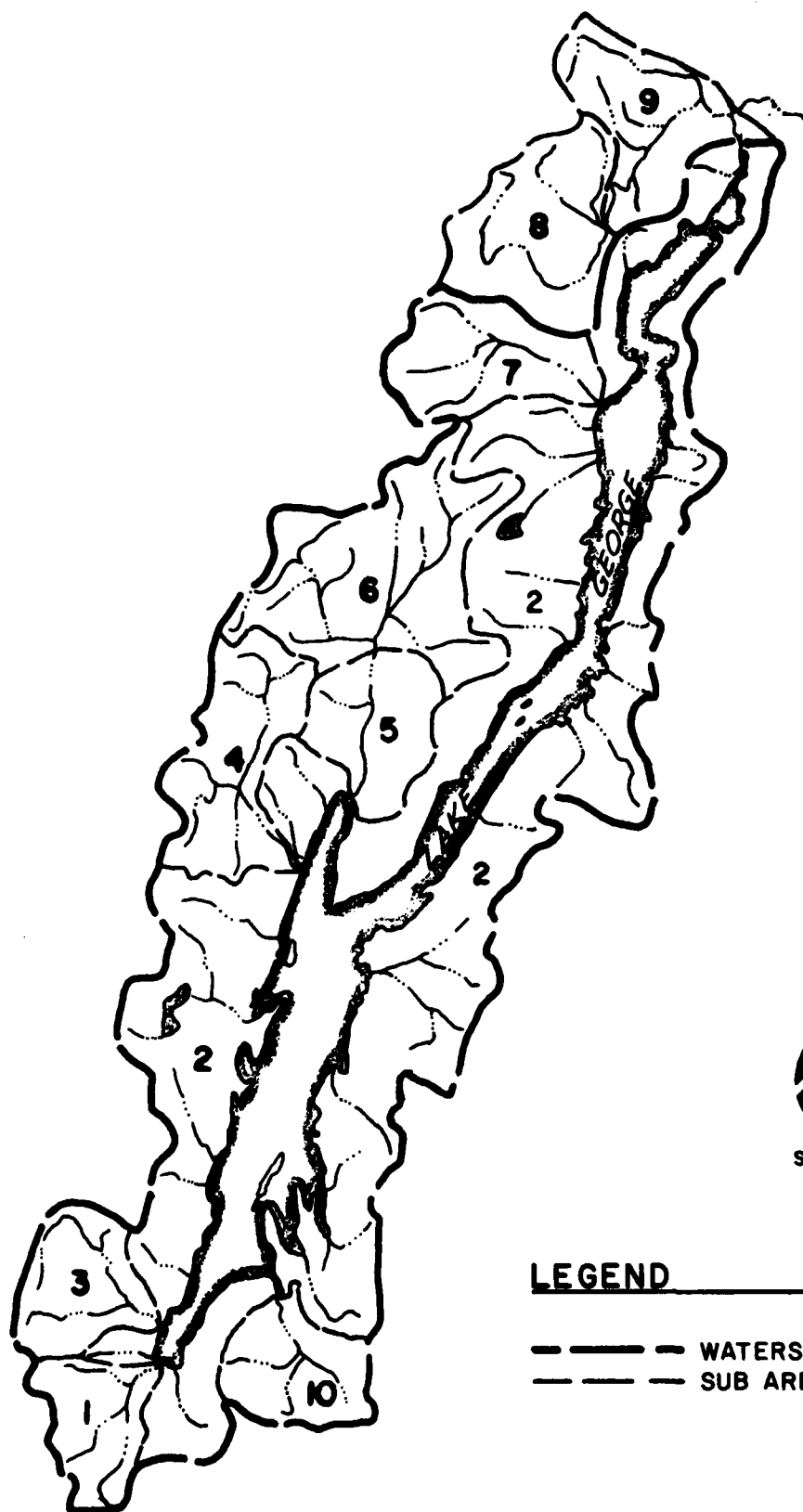
12-80

DTIC



APPENDIX C

HYDROLOGIC AND HYDRAULIC COMPUTATIONS



SCALE: 1"=4MI.±

### LEGEND

- WATERSHED AREA  
- - - - SUB AREA

**DRAINAGE BASIN**

**STETSON • DALE**BANKERS TRUST BUILDING  
UTICA • NEW YORK • 13501  
TEL 315-797-6800**DESIGN BRIEF**

PROJECT NAME NEW YORK STATE DAM INSPECTIONS DATE 4-15-80  
SUBJECT LAKE GEORGE OUTLET PROJECT NO. 2399  
SUB AREA - AREAS DRAWN BY JPG

|          |    | <u>AREA</u>    | <u>AREA OF LAKES</u> |
|----------|----|----------------|----------------------|
| SUB AREA | 1  | 9.53 SQ MI     |                      |
|          | 2  | 159.53 SQ MI * | 45.32 SQ M           |
|          | 3  | 7.87 SQ MI     |                      |
|          | 4  | 11.52 SQ MI    |                      |
|          | 5  | 8.32 SQ MI     |                      |
|          | 6  | 22.30 SQ MI    |                      |
|          | 7  | 10.49 SQ MI    |                      |
|          | 8  | 13.57 SQ MI    |                      |
|          | 9  | 12.25 SQ MI    |                      |
|          | 10 | 7.88 SQ MI     |                      |

\* INCLUDES LAKE AREA

Additional area to downstream hazard (Areas 8 & 9) 25.82 mi

AREA OF LAKE 29,005.51 ACRES

Contributing Area - Lake George = 231.4 mi<sup>2</sup>

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

PROJECT NAME NEW YORK STATE DAM INSPECTIONS DATE 4-15-80  
SUBJECT LAKE GEORGE OUTLET PROJECT NO. 2599  
ESTIMATE OF SNYDER'S PARAMETERS DRAWN BY JPS

640 CP .625 FOR ALL SUBAREAS

| SUB AREA | C <sub>t</sub> | L (MI) | LCA (MI) | (LLCA) <sup>3</sup> | t <sub>p</sub> (HRS) |
|----------|----------------|--------|----------|---------------------|----------------------|
| 1        | 1.5            | 5.04   | 2.39     | 2.11                | 3.17                 |
| 2        | 1.5            | 3.79   | .78      | 1.37                | 2.07                 |
| 3        | 1.5            | 6.36   | 2.16     | 2.19                | 3.29                 |
| 4        | 1.5            | 7.31   | 3.79     | 2.71                | 4.07                 |
| 5        | 1.5            | 4.73   | 2.27     | 2.04                | 3.06                 |
| 6        | 1.5            | 7.31   | 2.27     | 2.32                | 3.48                 |
| 7        | 1.5            | 6.44   | 3.18     | 2.47                | 3.71                 |
| 8        | 1.5            | 6.70   | 3.37     | 2.55                | 3.83                 |
| 9        | 1.5            | 7.46   | 3.71     | 2.71                | 4.07                 |
| 10       | 1.5            | 6.33   | 2.01     | 2.14                | 3.21                 |



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

## DESIGN BRIEF

PROJECT NAME NEW YORK STATE DAM INSPECTIONS DATE 4.16.80  
SUBJECT LAKE GEORGE OUTLET PROJECT NO. 2879  
DEPTH-AREA-DURATION DRAWN BY JP6

### PMF

INDEX RAINFALL : 17.5" - 200 SQ MI  
24 HR

| <u>DURATION</u> | <u>% INDEX</u> | <u>DEPTH</u> |
|-----------------|----------------|--------------|
| 6 HRS           | 73%            | 12.78"       |
| 12 HRS          | 88             | 15.4         |
| 24 HRS          | 99             | 17.33        |
| 48 HRS          | 104            | 18.2         |

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

PROJECT NAME N.Y.S. Dam Inspections - 1980 DATE \_\_\_\_\_  
SUBJECT Lake George PROJECT NO. \_\_\_\_\_  
Travel Time Through Lake DRAWN BY \_\_\_\_\_

Due to length of Lake George, the hydrographs from the sub-basins will be lagged to reflect the travel time through the lake.

$$V_w = \sqrt{g D_m}$$

$$g = 32.2 \text{ ft/sec}^2$$

$$D_m = \text{avg. depth of lake} \sim 75'$$

$$V_w = 49 \text{ fps}$$

travel time through lake,  $t = \frac{\text{travel distance}}{V_w}$

| <u>Sub-basin</u> | <u>travel dist.</u> | <u>t</u> |
|------------------|---------------------|----------|
| 1                | 169,000 ± ft.       | .96 hr   |
| 2                | 85,000              | .48      |
| 3                | 165,000             | .94      |
| 4                | 114,000             | .65      |
| 5                | 116,000             | .66      |
| 6                | 116,000             | .66      |
| 7                | 40,000              | .23      |
| 10               | 155,000             | .88      |



STETSON • DALE

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

## DESIGN BRIEF

PROJECT NAME

DATE

SUBJECT

PROJECT NO.

DRAWN BY

Lake George  
Elev. - Discharge @ Dam.CASE A- All gates closed

1. Flow over Spillway @ Elev. 319.6;
- $L = 59.5'$

$$Q = CLH^{3/2}$$

C based on width (~5.5') and head, from  
"Handbook of Hydraulics" - King & Brater

| Elev. | H    | C    | Q        |
|-------|------|------|----------|
| 319.6 | -    | -    | -        |
| 320.0 | 0.4' | 2.5  | 37.6 cfs |
| 321.0 | 1.4  | 2.65 | 261      |
| 322.  | 2.4  | 2.67 | 591      |
| 323.  | 3.4  | 2.68 | 1000     |
| 324.  | 4.4  | 2.74 | 1505     |
| 325.  | 5.4  | 2.88 | 2150     |
| 326.  | 6.4  | 3.1  | 2986     |
| 327.  | 7.4  | 3.32 | 3977     |
| 328   | 8.4  | 3.32 | 4809     |
| 329   | 9.4  | 3.32 | 5693     |

2. Flow over sluice gates (assumed closed)

@ Elev. 320.0,  $L = 28'$   $C = 3.32$ 

3. Flow over non-overflow section @ elev. 321.0
- 
- $L = 24.5'$
- $C = 2.64$

| Elev. | $H_2$ | $Q_2$  | $H_3$ | $Q_3$  |
|-------|-------|--------|-------|--------|
| 320.0 | -     | -      | -     | -      |
| 321.0 | 1'    | 93 cfs | -     | -      |
| 322   | 2     | 263    | 1'    | 65 cfs |
| 323   | 3     | 483    | 2     | 183    |
| 324   | 4     | 744    | 3     | 336    |
| 325   | 5     | 1039   | 4     | 517    |
| 326   | 6     | 1366   | 5     | 723    |
| 327   | 7     | 1722   | 6     | 951    |
| 328   | 8     | 2103   | 7     | 1198   |
| 329   | 9     | 2510   | 8     | 1463   |



STETSON • DALE

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

# DESIGN BRIEF

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

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

Lake George  
Stage Discharge @ Dam  
CASE A

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

Elev.

Q total over dam

319.6

320.0

321

322

323

324

325

326

327

328

329

38 cfs

354

919

1666

2585

3706

5075

6650

8110

9645



STETSON • DALE

BANKERS TRUST BUILDING  
UTICA • NEW YORK • 13501

TEL 315-797-5800

## DESIGN BRIEF

PROJECT NAME N.Y.S. Dam Inspections

DATE \_\_\_\_\_

SUBJECT Lake George

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

Elev. - Discharge @ Dam

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

CASE B - 3 gates opened 5'  
All 3 gates are assumed to be opened when the water level reaches the top of spillway, elev. 319.6 because of the law regulating the lake level and the staffing responsible for regulation of the gates

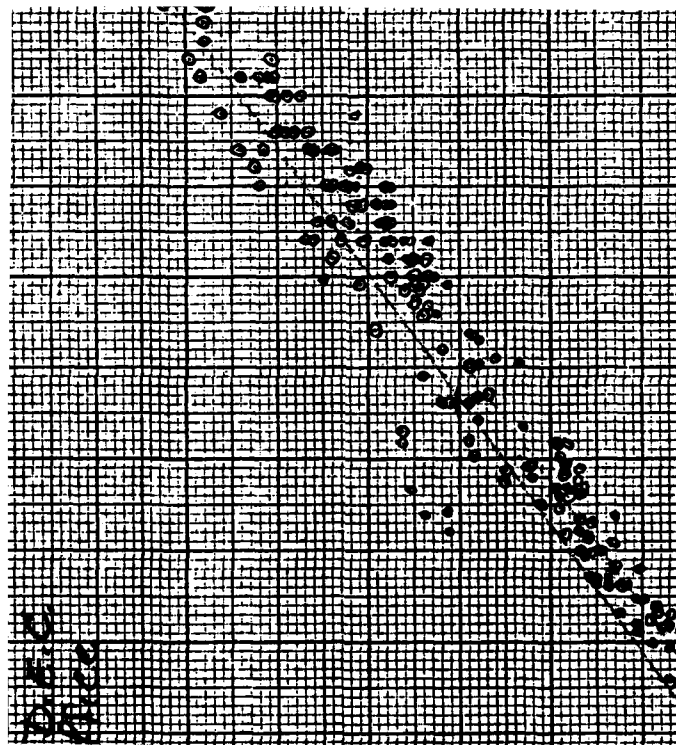
1. Flow through Sluice-gated outlets From Rating CURVE following this section. Supplied by D.E.C. Gates assumed to be opened 5' which corresponds to the max. opening as the gates are presently set up.

2. Flow over spillway @ elev. 319.6 ;  $L = 59.5'$   
 $Q = CL H^{3/2}$

"C" based on width (~515') and head, From "Handbook of Hydraulics" - King & Brater

3. Flow over non-overflow section @ elev. 321.0  
 $L = 24.5'$   $C = 2.64$

| Elev. | $Q_1$ | $H_2$ | $C_2$ | $Q_2$ | $H_3$ | $Q_3$ | $Q_{TOTAL}$ |
|-------|-------|-------|-------|-------|-------|-------|-------------|
| 319.6 | 9450  | 0     | -     | -     | -     | -     | 9450        |
| 320.  | 1075  | 0.4'  | 2.5   | 38    | -     | -     | 1115        |
| 321.  | 1405  | 1.4   | 2.65  | 261   | 0     | -     | 1665        |
| 322.  | 1735  | 2.4   | 2.67  | 591   | 1     | 65    | 2390        |
| 323.  | 2065  | 3.4   | 2.68  | 1000  | 2     | 183   | 3250        |
| 324.  | 2395  | 4.4   | 2.74  | 1505  | 3     | 336   | 4235        |
| 325.  | 2725  | 5.4   | 2.88  | 2150  | 4     | 517   | 5390        |
| 326.  | 3055  | 6.4   | 3.1   | 2986  | 5     | 723   | 6765        |
| 327.  | 3385  | 7.4   | 3.32  | 3977  | 6     | 951   | 8315        |
| 328.  | 3715  | 8.4   | 3.32  | 4809  | 7     | 1198  | 9720        |
| 329.  | 4045  | 9.4   | 3.32  | 5693  | 8     | 1463  | 11,200      |





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UTICA • NEW YORK • 13501

TEL 315-797-5800

# DESIGN BRIEF

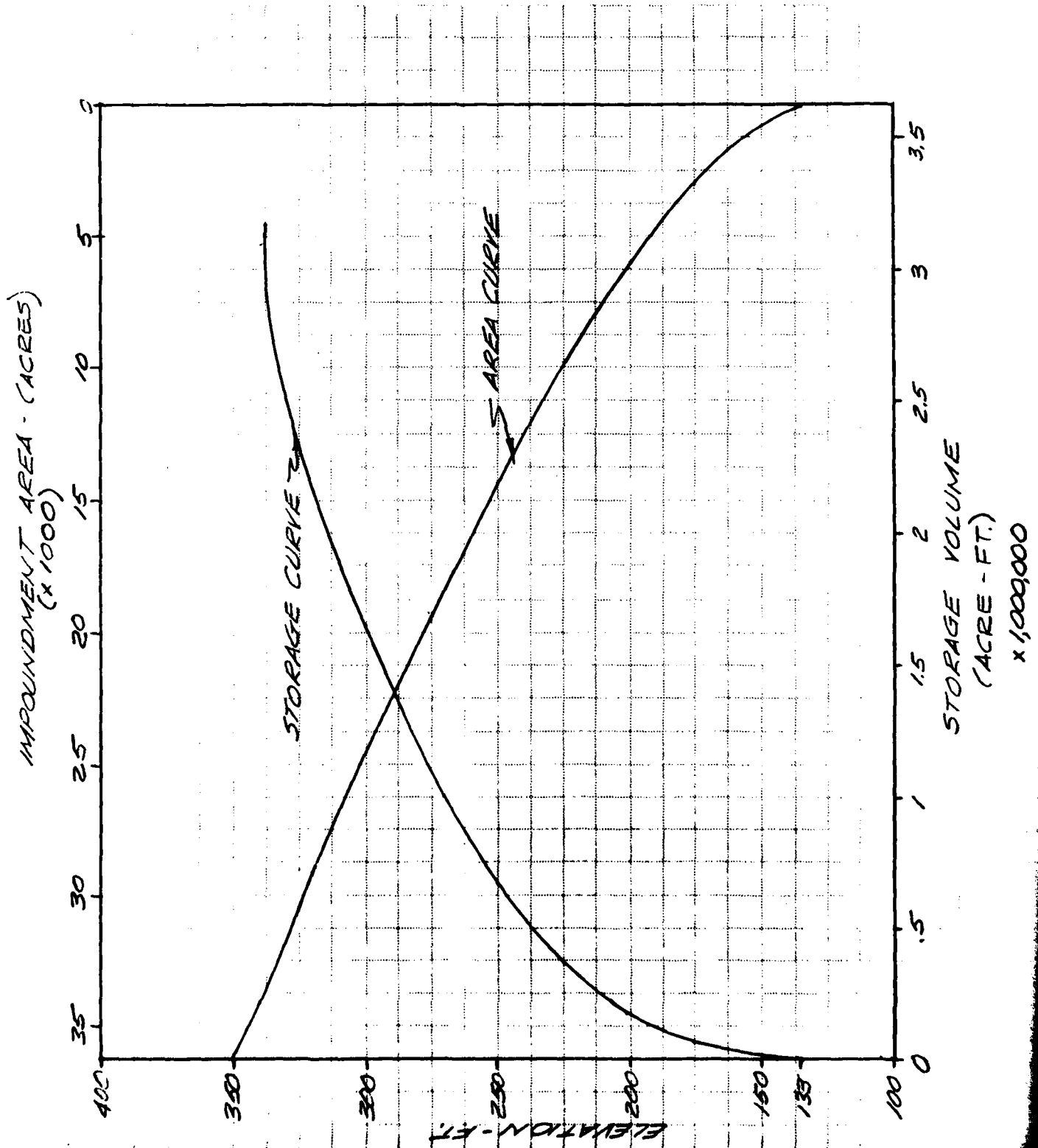
PROJECT NAME N.Y.S. DAM INSPECTIONS 1980

DATE 5-2-80

SUBJECT LAKE GEORGE DAM

PROJECT NO. 2399

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



| LAKE GEORGE                                          |    |     |   |    |   |   |   |   |   |
|------------------------------------------------------|----|-----|---|----|---|---|---|---|---|
| HEC-1DB (SNYDER PARAMETERS)                          |    |     |   |    |   |   |   |   |   |
| PMF-DAM OVERTOPPING ANALYSIS WITH ALL 3 GATES CLOSED |    |     |   |    |   |   |   |   |   |
| 0001)                                                | A1 | 180 | 0 | 30 | 0 | 0 | 0 | 0 | 4 |
| 0002)                                                | A2 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0003)                                                | A3 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0004)                                                | B  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0005)                                                | B1 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0006)                                                | J  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0007)                                                | J1 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0008)                                                | K  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0009)                                                | K1 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0010)                                                | M  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0011)                                                | F  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0012)                                                | T  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0013)                                                | W  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0014)                                                | X  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0015)                                                | K  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0016)                                                | K1 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0017)                                                | Y  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0018)                                                | Y1 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0019)                                                | Y6 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0020)                                                | Y7 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0021)                                                | Y7 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0022)                                                | K  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0023)                                                | K1 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0024)                                                | Y  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0025)                                                | Y1 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0026)                                                | K  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0027)                                                | K1 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0028)                                                | M  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0029)                                                | F  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0030)                                                | T  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0031)                                                | W  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0032)                                                | X  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0033)                                                | K  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0034)                                                | K1 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0035)                                                | Y  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0036)                                                | Y1 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0037)                                                | K  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0038)                                                | K1 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |

| CHANNEL ROUTE THRU SUBAREA 5 TO LAKE GEORGE |    |     |   |    |   |   |   |   |   |
|---------------------------------------------|----|-----|---|----|---|---|---|---|---|
| 0001)                                       | A1 | 180 | 0 | 30 | 0 | 0 | 0 | 0 | 4 |
| 0002)                                       | A2 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0003)                                       | A3 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0004)                                       | B  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0005)                                       | B1 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0006)                                       | J  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0007)                                       | J1 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0008)                                       | K  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0009)                                       | K1 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0010)                                       | M  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0011)                                       | F  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0012)                                       | T  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0013)                                       | W  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0014)                                       | X  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0015)                                       | K  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0016)                                       | K1 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0017)                                       | Y  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0018)                                       | Y1 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0019)                                       | Y6 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0020)                                       | Y7 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0021)                                       | Y7 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0022)                                       | K  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0023)                                       | K1 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0024)                                       | Y  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0025)                                       | Y1 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0026)                                       | K  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0027)                                       | K1 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0028)                                       | M  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0029)                                       | F  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0030)                                       | T  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0031)                                       | W  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0032)                                       | X  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0033)                                       | K  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0034)                                       | K1 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0035)                                       | Y  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0036)                                       | Y1 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0037)                                       | K  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0038)                                       | K1 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |

| ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE |    |     |   |    |   |   |   |   |   |
|--------------------------------------------------------|----|-----|---|----|---|---|---|---|---|
| 0001)                                                  | A1 | 180 | 0 | 30 | 0 | 0 | 0 | 0 | 4 |
| 0002)                                                  | A2 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0003)                                                  | A3 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0004)                                                  | B  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0005)                                                  | B1 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0006)                                                  | J  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0007)                                                  | J1 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0008)                                                  | K  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0009)                                                  | K1 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0010)                                                  | M  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0011)                                                  | F  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0012)                                                  | T  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0013)                                                  | W  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0014)                                                  | X  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0015)                                                  | K  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0016)                                                  | K1 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0017)                                                  | Y  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0018)                                                  | Y1 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0019)                                                  | Y6 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0020)                                                  | Y7 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0021)                                                  | Y7 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0022)                                                  | K  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0023)                                                  | K1 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0024)                                                  | Y  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0025)                                                  | Y1 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0026)                                                  | K  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0027)                                                  | K1 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0028)                                                  | M  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0029)                                                  | F  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0030)                                                  | T  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0031)                                                  | W  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0032)                                                  | X  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0033)                                                  | K  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0034)                                                  | K1 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0035)                                                  | Y  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0036)                                                  | Y1 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0037)                                                  | K  | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |
| 0038)                                                  | K1 | 0   | 0 | 0  | 0 | 0 | 0 | 0 | 0 |

## LAKE GEORGE

PAGE 0002

|        |    |      |       |        |    |       |     |     |      |
|--------|----|------|-------|--------|----|-------|-----|-----|------|
| (0039) | P  | 1    | 1     | 9.53   | 0  | 231.4 | 0   | 0   | 1    |
| (0040) | F  | 0    | 17.5  | 73     | 28 | 99    | 104 | 0   | 0    |
| (0041) | T  | 0    | 0     | 0      | 0  | 0     | 0   | 1.0 | 0.03 |
| (0042) | A  | 3.17 | 0.625 | 1.6    | 0  | 0     | 0   | 0   | 0    |
| (0043) | X  | -2.0 | -0.10 | 0      | 0  | 0     | 0   | 0   | 0    |
| (0044) | K  | 1    | 100   | 0      | 0  | 0     | 0   | 1   | 0    |
| (0045) | K1 |      |       |        |    |       |     |     |      |
| (0046) | Y  | 0    | 0     | 0      | 0  | 0     | 0   | 0   | 0    |
| (0047) | Y1 | 0    | 3     | 2      | 0  | 0     | 0   | 0   | 0    |
| (0048) | K  | 0    | 200   | 0      | 0  | 0     | 0   | 1   | 0    |
| (0049) | K1 |      |       |        |    |       |     |     |      |
| (0050) | M  | 1    | 1     | 153.53 | 0  | 231.4 | 0   | 0   | 1    |
| (0051) | F  | 0    | 17.5  | 73     | 88 | 99    | 104 | 0   | 0    |
| (0052) | T  | 0    | 0     | 0      | 0  | 0     | 0   | 1.0 | 0.32 |
| (0053) | A  | 2.07 | 0.625 | 1.6    | 0  | 0     | 0   | 0   | 0    |
| (0054) | X  | -2.0 | -0.10 | 0      | 0  | 0     | 0   | 0   | 0    |
| (0055) | K  | 1    | 200   | 0      | 0  | 0     | 0   | 1   | 0    |
| (0056) | K1 |      |       |        |    |       |     |     |      |
| (0057) | Y  | 0    | 0     | 0      | 0  | 0     | 0   | 0   | 0    |
| (0058) | Y1 | 0    | 3     | 1      | 0  | 0     | 0   | 0   | 0    |
| (0059) | K  | 4    | 202   | 0      | 0  | 0     | 0   | 1   | 0    |
| (0060) | K1 |      |       |        |    |       |     |     |      |
| (0061) | K  | 0    | 300   | 0      | 0  | 0     | 0   | 1   | 0    |
| (0062) | K1 |      |       |        |    |       |     |     |      |
| (0063) | M  | 1    | 1     | 7.87   | 0  | 231.4 | 0   | 0   | 1    |
| (0064) | P  | 0    | 17.5  | 73     | 28 | 99    | 104 | 0   | 0    |
| (0065) | T  | 0    | 0     | 0      | 0  | 0     | 0   | 1.0 | 0.02 |
| (0066) | A  | 3.29 | 0.625 | 1.6    | 0  | 0     | 0   | 0   | 0    |
| (0067) | X  | -2.0 | -0.10 | 0      | 0  | 0     | 0   | 0   | 0    |
| (0068) | K  | 1    | 300   | 0      | 0  | 0     | 0   | 1   | 0    |
| (0069) | K1 |      |       |        |    |       |     |     |      |
| (0070) | Y  | 0    | 0     | 0      | 0  | 0     | 0   | 0   | 0    |
| (0071) | Y1 | 0    | 3     | 2      | 0  | 0     | 0   | 0   | 0    |
| (0072) | K  | 0    | 400   | 0      | 0  | 0     | 0   | 1   | 0    |
| (0073) | K1 |      |       |        |    |       |     |     |      |
| (0074) | M  | 1    | 1     | 11.52  | 0  | 231.4 | 0   | 0   | 1    |
| (0075) | P  | 0    | 17.5  | 73     | 28 | 99    | 104 | 0   | 0    |
| (0076) | T  | 0    | 0     | 0      | 0  | 0     | 0   | 1.0 | 0.01 |



L-KE GEORGE

10115) K 59  
10116) A  
10117) A  
10118) A  
10119) A  
10120) A

PAGE 0004

# REVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

```

RUNOFF HYDROGRAPH AT 600
ROUTE HYDROGRAPH TO 500
ROUTE HYDROGRAPH TO 600
RUNOFF HYDROGRAPH AT 500
ROUTE HYDROGRAPH TO 500
ROUTE HYDROGRAPH AT 100
ROUTE HYDROGRAPH TO 100
RUNOFF HYDROGRAPH AT 200
ROUTE HYDROGRAPH TO 200
COMBINE 4 HYDROGRAPHS AT 202
RUNOFF HYDROGRAPH AT 300
ROUTE HYDROGRAPH TO 300
ROUTE HYDROGRAPH AT 400
ROUTE HYDROGRAPH TO 400
RUNOFF HYDROGRAPH AT 700
ROUTE HYDROGRAPH TO 700
COMBINE 5 HYDROGRAPHS AT 202
ROUTE HYDROGRAPH TO 202
END OF NETWORK
    
```

\*\*\*\*\*  
 FLOW HYDROGRAPH PACKAGE (SEC-1)  
 DAY SAFETY VERSION: JULY 1972  
 LAST MODIFICATION: 26 FEB 75  
 \*\*\*\*\*

RUN DATE: THU JUL 1 1982  
 TIME: 10:00:00

LAKE GEORGE  
 REC-10B (SNYDER PARAMETERS)  
 PWF-DAY OVERTOPPING ANALYSIS WITH ALL 3 GATES CLOSED

| JOB SPECIFICATION |     |      |      |     |       |       |      |      |       |
|-------------------|-----|------|------|-----|-------|-------|------|------|-------|
| AG                | RHR | NMIN | IDAY | INR | IMIN  | METRC | IPLY | IFRT | NSTAN |
| 100               | 0   | 50   | 0    | 0   | 0     | 0     | 0    | 4    | 0     |
| JOFR              |     |      |      | NWT | LROPT | TPACE |      |      |       |
| 5                 |     |      |      | 0   | 0     | 0     |      |      |       |

MULTI-PLAN ANALYSES TO BE PERFORMED

RTICS= 0.20 0.30 0.40 0.50 0.60 0.80 1.00  
 NPLAN= 1 NRTIC= 7 LRTIC= 1

\*\*\*\*\*

SUB-AREA RUNOFF COMPUTATION

| SUBAREA 6 |       |       |       |      |      |       |        |       |  |
|-----------|-------|-------|-------|------|------|-------|--------|-------|--|
| ISTAQ     | ICOMP | IECON | ITAPE | JPLT | JPRY | INAME | ISTAGE | IAUTO |  |
| 600       | 0     | 0     | 0     | 0    | 0    | 1     | 0      | 0     |  |

HYDROGRAPH DATA

| INTEL | IUGC | TAREA | SNAF | TRSDA  | TRSFC | RATIO | ISNOW | ISAME | LOCAL |
|-------|------|-------|------|--------|-------|-------|-------|-------|-------|
| 1     | 1    | 22.30 | 0.00 | 231.40 | 0.00  | 0.000 | 0     | 1     | 0     |

PRECIP DATA

| SPFE | PMS   | R6    | R12   | R24   | R48    | R72  | R96  |
|------|-------|-------|-------|-------|--------|------|------|
| 0.00 | 17.50 | 73.00 | 88.00 | 99.00 | 104.00 | 0.00 | 0.00 |

TRSF0 COMPUTED BY THE PROGRAM IS 0.005

LOSS DATA

| LROPT | STK0 | DLTKR | RTIOL | ERAJN | STKRS | RTICK | STIRL | CNSTL | ALSMN | RTIME |
|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00  | 0.00 | 0.00  | 1.00  | 0.00  | 0.00  | 1.00  | 1.00  | 0.10  | 0.00  | 0.11  |

UNIT HYDROGRAPH DATA

TF= 3.48 CP=0.63 NTA= 0

RECESSION DATA

STIRK= -2.00 ORCSN= -0.10 RTICK= 1.00

13. 502. 1000. 1558. 2013. 2401. 2645. 2592. 2314. 1975.  
 10. 1439. 1226. 1048. 894. 763. 651. 556. 474. 405.  
 34. 295. 252. 215. 183. 156. 134. 114. 97. 83.  
 71. 60. 52. 44. 36. 32. 27. 23.

3. END-OF-PERIOD OPERATES: LAL= 3.46 HOURS, CP= 0.63 VOL= 1.00  
 16.11 12.94 3.17 406557.  
 SUM ( 409.)( 329.)( 81.)(11512.40)

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

# HYDROGRAPH ROUTING

CHANNEL ROUTE THRU SUBAREA 5 TO LAKE GEORGE

| ISTAQ | ICOMP | IECON | ITAPE | JPLT | JFRT | INAME | ISTAGE | IAUTO |
|-------|-------|-------|-------|------|------|-------|--------|-------|
| 500   | 1     | 0     | 0     | 0    | 0    | 1     | 0      | 0     |

| ROUTING DATA | IPMP | LSTR |
|--------------|------|------|
| IPMP         | 0    | 0    |

| BLSS | CLOSS | AVG  | IRIS | ISAKE | IOPT | TSK   | STORA | ISFRAT |
|------|-------|------|------|-------|------|-------|-------|--------|
| 0.0  | 0.000 | 0.00 | 1    | 1     | 0    | 0.000 | -1.   | 0      |

| NSTPS | NSTDL | LAG | ANRKK | X     |
|-------|-------|-----|-------|-------|
| 1     | 0     | 0   | 0.000 | 0.000 |

## NORMAL DEPTH CHANNEL ROUTING

GA(1) GA(2) GN(3) ELNVI ELMAX RLNTH SEL  
 200.00 420.00 440.00 400.00 450.00 395.00  
 520.00 395.00 580.00 400.00 900.00 420.00

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

200.00 420.00 440.00 400.00 450.00 395.00  
 520.00 395.00 580.00 400.00 900.00 420.00

| STORAGE | 1.14     | 2.72     | 5.47     | 10.19     | 16.88     | 25.63     | 36.85     | 50.58     |
|---------|----------|----------|----------|-----------|-----------|-----------|-----------|-----------|
| OUTFLOW | 16.84    | 130.62   | 156.91   | 185.72    | 217.03    | 250.86    | 287.21    | 326.06    |
| STAGE   | 203.75   | 997.41   | 2434.72  | 4007.13   | 8369.67   | 13283.46  | 19498.48  | 28559.82  |
| FLOW    | 53015.90 | 69276.69 | 88519.59 | 110955.51 | 136782.69 | 159405.05 | 236576.22 | 277897.94 |
|         | 396.01   | 396.47   | 396.95   | 397.89    | 399.37    | 400.84    | 402.32    | 403.79    |
|         | 408.21   | 408.60   | 411.16   | 412.63    | 414.10    | 415.58    | 417.05    | 418.53    |
|         | 283.75   | 997.41   | 2434.72  | 4007.13   | 8369.67   | 13283.46  | 19498.48  | 28559.82  |
|         | 53015.90 | 69276.69 | 88519.59 | 110955.51 | 136782.69 | 159405.05 | 236576.22 | 277897.94 |

MAXIMUM STAGE IS 352.0  
 MAXIMUM STAGE IS 369.0  
 MAXIMUM STAGE IS 400.0  
 MAXIMUM STAGE IS 401.0  
 MAXIMUM STAGE IS 402.0  
 MAXIMUM STAGE IS 402.9

\*\*\*\*\*

# HYDROGRAPH ROUTING

## ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE

| ISTAQ | ICOMP | IECON | ITAPE | JFLT | JPRT | INAME | ISTAGE | IAUTO |
|-------|-------|-------|-------|------|------|-------|--------|-------|
| 600   | 1     | 0     | 0     | 3    | 0    | 1     | 0      | 0     |

| ROUTING DATA |      |      |       |
|--------------|------|------|-------|
| QLCSS        | AVG  | IRCS | ISAME |
| 0.0          | 0.00 | 0    | 1     |

| ROUTING DATA |      |      |      |
|--------------|------|------|------|
| ISAME        | ISFT | IPMP | LSTR |
| 1            | 3    | 0    | 0    |

| ROUTING DATA |      |      |        |
|--------------|------|------|--------|
| LAG          | AMSK | X    | ISFRAT |
| 1            | 0.00 | 0.00 | 0      |

\*\*\*\*\*

## SUB-AREA RUNOFF COMPUTATION

RUNOFF SUBAREA 5

| ISTAQ | ICOMP | IECON | ITAPE | JFLT | JPRT | INAME | ISTAGE | IAUTO |
|-------|-------|-------|-------|------|------|-------|--------|-------|
| 500   | 0     | 0     | 0     | 3    | 0    | 1     | 0      | 0     |

| HYDROGRAPH DATA |      |       |      |
|-----------------|------|-------|------|
| INVDG           | IUNG | TAREA | SNAP |
| 1               | 1    | 8.32  | 0.00 |

| HYDROGRAPH DATA |       |       |       |
|-----------------|-------|-------|-------|
| TRSDA           | TRSPC | RATIO | ISNOW |
| 231.40          | 0.00  | 0.00  | 0     |

| HYDROGRAPH DATA |       |       |       |
|-----------------|-------|-------|-------|
| ISAME           | ISAME | LOCAL | ISAME |
| 1               | 1     | 1     | 0     |

## PRECIP DATA

| SPFE | FMS   | AC    | R12   | R24   | R48    | R72  | R96  |
|------|-------|-------|-------|-------|--------|------|------|
| 0.00 | 17.50 | 73.00 | 08.00 | 59.00 | 104.00 | 0.00 | 0.00 |

TRSPC COMPUTED BY THE PROGRAM IS 0.845

## LOSS DATA

| LRPOT | STKX | DLTKR | RTICL | ERAIN | STKRS | RTIOK | STRTL | CNSTL | ALSPX | RTIMP |
|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00  | 0.00 | 1.00  | 0.00  | 0.00  | 1.00  | 1.00  | 0.10  | 0.00  | 0.00  | 0.01  |

## UNIT HYDROGRAPH DATA

TIE 4.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

RECESSION DATA  
 STRTO= -2.00 ORCSN= -0.10 RTIOR= 1.60  
 U.I.T HYDROGRAPH 34 END-OF-PERIOD COORDINATES, LAG= 3.03 HOURS, CP= 0.62 VOL= 1.00  
 49. 453. 755. 974. 1098. 1107. 591. 827. 690.  
 570. 481. 335. 219. 233. 195. 162. 135. 113.  
 79. 56. 55. 46. 36. 32. 27. 22. 19.  
 13. 11. 9.

END-OF-PERIOD FLOW  
 NO.DA HR.MN PERIOD MAIN EXCS LOSS COMP Q MO.DA HR.MN PERIOD RAIN EXCS LOSS COMP Q  
 SUM 16.11 12.94 3.17 153353.  
 ( 409. )( 329. )( 81. )( 4342.47 )

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# HYDROGRAPH ROUTING

ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE  
 ISTAQ ICCPP IECON ITAPE JPLT JPT INAPE ISTAGE IAUTO  
 500 1 0 0 0 0 1 0 0  
 ROUTING DATA  
 GLUSS CLOSS AVG IRES ISAME IOPT IFPP LSTR  
 0.0 0.000 0.00 0 1 0 0 0  
 NSTPS NSTDL LAG AMSKK X TSK STORA ISPRAT  
 0 3 1 0.000 0.000 0.000 0

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# SUB-AREA RUNOFF COMPUTATION

RUNOFF SUBAREA 1  
 ISTAQ ICCPP IECON ITAPE JPLT JPT INAPE ISTAGE IAUTO  
 100 0 0 0 0 0 1 0 0  
 HYDROGRAPH DATA  
 IHYD0 IUHG TAREA SNAF TRSDA TRSPC RATIO ISNOW ISAME LOCAL  
 1 1 9.53 0.00 231.40 0.00 0.000 0 1 0  
 PRECIP DATA  
 SPFE FMS RC R12 R24 R48 R72 R96  
 0.00 17.50 73.00 86.00 99.00 104.00 0.00 0.00

LOSS DATA  
 LAGT STAKR DLTKR RTIOL ERATN STRKS RTIOK STRTL CNSTL ALSPX RTIYP  
 0.00 0.00 1.00 0.00 0.00 1.00 1.00 0.10 0.00 0.00

TRSPC COMPUTED BY THE PROGRAM IS 0.005

UNIT HYDROGRAPH DATA  
 TS= 3.17 CP=0.63 NTA= C

STRIC= -2.00 RECESION DATA  
 UNCSN= -0.10 RTIOR= 1.60

UNIT HYDROGRAPH: 55 END-OF-PERIOD ORIGINATES, LAG= 3.17 HOURS, CP= 0.63 VOL= 1.00  
 255. 5.5. 761. 1024. 1179. 1229. 1146. 979. 822.  
 475. 487. 429. 343. 288. 242. 203. 171. 143.  
 12. 101. 5. 71. 60. 50. 35. 30. 25.  
 21. 18. 15. 12. 10.

NO.DA HR.MN PERIOD RAIN EXCS LOSS COMP Q  
 SUM 16.11 13.01 3.11 175935.  
 ( 409.)( 330.)( 79.)( 4981.92)

# END-OF-PERIOD FLOW

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# HYDROGRAPH ROUTING

ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE  
 ISTAT ICCPF IECON ITAPE JPLT JFRT INAPE ISTAGE IAUTO  
 100 1 0 0 0 0 1 0 0  
 ROUTING DATA  
 QLOSS CLOSS AVG IRES ISAME IOPT IFMP LSTR  
 0.00 0.00 0.00 0 1 0 0 0  
 NSTFS NSTDL LAG AMSKK X TSK STORA ISPRAT  
 0 3 2 0.00 0.00 0.00 0.00 0

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# SUB-AREA RUNOFF COMPLETION

RUNOFF SUBAREA 1  
 ISTAT ICCPF IECON ITAPE JPLT JFRT INAPE ISTAGE IAUTO  
 2 2 0 0 0 0 1 0 0  
 HYDROGRAPH DATA  
 ISTAT IUNG TAREA SNAF TRSDA TRSPC RATIO ISNOW ISAME LOCAL  
 1 1 155.53 0.00 251.40 0.00 C.000 C 1 0  
 PRECIP DATA  
 SPTL FMS RQ R12 R24 R48 R72 R96  
 C.CC 17.50 73.00 88.00 99.00 104.00 C.00 C.00

TRSPC COMPUTED BY THE PROGRAM IS 0.005

LOSS DATA

| LOSS | STRA | STRA | RTIO | STRA | RTIO | STRA | RTIO | STRA | RTIO |
|------|------|------|------|------|------|------|------|------|------|
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

UNIT HYDROGRAPH DATA

TF= 2.07 CP=0.63 RTA= C

RECESSION DATA

STRT= -2.00 GRCSN= -0.10 RTIOR= 1.60

UNIT HYDROGRAPH 22 END-OF-PERIOD ORDINATES, LAG= 2.07 HOURS, CP= 0.63 VOL= 1.00

| 3056. | 10967. | 20760. | 29795. | 25516. | 19336. | 14652. | 11103. | 8414. |
|-------|--------|--------|--------|--------|--------|--------|--------|-------|
| 6376. | 3061.  | 2774.  | 2102.  | 1593.  | 1207.  | 915.   | 653.   | 525.  |
| 390.  | 302.   |        |        |        |        |        |        |       |

END-OF-PERIOD FLOW

| MO.DA | HR.MN   | PERIOD  | RAIN   | EXCS       | LOSS | COMP Q | MO.DA | HR.MN | PERIOD | RAIN | EXCS | LOSS | COMP Q |
|-------|---------|---------|--------|------------|------|--------|-------|-------|--------|------|------|------|--------|
| SUM   | 16.11   | 13.94   | 2.18   | 3112022.   |      |        |       |       |        |      |      |      |        |
|       | ( 409.) | ( 354.) | ( 55.) | (88122.56) |      |        |       |       |        |      |      |      |        |

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# HYDROGRAPH ROUTING

ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE

| ISTAG | ICOMP | IECON | ITAFE | JPLT  | JPRY  | INAME | ISTAGE | IAUTO |
|-------|-------|-------|-------|-------|-------|-------|--------|-------|
| 200   | 1     | 0     | 0     | 0     | 0     | 1     | 0      | 0     |
| 0LGS  | CLGS  | AVG   | IRIS  | ISAP  | IQFT  | IPMP  | LSTR   |       |
| C.0   | 0.000 | 0.00  | 0     | 1     | 0     | 0     |        |       |
| NSTPS | NSTDL | LAG   | AMSK  | X     | TSK   | STORA | ISPRAT |       |
|       | 3     | 1     | 0.000 | 0.000 | 0.000 | C.    | 0      |       |

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# COMBINE HYDROGRAPHS

COMBINE 4 HYDROGRAPHS AT LAKE GEORGE

| ISTAG | ICOMP | IECON | ITAFE | JPLT | JPRY | INAME | ISTAGE | IAUTO |
|-------|-------|-------|-------|------|------|-------|--------|-------|
| 200   | 4     | 0     | 0     | 0    | 0    | 1     | 0      | 0     |

# SUB-AREA RUNOFF COMPUTATION

| ISTAG | ICOMP | IECON | ITAFE | JPLT | JPRY | INAME | ISTAGE | IAUTO |
|-------|-------|-------|-------|------|------|-------|--------|-------|
| ISTAG | ICOMP | IECON | ITAFE | JPLT | JPRY | INAME | ISTAGE | IAUTO |

SUB-AREA RUNOFF COMPUTATION

PURGE SUPAREA 4

ISTAG 10.0 IECON 0 ITAPE 0 JFLT 0 JFRT 1 INAME 1 ISTAGE 0 IAUTO 0

HYDROGRAPH DATA

IMVLC IUMG TAREA SNAF TRSDA TRSPC RATIO ISNOW ISAME LOCAL

1 1 11.52 0.00 251.40 0.00 0.000 0 1 0

PRECIP DATA

SPFE PMS RQ R12 R24 R48 R72 R96

0.00 17.50 73.00 88.00 99.00 104.00 0.00 0.00

TRSPC COMPUTED BY THE PROGRAM IS 0.845

LOSS DATA

LROFT STRKR ULTKR RTIOL ERAIN STRKS RTIOLK STRTL CNSTL ALSMX RTIIP

0.00 0.00 1.00 0.00 0.00 1.00 1.00 0.10 0.00 0.01

UNIT HYDROGRAPH DATA

IF= 4.07 CP=0.63 NTA= 0

RECESSION DATA

STRIC= -2.00 QRCSN= -0.10 RTIOR= 1.60

UNIT HYDROGRAPH 45 END-OF-PERIOD ORDINATES, LAG= 4.05 HOURS, CP= 0.63 VOL= 1.00

47. 100. 300. 500. 701. 970. 1102. 1171. 1167. 1074.

54. 21. 17. 16. 15. 14. 13. 12. 11. 10.

244. 213. 186. 163. 142. 124. 108. 95. 83. 72.

63. 55. 48. 42. 37. 32. 28. 25. 21. 19.

MO.DA HR.MN PERIOD RAIN EXCS LOSS COMP G MO.DA HR.MN PERIOD RAIN EXCS LOSS COMP G

SUM 16.11 12.94 3.17 207155.

( 409. ) ( 329. ) ( 81. ) ( 5865.97 )

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HYDROGRAPH ROUTING

ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE

ISTAG ICCPF IECON ITAPE JFLT JFRT INAME ISTAGE IAUTO

4.00 1 0 0 0 0 1 0 0

ROUTING DATA

QLOSS CLOSS AVG IRES ISAME IOFT IFMP LSTR

0.00 0.00 0.00 0 1 0 0 0

INSTPS NSTDL LAG AMSKK X TSK STORA ISFRAT

0 3 1 0.000 0.000 C.000 C. 0

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SUB-AREA RUNOFF COMPLETION

RUNOFF SUBAREA 7  
ISTAQ ICCPF IECON ITAFE JFLT JPRT INAME ISTAGE IAUTO  
700 0 0 0 0 1 C 0

HYDROGRAPH DATA  
INVOG IUNG TAREA SNAP TRSDA TRSEC RATIO ISNOW ISAME LOCAL  
1 1 10.49 3.00 231.40 0.00 C.000 C 1 0

PRECIP DATA  
SPFE PMS RC R12 R24 R48 R72 R96  
C.00 17.50 23.00 64.00 99.00 104.00 C.00 C.00

TRSEC COMPUTED BY THE PROGRAM IS 1.885

LOSS DATA  
LROPT STRKR DLTKR RTIUL ERAIN STRKS RTIOK STRTL CNSTL ALSMX RTIMP  
C C.00 C.00 1.00 1.00 C.00 C.00 1.00 1.00 0.10 C.00 0.01

UNIT HYDROGRAPH DATA  
TF= 5.71 CP=C.63 RTA= C

RECESSION DATA  
STRTG= -2.00 QRCSN= -C.10 RTIOR= 1.60

UNIT HYDROGRAPH 41 END-OF-PERIOD ORDINATES, LAGE= 3.72 HOURS, CP= 0.63 VOL= 1.00  
53. 194. 388. 607. 828. 1009. 1121. 1160. 1163. 973.  
859. 724. 624. 538. 464. 400. 345. 298. 257. 221.  
191. 165. 142. 122. 106. 91. 78. 68. 58. 50.  
43. 37. 32. 24. 21. 16. 15. 13. 11.  
10.

END-OF-PERIOD FLOW  
MO.DA HR.MN PERIOD RAIN EXCS LOSS COMP Q MO.DA HR.MN PERIOD RAIN EXCS LOSS COMP Q  
SUM 16.11 12.94 3.17 190024.  
( 409.)( 329.)( 81.)( 5380.82)

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SUB-AREA RUNOFF COMPLETION

RUNOFF SUBAREA 10  
ISTAQ ICCPF IECON ITAFE JFLT JPRT INAME ISTAGE IAUTO  
1000 0 0 0 0 0 1 C 0

HYDROGRAPH DATA

INSTR 1 1 7.00 TAREA 0.00 TMSDA 231.40 TRSPC 0.00 RATIO 0.00 ISNOW 0 ISAME 1 LOCAL 0

PRECIP DATA  
 SPEE PMS R6 R12 R24 R48 R72 R96  
 0.00 17.50 73.00 88.00 99.00 104.00 0.00 0.00 0.00

TRSPC COMPUTED BY THE PROGRAM IS 0.00

LOSS DATA  
 UNCFIT SIKR OLTR RTIOL ERIN SINKS WIOK SIRT CNSTL ALSMX RTIMP  
 0.00 0.00 0.00 1.00 0.00 0.00 1.00 0.00 0.10 0.00 0.05

UNIT HYDROGRAPH DATA  
 TF= 3.21 CP=0.63 NTA= 0

RECESSION DATA  
 STRIQ= -2.00 QRCSN= -0.10 RTIOR= 1.60

UNIT HYDROGRAPH 36 END-OF-PERIOD ORDINATES LAG= 3.23 HOURS CP= 0.63 VOL= 1.00  
 55. 202. 401. 621. 819. 948. 996. 939. 811. 684.  
 577. 487. 411. 346. 292. 247. 208. 175. 148. 125.  
 105. 89. 75. 63. 53. 45. 38. 32. 27. 23.  
 19. 16. 14. 12. 10. 8.

MO.DA HR.MN PERIOD RAIN EXCS LOSS END-OF-PERIOD FLOW  
 COMP Q MO.DA HR.MN PERIOD RAIN EXCS LOSS COMP Q  
 SUM 16.11 13.07 3.04 145819.  
 ( 409.)( 332.)( 77.)( 4129.13)

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# HYDROGRAPH ROUTING

ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE

ISTAQ ICCMP IECON ITAPE JPLT JPRT INAME ISTAGE IAUTO  
 1000 1 0 0 0 0 0 0 0

## ROUTING DATA

QLOSS CLOSS AVG IRES ISAME IOPT IPMP LSTR  
 0.0 0.000 0.00 0 1 0 0 0

ASTPS NSTDL LAG AMSVK X TSK STORA ISPRAT  
 0 3 2 0.000 0.000 0.000 0.000 0

\*\*\*\*\*

# COMBINE HYDROGRAPHS

COMBINE 3 HYDROGRAPHS (TOTAL INFLOW HYDROGRAPH AT LAKE GEORGE DAM)

ISTAQ ICCMP IECON ITAPE JPLT JPRT INAME ISTAGE IAUTO  
 1000 1 0 0 0 0 0 0 0

金  
金  
金  
金  
金  
金  
金  
金  
金

19

55

2

153.

329  
471

1268.

154J.

5762.

2026

[illegible]

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

| OPERATION     | STATION | AREA                | PLAN | RATIO                | RATIOS APPLIED TO FLOWS |                      |                       |                       |                       |                       |         |
|---------------|---------|---------------------|------|----------------------|-------------------------|----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------|
|               |         |                     |      |                      | RATIO 1                 | RATIO 2              | RATIO 3               | RATIO 4               | RATIO 5               | RATIO 6               | RATIO 7 |
|               |         |                     |      |                      | C.20                    | 0.30                 | C.40                  | 0.50                  | C.60                  | 0.80                  | 1.00    |
| HYDROGRAPH AT | 600     | 22.30<br>( 57.76)   | 1    | 4647.<br>( 131.58)   | 6970.<br>( 197.36)      | 9293.<br>( 263.15)   | 11616.<br>( 328.94)   | 13940.<br>( 394.73)   | 18586.<br>( 526.30)   | 23233.<br>( 657.88)   |         |
| ROUTED TO     | 500     | 22.30<br>( 57.76)   | 1    | 4644.<br>( 131.51)   | 6966.<br>( 197.26)      | 9289.<br>( 263.03)   | 11612.<br>( 328.80)   | 13936.<br>( 394.63)   | 18576.<br>( 526.07)   | 23227.<br>( 657.72)   |         |
| ROUTED TO     | 600     | 22.30<br>( 57.76)   | 1    | 4571.<br>( 125.43)   | 6857.<br>( 194.16)      | 9142.<br>( 258.88)   | 11428.<br>( 323.60)   | 13713.<br>( 388.31)   | 18285.<br>( 517.78)   | 22856.<br>( 647.20)   |         |
| HYDROGRAPH AT | 500     | 8.32<br>( 21.53)    | 1    | 1859.<br>( 52.63)    | 2768.<br>( 78.95)       | 3717.<br>( 105.26)   | 4647.<br>( 131.58)    | 5576.<br>( 157.89)    | 7435.<br>( 210.52)    | 9293.<br>( 263.15)    |         |
| ROUTED TO     | 500     | 8.32<br>( 21.53)    | 1    | 1825.<br>( 51.68)    | 2737.<br>( 77.51)       | 3650.<br>( 103.35)   | 4562.<br>( 129.19)    | 5475.<br>( 155.03)    | 7300.<br>( 206.70)    | 9124.<br>( 258.38)    |         |
| HYDROGRAPH AT | 100     | 9.53<br>( 24.66)    | 1    | 2059.<br>( 59.17)    | 3134.<br>( 88.75)       | 4179.<br>( 118.33)   | 5223.<br>( 147.91)    | 6268.<br>( 177.49)    | 8358.<br>( 236.66)    | 10447.<br>( 295.82)   |         |
| ROUTED TO     | 100     | 9.53<br>( 24.66)    | 1    | 2051.<br>( 58.08)    | 3076.<br>( 87.12)       | 4102.<br>( 116.15)   | 5127.<br>( 145.19)    | 6153.<br>( 174.23)    | 8204.<br>( 232.31)    | 10255.<br>( 290.39)   |         |
| HYDROGRAPH AT | 200     | 153.53<br>( 397.64) | 1    | 43108.<br>( 1226.68) | 64662.<br>( 1831.01)    | 86216.<br>( 2441.35) | 107769.<br>( 3051.69) | 129323.<br>( 3662.02) | 172431.<br>( 4882.70) | 215539.<br>( 6103.37) |         |
| ROUTED TO     | 200     | 153.53<br>( 397.64) | 1    | 41515.<br>( 1184.07) | 62723.<br>( 1776.11)    | 83630.<br>( 2368.14) | 104538.<br>( 2960.18) | 125445.<br>( 3552.21) | 167261.<br>( 4736.29) | 209076.<br>( 5920.36) |         |
| * COMBINED    | 202     | 193.68<br>( 501.63) | 1    | 45374.<br>( 1398.13) | 74063.<br>( 2057.24)    | 98751.<br>( 2796.32) | 123441.<br>( 3455.46) | 148129.<br>( 4194.54) | 197509.<br>( 5592.84) | 246888.<br>( 6991.07) |         |
| HYDROGRAPH AT | 300     | 7.87<br>( 20.38)    | 1    | 1677.<br>( 47.49)    | 2516.<br>( 71.24)       | 3354.<br>( 94.98)    | 4193.<br>( 118.73)    | 5031.<br>( 142.48)    | 6709.<br>( 189.97)    | 8386.<br>( 237.46)    |         |
| ROUTED TO     | 300     | 7.87<br>( 20.38)    | 1    | 1648.<br>( 46.66)    | 2472.<br>( 69.99)       | 3295.<br>( 93.32)    | 4119.<br>( 116.65)    | 4943.<br>( 135.98)    | 6591.<br>( 186.64)    | 8239.<br>( 233.29)    |         |
| HYDROGRAPH AT | 400     | 11.52<br>( 29.84)   | 1    | 2173.<br>( 61.54)    | 3260.<br>( 92.31)       | 4347.<br>( 123.08)   | 5433.<br>( 153.85)    | 6520.<br>( 184.62)    | 8693.<br>( 246.16)    | 10866.<br>( 307.70)   |         |
| ROUTED TO     | 400     | 11.52<br>( 29.84)   | 1    | 2147.<br>( 60.80)    | 3226.<br>( 91.19)       | 4254.<br>( 121.59)   | 5367.<br>( 151.99)    | 6441.<br>( 182.39)    | 8588.<br>( 243.18)    | 10735.<br>( 303.97)   |         |

|               |      |         |   |          |            |            |            |            |            |            |
|---------------|------|---------|---|----------|------------|------------|------------|------------|------------|------------|
| HYDROGRAPH AT | 700  | 10.49   | 1 | 2001.    | 3121.      | 4162.      | 5202.      | 6243.      | 8323.      | 10404.     |
|               | (    | 27.17)  | ( | 58.92)   | ( 88.38)   | ( 117.85)  | ( 147.31)  | ( 176.77)  | ( 235.69)  | ( 294.62)  |
| HYDROGRAPH AT | 1000 | 7.08    | 1 | 1709.    | 2503.      | 3417.      | 4272.      | 5126.      | 6835.      | 8544.      |
|               | (    | 20.41)  | ( | 40.39)   | ( 72.52)   | ( 90.77)   | ( 120.96)  | ( 145.16)  | ( 193.54)  | ( 241.93)  |
| ROUTED TO     | 1000 | 7.28    | 1 | 1678.    | 2517.      | 3356.      | 4195.      | 5035.      | 6713.      | 8391.      |
|               | (    | 20.41)  | ( | 47.52)   | ( 71.28)   | ( 95.04)   | ( 118.80)  | ( 142.56)  | ( 190.08)  | ( 237.60)  |
| 5 COMBINED    | 200  | 231.44  | 1 | 55093.   | 83841.     | 111728.    | 139737.    | 167684.    | 223583.    | 279480.    |
|               | (    | 599.42) | ( | 1582.71) | ( 2374.11) | ( 3165.49) | ( 3956.91) | ( 4748.28) | ( 6331.16) | ( 7913.98) |
| ROUTED TO     | 200  | 231.44  | 1 | 328.     | 671.       | 1068.      | 1540.      | 2148.      | 3782.      | 5624.      |
|               | (    | 599.42) | ( | 9.28)    | ( 18.95)   | ( 30.23)   | ( 43.59)   | ( 60.83)   | ( 107.09)  | ( 159.27)  |

PLAN 1 STATION 500

| RATIO | MAXIMUM<br>FLOW, CFS | MAXIMUM<br>STAGE, FT | TIME<br>HOURS |
|-------|----------------------|----------------------|---------------|
| C.20  | 4644.                | 397.8                | 43.00         |
| C.30  | 6566.                | 398.6                | 43.00         |
| C.40  | 9289.                | 399.6                | 43.00         |
| C.50  | 11812.               | 400.3                | 43.00         |
| C.60  | 13936.               | 401.0                | 43.00         |
| C.80  | 18575.               | 402.0                | 43.00         |
| 1.00  | 23227.               | 402.9                | 43.00         |

# SUMMARY OF DAY SAFETY ANALYSIS

PLAN 1 .....

| ..... |                                   |                             |                           |                               |                                 |                             |
|-------|-----------------------------------|-----------------------------|---------------------------|-------------------------------|---------------------------------|-----------------------------|
|       | ELEVATION                         | INITIAL VALUE               | SPILLWAY CREST            | TOP OF DAM                    |                                 |                             |
|       | STORAGE                           | 319.60                      | 319.60                    | 323.00                        |                                 |                             |
|       | OUTFLOW                           | 2185393.                    | 2185391.                  | 2278960.                      |                                 |                             |
|       |                                   | 0.                          | C.                        | 1666.                         |                                 |                             |
|       | MAXIMUM<br>RESERVOIR<br>W.S. ELEV | MAXIMUM<br>STORAGE<br>AC-FT | MAXIMUM<br>OUTFLOW<br>CFS | DURATION<br>OVER TOP<br>HOURS | TIME OF<br>MAX OUTFLOW<br>HOURS | TIME OF<br>FAILURE<br>HOURS |
| 0.20  | 320.92                            | 2221624.                    | 328.                      | 0.00                          | 79.50                           | 0.00                        |
| 0.30  | 321.56                            | 2239346.                    | 671.                      | 0.00                          | 77.00                           | 0.00                        |
| 0.40  | 322.20                            | 2256917.                    | 1068.                     | 0.00                          | 75.00                           | 0.00                        |
| 0.50  | 322.83                            | 2274300.                    | 1540.                     | 0.00                          | 73.50                           | 0.00                        |
| 0.60  | 323.46                            | 2291485.                    | 2148.                     | 41.50                         | 72.00                           | 0.00                        |
| 0.80  | 324.67                            | 2324876.                    | 3782.                     | 46.00                         | 69.50                           | 0.00                        |
| 1.00  | 325.72                            | 2358018.                    | 5626.                     | 47.00                         | 67.50                           | 0.00                        |



|        |    |      |                                                        |        |    |       |     |     |     |   |
|--------|----|------|--------------------------------------------------------|--------|----|-------|-----|-----|-----|---|
| 00039) | M  | 1    | 1                                                      | 9.53   | C  | 231.4 | C   | C   | 1   |   |
| 00040) | P  | 0    | 17.5                                                   | 73     | 88 | 99    | 104 |     |     |   |
| 00041) | T  | 0    | 0                                                      | 0      | 0  | 0     | 0   | 1.0 | 0.1 | 0 |
| 00042) | W  | 3.17 | 0.625                                                  |        |    |       |     |     |     |   |
| 00043) | X  | -2.0 | -0.10                                                  | 1.6    |    |       |     |     |     |   |
| 00044) | K  | 1    | 100                                                    | 0      | C  | C     | C   | 1   |     |   |
| 00045) | K1 |      | ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE |        |    |       |     |     |     |   |
| 00046) | Y  | 0    | 0                                                      | 0      | C  | 1     |     |     |     |   |
| 00047) | V1 | 0    | 3                                                      | 2      |    |       |     |     |     |   |
| 00048) | K  | 0    | 200                                                    | 0      | 0  | 0     | 0   | 1   |     |   |
| 00049) | K1 |      | RUNOFF SUBAREA 2                                       |        |    |       |     |     |     |   |
| 00050) | M  | 1    | 1                                                      | 153.53 | C  | 231.4 | 0   | C   | C   | 1 |
| 00051) | P  | 0    | 17.5                                                   | 73     | 88 | 99    | 104 |     |     |   |
| 00052) | T  | 0    | 0                                                      | 0      | 0  | 0     | 0   | 1.0 | 0.1 | 0 |
| 00053) | W  | 2.07 | 0.625                                                  |        |    |       |     |     |     |   |
| 00054) | X  | -2.0 | -0.10                                                  | 1.6    |    |       |     |     |     |   |
| 00055) | K  | 1    | 200                                                    | 0      | C  | C     | 0   | 1   |     |   |
| 00056) | K1 |      | ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE |        |    |       |     |     |     |   |
| 00057) | Y  | 0    | 0                                                      | 0      | 0  | 1     |     |     |     |   |
| 00058) | V1 | 0    | 3                                                      | 1      |    |       |     |     |     |   |
| 00059) | K  | 4    | 202                                                    | 0      | 0  | 0     | 0   | 1   |     |   |
| 00060) | K1 |      | COMBINE 4 HYDROGRAPHS AT LAKE GEORGE                   |        |    |       |     |     |     |   |
| 00061) | K  | 0    | 300                                                    | 0      | C  | C     | C   | 1   |     |   |
| 00062) | K1 |      | RUNOFF SUBAREA 3                                       |        |    |       |     |     |     |   |
| 00063) | M  | 1    | 1                                                      | 7.87   | 0  | 231.4 | 0   | 0   | C   | 1 |
| 00064) | P  | 0    | 17.5                                                   | 73     | 88 | 99    | 104 |     |     |   |
| 00065) | T  | 0    | 0                                                      | 0      | 0  | 0     | 0   | 1.0 | 0.1 | 0 |
| 00066) | W  | 3.29 | 0.625                                                  |        |    |       |     |     |     |   |
| 00067) | X  | -2.0 | -0.10                                                  | 1.6    |    |       |     |     |     |   |
| 00068) | K  | 1    | 300                                                    | 0      | C  | C     | 0   | 1   |     |   |
| 00069) | K1 |      | ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE |        |    |       |     |     |     |   |
| 00070) | Y  | 0    | 0                                                      | 0      | C  | 1     |     |     |     |   |
| 00071) | V1 | 0    | 3                                                      | 2      |    |       |     |     |     |   |
| 00072) | K  | 0    | 400                                                    | 0      | 0  | 0     | 0   | 1   |     |   |
| 00073) | K1 |      | RUNOFF SUBAREA 4                                       |        |    |       |     |     |     |   |
| 00074) | M  | 1    | 1                                                      | 11.52  | C  | 231.4 | C   | C   | C   | 1 |
| 00075) | P  | 0    | 17.5                                                   | 73     | 88 | 99    | 104 |     |     |   |
| 00076) | T  | 0    | 0                                                      | 0      | C  | C     | 0   | 1.0 | 0.1 | 0 |



LAKE GEORGE

|        |   |    |
|--------|---|----|
| (0115) | K | 53 |
| (0116) | A |    |
| (0117) | A |    |
| (0118) | A |    |
| (0119) | A |    |
| (0120) | A |    |

PAGE CCC4

# PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

|                          |      |
|--------------------------|------|
| RUNOFF HYDROGRAPH AT     | 600  |
| ROUTE HYDROGRAPH TO      | 500  |
| RUNOFF HYDROGRAPH AT     | 600  |
| ROUTE HYDROGRAPH TO      | 500  |
| RUNOFF HYDROGRAPH AT     | 500  |
| ROUTE HYDROGRAPH TO      | 100  |
| RUNOFF HYDROGRAPH AT     | 100  |
| ROUTE HYDROGRAPH TO      | 200  |
| RUNOFF HYDROGRAPH AT     | 200  |
| ROUTE HYDROGRAPH TO      | 200  |
| COMBINE 4 HYDROGRAPHS AT | 202  |
| RUNOFF HYDROGRAPH AT     | 300  |
| ROUTE HYDROGRAPH TO      | 300  |
| RUNOFF HYDROGRAPH AT     | 400  |
| ROUTE HYDROGRAPH TO      | 400  |
| RUNOFF HYDROGRAPH AT     | 700  |
| ROUTE HYDROGRAPH TO      | 1000 |
| RUNOFF HYDROGRAPH AT     | 1000 |
| ROUTE HYDROGRAPH TO      | 202  |
| COMBINE 5 HYDROGRAPHS AT | 202  |
| ROUTE HYDROGRAPH TO      | 202  |
| END OF NETWORK           |      |

\*\*\*\*\*  
 FLOOD HYDROGRAPH PACKAGE (HEC-1)  
 DAM SAFETY VERSION JULY 1978  
 LAST MODIFICATION 26 FEB 75  
 \*\*\*\*\*

ALA DATE: THU, JUL 1, 1980  
 TIME: 212:44:35

LAKE GEORGE  
 HEC-1DB (SNYDER PARAMETERS)  
 PMF-DAM OVERTOPPING ANALYSIS WITH ALL 3 GATES OPEN 5 FT.

| JOB SPECIFICATION |     |      |       |     |       |       |      |      |       |
|-------------------|-----|------|-------|-----|-------|-------|------|------|-------|
| NG                | NHR | NMIN | IDAY  | IHR | IMIN  | METRC | IPLT | IFRT | NSTAN |
| 180               | 0   | 30   | C     | 0   | 0     | 0     | 0    | 4    | 0     |
|                   |     |      | JOPER | NWT | LRCPT | TRACE |      |      |       |
|                   |     |      | 5     | 0   | 0     | 0     |      |      |       |

MULTI-PLAN ANALYSES TO BE PERFORMED  
 NPLAN= 1 NRTIO= 7 LRTIO= 1

RTIOS= 0.20 0.30 0.40 0.50 0.60 0.80 1.00

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

SUB-AREA RUNOFF COMPUTATION

| RUNOFF SUBAREA 6 |       |       |       |      |      |       |        |       |  |
|------------------|-------|-------|-------|------|------|-------|--------|-------|--|
| ISTAQ            | ICOMP | IECON | ITAPE | JPLT | JFRT | INAME | ISTAGE | IAUTO |  |
| 600              | 0     | 0     | 0     | 0    | 0    | 1     | 0      | 0     |  |

| HYDROGRAPH DATA |      |       |      |        |       |       |       |       |       |
|-----------------|------|-------|------|--------|-------|-------|-------|-------|-------|
| IMYCG           | IUNG | TAREA | SNAP | TRSDA  | TRSPC | RATC  | ISNOW | ISAME | LOCAL |
| 1               | 1    | 22.30 | 0.00 | 251.40 | 0.00  | 0.000 | 0     | 1     | 0     |

| PRECIP DATA |       |       |        |
|-------------|-------|-------|--------|
| SPFE        | PMS   | RC    | R24    |
| 0.00        | 17.50 | 73.00 | 88.00  |
|             |       |       | 95.00  |
|             |       |       | 104.00 |
|             |       |       | 0.00   |
|             |       |       | R72    |
|             |       |       | 0.00   |
|             |       |       | R96    |
|             |       |       | 0.00   |

TRSPC COMPUTED BY THE PROGRAM IS 0.885

| LOSS DATA |       |       |       |       |        |       |       |       |       |
|-----------|-------|-------|-------|-------|--------|-------|-------|-------|-------|
| LROPT     | STIRK | DLTKR | RTIOL | EGAIN | STIRKS | RTIOL | STRTL | CNSTL | ALSMX |
| 1         | 0.00  | 0.00  | 1.00  | 0.00  | 0.00   | 1.00  | 1.00  | 0.10  | 0.00  |
|           |       |       |       |       |        |       |       |       | 0.01  |

UNIT HYDROGRAPH DATA  
 IF= 3.48 CP=0.63 NTA= C

RECESSION DATA  
 STMG= -2.00 GRCSN= -0.10 RTIOR= 1.60

UNIT HYDROGRAPH 3N END-OF-PERIOD ORIGINATES, LAC= 5.46 HOURS, CP= C.63 VOL= 1.0C

| MO.DA | HR.MN | PERIOD | RAIN  | EXCS  | LCSS  | COMP G | PO.DA | HR.MN | PERIOD | RAIN  | EXCS  | LOSS  | COMP G |
|-------|-------|--------|-------|-------|-------|--------|-------|-------|--------|-------|-------|-------|--------|
| 136.  | 502.  | 1000.  | 1558. | 2023. | 2461. |        |       |       |        | 2592. | 2314. | 1975. |        |
| 1666. | 1434. | 1228.  | 1048. | 874.  | 763.  |        |       |       |        | 556.  | 474.  | 405.  |        |
| 346.  | 295.  | 252.   | 215.  | 183.  | 156.  |        |       |       |        | 134.  | 57.   | 83.   |        |
| 71.   | 60.   | 52.    | 44.   | 38.   | 32.   |        |       |       |        | 27.   | 23.   |       |        |

SUM 16.11 12.94 3.17 406557.  
( 409.)( 329.)( 81.)(11512.40)

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HYDROGRAPH ROUTING

CHANNEL ROUTE THRU SLBAREA 5 TO LAKE GEORGE

| ISTAQ | ICOMP | IECON | ITAFE | JPLT | JPRT | INAME | ISTAGE | IAUTO |
|-------|-------|-------|-------|------|------|-------|--------|-------|
| 500   | 1     | 0     | 0     | 0    | 0    | 1     | C      | 0     |

ROUTING DATA

| GLSS | CLOSS | AVG  | IRIS | ISAME | IOPT | IPMP | LSTR |
|------|-------|------|------|-------|------|------|------|
| G.C  | 0.000 | 0.00 | 1    | 1     | 0    | 0    | 0    |

NSIPS NSTDL LAG AMSKK X TSK STORA ISFRAT C

| 1 | 0 | 0.000 | 0.000 | -1. | C |
|---|---|-------|-------|-----|---|
|---|---|-------|-------|-----|---|

NORMAL DEPTH CHANNEL ROUTING

GN(1) GN(2) GN(3) ELNVT ELMAX RLNTH SEL  
0.0600 0.0600 0.0600 392.0 420.0 1800. 0.06000

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC  
200.00 420.00 440.00 400.00 490.00 395.00 497.00 392.00 512.00 392.00  
520.00 395.00 580.00 400.00 900.00 420.00

| STORAGE | ELNVT    | ELMAX    | RLNTH    | SEL       |
|---------|----------|----------|----------|-----------|
| 5.57    | 1.14     | 2.72     | 5.47     | 10.19     |
|         | 106.84   | 130.62   | 156.91   | 185.72    |
| OUTFLOW | 3.00     | 203.75   | 997.41   | 2430.72   |
|         | 53 15.98 | 69276.69 | 98519.39 | 110953.81 |
| STAGE   | 342.00   | 393.47   | 394.95   | 396.42    |
|         | 406.74   | 400.21   | 409.68   | 411.16    |
| FLOW    | 1.00     | 293.75   | 997.41   | 2438.72   |
|         | 53 15.98 | 69276.69 | 98519.39 | 110953.81 |

MAXIMUM STAGE IS 397.  
 MAXIMUM STAGE IS 396.2  
 MAXIMUM STAGE IS 399.0  
 MAXIMUM STAGE IS 400.3  
 MAXIMUM STAGE IS 401.0  
 MAXIMUM STAGE IS 402.0  
 MAXIMUM STAGE IS 402.9

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# HYDROGRAPH ROUTING

ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE  
 ISTAQ 1 IECON 0 ITAFE 0 JPLY 0 JPRT 0 INAME 1 ISTAGE 0 IAUTO 0  
 600 0  
 ROUTING DATA  
 OLCSS CLCSS AVG IRES ISAME IOFT IFMP LSTR  
 C.C 0.000 C.CC 0 1 0 0 0  
 NSTPS NSTDL LAG AMSKK X TSK STORA ISPRAT  
 0 3 1 0.000 0.000 C.000 C. 0

\*\*\*\*\*

# SUB-AREA RUNOFF COMPUTATION

RUNOFF SUBAREA 5  
 ISTAQ 1 IECON 0 ITAFE 0 JPLY 0 JPRT 0 INAME 1 ISTAGE 0 IAUTO 0  
 500 0

HYDROGRAPH DATA  
 INYDG IUNG TAREA SNAF TRSDA TRSPC RATIO ISNOW ISAME LOCAL  
 1 1 8.32 0.00 231.40 C.CC C.000 C 1 0

PRECIP DATA  
 SPFE PMS R6 R12 R48 R72 R96  
 0.00 17.50 73.00 88.00 99.00 104.00 C.00 C.00

TRSPC COMPUTED BY THE PROGRAM IS 0.825

LOSS DATA  
 LROPT STRKR DLTKR RTIOL ERAIN STRKS RTIOK STRIL CNSTL ALSHX RTIMP  
 0.00 0.00 1.00 0.00 0.00 1.00 1.00 C.10 C.CC 0.01

UNIT HYDROGRAPH DATA  
IF= 3.00 CP=0.03 NTA= 0

RECESSION DATA  
STRTO= -2.00 QRCN= -0.10 RTION= 1.60

UNIT HYDROGRAPH 34 END-OF-PERIOD ORIGINATES, LAG= 3.03 HOURS, CP= 0.62 VOL= 1.00  
249. 493. 755. 974. 1096. 1107. 991. 827. 690.  
576. 481. 335. 279. 233. 195. 162. 135. 113.  
54. 68. 55. 40. 38. 32. 27. 22. 19.  
15. 11. 9.

END-OF-PERIOD FLOW  
COMP Q PO.DA HR.MN PERIOD RAIN EXCS LOSS COMP Q  
SUM 16.11 12.94 3.17 153353.  
( 409.)( 329.)( 81.)( 4342.47)

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HYDROGRAPH ROUTING

ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE  
ISTAG ICCMP IECON ITAFE JPLT JFRT INARE ISTAGE IPUTD  
500 1 0 0 0 0 1 0 0

ROUTING DATA  
LSTR  
QLOSS CLOSS AVG IRES ISAME IOPT IPMP LSTR  
C.0 0.000 0.00 0 1 0 0 0  
NSTPS NSTDL LAG AMSKK X TSK STORA ISFRAT  
0 3 1 0.000 0.000 C.000 C. 0

\*\*\*\*\*

SUB-AREA RUNOFF COMPLETION

RUNOFF SUBAREA 1  
ISTAG ICCMP IECON ITAFE JPLT JFRT INARE ISTAGE IPUTD  
100 0 0 0 0 0 1 0 0

HYDROGRAPH DATA  
IHYDG IUNG TAREA SNAP TRSDA TRSPC RATIO ISNOW ISAME LOCAL  
1 1 9.53 0.00 231.40 0.00 C.000 0 1 0

PRECIP DATA  
SPFE PMS R6 R12 R24 R46 R72 R96  
C.00 17.50 73.00 88.00 99.00 104.00 C.00 C.00

TRSPC COMPUTED BY THE PROGRAM IS 0.885

LOSS DATA



TRFPC COMPUTED BY THE PROGRAM IS LOGGED

LOSS DATA  
 LROFT STPKR DLTKR RTIOL ERAIN STRKS RTIOK STRTL CNSTL ALSMX RTIMP  
 1.00 0.00 1.00 0.00 0.00 1.00 1.00 0.00 0.00 0.32

UNIT HYDROGRAPH DATA  
 TF= 2.07 CP=C.63 NTA= C

RECESSION DATA  
 STRTG= -2.00 QRCN= -0.10 RTIOR= 1.60

UNIT HYDROGRAPH 22 END-OF-PERIOD ORIGINATES, LAG= 2.07 HOURS, CP= 0.63 VOL= 1.00  
 325. 1967. 2076. 28129. 29795. 25516. 19336. 14652. 11103. 8414.  
 6370. 4231. 2774. 2102. 1593. 1207. 915. 693. 525.  
 39. 502.

END-OF-PERIOD FLOW  
 MO.DA HR.MN PERIOD RAIN EXCS LOSS COMP Q  
 SUM 16.11 13.94 2.18 3112022.  
 ( 409.)( 354.)( 55.)(88122.56)

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# HYDROGRAPH ROUTING

ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE

ISTAQ ICOPP IECON ITAPE JPLT JPRY INAME ISTAGE IAUO  
 200 1 0 0 0 0 1 0 0

## ROUTING DATA

QLOSS CLCSS AVG IRES ISAME IOFT IPMP LSTR  
 C.C 0.000 C.CC 0 1 0 0 0

NSTPS NSTOL LAG AMSKK X TSK STORA ISPRAT  
 0 3 1 0.000 0.000 C.000 0

\*\*\*\*\*

# COMBINE HYDROGRAPHS

COMBINE 4 HYDROGRAPHS AT LAKE GEORGE

ISTAQ ICOPP IECON ITAPE JPLT JPRY INAME ISTAGE IAUO  
 212 4 0 0 0 0 1 0 0

\*\*\*\*\*

SUB-AREA RUNOFF COMPLETION

FUNCTA SCHAREA 3

ISTAG ICCMF IECON ITAFE JPLT JFRT INAME ISTAGE IAUTO  
300 0 0 0 0 1 0 0

HYDROGRAPH DATA  
INVDG IUDC TAREA SNAF TRSDA TRSFC RATIO ISNOW ISAME LOCAL  
1 1 7.07 0.00 231.40 0.00 C.000 C 1 0

PRECIP DATA  
SPFE PMS RC R12 R24 R48 R72 R96  
0.00 17.50 13.00 88.00 99.00 104.00 0.00 C.00

TRSPC COMPUTED BY THE PROGRAM IS 0.885

LOSS DATA  
LNOUT STRKR DLTKR RTIOL ERAIN STRKS RTIOK STRTL CNSTL ALSMX RTIMP  
0.00 0.00 1.00 0.00 0.00 1.00 1.00 0.10 0.00 0.02

UNIT HYDROGRAPH DATA  
TF= 3.29 CP=0.63 NTA= C

RECESSION DATA  
STRSQ= -2.00 GRCSN= -0.10 RTIOR= 1.60

UNIT HYDROGRAPH 37 END-OF-PERIOD OPERATES, LAG= 3.28 HOURS, CP= 0.62 VOL= 1.00  
53. 194. 300. 599. 792. 921. 972. 923. 802. 681.  
578. 491. 354. 300. 255. 217. 184. 156. 133.  
113. 81. 69. 53. 42. 36. 30. 26.  
22. 16. 13. 11. 10. 8.

END-OF-PERIOD FLOW  
MO.DA HR.MN PERIOD RAIN EXCS LOSS COMP G  
SUM 16.11 12.98 3.14 144277.  
( 409.)( 330.)( 80.)( 4085.47)

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HYDROGRAPH ROUTING

ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE  
ISTAG ICCMF IECON ITAFE JPLT JFRT INAME ISTAGE IAUTO  
300 1 0 0 0 1 0 0

ROUTING DATA  
QLOSS CLOSS AVG IRES ISAME IOFT IPMP LSTR  
0.0 0.000 0.00 0 1 0 0 0  
NSTPS NSTDL LAG AMSK X TSK STORA ISPRAT  
0 3 2 0.000 0.000 0.000 0

\*\*\*\*\*

# SUB-AREA RUNOFF COMPUTATION

PUNOFF SUBAREA 4

ISTAG 400 ICOMP C IECON 0 ITAFE 0 JPLT 0 JFRT 0 INAME 1 ISTAGE 0 IAUTO 0

IMYD 1 IUG 1 TAREA 11.52 SNAF 0.00 TRSDA 231.40 TRSEC 0.00 KATIG 0 ISNOW 0 ISAME 1 LOCAL 0

PRECIP DATA  
SPEE PMS R6 R12 R24 R48 R72 R96  
0.00 17.50 73.00 88.00 99.00 104.00 C.00 C.00 C.00

TRSEC COMPUTED BY THE PROGRAM IS 0.005

LOSS DATA  
LROFT STRKE DLTKR RTIOL ERAIN STRKS RTIOK STRTL CMSTL ALSMX RTIMP  
0.00 0.00 1.00 0.00 0.00 1.00 1.00 0.10 C.00 0.01

UNIT HYDROGRAPH DATA  
TF= 4.07 CP=C.63 NTA= C

RECESSION DATA  
STARTC= -2.00 QRCEN= -0.10 RTIOR= 1.00

UNIT HYDROGRAPH 45 END-OF-PERIOD ORDINATES, LAG= 4.05 HOURS, CP= 0.63 VOL= 1.00  
47. 100. 300. 566. 781. 970. 1102. 1171. 1167. 1074.  
940. 821. 717. 627. 548. 478. 418. 365. 319. 279.  
244. 213. 186. 163. 142. 124. 108. 95. 83. 72.  
63. 48. 42. 37. 32. 28. 25. 21. 19.  
16. 15. 11. 10.

END-OF-PERIOD FLOW  
NO.DA HR.MN PERIOD RAIN EXCS LCSS COMP G NO.DA HR.MN PERIOD RAIN EXCS LOSS COMP G  
SUM 16.11 12.94 3.17 207155.  
( 409.)( 329.)( 81.)( 5865.97)

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## HYDROGRAPH ROUTING

ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE  
ISTAG 400 ICOMP 1 IECON 0 ITAFE 0 JPLT 0 JFRT 0 INAME 1 ISTAGE 0 IAUTO 0  
ROUTING DATA  
GROSS CLOSS AVG IRES ISAVE IOFT IFWP LSTR  
0.0 0.000 0.00 0 1 0 0 C

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| PUN.T.F.F | SUBAREA | 15 | ISTAQ | ICOMP | IECON | IT+FE | JPLT | JIRT | INAME | ISTAGE | IAUTO |
|-----------|---------|----|-------|-------|-------|-------|------|------|-------|--------|-------|
|-----------|---------|----|-------|-------|-------|-------|------|------|-------|--------|-------|

| INSTRUMENT | TOTAL | TAKEN | SNAP | TRSDA  | TRSFCD | RATIO | ISNOW | ISAME | LOCAL |
|------------|-------|-------|------|--------|--------|-------|-------|-------|-------|
| INSTRUMENT | 1     | 1     | 0.00 | 231.40 | 0.00   | 0.000 | 0     | 1     | 0     |

HYDROGRAPH DATA

| PRECIP DATA | R6    | PMS   | SPFE |
|-------------|-------|-------|------|
| R12 R24     |       |       |      |
| 88.00 99.00 | 15.00 | 17.50 | 0.00 |

TRSPC COMPUTED BY THE PROGRAM IS 0.005

| LOSS DATA |       |       |       |       |       |       |       |       |       |       |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| LROPT     | STRKA | DLTKR | RTIOL | ERAIN | STRKS | RTIOK | STRTL | CNSTL | ALSMX | RTIMP |
| .         | 0.00  | 0.00  | 1.00  | 0.00  | 0.00  | 1.00  | 1.00  | 0.10  | 0.00  | 0.05  |

UNIT HYDROGRAPH DATA  
IF= 3.21 CP=C.63 NTA= 0

```
STRIG= -2.00 RECESSION DATA RTIOR= 1.60
          QRCN= -C.10
```

| UNIT | HYDROGRAPH | 36   | END-OF-PERIOD | ORDINATES, | LAG= | 3.23 | HOURS, | CP=  | 0.63 | VOL= | 1.00 |
|------|------------|------|---------------|------------|------|------|--------|------|------|------|------|
| 55.  | 202.       | 401. | 621.          | 819.       | 948. | 996. | 939.   | 811. |      | 684. |      |
|      | 481.       | 411. | 346.          |            | 247. | 292. | 206.   | 148. |      | 125. |      |
| 15.  | 64.        | 75.  | 63.           | 53.        | 45.  | 38.  | 32.    | 27.  |      | 23.  |      |
| 19.  | 16.        | 14.  | 12.           | 10.        | 6.   |      |        |      |      |      |      |

|  | MC.DA | HR.WN | PERIOD | RAIN | EXCS | LOSS | COMP Q | END-OF-PERIOD FLOW | PO.DA | HR.WN | PERIOD | RAIN    | EXCS    | LOSS   | COMP Q     |
|--|-------|-------|--------|------|------|------|--------|--------------------|-------|-------|--------|---------|---------|--------|------------|
|  |       |       |        |      |      |      |        |                    |       |       | SUM    | 16.11   | 13.07   | 3.04   | 145819.    |
|  |       |       |        |      |      |      |        |                    |       |       |        | ( 409.) | ( 332.) | ( 77.) | ( 4129.13) |

[illegible]

## HYDROGRAPH ROUTING

| ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE |       |       |       |      |      |       |        |       |  |
|--------------------------------------------------------|-------|-------|-------|------|------|-------|--------|-------|--|
| ISTAQ                                                  | ICAPP | IECON | ITAPE | JPLT | JFRT | INAVE | ISTAGE | IAUTO |  |
| 1000                                                   | 1     | 0     | 0     | 0    | 0    | 1     | 0      | 0     |  |

| QGLUSS | CLOSS | AVG  | IMES | ISAME | IUFT | IFPP | LSTR |
|--------|-------|------|------|-------|------|------|------|
| 9.00   | 9.000 | 9.00 | 0    | 0     | 1    | 0    | 0    |
| 9.00   | 9.000 | 9.00 | 0    | 0     | 1    | 0    | 0    |

| INSTPS | INSTOL | LAG   | APSRK | X     | TSK   | STORA | ISPRAT |
|--------|--------|-------|-------|-------|-------|-------|--------|
| 3      | 2      | 0.000 | 0.000 | 0.000 | 0.000 | C.    | C.     |

[illegible]

## COMBINE HYDROGRAPHS

COMPLETE 5 HYDROGRAPHS (TOTAL INFLOW HYDROGRAPH AT LAKE GEORGE DAM)  
 ISTAG ICLPP IECON ITAVE JPLT JFRT INAME ISTAGE IAUTO  
 202 5 0 0 0 0 0 1 0 0

\*\*\*\*\*

HYDROGRAPH ROUTING

ROUTE OVER LAKE GEORGE DAM

ISTAG ICLPP IECON ITAVE JPLT JFRT INAME ISTAGE IAUTO  
 202 1 0 0 0 0 0 1 0 0  
 ROUTING DATA  
 QCLASS CLASS AVG IRES ISAVE IUFF IFPP LSTR  
 0.0 0.000 0.00 1 1 0 0 0  
 NSTPS NSTDL LAG AMSKK X TSK STORA ISPRAT  
 1 0 0 0.000 0.000 0.000 -320. -1

STAGE 319.61 320.00 321.00 322.00 323.00 324.00 325.00 326.00  
 328.00  
 FLOW 0.00 945.00 1115.00 1665.00 2390.00 3250.00 4235.00 5390.00  
 9721.00 11270.00  
 CAPACITY= 43000. 176000. 373000. 674000. 1096000. 1640000. 2334000. 3168000.  
 ELEVATION= 133. 175. 200. 225. 250. 275. 300. 325. 350.

DAM DATA  
 TOPEL CUGD EXPD DAMWID  
 323.0 2.6 1.5 EC.

PEAK OUTFLOW IS 1535. AT TIME 64.00 HOURS  
 PEAK OUTFLOW IS 1940. AT TIME 66.00 HOURS  
 PEAK OUTFLOW IS 2399. AT TIME 66.50 HOURS  
 PEAK OUTFLOW IS 2932. AT TIME 67.00 HOURS  
 PEAK OUTFLOW IS 3522. AT TIME 67.00 HOURS  
 PEAK OUTFLOW IS 5144. AT TIME 66.00 HOURS  
 PEAK OUTFLOW IS 6596. AT TIME 65.00 HOURS

\*\*\*\*\*

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

|               |               | RATIOS APPLIED TO FLOWS |      |                      |                      |                      |                       |                       |                       |                       |
|---------------|---------------|-------------------------|------|----------------------|----------------------|----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| OPERATION     | STATION       | AREA                    | PLAN | RATIO 1              | RATIO 2              | RATIO 3              | RATIO 4               | RATIO 5               | RATIO 6               | RATIO 7               |
|               |               |                         |      | 0.20                 | 0.30                 | 0.40                 | 0.50                  | 0.60                  | 0.80                  | 1.00                  |
| HYDROGRAPH AT | 000           | 42.30<br>( 57.76)       | 1    | 4647.<br>( 131.58)   | 6970.<br>( 197.36)   | 9293.<br>( 263.15)   | 11616.<br>( 328.94)   | 13940.<br>( 394.73)   | 18586.<br>( 526.30)   | 23233.<br>( 657.88)   |
|               | ROUTED TO     | 500                     | 1    | 4644.<br>( 131.51)   | 6966.<br>( 197.26)   | 9289.<br>( 263.03)   | 11612.<br>( 328.50)   | 13936.<br>( 394.63)   | 18578.<br>( 526.07)   | 23227.<br>( 657.72)   |
| ROUTED TO     | 600           | 22.30<br>( 57.76)       | 1    | 4571.<br>( 125.43)   | 6857.<br>( 194.16)   | 9142.<br>( 256.00)   | 11426.<br>( 323.60)   | 13713.<br>( 386.31)   | 18285.<br>( 517.78)   | 22856.<br>( 647.20)   |
|               | HYDROGRAPH AT | 500                     | 1    | 1859.<br>( 52.63)    | 2788.<br>( 78.45)    | 3717.<br>( 105.26)   | 4647.<br>( 131.58)    | 5576.<br>( 157.89)    | 7435.<br>( 210.52)    | 9293.<br>( 263.15)    |
| ROUTED TO     | 500           | 8.32<br>( 21.55)        | 1    | 1825.<br>( 51.68)    | 2737.<br>( 77.51)    | 3650.<br>( 103.35)   | 4562.<br>( 129.19)    | 5475.<br>( 155.03)    | 7300.<br>( 206.70)    | 9124.<br>( 258.38)    |
|               | HYDROGRAPH AT | 100                     | 1    | 2089.<br>( 55.17)    | 3136.<br>( 88.75)    | 4179.<br>( 118.33)   | 5223.<br>( 147.51)    | 6268.<br>( 177.49)    | 8358.<br>( 236.66)    | 10447.<br>( 295.82)   |
| ROUTED TO     | 100           | 9.53<br>( 24.68)        | 1    | 2051.<br>( 58.08)    | 3076.<br>( 87.12)    | 4102.<br>( 116.15)   | 5127.<br>( 145.19)    | 6153.<br>( 174.23)    | 8204.<br>( 232.31)    | 10255.<br>( 290.39)   |
|               | HYDROGRAPH AT | 200                     | 1    | 43108.<br>( 1220.68) | 64662.<br>( 1831.01) | 86216.<br>( 2441.35) | 107769.<br>( 3051.69) | 129323.<br>( 3662.02) | 172431.<br>( 4882.70) | 215539.<br>( 6103.37) |
| ROUTED TO     | 200           | 153.53<br>( 397.64)     | 1    | 41215.<br>( 1184.07) | 62723.<br>( 1776.11) | 83630.<br>( 2366.14) | 104536.<br>( 2960.18) | 125445.<br>( 3552.21) | 16721.<br>( 473.29)   | 209076.<br>( 5920.36) |
|               | 4 COMBINED    | 200                     | 1    | 49374.<br>( 1395.13) | 74063.<br>( 2097.24) | 98751.<br>( 2756.32) | 123441.<br>( 3455.46) | 148129.<br>( 4194.54) | 197509.<br>( 5592.84) | 246888.<br>( 6991.07) |
| HYDROGRAPH AT | 300           | 7.87<br>( 20.38)        | 1    | 1677.<br>( 47.49)    | 2516.<br>( 71.24)    | 3354.<br>( 94.98)    | 4193.<br>( 118.73)    | 5031.<br>( 142.48)    | 6709.<br>( 189.57)    | 8386.<br>( 237.46)    |
|               | ROUTED TO     | 300                     | 1    | 1646.<br>( 47.66)    | 2472.<br>( 69.99)    | 3295.<br>( 93.52)    | 4119.<br>( 116.65)    | 4943.<br>( 139.98)    | 6591.<br>( 186.64)    | 8239.<br>( 233.29)    |
| HYDROGRAPH AT | 400           | 11.52<br>( 29.84)       | 1    | 2173.<br>( 61.54)    | 3266.<br>( 92.51)    | 4347.<br>( 123.08)   | 5433.<br>( 153.25)    | 6520.<br>( 184.62)    | 8693.<br>( 246.16)    | 10866.<br>( 307.70)   |
|               | ROUTED TO     | 400                     | 1    | 2147.<br>( 58.58)    | 3220.<br>( 88.58)    | 4294.<br>( 120.58)   | 5357.<br>( 150.58)    | 6441.<br>( 180.58)    | 8588.<br>( 240.58)    | 10735.<br>( 300.58)   |

|               |           |            |            |            |            |            |            |            |
|---------------|-----------|------------|------------|------------|------------|------------|------------|------------|
|               | ( 29.14)  | ( 60.80)   | ( 91.12)   | ( 121.59)  | ( 151.99)  | ( 182.39)  | ( 243.18)  | ( 303.97)  |
| HYDROGRAPH AT | 7         | ( 10.49    | 1          | 3121.      | 4162.      | 5202.      | 6243.      | 8323.      |
|               | ( 27.17)  | ( 58.92)   | ( 88.32)   | ( 117.85)  | ( 147.31)  | ( 176.77)  | ( 235.69)  | ( 294.62)  |
| HYDROGRAPH AT | 100       | ( 7.68     | 1          | 1769.      | 3417.      | 4272.      | 5126.      | 6635.      |
|               | ( 46.41)  | ( 62.59)   | ( 72.58)   | ( 96.77)   | ( 120.96)  | ( 145.16)  | ( 193.56)  | ( 241.93)  |
| MULTIPLYED T  | 1         | ( 7.88     | 1          | 1878.      | 3350.      | 4195.      | 5035.      | 6713.      |
|               | ( 20.41)  | ( 47.52)   | ( 71.20)   | ( 95.04)   | ( 118.80)  | ( 142.56)  | ( 190.08)  | ( 237.60)  |
| 5 COMBINED    | 212       | ( 231.44   | 1          | 55093.     | 111786.    | 139737.    | 167684.    | 223583.    |
|               | ( 599.42) | ( 1582.71) | ( 2374.11) | ( 3165.49) | ( 3956.91) | ( 4748.28) | ( 6331.16) | ( 7913.98) |
| ROUTED T.     | 212       | ( 231.44   | 1          | 1535.      | 2399.      | 2932.      | 3522.      | 5144.      |
|               | ( 599.42) | ( 43.47)   | ( 55.10)   | ( 67.95)   | ( 83.02)   | ( 99.73)   | ( 145.66)  | ( 198.09)  |

PLAN 1 STATION 500

| RATIO | MAXIMUM FLOW, CFS | MAXIMUM STAGE, FT | TIME HOURS |
|-------|-------------------|-------------------|------------|
| C-20  | 4644.             | 397.8             | 43.00      |
| C-30  | 6966.             | 398.8             | 43.00      |
| C-40  | 9289.             | 399.6             | 43.00      |
| C-50  | 11612.            | 400.3             | 43.00      |
| C-60  | 13936.            | 401.0             | 43.00      |
| C-80  | 18578.            | 402.0             | 43.00      |
| 1.00  | 23227.            | 402.9             | 43.00      |

1

| RATIO | MAXIMUM<br>RESERVOIR<br>W.S.-ELEV | MAXIMUM<br>DEPTH<br>OVER DAM | MAXIMUM<br>STORAGE<br>AC-FT | MAXIMUM<br>OUTFLOW<br>CFS | DURATION<br>OVER TOF<br>HOURS | TIME OF<br>FAILURE |        |
|-------|-----------------------------------|------------------------------|-----------------------------|---------------------------|-------------------------------|--------------------|--------|
|       |                                   |                              |                             |                           |                               | MAX                | CUTLOW |
| SAFE  |                                   |                              |                             |                           |                               | HOURS              |        |
| 0.00  | 320.75                            | 0.00                         | 2217415.                    | 1535.                     | 0.00                          | 64.00              | 0.00   |
| 0.30  | 321.39                            | 0.00                         | 2234568.                    | 1946.                     | 0.00                          | 66.00              | 0.00   |
| 0.40  | 322.01                            | 0.00                         | 2251725.                    | 2399.                     | 0.00                          | 66.50              | 0.00   |
| 0.50  | 322.43                            | 0.00                         | 2268774.                    | 2932.                     | 0.00                          | 67.00              | 0.00   |
| 0.60  | 323.25                            | 0.25                         | 2285637.                    | 3522.                     | 39.50                         | 67.00              | 0.00   |
| 0.80  | 324.47                            | 1.47                         | 2319330.                    | 5144.                     | 46.00                         | 66.00              | 0.00   |
| 1.00  | 325.50                            | 2.55                         | 2352390.                    | 6996.                     | 47.00                         | 65.00              | 0.00   |

APPENDIX D  
STABILITY ANALYSIS



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DESIGN BRIEF

7/6

PROJECT NAME LAKE GEORGE DAM

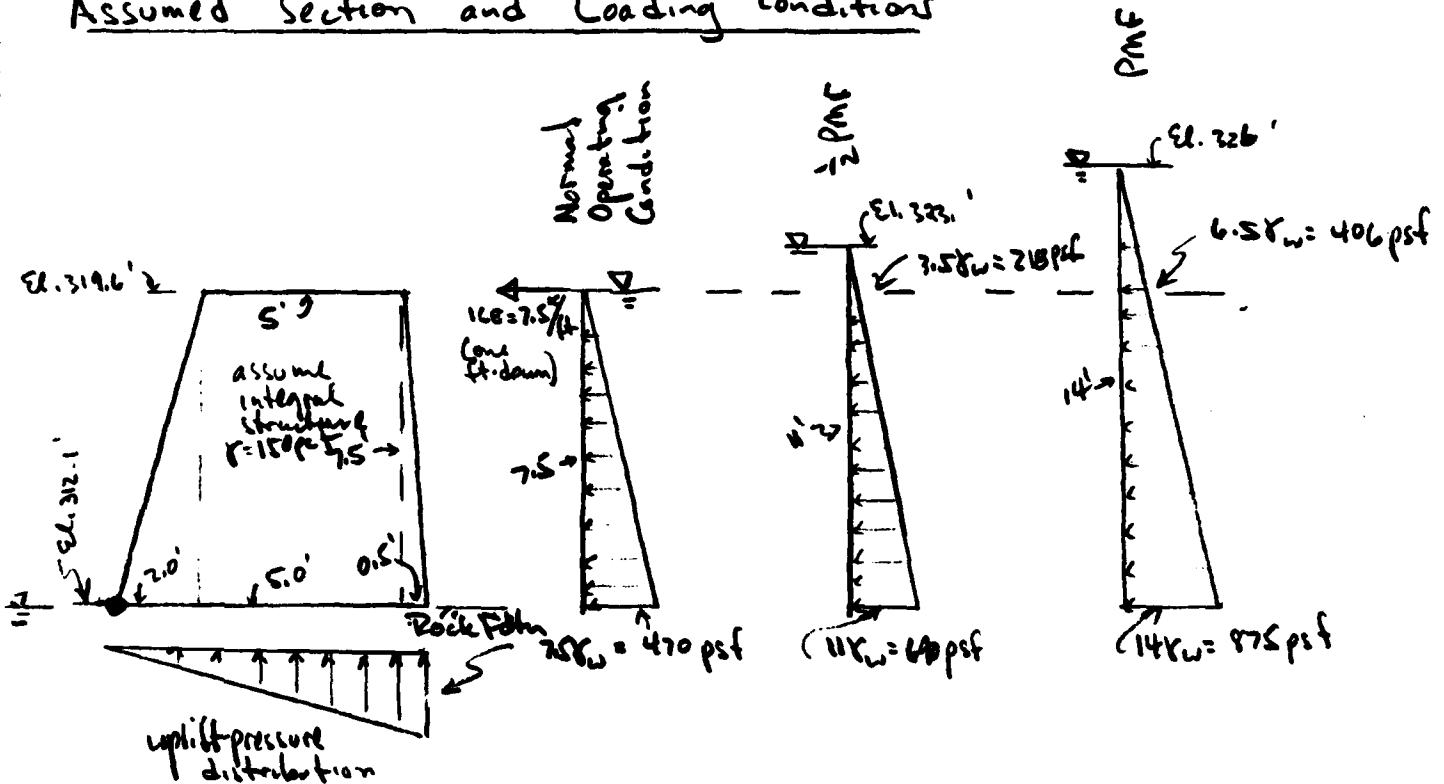
DATE 5/15/80

SUBJECT STABILITY ANALYSIS

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

DRAWN BY JFM

### Assumed Section and Loading Conditions



Case I. WL @ Spillway Elevation

a) Overturning:  $M_{\text{toe}}$  resulting due to mass of dam =  $.15 \left[ 2 \times 7.5 \left( \frac{4}{3} \right) + (5 \times 7.5) \left( \frac{4}{3} \right) + \left( \frac{7.5}{4} \right) \left( \frac{7.5}{3} \right) \right]$

$= 28.8 \text{ ft} \cdot \text{dam}$

$M_{\text{res}}$  causing due to horiz water pressure + ice + uplift

$= \left( \frac{1}{2} \times 7.58 \times 1.47 \right) \left( \frac{7.5}{3} \right) + (7.58 \times 1.47) \left( \frac{7.5}{2} \right) + \left( \frac{1}{2} \times 7.58 \times 1.47 \right) \left( \frac{7.5}{3} \right) = 62 \text{ ft} \cdot \text{dam}$

FS against overturning =  $\frac{28.8}{62} = 0.46$

(unsafe)



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DATE \_\_\_\_\_

SUBJECT \_\_\_\_\_

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

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

Position of Resultant, R:  $d = \frac{\Sigma M_{toe}}{\Sigma V}$ 

$$\Sigma V = (15) \left[ \overset{1.5}{\left( \frac{7.5 \times 2}{2} \right)} + \overset{2.5}{(5 \times 7.5)} + \overset{1.1}{\left( \frac{7.5 \times 0.5}{2} \right)} \right] - \left( \overset{1.76}{\frac{7.5}{2} \times 1.47} \right) = 5.27^k$$

7.03 wt. dam      uplight

$$d = \frac{(28.8 - 62.0)^k}{5.27^k} = -5.3 \text{ (in front of toe)}$$

- fictitious -

(b) Sliding: Shear-friction on plane through base of dam

$$\text{Shear-Friction FS} = \frac{\mu(\Sigma V) + bT}{\Sigma H}$$

where  $T$  = shear bond of concrete to rock  
assume 50 psi (100)  
 $\mu = 0.65$

$$= \frac{(0.65)(5.27^k) + \overset{2.4}{(7.5') \overset{54}{\times} 50^{\frac{lb}{in^2}} \times 144^{\frac{in^2}{ft^2}})}{\underset{9.3}{(7.5^k) + (1.8^k)}} = 6 \pm \text{ (ok)}$$



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PROJECT NAME L. GEORGEDATE 5/20/80

SUBJECT \_\_\_\_\_

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

DRAWN BY DFM

Case I a · WL Below Spillway Elevation [ @ Elev. 318.7, ice 2 one foot thick ]  
 - Winter Conditions - [ in accord with report of Bill Glass, Dec ]

(-) Overturning:  $M_{tor}$  resisting = 28.8 <sup>1k</sup>

$$M_{tor} \text{ causing} = \left( 6.5 \times 0.0624 \times \frac{6.5}{2} \times \frac{6.5}{3} \right) + (5^k \times 6') + \left( 6.5 \times 0.0624 \times \frac{7.5}{2} \times \frac{7.5}{3} \right)$$

<sup>lateral H<sub>2</sub>O</sup>                      <sup>ice</sup>                      <sup>wght</sup>  
<sub>15 of ice 1/2 ft thick</sub>                      <sub>25 of ice 1/2 ft thick</sub>

$$= 2.9 + 30 + 7.6 = 40.5 \text{ }^{1k}$$

$$FS \text{ against overturning} = \frac{28.8}{40.5} = 0.71 \quad (\text{unsafe})$$

$\frac{28.8}{25.1} = 1.13$

$$ii) \text{ Sliding: } FS = \frac{(0.65)(7.03 - \frac{6.5 \times 0.0624 \times 7.5}{2}) + 54}{5^k + \frac{6.5 \times 0.0624 \times 6.5}{2}} = \frac{55}{63} = 0.87$$

<sup>1.57</sup>  
<sub>1.5</sub>

$$iii) FS \text{ against overturning if no ice} = \frac{(28.8)}{(4.4 + 4.8)} = 2.2$$

$$\text{Position of Resultant, } d = \frac{28.8 - 13.2}{5.27} \approx 3' = \frac{3}{7.5} (6) = 0.40 b$$

$$FS \text{ against sliding if no ice} = \frac{55}{1.3} = 42$$

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

Note  $\frac{5}{8}$ " dia of steel dowels embedded 2' into foundation rock at heel:  
@ 1' cc  
for FS against out to be unity, resistance to pullout need be -

$$\frac{(62.0 - 200)''}{7'} = 4.75'' \text{ per dowel}$$

required bond of steel to grout =  $\frac{4.75''}{24'' \pi \times d.} = 102 \text{ psi} \pm$   
 $\frac{47.1}{48}$  possible, but on the high side.  
 Also, this only increases FS=1, does not bring resultant within middle third



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Case II: WL @  $\frac{1}{2}$  PMF Elevation(a) Overturning:  $M_{tot}$  resisting due to mass of dam = 28.8" $M_{tot}$  causing due to horz. water pressure + uplift =  
(assume upl. ft as for normal operations)

$$= \underbrace{(1.218 \times 7.5 \times \frac{7.5}{2})}_{6.13} + \underbrace{(.470 \times \frac{7.5}{2} \times \frac{7.5}{3})}_{4.4} + 8.8 = 19.3"$$

$$FS \text{ against overturning} = \frac{28.8}{19.3} = 1.49$$

$$\text{Position of Resultant, } R: d = \frac{\sum M_{tot}}{\sum V} = \frac{(28.8 - 19.3)''}{5.27''} = 1.8 \text{ ft from toe}$$

$$= 0.24 b \quad (\text{not in mid-third})$$

(b) Sliding: Shear Friction on plane through base of dam

$$\text{Shear Friction } FS = \frac{57.4^k}{\underbrace{(1.218 + .470)}_{5.4} \times 25} = 17 \div \quad (OK)$$

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5/6

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

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Case III . WL @ PMF Elevation(a) Overturning :  $M_{\text{toe}}$  resisting due to mass of dam = 28.8  $\text{ft-k}$ 

$$M_{\text{toe}} \text{ causing due to horiz. water pressure + uplift} =$$

$$= \left[ (.406 \times 7.5 \times \frac{7.5}{2}) + (.470 \times \frac{4.4}{2} \times 7.5) \right] + 8.8 = 24.6 \text{ ft-k}$$

$$\text{FS against overturning} = \frac{28.8 \text{ ft-k}}{24.6 \text{ ft-k}} = 1.17$$

$$\text{Position of Resultant, } R : d = \frac{\sum M_{\text{toe}}}{\sum V} = \frac{(28.8 - 24.6) \text{ ft-k}}{5.27 \text{ k}} = 0.80' \text{ from toe}$$

$$= \frac{.80}{7.5} = .11 \text{ b} \quad (\text{not in mid-third})$$

(b) Sliding : Shear-Friction on plane through base of dam

$$\text{Shear-friction FS} = \frac{57.4 \text{ k}}{\underset{3.05}{(.49 \times 7.5)} + \underset{4.81}{(.47 \times \frac{7.5}{2})}} = 12 \pm \quad (\text{ok})$$



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SUBJECT

PROJECT NO.

DRAWN BY

## Case IV. Normal Operating Condition Plus Seismic Effects

Ref. Case I (iii)  $M_a$  resisting overturning = 28.8<sup>IK</sup>  
 $M_a$  causing overturning = 13.2<sup>IK</sup>

### (a) Overturning



(i) Additional  $M_a$  due to inertial effect on dam mass, apply coef for zone 2, where factor becomes .05W for horizontal, .025 for vertical

$$M_a = (5 \times 7.5 \times 15 \times .05 \times \frac{7.5}{2}) + (5 \times 7.5 \times 15 \times .025 \times 4.5) + \\ + (\frac{1}{2} \times 2 \times 7.5 \times 15 \times .05) (\frac{7.5}{3}) + (\frac{1}{2} \times 2 \times 7.5 \times 15 \times .025) (\frac{2}{3} \times 2) \\ = 1.05 + 0.63 + 0.14 + .04 = 1.86^{IK}$$

(ii) additional  $M_a$  due to inertial effect on reservoir water

$$M_a = (0.30) P_w H^2 = (0.3) (7.3 \times .05 \times .0624 \times 7.5) (7.5 \times 7.5) = 0.29^{IK}$$

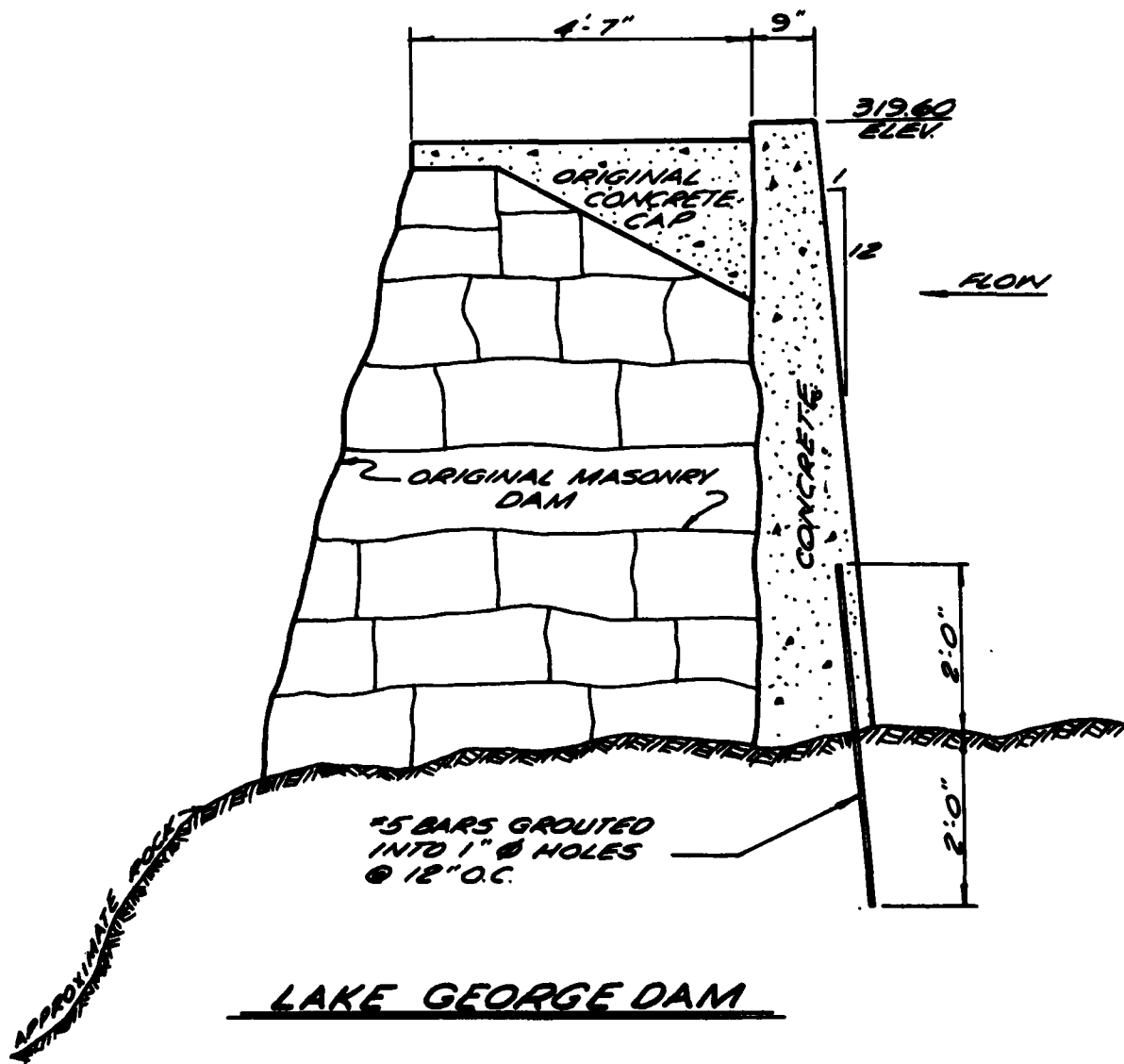
$$FS \text{ against overturning} = \frac{28.8^{IK}}{(13.2 + 1.86 + 0.29)^{IK}} = \underline{1.88}$$

$$d = \frac{(28.8 - 15.35)}{(15.35)} = 2.54' = \frac{2.54}{7.5} (b) = \underline{0.34 b}$$

### (b) Sliding

(i) Additional horiz. forces causing sliding due to horiz. acceleration of dam mass plus horiz. acceleration of reservoir water  
= .05W +  $V_w = (.05)(7.03) + (7.3)(7.3 \times .05 \times .0624 \times 7.5)$

$$FS = \frac{55}{1.3 + 0.36} = 33$$



APPENDIX E

REFERENCES

## APPENDIX

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