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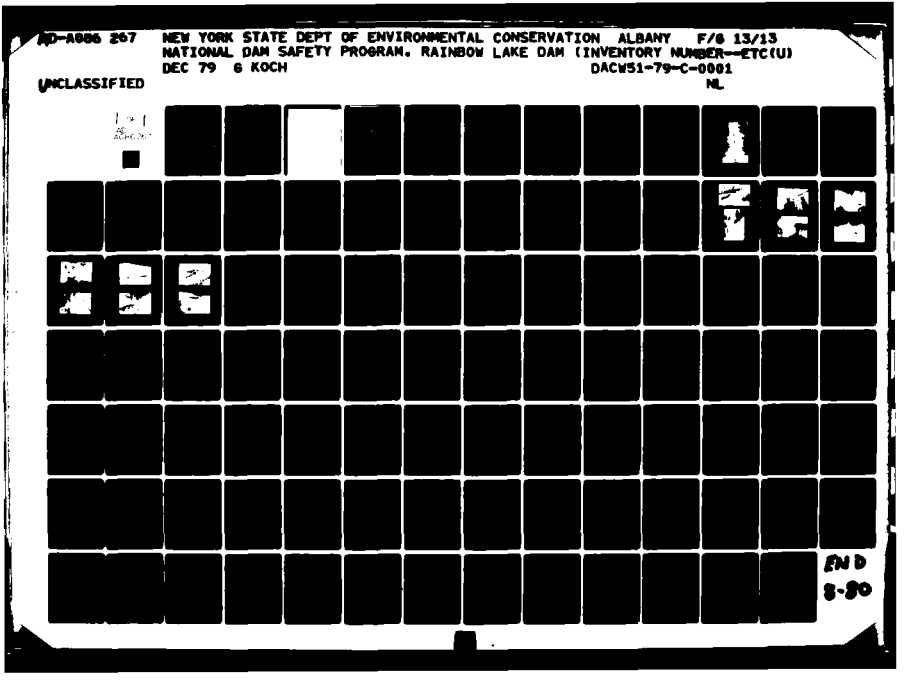

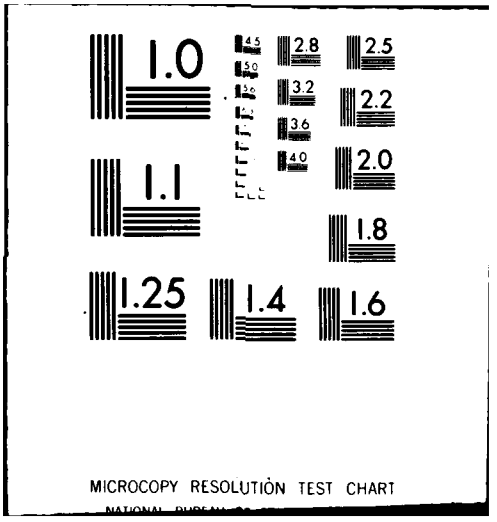
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Upper Hudson River Basin, Hamilton County, NY
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Hamilton County
Indian Lake

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

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

Visual inspection of this dam and engineering analyses which have been performed revealed conditions which constitute a hazard to human life or property. As a result of these determinations the dam has been assessed as unsafe, emergency.

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Serious leaks through the dam and along the interface between the dam and its foundation were noted. There was overall deterioration of the concrete and masonry sections. A void near the top of the masonry section provides evidence of past overtopping. Stability analyses performed for the structure indicate that under extreme loading conditions ice loading, ½ PMF, PMF safety factors against both sliding and overturning are unacceptable (below 1.0).

Using the Corps of Engineer's Screening Criteria for the initial review of the spillway adequacy, it has been determined that the structure would be overtopped for all storms exceeding 4% of the Probable Maximum Flood (PMF). Due to the condition of the structure, it is questionable as to whether it could withstand a substantial flow over the crest. Therefore, a flood-wave analysis was performed. This analysis indicates that in the event of a complete breaching of the dam water surface levels downstream could reach depths which pose significant danger to residents. The spillway is, therefore, adjudged as seriously inadequate.

Due to the serious nature of the deficiencies on this dam, it is recommended that as soon as possible, the water surface in the lake be lowered to a level at least 10 feet below the top of the dam. For the time, until this action is taken, a detailed emergency operation plan and warning system should be developed and around the clock surveillance should be provided during periods of unusually heavy precipitation.

Within 3 months of the notification of the owner, additional hydrologic/hydraulic investigations should be commenced. These investigations should attempt to more accurately define the site specific characteristics of the watershed and determine appropriate mitigating measures to be taken in response to the seriously inadequate spillway capacity. Further investigation into structural stability, including subsurface and structural explorations, should be commenced within the same time frame. An investigation into the treatments required to repair the other deficiencies which exist on this structure should also be commenced within 3 months. Within 18 months of the date of notification, appropriate remedial measures should be completed.

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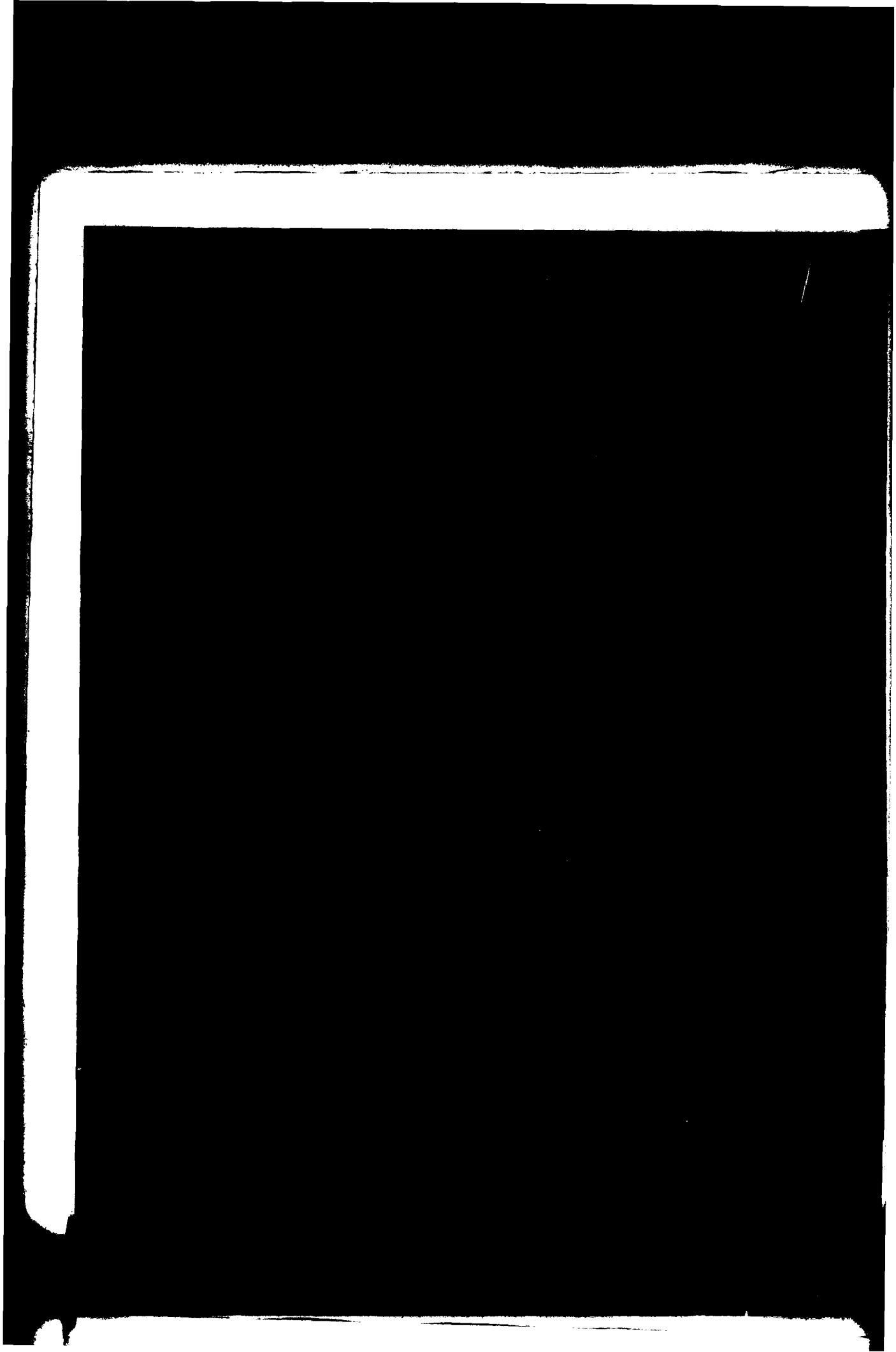

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PREFACE

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.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
RAINBOW LAKE DAM
I.D. No. NY-18
UPPER HUDSON RIVER BASIN
HAMILTON COUNTY, NEW YORK

TABLE OF CONTENTS

PHASE 1 REPORT

NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Rainbow Lake Dam I.D. No. NY 18
State Located:	New York
County Located:	Hamilton
Watershed:	Upper Hudson River Basin
Date of Inspection:	October 18, 1979

ASSESSMENT

Visual inspection of this dam and engineering analyses which have been performed revealed conditions which constitute a hazard to human life or property. As a result of these determinations the dam has been assessed as "unsafe, emergency".

Serious leaks through the dam and along the interface between the dam and its foundation were noted. There was overall deterioration of the concrete and masonry sections. A void near the top of the masonry section provides evidence of past overtopping. Stability analyses performed for the structure indicate that under extreme loading conditions ice loading, ½ PMF, PMF safety factors against both sliding and overturning are unacceptable (below 1.0).

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George Koch

George Koch
Chief, Dam Safety Section
New York State Department
of Environmental Conservation
NY License No. 45937

Approved By:

Col. Clark H. Benn
New York District Engineer

Date: 19 February 80

OVERVIEW
RAINBOW LAKE DAM
I.D. No. NY 18

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
RAINBOW LAKE DAM
I.D. No. NY 18
#186-849
UPPER HUDSON RIVER BASIN
HAMILTON COUNTY, NEW YORK

SECTION 1: PROJECT INFORMATION

1.1 GENERAL

a. Authority

The Phase 1 inspection reported herein was authorized by the Department of the Army, New York District, Corps of Engineers, to fulfill the requirements of the National Dam Inspection Act, Public Law 92-367.

b. Purpose of Inspection

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

1.2 DESCRIPTION OF PROJECT

a. Description of Dam

The Rainbow Lake Dam is a masonry and concrete dam with the spillway located in the center of the structure, and a small bridge crossing over the spillway.

The dam is approximately 75 feet long and a maximum of 25 feet high. of the dam. The lower portion of the central section dam on either side of the spillway is composed of a mixture of concrete and cobbles. The upper portion of the dam is laid up stone with mortar in the joints between stones. The stones near the center of the structure are predominantly cobble sized while at either end of the dam larger stones are present.

The spillway is 19 feet wide. The crest of the spillway is approximately 4 feet below the top of the dam. The water flowing over the crest plunges 7 feet onto a 4 foot long inclined concrete section. At the end of the inclined section, there is another verticle drop of about 10 feet to the base of the dam.

The plans for the structure indicate that there is a reservoir drain in the center of the spillway section. This drain consists of a sluice gate 2 feet wide by 1.5 feet high. The existence of this drain could not be verified during the visual inspection. No apparent means of controlling the drain sluice gate was found.

A small corrugated metal pipe arch (13"x22") located on the southern end of the dam provides a small amount of additional spillway capacity. The invert of this pipe is approximately 1 foot below the crest of the dam.

A steel truss bridge with a timber plank deck crosses over the spillway. There are concrete piers on either end of the spillway. Piers do not extend the full width of the bridge, so a stell frame has been constructed to support the downstream edge of the bridge. The concrete bridge abutments are approximately 5 feet beyond the piers and are a part of the main dam.

b. Location

This dam is located in the Town of Indian Lake on Wilderness Road, which is off County Route 4. It is just downstream of Wilderness Rainbow Lake Lodge. The dam is approximately 5 miles southeast of the village of Indian Lake.

c. Size Classification

The dam is 25 feet high and the lake has a storage capacity of 97.4 acre-feet. Therefore, the dam is in the small size category as defined by the Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification

The dam is classified as "high" hazard due to the presence of 10 to 15 houses and mobile home trailers along the banks downstream of the dam.

e. Ownership

The dam is owned by 208633 Holdings Ltd. of Hawley, Pennsylvania. The administrator for this company is Mr. Art Lemp. Mr. Lemp's address is Box 1000, Hemlock Farms, Hawley, Pennsylvania 18428 and his phone number is (717) 775-7393. The caretaker for the property is Mr. Jerry Campbell. His phone number is (518) 648-5151.

f. Purpose of Dam

The dam is used to maintain the water surface of Rainbow Lake for recreational purposes.

g. Design and Construction History

No information about the original construction of the dam was available. The dam was reconstructed in 1929 and except for minor repairs has remained essentially unchanged since that time.

h. Normal Operating Procedures

Water flows over an ungated spillway. There are provisions for up to 3 feet of stoplogs. These stoplogs are added during the summer months to raise the level of the lake.

1.3 PERTINENT DATA

a. Drainage Area (acres)	5626
b. Discharge at Dam (cfs)	
Spillway at Top of Dam	370
13"x22" Pipe Arch at Top of Dam	3
c. Elevation (plan datum)	
Top of dam	117.5
Spillway Crest (With 6"x6" Timber)	114.2
Invert of 13"x22" Pipe Arch	116.5

Lake Surface Elevation-(USGS Datum) (USGS-Thirteenth Lake, NY Quad, 1954)	1680

d. Reservoir - Surface Area	(acres)
Top of Dam	26.6
Spillway Crest	14.7

e. Storage Capacity	(acre-feet)
Top of Dam	97.4
Spillway Crest	37.7

f. Dam

Type: Concrete and Masonry	
Dam Length (ft.)	75
Crest Elevation (Plan Datum)	117.5
Crest Width (ft.)	12.4

g. Spillway

Type: Uncontrolled concrete rectangular weir. Provisions for up to 3.3 feet of flashboards. Possibly several timbers still in place below flashboards

Length (ft.) 19

h. Reservoir Drain

Type: Sluice gate 2 feet wide by 1.5 feet high

Control: No apparent means of control

SECTION 2: ENGINEERING DATA

2.1 GEOTECHNICAL DATA

a. Geology

The Rainbow Lake Dam is located in the Adirondack Highlands physiographic province of New York State. The original rock was sedimentary with large intrusions of igneous rocks (anorthosites, granites, gabbros). Much of this rock has been metamorphosed by heat, pressure, folding and faulting. Surface features of the rock reflects the effects of glaciation, A review of the "Brittle Structures Map of the State of New York" indicated that there are no faults in the immediate vicinity of the dam.

The surficial soils are the result of glaciations during the Cenozoic Era, the last of which was the Wisconsin glaciation.

b. Subsurface Investigations

No records of any subsurface investigations were available either from the original construction or the 1929 reconstruction. In the application for the reconstruction, it was stated that the dams would be founded on rock which contained no porous seams or fissures.

2.2 DESIGN RECORDS

No records from the original construction of the dam were available. An application for the 1929 reconstruction provided certain design data concerning the structure. This design data included sketches of the structure, However, measurements made during the visual inspection did not agree with these sketches. A sketch of the field measurements has been included in Appendix F.

2.3 CONSTRUCTION RECORDS

No construction records were available.

2.4 OPERATION RECORDS

No operation records were available.

2.5 EVALUATION OF DATA

Data available for the preparation of this report was very limited. The primary source of information was the Department of Environmental Conservation files, Due to the limited data available, certain assumptions had to be made concerning the structure. Within these limitations, the available data was adequate for the purpose of the Phase 1 inspection.

SECTION 3: VISUAL INSPECTION

3.1 FINDINGS

a. General

Visual inspection of the Rainbow Lake Dam was conducted on October 18, 1979. The weather was generally overcast with the temperature in the fifties. The water surface at the time of inspection was 3 feet below the crest of the dam. Water was flowing over the spillway at a depth of several inches.

b. Dam

The main dam can be considered to consist of three sections differentiated by the composition. There is a central section on either side of the spillway which will be discussed as lower and upper portions. The third section is the low masonry portions on either end of the dam.

The concrete on the lower portion of the central section was badly deteriorated. The surface was entensively worn with boulders and cobbles protruding from all exposed faces. Seepage was noted coming through this segment in several locations. In addition, there was extensive seepage along the interface between the concrete and the rock foundation.

The upper portion of the central section is laid-up stone with a small amount of mortar between stones. The stones appeared to be slightly larger than those in the lower section, but they were still predominantly cobble size. Mortar was missing in some of the joints between stones at the northern end of the spillway. The top layers of stones had been removed on the section beyond the southern end of the spillway, leaving a void under the bridge deck. The void is approximately 1 foot deep and 3 feet wide and extends from the downstream face to within 2 feet of the upstream face. As a temporary repair measure, the upstream portion of this void had been filled with sand bags, stone, plastic and some concrete. This had returned the crest at the face of this section to its previous elevation.

Due to the bedrock elevation, the height of the dam is less on either end than it is in the central section. This lower section on the southern end of the dam is deteriorated and leaking in several locations. Three areas of substantial leakage were noted along the base of the section. The low section on the northern end of the dam is composed of large boulders and random fill. No leaks were observed on this section.

c. Spillway

Visual inspection of the spillway was hindered by water flowing over the crest. There are provisions for up to 3 feet of stop logs above the spillway crest. At the time of the inspection, all these stop logs had been removed. It is possible that there are several timbers in place which raise the spillway crest. The flow over the spillway prevented inspection of these timbers. This dam had previously been inspected on October 4, 1979. Some of the stop logs had been in place at that time. Photographs from that inspection seem to indicate that the spillway is in satisfactory condition.

The small pipe arch at the southern end of the dam was in satisfactory condition. Water flowing over the spillway prevented any observation of the reservoir drain. Its existence could not be verified.

d. Downstream Channel

The channel immediately downstream of the dam was cut into bedrock and was in good condition. The stream then proceeded in a westerly direction in a meandering rock-filled channel.

e. Reservoir

There were no signs of soil instability in the reservoir area.

f. Appurtenant Structures-Bridge

The steel truss bridge with the wood plank deck across the spillway is in good condition. The device for removing the stop logs, which is located on the top of the bridge, appears to be operable. The legs of the frame founded in the stream channel which supports the downstreamside of the bridge were bowed in the downstream direction. The abutments to the bridge are formed by the dam itself. The seepage and deterioration of the dam on either end of the spillway was previously discussed. Seepage has resulted in the downstream corner of the southern abutment being undermined.

3.2 EVALUATION OF OBSERVATIONS

Visual observations revealed several serious deficiencies on this structure. The following items were noted.

(1) The overall deterioration of the concrete and masonry sections which compose the dam.

(2) The seepage through the dam and along the interface between the dam and bedrock.

(3) The void at the top of the masonry section under the bridge deck.

(4) The undermining of the corner of the southern bridge abutment.

SECTION 4: OPERATION AND MAINTENANCE PROCEDURES

4.1 PROCEDURES

There are no formal operating procedures for this dam. Stop logs are removed in the fall to provide additional spillway capacity, They are replaced during the summer months to provide a higher lake level.

4.2 MAINTENANCE OF DAM

No regular maintenance is performed on this structure.

4.3 WARNING SYSTEM IN EFFECT

No apparent warning system for evacuation of downstream residents is present.

4.4 EVALUATION

The operation and maintenance procedures on this dam are unsatisfactory. The overall poor condition of the dam is evidence of the deficiency in maintenance procedures. The installation of flashboards decreases the spillway capacity which is rated as seriously inadequate even with no flashboards in place. This in turn increases the possibility of overtopping.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 DRAINAGE AREA CHARACTERISTICS

Delineation of the watershed draining into the reservoir pool area was made using the U.S.G.S. 15 minute quadrangles for Thirteenth Lake and Newcomb, NY. The 8.79 square mile drainage area consists primarily of wooded lands with several ponds located in the lower portion of the drainage area. Relief in the drainage area is relatively steep with slopes ranging from 10 to 36%. Mountain peaks occur at elevations from 500 to 1600 feet above the normal lake level.

5.2 ANALYSIS CAPACITY

The analysis of the floodwater retarding capability of this dam was performed using the Corps of Engineers HEC-1 computer program, Dam Safety version. This program incorporates the"Snyder Synthetic Unit Hydrograph" method and the "Modified Puls" flood routing procedure. The spillway design flood selected for analysis was the PMF in accordance with recommended guidelines for the U.S. Army Corps of Engineers.

5.3 SPILLWAY CAPACITY

The dam has an ungated rectangular spillway which provides the almost all of the available spillway capacity. A small corrugated metal pipe arch located on the southern end of the dam provides an insignificant amount of additional spillway capacity. The spillway operates under weir flow conditions and was analyzed as a sharp crested weir having a discharge coefficient (c) of 3.32.

5.4 RESERVOIR CAPACITY

Normal storage capacity of the reservoir between the spillway crest and the top of the dam is 60 acre feet which is equivalent to a runoff depth of 0.13 inches over the drainage area. Total storage capacity of the dam is 97.4 acre feet.

5.5 FLOODS OF RECORD

No information was available regarding the occurence of the maximum known flood.

5.6 OVERTOPPING POTENTIAL

Analysis using the PMF and one-half the PMF indicates that the dam does not have sufficient spillway capacity. For a PMF peak outflow of 11,132 cfs, the dam would be overtopped to a computed depth of 6.30 feet. For the peak outflow from one-half the PMF, the depth of overtopping would be 3.81 feet. All storms exceeding 4% of the PMF will result in the dam being overtopped. The spillway only has sufficient capacity to discharge 373 cfs.

5.7 EVALUATION

Using the Corps of Engineers screening criteria for initial review of spillway adequacy, it has been determined that the dam would be overtopped by all storms exceeding 4% of the PMF. A flood wave analysis, assuming complete breaching of the dam, indicates that the water surface levels downstream of the dam could reach depths which pose a significant danger to residents.

The spillway capacity is, therefore, adjudged to be seriously inadequate.

SECTION 6: STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

Visual observations revealed that the structure is in poor condition. Extensive deterioration and serious leaks were noted. The masonry near the top of dam was in poor condition and did not appear to be capable of withstanding severe or prolonged overtopping.

b. Data Review and Stability Evaluation

The primary source of structural information was two sheets prepared by H. Atkinson in 1929. These sheets contained sketches of the proposed reconstruction which was implemented in 1929.

Stability analyses were performed for both the main dam section and the spillway section. The following conditions were analyzed for each case:

a. Normal conditions with the reservoir level at the spillway crest;
b. Reservoir level at spillway crest with an ice load of 10,000 lb/ft;
c. One-half PMF; water flowing over the top of dam to a depth of 3.81 ft.
d. PMF; water flowing over the top of dam to a depth of 6.30 feet.

The analyses performed (See Appendix D) indicate that the factors of safety against overturning and sliding for each of the sections are as follows:

Main Dam Section

Case	Factors of Safety Overturning	Sliding
a. Reservoir level at spillway crest,	1.58	1.16
b. Same as (a) plus an ice load of 10000 lb/ft	.43	.43
c. One-half PMF, water flowing 3.81 feet over top of dam	1.15	.78
d. PMF, water flowing 6.30 feet over top of dam	.97	.64

Spillway Section

Case	Factors of Safety Overturning	Sliding
a. Reservoir level at spillway crest,	.80	.35
b. Same as (a) plus an ice load of 10,000 lb/ft	.15	.18
c. One-half PMF; water flowing 3.81 feet over top of dam	.67	.29
d. PMF; water flowing 6.30 feet over top of dam	.60	.27

The stability analyses indicate that the stability of both sections of the structure is seriously deficient. The safety factors fall to critical levels under extreme loading conditions (ice load, ½ PMF, PMF).

Due to the lack of accurate data concerning the structure, the analyses were based on approximate dimensions. Field investigations are

required to obtain more information about the foundation bedrock and about the dimensions of the dam itself. This information should then be incorporated into a more detailed structural stability analysis for each of the sections of the dam. This analysis should be combined with studies of the other structural deficiencies noted on this structure. The studies should result in a coordinated design to correct the deficiency in the overall stability of the structure, as well as the localized defects (deteriorated concrete, leakage, etc.)

d. Seismic Stability

This dam is located in Seismic Zone 2. Due to the location, a seismic stability analysis was performed in accordance with Corps of Engineers guidelines. The seismic analysis was performed for normal conditions with the water level near the top of dam. For the main dam section the safety factor against overturning with seismic considerations included is 1.36 and against sliding is 1.16. For the spillway section, the safety factors against both overturning and sliding are below 1.0. These low safety factors further indicate that additional stability studies are required.

SECTION 7: ASSESSMENT/RECOMMENDATION

7.1 ASSESSMENT

a. Safety

The Phase 1 inspection of the Rainbow Lake Dam revealed that the dam is in poor condition with several serious deficiencies. Serious leaks and substantial deterioration of the structure were noted by the visual inspection. Engineering investigations indicated that the spillway capacity is seriously inadequate (unable to discharge outflow of 1/2 the PMF), and that the dam may be unstable under extreme loading conditions. For these reasons, this dam has been assessed as "unsafe".

b. Adequacy of Information

Information which was available concerning this structure was extremely limited. The 1929 sketches of the dam provided some information concerning the structure. However, the dimensions shown on these plans did not agree with measurements made during the visual inspection. Information about the lake was obtained from the 1971 plan of the area prepared by Edward C. Hess Associates, Inc. Due to the limited amount of information available, certain assumptions had to be made concerning both the dam and the reservoir.

c. Need for Additional Investigations

Since the spillway was assessed as seriously inadequate, additional hydrologic and hydraulic investigations are required to more accurately determine the site specific characteristics of the watershed.

Further investigation of the structural stability of the dam is also required. These studies should include subsurface and structural investigations to obtain information about the condition of the structure and its foundation. This information should then be incorporated into a detailed stability evaluation.

d. Urgency

Due to the poor condition of this structure, immediate attention is required. Until the required repairs are made, the water level should be lowered to a level at least 10 feet below the top of the dam. If the reservoir drain is operational and capable of lowering the level of the lake to the required elevation, it may be used. If it is not operational, some other method of lowering the water surface must be devised.

The additional hydrologic and hydraulic investigations which are needed should be commenced within 3 months of the date of final approval of this report. Investigation of the structural stability of the dam should also be commenced within 3 months.

Mitigating measures deemed necessary as a result of the investigations and repairs required due to the overall deterioration should be completed within 1 year of the date of final approval of this report.

7.2 RECOMMENDED MEASURES

a. Lower the water surface to 10 feet below the top of dam until required repairs and modifications are made.

b. The serious leaks both in the dam and along the interface between

the dam and bedrock should be repaired.

c. Additional necessary repairs dealing with the overall deterioration of the dam should be made.

d. After completing the hydrological investigations, mitigating measures dealing with the seriously inadequate spillway capacity should be determined.

e. After the structural stability analysis has been completed, appropriate remedial work should be undertaken.

f. The void at the top of the masonry section under the bridge deck should be repaired.

APPENDIX A

PHOTOGRAPHS

Upstream Face - Note Void to Left of Spillway

Downstream Face on South End of Spillway - Note Void at Top and Deterioration on Lower Portion

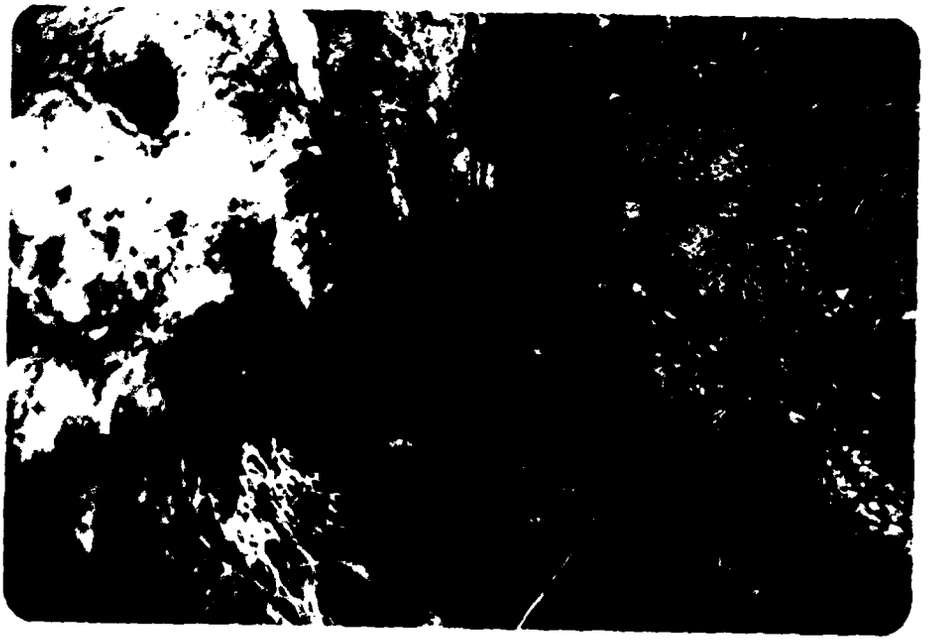
Area on Upstream Face to Left of Spillway in Which Void Had Been Partially Filled

Upper Portion of Central Section at Northern End of Spillway - Note Deterioration of Concrete and Seepage at the Base.

Southern End of Dam - Lower Portion of Central Section in Foreground - Also Steel Frame which Supports Bridge

Outlet of Small Pipe Arch at Southern End of Dam

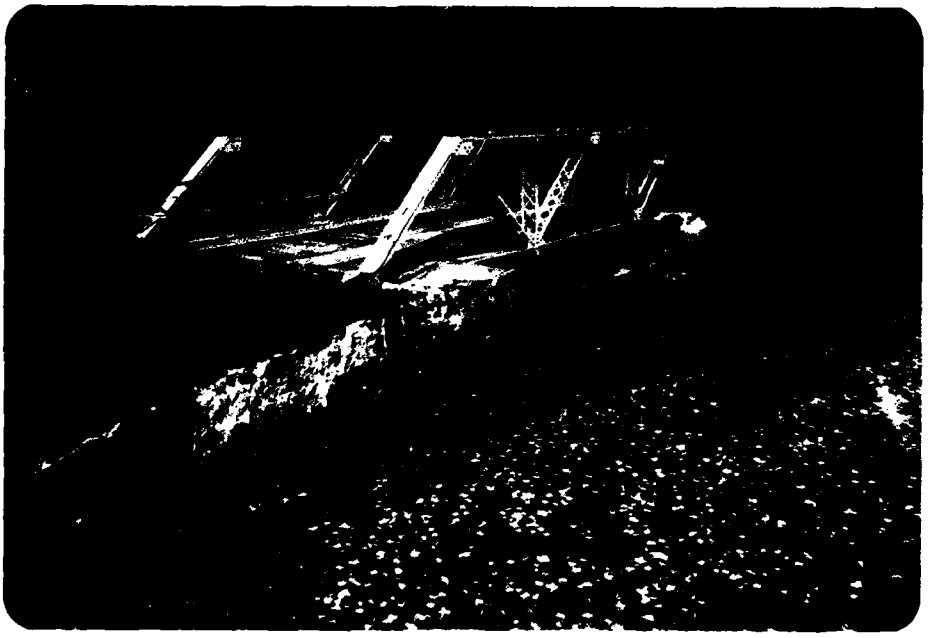
Downstream Face of Low Masonry Portion to South of Spillway - Note Seepage Near Center of Picture



Close-up of Leak Shown in Picture Above

Upper Portion of Central Section to North of Spillway

Downstream Face of Northern Low Masonry Section



Dam and Spillway As It Appeared on 10/4/79 With Some Flashboards in Place

Downstream View of Spillway with Flashboards in Place on 10/4/79

APPENDIX B

VISUAL INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST

1) Basic Data

a. General

Name of Dam RAINBOW LAKE DAM

Fed. I.D. # N.Y. 18 DEC Dam No. 186-849 - [redacted]

River Basin UPPER HUDSON

Location: Town INDIAN LAKE County HAMILTON

Stream Name BIG BROOK

Tributary of _____

Latitude (N) 43° 44.4' Longitude (W) 74° 13'

Type of Dam MASONRY-LAID UP STONE WITH EARTH FILL FORMING CREST ROAD

Hazard Category C

Date(s) of Inspection 10/18/79

Weather Conditions 50's PARTLY CLOUDY

Reservoir Level at Time of Inspection 3' BELOW BRIDGE DECK

b. Inspection Personnel R. WARRENDER; W. LYNICK

c. Persons Contacted (Including Address & Phone No.) _____

d. History:

Date Constructed _____ Date(s) Reconstructed 1929

Designer _____

Constructed By _____

Owner _____

(1) Erosion at Contact _____

(2) Seepage Along Contact _____

3) Drainage System

a. Description of System NONE

b. Condition of System _____

c. Discharge from Drainage System _____

4) Instrumentation (Momumentation/Surveys, Observation Wells, Weirs, Piezometers, Etc.) NONE

5) Reservoir

a. Slopes SATISFACTORY

b. Sedimentation NONE APPARENT

c. Unusual Conditions Which Affect Dam SWAMPY AREA WITH LAKE IN CENTER - LAKE GOES BACK FOR A MILE OR TWO.

6) Area Downstream of Dam

a. Downstream Hazard (No. of Homes, Highways, etc.) 10-15 HOMES NEAR STREAM (ABOUT 5 OF THESE ARE HOUSE TRAILERS)

b. Seepage, Unusual Growth SEEPAGE - EXTENSIVE THROUGH DAM

c. Evidence of Movement Beyond Toe of Dam ROCK FOUNDATION - NO MOVEMENT

d. Condition of Downstream Channel ROCK FILLED; MEANDERING CHANNEL BEYOND DAM

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

a. General CENTRAL SPILLWAY CHANNEL, 1,3" x 22" PIPE ARCH ON SOUTH ~~SIDE~~ END - OUTLETS ON BEDROCK SLOPE

b. Condition of Service Spillway - CHANNEL - PROVISIONS FOR UP TO 3' OF STOP LOGS - HAD BEEN REMOVED AT TIME OF INSPECTION. 6"x6" WOOD TIMBER ~~SILL~~ SILL ON TOP OF CONCRETE WHICH FORMS CREST. POSSIBLY MORE TIMBERS BUT COULDN'T BE DETERMINED INSPECTION COMPLICATED BY WATER FLOWING OVER SPILLWAY CREST.

c. Condition of Auxiliary Spillway SMALL PIPE ARCH - SATISFACTORY CONDITION - INVERT ABOUT 1' BELOW DAM CREST

d. Condition of Discharge Conveyance Channel GOOD BEDROCK FOR A DISTANCE THEN BOULDER FILLED & MEANDERING

8) Reservoir Drain/Outlet - DRAIN WAS INDICATED ON PLANS BUT COULD NOT BE OBSERVED DUE TO WATER FLOWING IN SPILLWAY

Type: Pipe _____ Conduit _____ Other _____

Material: Concrete _____ Metal _____ Other _____

Size: _____ Length _____

Invert Elevations: Entrance _____ Exit _____

Physical Condition (Describe): Unobservable _____

Material: _____

Joints: _____ Alignment _____

Structural Integrity: _____

Hydraulic Capability: _____

Means of Control: Gate NONE OBSERVED Valve _____ Uncontrolled _____

Operation: Operable _____ Inoperable _____ Other _____

Present Condition (Describe): EVEN IF THE DRAIN DOES EXIST IT IS UNLIKELY THAT IT IS OPERABLE

9) Structural

a. Concrete Surfaces SPALLING - DETERIORATED - SERIOUS LEAKAGE LOWER PART IS CONCRETE TYPE CONSTRUCTION - ~~UPPER PART~~ SUBSTANTIAL DETERIORATION UPPER PART IS LAID UP STONE & MORTAR - MUCH OF MORTAR IS MISSING & STONES ARE SITTING IN PLACE

b. Structural Cracking SOME NOTED - MUCH CONCRETE HAS BEEN ERODED ON LOWER PART OF DAM NEAR SPILLWAY - REMAINING MASONRY & CONCRETE SEEMS TO BE ~~IN~~ RELATIVELY SOUND. ~~CONDITION~~.

c. Movement - Horizontal & Vertical Alignment (Settlement) NO MOVEMENT BEDROCK FOUNDATION

d. Junctions with Abutments or Embankments ABUTMENTS GENERALLY OKAY

e. Drains - Foundation, Joint, Face NONE

f. Water Passages, Conduits, Sluices SPILLWAY IN CENTER - SATISFACTORY FROM WHAT CAN BE SEEN. WATER FLOWING OVER HINDERED THE INSPECTION.

g. Seepage or Leakage SUBSTANTIAL LEAKAGE - SOME COMING THROUGH THE DAM ITSELF - MOSTLY ALONG THE DAM - FOUNDATION INTERFACE 3 MAJOR LEAKS ON SOUTH SIDE AT 6', 14' & 18' FROM EDGE OF SPILLWAY CHANNEL. ANOTHER MAJOR LEAK AT INTERFACE AT NORTHERN END OF SPILLWAY

h. Joints - Construction, etc. JOINTS BETWEEN DIFFERENT TYPES OF CONSTRUCTION APPEARED OKAY

i. Foundation LEDGE ROCK- SEEPAGE ALONG INTERFACE WITH DAM

j. Abutments

k. Control Gates NONE

l. Approach & Outlet Channels OUTLET OKAY - EXCEPT FOR SLIGHT UNDERCUTTING OF DAM AT SOUTH D.S. CORNER OF SPILLWAY

m. Energy Dissipators (Plunge Pool, etc.) NATURAL BEDROCK POOL

n. Intake Structures NONE

o. Stability QUESTIONABLE - NO SIGNS OF OVERALL MOVEMENT BUT LOCALIZED PROBLEMS

p. Miscellaneous VOID AT TOP OF DAM AT SOUTH END OF SPILLWAY - UPSTREAM PART HAS BEEN FILLED WITH SAND BAGS & FILL AS TEMPORARY REPAIR

10) Appurtenant Structures (~~Power House~~, ~~Lock~~, ~~Gatehouse~~, Other)

a. Description and Condition BRIDGE CROSSES SPILLWAY - STEEL TRUSS BRIDGE WITH WOOD ~~DECK~~ PLANK DECK. TWO CHANNELS WHICH SUPPORT DOWNSTREAM PORTION OF BRIDGE ARE BOWED OUTWARD SLIGHTLY.

BRIDGE IN SATISFACTORY CONDITION, BUT ABUTMENTS & PIERS WHICH ARE FORMED BY THE DAM ITSELF ARE RATHER DETERIORATED.

DEVICE ON TOP OF BRIDGE CAN BE USED FOR REMOVING STOP LOGS

APPENDIX C

HYDROLOGIC/HYDRAULIC ENGINEERING DATA AND COMPUTATIONS

CHECK LIST FOR DAMS
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

AREA-CAPACITY DATA:

	Elevation (ft.)	Surface Area (acres)	Storage Capacity (acre-ft.)
1) Top of Dam	117.5	26.6	142.5
2) Design High Water (Max. Design Pool)			
3) ~~Auxiliary~~ Spillway Crest	114.2	14.7	62.7
4) Pool Level with Flashboards			
5) Service Spillway Crest			

DISCHARGES

	Volume (cfs)
1) Average Daily	
2) Spillway @ Maximum High Water	370
3) Spillway @ Design High Water	
4) PIPE ARCH @ MAX. HIGH WATER ~~Spillway @ Auxiliary Spillway Crest Elevation~~	3
5) Low Level Outlet	
6) Total (of all facilities) @ Maximum High Water	373
7) Maximum Known Flood	

CREST: ELEVATION: 117.5

Type: MASONRY AND EARTH

Width: 12.4 ft. Length: 75 ft.

Spillover CONCRETE CHANNEL

Location CENTER OF DAM

SPILLWAY:

PRINCIPAL		EMERGENCY
114.2	Elevation	
CONCRETE - VERTICAL DROP	Type	
19 ft	Width	
	Type of Control	
	Uncontrolled	
	Controlled:	
FLASHBOARDS - UP TO 3 ft.	Type (Flashboards; gate)	
UP TO 3 FT	Number	
	Size/Length	
	Invert Material	
	Anticipated Length of operating service	
	Chute Length	
	Height Between Spillway Crest & Approach Channel Invert (Weir Flow)	

OUTLET STRUCTURES/EMERGENCY DRAWDOWN FACILITIES: - ACCORDING TO PLANS

Type: Gate _____ Sluice V Conduit _____ Penstock _____

Shape : RECTANGULAR

Size: 2ft x 1.5ft

Elevations: Entrance Invert UNKNOWN

Exit Invert UNKNOWN

Tailrace Channel: Elevation _____

HYDROMETEROLOGICAL GAGES:

Type : NONE

Location: _____

Records:

Date - _____

Max. Reading - _____

FLOOD WATER CONTROL SYSTEM:

Warning System: NONE

Method of Controlled Releases (mechanisms):

NONE - EXCEPT FOR REMOVAL OF FLASHBOARDS

DRAINAGE AREA: 8.79 Sq. Mi.

DRAINAGE BASIN RUNOFF CHARACTERISTICS:

Land Use - Type: FORESTED

Terrain - Relief: STEEP

Surface - Soil: RELATIVELY PERMEABLE

Runoff Potential (existing or planned extensive alterations to existing (surface or subsurface conditions)

NONE

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

POSSIBLY SUBSTANTIAL SEDIMENTATION IN RESERVOIR NEAR DAM

Potential Backwater problem areas for levels at maximum storage capacity including surcharge storage:

NONE

Dikes - Floodwalls (overflow & non-overflow) - Low reaches along the Reservoir perimeter:

Location: NONE

Elevation: -

Reservoir:

Length @ Maximum Pool _____ (Miles)

Length of Shoreline (@ Spillway Crest) _____ (Miles)

00-15-1 (3/78)
Formerly GA-17

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT GRID

JOB	SHEET NO.	CHECKED BY	DATE
RAINBOW LAKE DAM	1		
SUBJECT		**COMPUTED BY**	**DATE**
HYDROLOGIC / HYDRAULIC COMPUTATIONS		RLW	10/25/79

DRAINAGE AREA = 8.79 SQ. IN. = 8.79 SQ. MI.

SNYDER SYNTHETIC UNIT HYDROGRAPH:

$L = 4.75$ mi. $\quad L_{CA} = 2.24$ mi.

PMP = 17.5 IN $\quad C_t = \rightarrow$ USE 2.0

$t_p = C_t (L \cdot L_{CA})^{.3} = 2.0 (4.75 (2.24))^{.3} = 4.06$ hours

$t_r = \frac{t_p}{5.5} = \frac{4.06}{5.5} = .74$ hours (USE ½ hour hydrograph)

$t_{pR} = t_p + .25 (t_R - t_r) = 4.06 + .25 (.5 - .74) = 4.0$ hours

HR #3B PMP RAINFALL

ZONE 1 $\quad$ PMP RAIN = 17.5" (200 mi² - 24 hr)

6 hr = 111% $\quad$ 24 hr = 132%

12 hr = 123% $\quad$ 48 hr = 142%

$TRSPC = T.F. = 1 + \frac{.300S}{(8.79)^{.3778}} = .795$

LOSS DATA: 1.0" $\quad$ CONTINUOUS = .1"

BASE FLOW = 2 cfs/sq. mi. $\quad 2(8.79) = 17.6$ USE 15 cfs

00-15-1 (3/78)
Formerly GA-17

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT GRID

JOB	SHEET NO.	CHECKED BY	DATE
RAINBOW LAKE DAM	2		
SUBJECT		**COMPUTED BY**	**DATE**
HYDROLOGIC / HYDRAULIC COMPUTATIONS		RLW	10/25/79

SURFACE AREAS OF LAKE AT VARIOUS ELEVATIONS

(TAKEN FROM EDWARD HESS ASSOCIATES PLAN)

AREA AT WATER SURFACE ELEVATION (113.4)

SEGMENT	MEASUREMENT	AREA
①	11.17 IN^2	111,700 ft^2
②	28.64 IN^2	286400 ft^2
③	16.45 IN^2	164500 ft^2
		$\frac{562600 ft^2}{43560} = 12.91$ ACRES

CONTOUR 116

SEGMENT	MEASUREMENT	AREA
①	12.89	128900
②	33.42	334200
③	41.22	412200
		$\frac{875300 ft^2}{43560} = 20.09$ ACRES

CONTOUR 118

SEGMENT	MEASUREMENT	AREA
①	14.62	146200
②	36.00+6.79+.53	433200
③	66.42	664200
		$\frac{1243600}{43560} = 28.55$ ACRES

00-15-1 (3/78)
Formerly GA-17

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT GRID

JOB	SHEET NO.	CHECKED BY	DATE
RAINBOW LAKE DAM	3		
SUBJECT		**COMPUTED BY**	**DATE**
HYDROLOGIC / HYDRAULIC COMPUTATIONS		RLW	10/25/79

VOLUME CALCULATIONS - CONIC METHOD - ASSUME DEPTH OF LAKE = 12'

ELEVATION	AREA (ACRES)	VOLUME (ACRE-FT)
113.4 (LAKE SURFACE)	12.91	29.69
116	20.09	63.62
118	28.55	109.42
117.5	26.55	97.35

ELEVATIONS (PLAN DATUM)

TOP OF DAM 117.5 — LAKE LEVEL (USGS DATUM) 1680

SPILLWAY CHANNEL CREST 114.2

INVERT OF PIPE ARCH 116.5

SPILLWAY CAPACITY

MAIN SPILLWAY CHANNEL

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

USE C = 3.32 (FROM TABLE 5-3 - HANDBOOK OF HYDRAULICS)

L = 18.6'

ELEVATION 114.2 H = 0

Q = 0

ELEVATION 116.5 H = 2.3

$Q = (3.32)(18.6)(2.3)^{1.5} = 215.4$ cfs

ELEVATION 117.5 H = 3.3

$Q = (3.32)(18.6)(3.3)^{1.5} = 370.2$ cfs

00-15-1 (3/78)
Formerly GA-17

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT GRID

JOB	SHEET NO.	CHECKED BY	DATE
RAINBOW LAKE DAM	4		
SUBJECT		**COMPUTED BY**	**DATE**
HYDROLOGIC/HYDRAULIC COMPUTATIONS		RLW	10/25/79

CAPACITY OF PIPE ARCH (13" x 22")

BY MANNING FORMULA

$$Q = A\left(\frac{1.486}{n}\right) r^{\frac{2}{3}} S^{\frac{1}{2}}$$

$r = \frac{168}{38} = 4.42$ in $\qquad A = 235.6$ in^2

$n = .035 \qquad S = .01$

$$Q = \left(\frac{235.6}{144}\right)\left(\frac{1.486}{.035}\right)\left(\frac{4.42}{12}\right)^{.67}(.01)^{.5} = 3.54 \text{ cfs}$$

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION: 26 FEB 79
  MODIFIED FOR HONEYWELL APR 79
**********

**********
THIS PROGRAM IS CURRENTLY BEING MODIFIED
TO RUN AT THE DGS HONEYWELL SYSTEM

PLEASE REPORT ANY UNUSUAL OPERATING PROBLEMS
TO JIM FILLSON (ext. 423) PH: 7-5665
**********
     1          ALRAINBOW LAKE DAM
     2          4 PAF WITH RATIOS - ANALYSIS
     3          AS DATE
     4          S   100     0     30     0     0     0     0     2     0     0
     5          B1    5
     6          J     1     3     1
     7          J1   .04    .5    1
     8          K     0     1                       1
     9          K1                    INFLOW HYDROGRAPH
    10          H     1     1    8.79              .795              1
    11          P     0    17.5   111   123   132   142
    12          T                                   1    .1
    13          W   4.06   .625
    14          X    15    15     1
    15          K     1     1                       1
    16          K1 ROUTED HYDROGRAPH
    17          Y                       1     1
    18          Y1    1                                  -114.2    -1
    19          Y4 114.2  116.3  117.5
    20          Y5    0   215.4  372.8
    21          S     0    29.7   63.6   97.4
    22          SE 106.5  113.4   116   117.5
    23          SS 114.2
    24          SD 117.5  3.087   1.5    200
    25          K     1    1000                    1
    26          K1  LOCATION TOE OF DAM
```

```
Y1    1
Y6   .05    .05    .05     97    120     15     .8
Y7    0     120    115     110   120     100    122    97    131    97
Y7   134    100    138     116   205     118
K     1    1400                                  1
K1  LOCATION  END OF PLANS
Y                                    1     1
Y1    1
Y6   .05    .05    .05     87    100     400    .025
Y7    0     100     50     94    160     90     162    87    168    87
Y7   170     90    184     90    290     100
K     1    2000                                  1
K1  LOCATION FIRST HOUSE DOWNSTREAM
Y                                    1     1
Y1    1
Y6   .05    .05    .05     71    91      600    .027
Y7    0     91     120     80    180     74     182    71    193    71
Y7   195     74    230     79    400     87
K     1    3700                                  1
K1  LOCATION INTERSECTION CR 4
Y                                    1     1
Y1    1
Y6   .05    .05    .05     57    74      1700   .008
Y7    0     74     120     64    160     60     162    57    172    57
Y7   175     60    240     65    360     74
K    99
A
A
A
A
A
```

```
**********
HEC-1 FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION          JULY 1978
     STANDARD VERSION  24 FEB 79
  ADDITIONAL SUBROUTINES FOR
**********

**********
THIS PROGRAM IS CURRENTLY BEING MODIFIED
TO RUN ON THE DSS INTERACTIVE SYSTEM

PLEASE REPORT ANY UNUSUAL OPERATING PROBLEMS
TO JOHN FLEMING (...-923) OR 7-5066
**********

RUN DATE 12/13/79

                    SALT LAKE DAM
                    PMF WITH RATIOS - ANALYSIS
                    DATE 12/03/79

                              JOB SPECIFICATION
      NO       NMIN      IDAY      IHR      IMIN     METRC      IPLT      IPRT     NSTAN
      100         0        30        0         0         0         2         0         0
                          JOPER       NWT     LROPT     TRACE
                              5         0         0         0

                        MULTI-PLAN ANALYSES TO BE PERFORMED
                                NPLAN= 1 NRTIO= 3 LRTIO= 1
                  RTIOS=   0.34     0.50     1.00

**********      **********      **********      **********      **********

                              SUB-AREA RUNOFF COMPUTATION

                                  INFLOW HYDROGRAPH
                        ISTAO    ICOMP    IECON    ITAPE    JPLT     JPRT     INAME    ISTAGE   IAUTO
                            1        0        0        0        0        0        1        0        0

                                  HYDROGRAPH DATA
                  IHYDG    IUHG    TAREA     SNAP     TRSDA    TRSPC    RATIO    ISNOW    ISAME    LOCAL
                      1       1     6.79       0.      8.79     0.80     0.          0        1        0

                                    PRECIP DATA
                            SPFE      PMS       R6       R12      R24      R48      R72      R96
                            0.       17.50    111.00   123.00   132.00   142.00     0.       0.

                                    LOSS DATA
                  LROPT    STRKR    DLTKR    RTIOL    ERAIN    STRKS    RTIOK    STRTL    CNSTL    ALSMX    RTIMP
                      0       0.       0.      1.00       0.       0.      1.00     1.00     0.10       0.       0.

                                  UNIT HYDROGRAPH DATA
                              TP=  4.06     CP=0.63     NTA=  0

                                  RECESSION DATA
                            STRTQ=   15.00     QRCSN=   15.00     RTIOR= 1.00
APP DATIATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 9.05 AND R= 7.41 INTERVALS

                    ... 133 ORDINATES, LAG=  4.06 HOURS, CP= 0.63  VOL= 1.00
```

			[illegible]	[illegible]	[illegible]	94.	82.	72.	63.	55.				
			47.	42.	21.	24.	21.	19.	16.	14.				
	12.	11.	9.	8.	7.									

END-OF-PERIOD FLOW

		PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
[illegible]	[illegible]	1	.00	0.	[illegible]	15.	1.02	1.30	51	0.04	0.	0.04	49.
[illegible]	[illegible]	2	.00	0.	[illegible]	15.	1.02	2.00	52	0.04	0.	0.04	45.
[illegible]	[illegible]	3	.00	0.	0.00	15.	1.02	2.30	53	0.04	0.	0.04	41.
[illegible]	[illegible]	4	.00	0.	0.00	15.	1.02	3.00	54	0.04	0.	0.04	38.
[illegible]	[illegible]	5	.00	0.	0.00	15.	1.02	3.30	55	0.04	0.	0.04	35.
[illegible]	[illegible]	6	.00	0.	0.00	15.	1.02	4.00	56	0.04	0.	0.04	32.
[illegible]	[illegible]	7	.00	0.	0.00	15.	1.02	4.30	57	0.04	0.	0.04	30.
[illegible]	[illegible]	8	.00	0.	0.00	15.	1.02	5.00	58	0.04	0.	0.04	28.
[illegible]	[illegible]	9	.00	0.	0.00	15.	1.02	5.30	59	0.04	0.	0.04	27.
[illegible]	[illegible]	10	.00	0.	0.00	15.	1.02	6.00	60	0.04	0.	0.04	25.
[illegible]	[illegible]	11	.00	0.	0.00	15.	1.02	6.30	61	0.14	0.09	0.05	27.
[illegible]	6.00	12	.00	0.	0.00	15.	1.02	7.00	62	0.14	0.09	0.05	38.
[illegible]	[illegible]	13	.01	0.	0.01	15.	1.02	7.30	63	0.14	0.09	0.05	62.
[illegible]	7.[illegible]	14	.01	0.	0.01	15.	1.02	8.00	64	0.14	0.09	0.05	100.
[illegible]	[illegible]	15	.01	0.	0.01	15.	1.02	8.30	65	0.14	0.09	0.05	152.
[illegible]	[illegible]	16	.01	0.	0.01	15.	1.02	9.00	66	0.14	0.09	0.05	218.
[illegible]	[illegible]	17	.01	0.	0.01	15.	1.02	9.30	67	0.14	0.09	0.05	293.
[illegible]	[illegible]	18	.01	0.	0.01	15.	1.02	10.00	68	0.14	0.09	0.05	372.
[illegible]	[illegible]	19	.01	0.	0.01	15.	1.02	10.30	69	0.14	0.09	0.05	451.
[illegible]	[illegible]	20	.01	0.	0.01	15.	1.02	11.00	70	0.14	0.09	0.05	524.
[illegible]	[illegible]	21	.01	0.	0.01	15.	1.02	11.30	71	0.14	0.09	0.05	587.
[illegible]	[illegible]	22	.01	0.	0.01	15.	1.02	12.00	72	0.14	0.09	0.05	642.
[illegible]	[illegible]	23	.01	0.	0.01	15.	1.02	12.30	73	0.77	0.72	0.05	714.
[illegible]	[illegible]	24	.01	0.	0.01	15.	1.02	13.00	74	0.77	0.72	0.05	844.
[illegible]	[illegible]	25	.06	0.	0.06	15.	1.02	13.30	75	0.93	0.88	0.05	1062.
[illegible]	[illegible]	26	.06	0.	0.06	15.	1.02	14.00	76	0.93	0.88	0.05	1390.
[illegible]	[illegible]	27	.07	0.	0.07	15.	1.02	14.30	77	1.16	1.11	0.05	1848.
[illegible]	[illegible]	28	.07	0.	0.07	15.	1.02	15.00	78	1.16	1.11	0.05	2442.
[illegible]	[illegible]	29	.09	0.	0.09	15.	1.02	15.30	79	1.41	1.36	0.05	3163.
[illegible]	[illegible]	30	.09	0.	0.09	15.	1.02	16.00	80	4.46	4.41	0.05	4112.
[illegible]	[illegible]	31	0.11	0.	0.11	15.	1.02	16.30	81	1.08	1.03	0.05	5325.
[illegible]	[illegible]	32	0.34	0.04	0.30	16.	1.02	17.00	82	1.08	1.03	0.05	6655.
[illegible]	[illegible]	33	0.08	0.03	0.05	21.	1.02	17.30	83	0.85	0.80	0.05	7985.
[illegible]	[illegible]	34	0.03	0.03	0.00	30.	1.02	18.00	84	0.85	0.80	0.05	9241.
[illegible]	[illegible]	35	0.00	0.01	0.00	44.	1.02	18.30	85	0.06	0.01	0.05	10277.
[illegible]	[illegible]	36	0.00	0.01	0.00	62.	1.02	19.00	86	0.06	0.01	0.05	10951.
[illegible]	[illegible]	37	.00	0.	0.00	80.	1.02	19.30	87	0.06	0.01	0.05	11221.
[illegible]	[illegible]	38	.00	0.	0.00	98.	1.02	20.00	88	0.06	0.01	0.05	11062.
[illegible]	[illegible]	39	.00	0.	0.00	112.	1.02	20.30	89	0.06	0.01	0.05	10460.
[illegible]	[illegible]	40	.00	0.	0.00	122.	1.02	21.00	90	0.06	0.01	0.05	9589.
[illegible]	[illegible]	41	.00	0.	0.00	124.	1.02	21.30	91	0.06	0.01	0.05	8649.
[illegible]	[illegible]	42	.00	0.	0.00	120.	1.02	22.00	92	0.06	0.01	0.05	7694.
[illegible]	[illegible]	43	.00	0.	0.00	112.	1.02	22.30	93	0.06	0.01	0.05	6773.
[illegible]	[illegible]	44	.00	0.	0.00	102.	1.02	23.00	94	0.06	0.01	0.05	5937.
[illegible]	[illegible]	45	.00	0.	0.00	91.	1.02	23.30	95	0.06	0.01	0.05	5207.
[illegible]	[illegible]	46	.00	0.	0.00	82.	1.03	0.	96	0.06	0.01	0.05	4568.
[illegible]	[illegible]	47	.00	0.	0.00	73.	1.03	0.30	97	0.	0.	0.	4010.
[illegible]	0.	48	.00	0.	0.00	66.	1.03	1.00	98	0.	0.	0.	3522.
[illegible]	[illegible]	49	.04	0.	0.04	60.	1.03	1.30	99	0.	0.	0.	3093.
[illegible]	1.[illegible]	50	.04	0.	0.04	54.	1.03	2.00	100	0.	0.	0.	2715.
									SUM	19.76	16.19	3.56	166259.
										(502.)(	411.)(	91.)(	4707.93)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	11221.	9183.	3394.	1649.	164896.
CMS	318.	260.	96.	47.	4669.
INCHES		9.72	14.37	14.54	14.54

OVER

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1

1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	2.	2.	3.	4.	4.	5.
5.	5.	4.	4.	4.	3.	3.	3.	2.	2.
2.	2.	2.	2.	1.	1.	1.	1.	1.	1.
1.	2.	2.	4.	6.	9.	12.	15.	18.	21.
24.	26.	29.	34.	42.	56.	74.	98.	127.	164.
213.	266.	319.	370.	411.	438.	449.	442.	418.	384.
345.	308.	271.	237.	208.	183.	160.	141.	124.	109.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	449.	367.	136.	66.	6596.
CMS	13.	10.	4.	2.	187.
INCHES		0.39	0.57	0.58	0.58
MM		9.87	14.60	14.77	14.77
AC-FT		182.	269.	273.	273.
THOUS CU M		225.	332.	336.	336.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2

3.	3.	3.	3.	8.	8.	8.	8.	8.	8.
8.	8.	8.	8.	8.	8.	8.	8.	8.	8.
8.	8.	8.	8.	8.	8.	8.	8.	8.	8.
8.	8.	11.	15.	22.	31.	40.	49.	56.	61.
62.	61.	56.	51.	46.	41.	37.	33.	30.	27.
24.	22.	20.	19.	17.	16.	15.	14.	13.	13.
14.	19.	31.	50.	76.	109.	146.	186.	225.	262.
293.	321.	357.	422.	531.	695.	924.	1221.	1582.	2056.
2669.	3424.	3993.	4621.	5139.	5476.	5611.	5531.	5230.	4795.
4325.	3847.	3387.	2969.	2603.	2284.	2005.	1761.	1546.	1358.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5611.	4592.	1697.	824.	82448.
CMS	159.	130.	48.	23.	2335.
INCHES		4.86	7.18	7.27	7.27
MM		123.43	182.45	184.69	184.69
AC-FT		2277.	3366.	3407.	3407.
THOUS CU M		2808.	4151.	4202.	4202.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 3

15.	15.	15.	15.	15.	15.	15.	15.	15.	15.
15.	15.	15.	15.	15.	15.	15.	15.	15.	15.
15.	15.	15.	15.	15.	15.	15.	15.	15.	15.
15.	19.	21.	30.	44.	62.	80.	98.	112.	122.
124.	123.	112.	102.	91.	82.	73.	66.	60.	54.
49.	45.	41.	38.	35.	32.	30.	28.	27.	25.
27.	38.	62.	100.	152.	218.	293.	372.	451.	524.
587.	662.	714.	844.	1062.	1390.	1848.	2442.	3163.	4112.
5429.	6955.	7965.	9241.	10277.	10951.	11221.	11062.	10460.	9589.
8647.	7694.	6773.	5937.	5207.	4568.	4010.	3522.	3093.	2715.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	11221.	9183.	3394.	1649.	164896.
CMS	318.	260.	96.	47.	4669.
INCHES		9.72	14.37	14.54	14.54
MM		246.85	364.90	369.37	369.37
AC-FT		[illegible]	[illegible]	[illegible]	[illegible]

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HYDROGRAPH ROUTING

SUB-HYDROGRAPH [redacted]

ISTA	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	1	0	0	0	0	1	0	0

ROUTING DATA

RLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.	0.	0.	1	1	0	0	0

ISTPS	ISTOL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.	0.	0.	-114.	-1

STAGE	114.20	116.50	117.50	
FLOW	0.	215.60	372.30	
CAPACITY=	0.	30.	64.	97.
ELEVATION=	107.	113.	116.	*116.

CREL	SPWID	COOW	EXPW	ELEVL	COOL	CAREA	EXPL
114.2	0.	0.	0.	0.	0.	0.	0.

DAM DATA

TOPEL	COOD	EXPD	DAMWID
117.5	3.1	1.5	200.

STATION 1, PLAN 1, RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

1.	1.	0.	0.	0.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	2.	2.	3.	3.
4.	4.	4.	4.	4.	4.	4.	3.	3.	3.
3.	4.	2.	2.	2.	2.	2.	2.	1.	1.
1.	1.	1.	2.	3.	4.	6.	8.	10.	12.
15.	17.	20.	23.	27.	33.	41.	52.	68.	88.
114.	146.	178.	204.	245.	290.	329.	358.	378.	389.
379.	364.	345.	322.	297.	271.	246.	222.	205.	191.

STORAGE

40.	40.	40.	40.	40.	40.	40.	40.	40.	40.
40.	40.	40.	40.	40.	40.	40.	40.	40.	40.
40.	40.	40.	40.	40.	40.	40.	40.	40.	40.
40.	40.	40.	40.	40.	40.	40.	40.	41.	41.
41.	41.	41.	41.	41.	41.	41.	41.	41.	41.
41.	40.	40.	40.	40.	40.	40.	40.	40.	40.
40.	40.	40.	40.	41.	41.	41.	41.	42.	42.
42.	42.	43.	43.	44.	45.	46.	47.	50.	52.
56.	61.	66.	72.	79.	86.	91.	95.	98.	99.
97.	94.	93.	90.	87.	83.	79.	76.	72.	69.

STAGE

114.2	114.2	114.2	114.2	114.2	114.2	114.2	114.2	114.2	114.2
114.2	114.2	114.2	114.2	114.2	114.2	114.2	114.2	114.2	114.2

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	114.2	114.2	114.2	114.2	114.2
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	114.2	114.2	114.2	114.2	114.2
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	114.2	114.3	114.3	114.3	114.3
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	114.5	114.6	114.8	114.9	115.1
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	117.0	117.2	117.4	117.5	117.6
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	116.9	116.7	116.5	116.4	116.2

PEAK OUTFLOW IS [illegible]. AT TIME 45.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	399.	330.	121.	59.	5696.
CMS	11.	9.	3.	2.	167.
INCHES		0.35	0.51	0.52	0.52
MM		8.88	13.05	13.21	13.21
AC-FT		164.	241.	244.	244.
THOUS CU M		202.	297.	301.	301.

G/19

STATION 1, PLAN 1, RATIO 2

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

2.	3.	4.	5.	6.	6.	7.	7.	7.	7.
7.	7.	7.	7.	7.	7.	7.	7.	7.	7.
7.	7.	7.	7.	7.	7.	7.	7.	7.	7.
7.	7.	7.	8.	12.	16.	21.	27.	34.	40.
45.	51.	52.	52.	51.	49.	46.	43.	40.	37.
34.	31.	29.	26.	24.	22.	21.	19.	18.	16.
15.	14.	14.	24.	34.	49.	69.	94.	123.	154.
179.	203.	225.	267.	320.	414.	719.	1048.	1405.	1848.
2422.	3022.	3773.	4431.	4990.	5393.	5586.	5567.	5328.	4926.
4453.	3976.	3533.	3106.	2729.	2399.	2111.	1858.	1636.	1441.

STORAGE

41.	41.	41.	41.	41.	41.	41.	41.	41.	41.
41.	41.	41.	41.	41.	41.	41.	41.	41.	41.
41.	41.	41.	41.	41.	41.	41.	41.	41.	41.
41.	41.	41.	41.	42.	42.	43.	44.	45.	46.
46.	47.	47.	47.	47.	47.	47.	46.	46.	45.
45.	45.	44.	44.	44.	43.	43.	43.	43.	42.
42.	42.	43.	43.	45.	47.	50.	53.	57.	62.
68.	71.	76.	82.	90.	100.	110.	118.	125.	133.
142.	152.	161.	170.	177.	181.	183.	183.	181.	176.
170.	164.	158.	152.	147.	142.	137.	133.	129.	126.

STAGE

114.2	114.2	114.2	114.3	114.3	114.3	114.3	114.3	114.3	114.3
114.3	114.3	114.3	114.3	114.3	114.3	114.3	114.3	114.3	114.3
114.3	114.3	114.3	114.3	114.3	114.3	114.3	114.3	114.3	114.3
114.3	114.3	114.3	114.3	114.3	114.4	114.4	114.5	114.6	114.6
114.7	114.7	114.8	114.8	114.7	114.7	114.7	114.7	114.6	114.6
114.5	114.5	114.5	114.5	114.5	114.4	114.4	114.4	114.4	114.4
114.4	114.4	114.4	114.5	114.6	114.7	114.9	115.2	115.5	115.8
116.1	116.4	116.6	116.8	117.2	117.6	118.1	118.4	118.7	119.1
119.5	119.9	120.3	120.7	121.0	121.2	121.3	121.3	121.2	121.0
120.7	120.5	120.2	119.9	119.7	119.5	119.3	119.1	118.9	118.8

PEAK OUTFLOW IS 5586. AT TIME 43.50 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5586.	4591.	1656.	804.	30383.
CMS	158.	130.	47.	23.	2276.
INCHES		4.86	7.01	7.09	7.09
MM		123.42	178.05	180.05	180.06
ACRE-FT		2277.	3284.	3322.	3322.
THOUS CU M		2808.	4051.	4097.	4097.

=DV.1=

STATION 1, PLAN 1, RATIO 3

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

[illegible]	7.	9.	10.	12.	13.	13.	14.	14.	14.
[illegible]	15.	15.	15.	15.	15.	15.	15.	15.	15.
[illegible]	15.	15.	15.	15.	15.	15.	15.	15.	15.
[illegible]	17.	16.	19.	23.	31.	41.	54.	67.	80.
[illegible]	95.	108.	104.	102.	98.	93.	87.	81.	74.
[illegible]	61.	53.	53.	49.	45.	41.	39.	35.	33.
[illegible]	37.	36.	48.	64.	96.	139.	181.	219.	286.
[illegible]	[illegible]	530.	750.	933.	1220.	1636.	2197.	2896.	3788.
[illegible]	8291.	7461.	6747.	10057.	10525.	11197.	11124.	10621.	9800.
[illegible]	7927.	[illegible]	6159.	5402.	4748.	4174.	3672.	3231.	2843.

STORAGE

[illegible]	41.	41.	42.	42.	42.	42.	42.	42.	42.
42.	42.	42.	42.	42.	42.	42.	42.	42.	42.
42.	42.	42.	42.	42.	42.	42.	42.	42.	42.
[illegible]	42.	42.	43.	43.	44.	46.	43.	49.	51.
55.	55.	55.	55.	54.	54.	53.	52.	51.	51.
[illegible]	[illegible]	44.	46.	47.	48.	46.	45.	45.	45.
[illegible]	[illegible]	45.	47.	50.	54.	59.	67.	75.	85.
[illegible]	101.	100.	111.	115.	121.	129.	139.	149.	162.
179.	191.	208.	219.	229.	237.	240.	239.	235.	227.
215.	207.	199.	190.	191.	174.	167.	160.	154.	149.

STAGE

114.2	114.3	114.3	114.3	114.3	114.3	114.3	114.3	114.3	114.4
114.4	114.4	114.4	114.4	114.4	114.4	114.4	114.4	114.4	114.4
114.4	114.4	114.4	114.4	114.4	114.4	114.4	114.4	114.4	114.4
114.4	114.4	114.4	114.4	114.5	114.5	114.6	114.8	114.9	115.1
115.2	115.3	115.3	115.3	115.3	115.2	115.2	115.1	115.1	115.0
114.9	114.9	114.8	114.8	114.7	114.7	114.6	114.6	114.6	114.6
114.5	114.5	114.6	114.7	114.9	115.2	115.7	116.1	116.5	117.0
117.4	117.7	118.0	118.1	118.3	118.6	119.0	119.3	119.8	120.3
120.8	121.7	122.3	122.9	123.4	123.7	123.8	123.8	123.6	123.3
122.9	122.4	122.0	121.6	121.2	120.9	120.6	120.3	120.0	119.8

EAK OUTFLOW IS 11197. AT TIME 43.50 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	11197.	9136.	3343.	1623.	162285.
CMS	317.	259.	95.	46.	4595.
INCHES		9.72	14.15	14.31	14.31
MM		246.93	359.45	363.52	363.52
AC-FT		4355.	6692.	6706.	6706.
THOUS CU M		5519.	8180.	8272.	8272.

OVER

HYDROGRAPH ROUTING

LOCATION AND DATA

ISTAO	ICOMP	ICON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
100C	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.	.	0.	1	1	0	0	0

STPS	ITDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.	0.	0.	0.	0

NORMAL DEPTH CHANNEL ROUTING

Q(1)	Q(2)	Q(3)	ELEVT	ELMAX	RLNTH	SEL
0.3000	2.0500	3.0000	97.0	12.0	15.	0.30000

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

0.	120.00	115.00	110.00	120.00	100.00	122.00	97.00	131.00	97.00
136.00	120.00	131.00	116.00	205.00	118.00				

STORAGE	0.	0.00	0.01	0.01	0.02	0.03	0.03	0.04	0.05	0.06
	0.07	0.08	0.09	0.11	0.13	0.17	0.20	0.26	0.34	0.42
OUTFLOW	0.	322.03	1023.36	2169.88	3776.16	5745.26	8063.51	10722.49	13717.02	17044.03
	20741.93	24835.63	29022.02	34043.87	42236.10	51504.13	62630.87	77465.79	98162.66	124293.02
STAGE	97.00	98.21	99.42	100.63	101.84	103.05	104.26	105.47	106.68	107.89
	109.11	110.32	111.53	112.74	113.95	115.16	116.37	117.58	118.79	120.00
FLOW	0.	322.03	1023.36	2169.88	3776.16	5745.26	8063.51	10722.49	13717.02	17044.03
	20741.93	24835.63	29022.02	34043.87	42236.10	51504.13	62630.87	77465.79	98162.66	124293.02

STATION 100C, PLAN 1, RTIO 1

OUTFLOW

0.	0.	1.	0.	1.	0.	1.	0.	1.	0.
1.	0.	1.	0.	1.	0.	1.	0.	1.	0.
1.	0.	1.	0.	1.	0.	1.	0.	1.	0.
1.	1.	1.	1.	1.	1.	2.	2.	3.	3.
3.	4.	4.	4.	4.	4.	4.	3.	3.	3.
3.	2.	2.	2.	2.	2.	2.	1.	2.	1.
1.	1.	2.	2.	3.	4.	6.	7.	10.	12.
15.	17.	20.	23.	27.	32.	41.	52.	68.	68.
114.	149.	178.	204.	245.	293.	329.	358.	378.	389.
374.	353.	345.	329.	297.	271.	246.	222.	206.	191.

STOR

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

```
      0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
      0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
      0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
      0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
      0.        0.        0.        0.        0.        0.        0.        0.        0.        0.

                                            STAGE
    97.0      97.0      97.0      97.0      97.0      97.0      97.0      97.0      97.0      97.0
    97.0      97.0      97.0      97.0      97.0      97.0      97.0      97.0      97.0      97.0
    97.0      97.0      97.0      97.0      97.0      97.0      97.0      97.0      97.0      97.0
    97.0      97.0      97.0      97.0      97.0      97.0      97.0      97.0      97.0      97.0
    97.0      97.0      97.0      97.0      97.0      97.0      97.0      97.0      97.0      97.0
    97.0      97.0      97.0      97.0      97.0      97.0      97.0      97.0      97.0      97.0
    97.0      97.0      97.0      97.0      97.0      97.0      97.0      97.0      97.0      97.0
    97.1      97.1      97.1      97.1      97.1      97.1      97.2      97.2      97.3      97.3
    97.4      97.5      97.7      97.6      97.9      98.1      98.2      98.3      98.3      98.3
    98.3      98.1      98.2      98.2      98.1      98.0      97.9      97.8      97.8      97.7

                            PEAK    6-HOUR   24-HOUR   72-HOUR  TOTAL VOLUME
                  CFS       309.      330.      121.       59.       5896.
                  CMS        11.        9.        3.        2.        167.
               INCHES                 0.35      0.51      0.52        0.52
                   MM                 8.88     13.05     13.21       13.21
                AC-FT                 164.      241.      244.        244.
            THOUS CU M                202.      297.      301.        301.

                              MAXIMUM STORAGE =       0.

MAXIMUM STAGE IS     98.3
```

```
*DV.*

                         STATION    1090, PLAN 1, RTIO 2

                                    OUTFLOW
   [illegible]   1.    [illegible]  [illegible]      1.      4.      9.      5.      9.      5.
   [illegible] [illegible]   7.     [illegible]      3.      6.      3.      6.      9.      6.
   [illegible] [illegible]   9.     [illegible]      0.      6.      9.      6.      9.      6.
   [illegible] [illegible]  10.     [illegible]     14.     14.     23.     25.     35.     38.
       47.   [illegible]    54.       5[illegible].  51.     47.     44.     42.     42.     35.
       30.   [illegible]    31.       2[illegible].  20.     21.     22.     17.     19.     15.
       17.     14.          20.       22.     36.     47.     71.     93.    125.    153.
   [illegible] [illegible] 227.      26[illegible]. 321.    412.    720.   1046.   1407.   1846.
   [illegible] [illegible] 3777.    443[illegible]. 4997.   3391.   5587.   5565.   5330.   4924.
   [illegible] [illegible] 3334.    310[illegible]. 2731.   2393.   2113.   1856.   1638.   1439.

                                     STOR
        0.   [illegible]    0.        0.      0.      0.      0.      0.      0.      0.
        0.   [illegible]    0.        0.      0.      0.      0.      0.      0.      0.
        0.   [illegible]    0.        0.      0.      0.      0.      0.      0.      0.
        0.   [illegible]    0.        0.      0.      0.      0.      0.      0.      0.
        0.   [illegible]    0.        0.      0.      0.      0.      0.      0.      0.
        0.   [illegible]    0.        0.      0.      0.      0.      0.      0.      0.
        0.   [illegible]    0.        0.      0.      0.      0.      0.      0.      0.
        0.   [illegible]    0.        0.      0.      0.      0.      0.      0.      0.
        0.   [illegible]    0.        0.      0.      0.      0.      0.      0.      0.

                                     STAGE
      97.0    97.0    97.0    97.0    97.0    97.0    97.0    97.0    97.0    97.0
      97.0    97.0    97.0    97.0    97.0    97.0    97.0    97.0    97.0    97.0
      97.0    97.0    97.0    97.0    97.0    97.0    97.0    97.0    97.0    97.0
      97.0    97.0    97.0    97.0    97.1    97.1    97.1    97.1    97.1    97.1
      97.2    97.2    97.2    97.2    97.2    97.2    97.2    97.2    97.2    97.1
      97.1    97.1    97.1    97.1    97.1    97.1    97.1    97.1    97.1    97.1
      97.1    97.1    97.1    97.1    97.1    97.2    97.3    97.3    97.5    97.6
      97.7    97.7    97.9    98.0    98.2    98.4    98.9    99.4    99.8   100.3
 [illegible] 101.3   101.6   102.2   102.6   102.8   103.0   102.9   102.8   102.5
     102.3   102.0   101.7   101.3   101.1   100.8   100.6   100.3   100.1    99.9

                      PEAK    6-HOUR    24-HOUR    72-HOUR   TOTAL VOLUME
          CFS  55[illegible]7.   4571.     1656.       804.          80383.
          CMS   15[illegible].    130.       47.        23.           2276.
       INCHES                     4.86      7.01       7.09            7.09
           MM                   123.42    178.05     180.06          180.06
        AC-FT                    2277.     3284.      3322.           3322.
  THOUS CU M                     2808.     4051.      4097.           4097.

                          MAXIMUM STORAGE =        0.

MAXIMUM STAGE IS     103.0
```

```
                              STATION   1000, PLAN 1, RTIO 3

                                          OUTFLOW
  [illegible]  [illegible]   13.      7.     15.      9.     17.     10.     18.     10.
  1[illegible] 1[illegible]  13.     11.     13.     11.     19.     11.     19.     11.
  1[illegible] 1[illegible]  13.     11.     19.     11.     19.     11.     19.     11.
  13.     1[illegible]       23.     15.     27.     27.     45.     50.     71.     76.
  [illegible]  [illegible]  107.    101.    106.     95.     97.     83.     84.     71.
  72.     [illegible]        61.     49.     52.     41.     45.     34.     39.     29.
  15.     2[illegible]       40.     44.     72.     95.    142.    177.    222.    283.
  [illegible]  [illegible]  560.    756.    941.   1217.   1639.   2193.   2900.   3784.
  [illegible]  [illegible] 7654.   9941.  10060.  10323.  11190.  11121.  10625.   9796.
  3875.   7924.            7007.   6149.   5403.   4744.   4178.   3669.   3235.   2840.

                                           STOR
     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

                                           STAGE
   97.0    97.0    97.0    97.0    97.1    97.0    97.1    97.0    97.1    97.0
   97.1    97.0    97.0    97.0    97.1    97.0    97.1    97.0    97.1    97.0
   97.1    97.0    97.0    97.0    97.1    97.0    97.1    97.0    97.1    97.0
   97.1    97.0    97.1    97.1    97.1    97.1    97.2    97.2    97.3    97.3
   97.4    97.4    97.4    97.4    97.4    97.4    97.4    97.3    97.3    97.3
   97.3    97.2    97.2    97.2    97.2    97.2    97.2    97.1    97.1    97.1
   97.1    97.1    97.1    97.2    97.3    97.4    97.5    97.7    97.8    98.1
   99.3    98.5    98.8    99.0    99.3    99.6   100.1   100.6   101.2   101.8
  102.0   103.3   104.0   104.7   105.2   105.5   105.7   105.6   105.4   105.1
  104.9   104.2   103.7   103.3   102.8   102.4   102.1   101.8   101.4   101.1

                       PEAK    6-HOUR   24-HOUR   72-HOUR   TOTAL VOLUME
            CFS       11190.    9196.    3343.     1623.     162285.
            CMS         317.     260.      95.       46.       4595.
         INCHES                  9.72    14.15     14.31      14.31
             MM                246.93   359.49    363.52     363.52
          AC-FT                 4555.    6632.     6706.      6706.
       THOUS CU M               5619.    8180.     8272.      8272.

                            MAXIMUM STORAGE =        0.

MAXIMUM STAGE IS      105.7
```

DIAL

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

LOCATE I FILE OF FLOWS

ISTAO	ICOMP	ICOMO	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1400	1	0	0	0	0	1	0	0

ROUTING DATA

NSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.	.0	0.	1	1	0	0	0

MSTPS	MSTOL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.	0.	0.	0.	0

NORMAL DEPTH CHANNEL ROUTING

Q(1)	Q(2)	Q(3)	FLOVT	FLMAX	RLNTH	SEL
0.0000	0.000	0.0000	87.0	100.0	400.	0.02500

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

0.	100.00	30.00	94.00	150.00	90.00	152.00	87.00	168.00	87.00
170.00	90.00	184.00	90.00	290.00	100.00				

STORAGE	0.	0.04	0.09	0.14	0.20	0.34	0.68	1.17	1.84	2.66
	3.65	4.78	5.99	7.28	8.66	10.11	11.65	13.27	14.97	16.75
OUTFLOW	0.	14.44	45.11	88.47	143.86	241.07	462.74	851.02	1448.31	2293.33
	3421.97	4952.23	6746.15	9046.45	11569.55	14419.38	17606.75	21139.05	25025.06	29273.82
STAGE	87.00	87.68	87.37	89.05	89.74	90.42	91.11	91.79	92.47	93.16
	93.84	94.53	95.21	95.89	96.58	97.26	97.95	98.63	99.32	100.00
FLOW	0.	14.44	45.11	88.47	143.86	241.07	462.74	851.02	1448.31	2293.33
	3421.97	4952.23	6746.15	9046.45	11569.55	14419.38	17606.75	21139.05	25025.06	29273.82

STATION 1400, PLAN 1, RTIO 1

OUTFLOW

1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	2.	2.	3.	3.
4.	4.	4.	4.	4.	4.	4.	3.	3.	3.
3.	3.	2.	2.	2.	2.	2.	2.	1.	1.
1.	1.	1.	2.	3.	4.	5.	7.	10.	12.
15.	17.	20.	23.	27.	32.	40.	52.	67.	87.
113.	143.	177.	214.	243.	283.	327.	358.	377.	389.
392.	390.	368.	329.	293.	272.	247.	223.	206.	192.

STOR

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

.	.	.	.	0.	0.	0.	0.	0.	0.
.	.	.	.	0.	0.	0.	0.	0.	0.
.	.	.	.	0.	0.	0.	0.	0.	0.
.	.	.	.	0.	0.	0.	0.	0.	0.
.	.	.	.	0.	0.	0.	1.	1.	1.
1.	1.	1.	1.	0.	0.	0.	0.	0.	0.

STAGE

[illegible]	[illegible]	[illegible]	87.0	87.0	87.0	87.0	87.0	87.0	87.0
[illegible]	[illegible]	[illegible]	87.0	87.0	87.0	87.0	87.0	87.0	87.0
[illegible]	[illegible]	[illegible]	87.0	87.0	87.0	87.0	87.0	87.0	87.0
[illegible]	[illegible]	[illegible]	87.0	87.0	87.1	87.1	87.1	87.1	87.1
87.2	87.2	87.2	87.2	87.2	87.2	87.2	87.2	87.2	87.1
87.1	87.1	87.1	87.1	87.1	87.1	87.1	87.1	87.1	87.1
87.1	87.1	87.1	87.1	87.1	87.2	87.3	87.4	87.5	87.6
87.7	87.7	87.8	87.9	88.0	88.1	88.3	88.5	88.7	89.0
[illegible]	[illegible]	90.6	90.2	90.4	90.6	90.7	90.8	90.8	90.9
[illegible]	90.8	90.7	90.7	90.6	90.5	90.4	90.3	90.2	90.1

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	300.	300.	121.	59.	5890.
CMS	11.	9.	3.	2.	167.
INCHES		0.35	0.51	0.52	0.52
MM		8.88	13.03	13.19	13.19
AC-FT		144.	240.	243.	243.
THOUS CU M		202.	297.	300.	300.

MAXIMUM STORAGE = 1.

MAXIMUM STAGE IS 90.9

```
*IV:*

                              STATION    1400, PLAN 1, RTIO 3

                                          OUTFLOW
     14.         .        15.        7.       14.       10.       15.       12.       15.       13.
     15.       15.        15.       14.       15.       15.       15.       15.       15.       15.
     15.       15.        15.       15.       15.       15.       15.       15.       15.       15.
     15.       15.        15.       15.       23.       31.       41.       53.       67.       80.
 [illegible]  [illegible] 103.      104.      102.       96.       93.       87.       81.       75.
     57.       43.        53.       53.       49.       45.       41.       38.       35.       33.
     31.       31.        35.       47.       67.       97.      133.      179.      218.      263.
 [illegible]   470.       634.      755.      933.     1211.     1625.     2182.     2881.     3767.
   9927.      9269.      7531.     3929.    10045.    10818.    11185.    11127.    10631.     9812.
   2853.      7741.      7016.     5166.     5413.     4759.     4184.     3681.     3239.     2851.

                                           STOR
      0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
      0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
      0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
      0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
      0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
      0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
      0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
      1.        1.        1.        1.        1.        2.        2.        3.        3.        4.
      5.        6.        6.        7.        8.        8.        8.        8.        8.        8.
      7.        7.        6.        6.        5.        5.        4.        4.        3.        3.

                                           STAGE
    87.6      87.7      87.7      87.3      87.7      87.5      87.7      87.6      87.7      87.6
    87.7      87.7      87.7      87.7      87.7      87.7      87.7      87.7      87.7      87.7
    87.7      87.7      87.7      87.7      87.7      87.7      87.7      87.7      87.7      87.7
    87.7      87.7      87.7      87.8      87.9      88.0      88.3      88.5      88.7      88.9
    89.1      89.2      89.2      89.2      89.2      89.2      89.1      89.0      88.9      88.8
    88.7      88.7      88.6      88.5      88.4      88.4      88.3      88.2      88.2      88.1
    89.1      88.1      89.2      88.4      88.7      89.2      89.7      90.0      90.3      90.5
    90.8      91.1      91.4      91.6      91.9      92.2      92.6      93.1      93.5      94.0
    94.5      95.0      95.5      95.9      96.2      96.4      96.5      96.5      96.3      96.1
    95.4      95.5      95.3      95.0      94.7      94.4      94.2      94.0      93.7      93.5

                                PEAK    6-HOUR    24-HOUR    72-HOUR   TOTAL VOLUME
                       CFS    11175.     9117.      3342.      1622.      162210.
                       CMS      317.      240.        95.        46.        4593.
                    INCHES                9.72      14.15      14.31        14.31
                        MM              246.94     359.33     363.36       363.36
                     AC-FT               4555.      6629.      6703.        6703.
                 THOUS CU M              5619.      8176.      8268.        8268.

                              MAXIMUM STORAGE =         8.

MAXIMUM STAGE IS       96.5
```

*DUMP

STATION 1400, PLAN 1, RTIO 2

OUTFLOW

7.	7.	7.	7.	7.	8.	7.	6.	7.	7.
7.	7.	7.	7.	7.	7.	7.	7.	7.	7.
7.	7.	7.	7.	7.	8.	7.	8.	7.	8.
7.	7.	8.	9.	12.	15.	21.	27.	33.	40.
55.	49.	52.	52.	51.	49.	47.	44.	40.	37.
34.	32.	29.	27.	24.	22.	21.	19.	18.	16.
15.	15.	17.	24.	34.	49.	69.	94.	123.	153.
179.	194.	224.	269.	316.	410.	705.	1043.	1391.	1840.
2409.	3134.	3782.	4426.	4984.	5392.	5580.	5572.	5330.	4937.
4471.	4039.	3532.	3117.	2734.	2403.	2116.	1865.	1640.	1447.

STOR

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	1.	1.	1.	2.	2.
4.	4.	4.	4.	5.	5.	5.	5.	5.	5.
4.	4.	4.	3.	3.	3.	2.	2.	2.	2.

STAGE

87.3	87.3	87.3	87.2	87.3	87.2	87.4	87.3	87.4	87.3
87.4	87.3	87.3	87.3	87.4	87.3	87.4	87.4	87.4	87.4
87.4	87.4	87.4	87.4	87.4	87.4	87.4	87.4	87.4	87.4
87.4	87.4	87.4	87.4	87.5	87.7	87.8	88.0	88.1	88.2
88.4	88.4	88.5	88.5	88.5	88.4	88.4	88.3	88.3	88.2
88.1	88.1	88.0	88.0	87.9	87.9	87.8	87.8	87.8	87.7
87.7	87.7	87.8	87.9	88.1	88.4	88.7	89.1	89.5	89.8
90.0	90.1	90.3	90.5	90.7	90.9	91.5	92.0	92.4	92.8
93.2	93.5	94.0	94.3	94.5	94.7	94.8	94.7	94.7	94.5
94.3	94.1	93.9	93.7	93.4	93.2	93.0	92.8	92.6	92.5

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5508.	4591.	1655.	803.	80339.
CMS	156.	130.	47.	23.	2275.
INCHES		4.86	7.01	7.09	7.09
MM		123.41	177.99	179.96	179.96
AC-FT		2277.	3283.	3320.	3320.
THOUS CU M		2808.	4049.	4095.	4095.

MAXIMUM STORAGE = 5.

MAXIMUM STAGE IS 94.3

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                    **********          **********          **********          **********          **********

                      LIGHTFIELD FIRST HOUSE DOWNSTREAM          HYDROGRAPH ROUTING
                             ISTAQ     ICOMP     IECON     ITAPE     JPLT      JPRT      INAME     ISTAGE    IAUTO
                              2000        1         0         0         0         0         1         0         0
                                                         ROUTING DATA
                    QLOSS     CLOSS       AVG      IRES     ISAME      IOPT      IPMP                LSTR
                      0.        0.         0.         1         1         0         0                   0
                             NSTPS     NSTDL       LAG     AMSKK         X       TSK     STORA    ISPRAT
                                 1         0         0        0.        0.        0.        0.         0

NORMAL DEPTH CHANNEL ROUTING
----------------------------

       QN(1)     QN(2)     QN(3)     ELNVT     ELMAX     RLNTH       SEL
      0.0500    0.0500    0.0500      71.0      91.0      600.   0.02700

       CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
          0.     91.00    120.00     69.00    131.00     74.00    182.00     71.00    193.00     71.00
      195.00     74.00    239.00     79.00    400.00     87.00

STORAGE       0.        1.17      6.35      6.57      1.06      1.95      3.27      4.99      7.12      9.64
          12.55     15.36     17.56     23.66     28.16     33.05     38.26     43.64     49.19     54.91

OUTFLOW       0.     5086.65   17600.0    350.35    669.15   1267.87   2264.94   3760.26   5855.27   8619.81
        12157.01   16397.17   21559.17  27655.28  34748.43  42898.97  53140.56  64752.24  77485.87  91341.60

STAGE     71.00     72.05     73.11     74.16     75.21     76.26     77.32     78.37     79.42     80.47
          81.53     82.58     83.63     84.68     85.74     86.79     87.84     88.89     89.95     91.00

FLOW          0.     5086.66   17600.0    350.35    669.15   1267.87   2264.94   3760.26   5855.27   8619.81
        12157.01   16397.67   21559.17  27655.28  34748.43  42898.97  53140.56  64752.24  77485.87  91341.60

                           STATION    2000, PLAN 1, RTIO 1

                                      OUTFLOW
      1.        1.        0.        0.        0.        1.        0.        1.        1.        1.
      1.        1.        1.        1.        1.        1.        1.        1.        1.        1.
      1.        1.        1.        1.        1.        1.        1.        1.        1.        1.
      1.        1.        1.        1.        1.        1.        2.        2.        3.        3.
      4.        4.        4.        4.        4.        2.        4.        4.        3.        3.
      4.        4.        2.        2.        2.        4.        2.        2.        1.        1.
      1.        1.        1.        2.        3.        32.       5.        7.        10.       12.
      15.       17.       29.       22.       26.       238.      40.       51.       67.       86.
      112.      [illegible]   176.      203.      241.      273.      326.      357.      377.      389.
      379.      [illegible]   367.      323.      299.                248.      223.      206.      192.

                                      STOR
      0.        0.        0.        0.        0.
      0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
      0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
      [illegible]
```

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	1.	1.	1.	1.
1.	1.	1.	1.	1.	0.	0.	0.	0.	0.

STAGE

71.0	71.0	71.0	71.0	71.0	71.0	71.0	71.0	71.0	71.0
71.0	71.0	71.0	71.0	71.0	71.0	71.0	71.0	71.0	71.0
71.0	71.0	71.0	71.0	71.0	71.0	71.0	71.0	71.0	71.0
71.0	71.0	71.0	71.0	71.0	71.0	71.0	71.0	71.0	71.1
71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1
71.1	71.0	71.0	71.0	71.0	71.0	71.0	71.0	71.0	71.0
71.0	71.0	71.0	71.0	71.0	71.1	71.1	71.1	71.2	71.2
71.3	71.4	71.4	71.4	71.5	71.6	71.7	71.9	72.1	72.3
72.5	73.0	73.1	73.3	73.5	73.8	74.0	74.2	74.2	74.3
74.3	74.2	74.1	74.0	73.8	73.7	73.5	73.4	73.3	73.2

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	339.	330.	121.	59.	5681.
CMS	11.	9.	3.	2.	167.
INCHES		0.35	0.51	0.52	0.52
CM		8.88	13.01	13.17	13.17
AC-FT		164.	240.	243.	243.
THOUS CU M		202.	296.	300.	300.

MAXIMUM STORAGE = 1.

MAXIMUM STAGE IS 74.3

•DV I•

STATION 2000, PLAN 1, RTIO 2

OUTFLOW

12.	[illegible]	8.	4.	6.	6.	6.	7.	6.	8.
[illegible]	[illegible]	7.	[illegible]	7.	8.	7.	9.	7.	8.
[illegible]	[illegible]	7.	[illegible]	7.	8.	7.	9.	7.	8.
7.	[illegible]	8.	9.	11.	15.	20.	26.	33.	39.
[illegible]	[illegible]	52.	52.	51.	49.	47.	44.	41.	38.
[illegible]	[illegible]	29.	27.	25.	23.	21.	19.	18.	17.
[illegible]	[illegible]	18.	23.	33.	47.	68.	93.	121.	152.
[illegible]	[illegible]	223.	254.	315.	405.	488.	1034.	1376.	1626.
[illegible]	[illegible]	[illegible]	4412.	4909.	5387.	5576.	5576.	5338.	4940.
[illegible]	[illegible]	3552.	3128.	2744.	2416.	2125.	1872.	1647.	1451.

STOR

[illegible]	[illegible]	0.	0.	0.	0.	0.	0.	0.	0.
[illegible]	[illegible]	0.	0.	0.	0.	0.	0.	0.	0.
[illegible]	[illegible]	0.	0.	0.	0.	0.	0.	0.	0.
0.	[illegible]	0.	0.	0.	0.	0.	0.	0.	0.
0.	[illegible]	0.	0.	0.	0.	0.	0.	0.	0.
0.	[illegible]	0.	0.	0.	0.	0.	0.	0.	0.
[illegible]	[illegible]	0.	[illegible]	0.	0.	0.	0.	0.	0.
[illegible]	[illegible]	0.	0.	1.	1.	1.	2.	2.	3.
5.	[illegible]	5.	5.	6.	7.	7.	7.	7.	6.
5.	[illegible]	5.	4.	4.	3.	3.	3.	2.	2.

STAGE

71.2	71.3	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1
71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1
71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1
71.1	71.1	71.1	71.2	71.2	71.3	71.4	71.5	71.6	71.7
71.9	71.9	72.0	72.0	72.0	71.9	71.9	71.9	71.8	71.7
71.0	71.0	71.5	71.5	71.5	71.4	71.4	71.4	71.3	71.3
71.3	71.3	71.3	71.4	71.6	71.9	72.2	72.4	72.6	72.9
73.1	73.2	73.4	73.6	73.9	74.3	75.2	75.9	76.4	76.9
77.4	77.7	78.4	78.7	79.0	79.2	79.3	79.3	79.2	79.0
77.7	78.5	79.2	77.9	77.7	77.4	77.2	76.9	76.7	76.5

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5576.	4321.	1654.	803.	80289.
CMS	158.	122.	47.	23.	2274.
INCHES		4.85	7.00	7.08	7.09
CM		123.41	177.84	179.85	179.88
A.-FT		2277.	3281.	3318.	3318.
THOUS CU M		2808.	4047.	4092.	4092.

MAXIMUM STORAGE = 7.

MAXIMUM STAGE IS 79.3

STATION 2000, PLAN 1, RTIO 3

OUTFLOW

[illegible]	[illegible]	12.	[illegible]	12.	13.	12.	14.	13.	15.
[illegible]	[illegible]	14.	15.	14.	15.	15.	15.	15.	15.
[illegible]	[illegible]	15.	15.	15.	15.	15.	15.	15.	15.
15.	15.	16.	18.	23.	30.	40.	52.	66.	79.
[illegible]	[illegible]	103.	134.	103.	99.	93.	87.	81.	75.
[illegible]	[illegible]	51.	35.	49.	45.	42.	38.	36.	33.
31.	31.	36.	46.	66.	96.	136.	178.	217.	280.
[illegible]	[illegible]	529.	751.	924.	1199.	1609.	2162.	2861.	3738.
[illegible]	[illegible]	7536.	8399.	10830.	10802.	11180.	11129.	10649.	9827.
[illegible]	[illegible]	7038.	8182.	5432.	4772.	4199.	3691.	3253.	2859.

STOR

.	.	0.	0.	0.	0.	0.	0.	0.	0.
.	0.	0.	0.	0.	0.	0.	0.	0.	0.
.	0.	0.	0.	0.	0.	0.	0.	0.	0.
.	0.	0.	0.	0.	0.	0.	0.	0.	0.
.	0.	0.	0.	0.	0.	0.	0.	0.	0.
.	0.	0.	0.	0.	0.	0.	0.	0.	0.
.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1.	1.	1.	1.	1.	2.	2.	3.	4.	5.
8.	7.	9.	10.	11.	11.	12.	12.	11.	11.
10.	9.	8.	7.	7.	6.	5.	5.	4.	4.

STAGE

71.2	71.2	71.2	71.2	71.2	71.2	71.2	71.3	71.2	71.3
71.3	71.3	71.3	71.3	71.3	71.3	71.3	71.3	71.3	71.3
71.3	71.3	71.3	71.3	71.3	71.3	71.3	71.3	71.3	71.3
71.3	71.3	71.3	71.3	71.4	71.6	71.7	72.0	72.1	72.2
72.3	72.3	72.5	72.5	72.5	72.4	72.4	72.3	72.3	72.2
72.2	72.1	72.1	72.0	71.9	71.8	71.8	71.7	71.7	71.6
71.5	71.5	71.7	71.9	72.1	72.4	72.7	73.1	73.3	73.7
74.2	74.3	75.1	75.4	75.7	76.1	76.6	77.2	77.7	78.4
79.9	79.8	80.1	80.6	80.9	81.1	81.2	81.2	81.1	80.8
80.5	80.2	79.9	79.5	79.2	78.9	78.6	78.3	78.0	77.7

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	11195.	9137.	3340.	1621.	162119.
CMS	317.	260.	95.	46.	4591.
INCHES		9.72	14.14	14.30	14.30
MM		246.94	359.12	363.15	363.15
AC-FT		4565.	6625.	6699.	6699.
THOUS CU M		5619.	8172.	8263.	8263.

MAXIMUM STORAGE = 12. .

MAXIMUM STAGE = 81.2

HYDROGRAPH ROUTING

	ISAVE	JOUTP	IECHO	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
	3700	1	0	0	0	0	1	0	0

ROUTING DATA

		AVG	IRES	ISAME	IOPT	IPMP		LSTR
			1	1	0	0		0

	STPS	ISTOL	LAG	AMSKK	X	TSK	STORA	ISPRAT
	1	0	0	0.	0.	0.	0.	0

NORMAL DEPTH CHANNEL ROUTING

0.050	0.050	0.050	57.0	174.00	17 0.	0.000000

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

0.	74.00	164.00	64.00	169.00	60.00	162.00	57.00	172.00	57.00
175.00	60.00	241.00	65.00	350.00	74.00				

STORAGE	0.	9.38	0.00	1.28	1.95	3.30	5.37	8.15	11.66	15.92
	20.97	26.62	33.25	40.38	49.09	58.19	67.90	78.50	89.88	102.05
OUTFLOW	0.	21.70	68.61	139.69	236.50	409.12	689.89	1110.80	1698.26	2474.99
	3475.44	4627.79	6256.40	8084.54	10234.63	12728.25	15586.35	18829.25	22476.73	26548.13
STAGE	57.00	57.79	58.27	59.08	60.56	61.47	62.37	63.26	64.16	65.05
	65.93	66.84	67.74	68.63	69.53	70.42	71.32	72.21	73.11	74.00
FLOW	0.	21.70	68.61	139.69	236.50	409.12	689.89	1110.80	1698.26	2474.99
	3475.44	4627.79	6256.40	8084.54	10234.63	12728.25	15586.35	18829.25	22476.73	26548.13

STATION 3700, PLAN 1, RTIO 1

OUTFLOW

1.	1.	0.	0.	0.	0.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	2.	2.	3.
3.	4.	4.	4.	4.	4.	4.	4.	3.	3.
2.	2.	2.	2.	2.	2.	2.	2.	1.	1.
1.	1.	1.	2.	2.	3.	5.	6.	9.	11.
15.	19.	19.	21.	25.	30.	38.	48.	63.	83.
107.	134.	171.	199.	234.	274.	320.	351.	374.	367.
341.	307.	280.	228.	303.	278.	252.	228.	208.	195.

STOR

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	1.	1.	1.	1.
1.	1.	2.	2.	2.	2.	3.	3.	3.	3.
3.	3.	3.	3.	2.	2.	2.	2.	2.	2.

STAGE

57.0	57.0	57.0	57.0	57.0	57.0	57.0	57.0	57.0	57.0
57.0	57.0	57.0	57.0	57.0	57.0	57.0	57.0	57.0	57.0
57.0	57.0	57.0	57.0	57.0	57.0	57.0	57.0	57.0	57.0
57.0	57.0	57.0	57.0	57.0	57.0	57.1	57.1	57.1	57.1
57.1	57.2	57.2	57.2	57.2	57.2	57.2	57.1	57.1	57.1
57.1	57.1	57.1	57.1	57.1	57.1	57.1	57.1	57.1	57.1
57.1	57.1	57.1	57.1	57.1	57.1	57.2	57.3	57.4	57.5
57.5	57.7	57.8	57.9	58.0	58.1	58.2	58.4	58.7	59.0
59.3	59.7	60.0	60.2	60.6	60.8	61.0	61.2	61.3	61.4
61.3	61.3	61.2	61.1	60.9	60.8	60.7	60.5	60.3	60.2

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	387.	330.	120.	58.	5841.
CMS	11.	9.	3.	2.	165.
INCHES		0.35	0.51	0.52	0.52
MM		4.88	12.92	13.08	13.08
AC-FT		144.	238.	241.	241.
THOUS CU M		178.	294.	298.	298.

MAXIMUM STORAGE = 3.

MAXIMUM STAGE IS 61.4

DVH

STATION 3700, PLAN 1, RTIO 2

OUTFLOW

1.	1.	1.	1.	5.	6.	6.	7.	7.	7.
7.	7.	7.	7.	7.	7.	7.	7.	7.	7.
7.	7.	7.	7.	7.	7.	6.	7.	8.	7.
1.	1.	1.	1.	10.	12.	16.	24.	32.	38.
44.	47.	51.	52.	52.	50.	47.	44.	41.	38.
35.	32.	30.	27.	25.	23.	21.	20.	18.	17.
15.	15.	17.	21.	30.	44.	63.	88.	116.	147.
179.	215.	219.	255.	305.	365.	823.	982.	1325.	1755.
2267.	2777.	3330.	3826.	4917.	5348.	5569.	5581.	5376.	4991.
4539.	4067.	3609.	3177.	2790.	2453.	2164.	1902.	1677.	1479.

STOR

0.	0.	1.	1.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	1.	1.	1.	1.	1.
2.	2.	2.	2.	2.	3.	5.	7.	9.	12.
19.	23.	22.	25.	23.	30.	30.	31.	30.	28.
25.	24.	22.	19.	18.	16.	14.	13.	12.	10.

STAGE

57.5	57.2	57.1	57.2	57.2	57.3	57.3	57.3	57.3	57.3
57.3	57.3	57.2	57.3	57.3	57.3	57.3	57.3	57.3	57.3
57.3	57.3	57.3	57.3	57.3	57.3	57.3	57.3	57.3	57.3
57.3	57.3	57.3	57.4	57.4	57.6	57.7	57.9	58.1	58.2
58.3	58.4	58.5	58.5	58.5	58.4	58.4	58.3	58.3	58.2
58.2	58.1	58.0	58.0	58.0	57.9	57.9	57.8	57.8	57.7
57.7	57.6	57.7	57.9	58.1	58.3	58.7	59.1	59.4	59.8
60.3	60.2	60.4	60.7	60.9	61.4	62.2	63.0	63.6	64.2
64.7	65.3	66.1	66.6	67.0	67.2	67.3	67.3	67.2	67.0
66.7	66.4	66.0	65.7	65.3	65.0	64.7	64.4	64.1	63.8

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5581.	4539.	1649.	800.	83044.
CMS	158.	130.	47.	23.	2267.
INCHES		4.85	6.98	7.06	7.06
MM		123.35	177.30	179.30	179.30
AC-FT		2276.	3271.	3308.	3308.
THOUS CU M		2807.	4034.	4080.	4080.

MAXIMUM STORAGE = 31.

MAXIMUM STAGE IS 67.3

STATION 3700, PLAN 1, RTID 3

OUTFLOW

27.	[illegible]	6.	11.	10.	12.	13.	13.	14.	14.
[illegible]	[illegible]	15.	15.	15.	15.	15.	15.	15.	15.
[illegible]	[illegible]	15.	15.	15.	15.	15.	15.	15.	15.
15.	15.	16.	17.	21.	28.	38.	50.	63.	77.
[illegible]	97.	103.	104.	103.	99.	94.	88.	82.	76.
[illegible]	[illegible]	50.	54.	50.	46.	42.	39.	36.	34.
32.	31.	34.	43.	61.	90.	129.	171.	211.	266.
[illegible]	[illegible]	599.	734.	891.	1151.	1544.	2081.	2766.	3626.
6757.	[illegible]	7472.	8783.	9933.	10752.	11163.	11153.	10703.	9914.
599.	[illegible]	7129.	8262.	9510.	9436.	9263.	3744.	3303.	2906.

STOR

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	0.
0.	0.	0.	1.	1.	1.	1.	2.	2.	2.
2.	4.	5.	6.	7.	8.	11.	14.	17.	22.
27.	33.	38.	44.	49.	51.	52.	52.	51.	48.
44.	41.	37.	33.	30.	27.	25.	22.	20.	18.

STAGE

57.2	57.2	57.2	57.4	57.4	57.5	57.5	57.6	57.6	57.6
57.6	57.6	57.6	57.6	57.6	57.6	57.6	57.6	57.6	57.6
57.6	57.6	57.6	57.6	57.6	57.6	57.6	57.6	57.6	57.6
57.6	57.6	57.6	57.7	57.9	58.0	58.2	58.4	58.7	58.9
59.1	59.2	59.2	59.3	59.2	59.2	59.1	59.1	59.0	58.9
58.8	58.7	58.6	58.5	58.4	58.4	58.3	58.2	58.2	58.1
58.1	58.1	58.1	58.3	58.6	59.1	59.6	60.0	60.3	60.7
61.1	61.6	62.1	62.5	62.8	63.3	63.9	64.6	65.3	66.1
66.9	67.6	68.3	68.9	69.4	69.7	69.9	69.9	69.7	69.4
69.0	68.6	68.2	67.7	67.3	66.9	66.5	66.1	65.8	65.4

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	11164.	9135.	3331.	1617.	161692.
CMS	316.	260.	94.	46.	4579.
INCHES		9.72	14.10	14.26	14.26
MM		246.90	358.18	362.20	362.20
AC-FT		4555.	6607.	6681.	6681.
THOUS CU M		5618.	8150.	8241.	8241.

MAXIMUM STORAGE = 52.

MAXIMUM STAGE IS 69.9

[illegible] FLOW FREQUENCY (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	RATIOS APPLIED TO FLOWS RATIO 1 0.04	RATIO 2 0.50	RATIO 3 1.00
HYDROGRAPH AT	1	4.79	1	449.	5611.	11221.
		(0.[illegible]		(12.71)(	158.87)(	317.75)(
ROUTED TO	1	4.79	1	389.	5586.	11187.
		(0.[illegible]		(11.02)(	158.17)(	316.78)(
ROUTED TO	1[illegible]0	4.79	1	389.	5587.	11190.
		(0.[illegible]		(11.01)(	158.21)(	316.87)(
ROUTED TO	1[illegible]0	4.79	1	389.	5580.	11185.
		(0.[illegible]		(11.01)(	158.02)(	316.73)(
ROUTED TO	2[illegible]0	4.79	1	389.	5576.	11186.
		(0.[illegible]		(11.01)(	157.91)(	316.76)(
ROUTED TO	3[illegible]0	4.79	1	387.	5581.	11163.
		(0.[illegible]		(10.95)(	158.04)(	316.11)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	114.20	114.20	117.50
STORAGE	40.	40.	97.
OUTFLOW	0.	0.	373.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.04	117.55	0.05	99.	389.	1.50	45.00	0.
0.50	121.32	3.82	183.	5586.	12.50	43.50	0.
1.00	123.82	6.32	240.	11187.	14.50	43.50	0.

PLAN 1 STATION 1000

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.04	389.	98.3	45.00
0.50	5567.	103.0	43.50
1.00	11190.	105.7	43.50

PLAN 1 STATION 1400

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.04	389.	90.9	45.00
0.50	5580.	94.8	43.50
1.00	11185.	96.5	43.50

PLAN 1 STATION 2000

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.04	389.	74.3	45.00
0.50	5576.	79.3	43.50
1.00	11186.	81.2	43.50

PLAN 1 STATION 3700

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.04	387.	61.4	45.00
0.50	5561.	67.3	44.00
1.00	11163.	69.9	43.50

```
*****
FLUID HYDRODYNAMICS, INCORPORATED (FHI)
DAM SAFETY VERSION                    JULY 1977
  LAST MODIFICATION:  28 APR 78
  PROTECTED BY COPYRIGHT LAW (P.L. 94-553)
*****

**********
THIS PROGRAM IS CURRENTLY BEING MODIFIED
TO INCLUDE THE DAM-BREACH OPTION

PLEASE REPORT ANY ERRORS, OMISSIONS, OR DIFFICULTIES
TO DAVE TILLSTON (617) 491-2450 X-504
**********
    1              ANALYSIS OF LAKE DAM
    2              A RIF HIGH RATIOS - ANALYSIS
    3              A1 DATE
    4              B    1.0          .4       0       0       0       0       0       0       0
    5              B1     5
    6              J      1       3       1
    7              J1   .04      .5       1
    8              K               1                                       1
    9              K1                                 INFLOW HYDROGRAPH
   10              M      1       1    3.79                       .795                    1
   11              P              17.5     111     123     132     142
   12              T                                                       1      .1
   13              U    9.05     .625
   14              X     15      15       1
   15              Y      1       1                                       1
   16              Y1 ROUTED HYDROGRAPH  BREACH
   17              Y                               1       1
   18              Y1     1                                        -114.2      -1
   19              Y2 114.2   116.3   117.5
   20              Y2         315.4   372.
   21              Y5     1    20.7    63.     97.4
   22              Y6 112.5   113.4     11    117.5
   23              Y8 114.
   24              Y9 117.    1.E+7     1.5     200
   25              Z      1      .1   107.      .5   114.2   117.5
```

```
Y                                   1       1
Y1      1
Y5  .05     .05     .05     97      120     15      .8
Y7  0       120     115     110     120     100     122     97      131     97
Y7  134     100     134     116     205     118
K       1   1400                                    1
K1  LOCATION  END OF PLANS
Y                                   1       1
Y1      1
Y5  .05     .05     .05     37      100     400     .025
Y7  0       100     50      94      160     90      162     87      168     87
Y7  170     90      134     90      290     100
K       1   2000                                    1
K1  LOCATION FIRST HOUSE DOWNSTREAM
Y                                   1       1
Y1      1
Y5  .05     .05     .05     71      91      600     .027
Y7  0       91      120     80      180     74      182     71      193     71
Y7  195     74      240     79      400     87
K       1   3750                                    1
K1  LOCATION INTERSECTION CR 4
Y                                   1       1
Y1      1
Y5  .05     .05     .05     57      74      1700    .008
Y7  0       74      120     64      160     60      162     57      172     57
Y7  175     60      240     65      360     74
K       29
A
A
A
A
A
```

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

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1	RATIO 2	RATIO 3
				0.04	0.50	1.00
HYDROGRAPH AT	1	8.79	1	449.	5611.	11221.
		(0.30E 19)		(12.71)(	158.87)(	317.75)(
ROUTED TO	1	8.79	1	1370.	5585.	11180.
		(0.30E 19)		(38.79)(	158.15)(	316.81)(
ROUTED TO	1000	8.79	1	1370.	5586.	11191.
		(0.23E 19)		(38.78)(	158.10)(	316.90)(
ROUTED TO	1400	8.79	1	1315.	5600.	11159.
		(0.23E 18)		(37.25)(	159.58)(	315.99)(
ROUTED TO	2000	8.79	1	1252.	5600.	11165.
		(0.42E 18)		(35.46)(	158.56)(	316.17)(
ROUTED TO	3700	8.79	1	1191.	5581.	11174.
		(0.61E 18)		(33.73)(	158.05)(	316.41)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	114.20	114.20	117.50
STORAGE	40.	40.	97.
OUTFLOW	0.	0.	373.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.04	117.53	0.03	98.	1370.	1.64	45.00	44.50
0.50	120.32	2.82	161.	5585.	10.44	43.50	39.00
1.00	122.80	5.30	217.	11188.	12.39	43.50	36.00

PLAN 1 STATION 1000

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.04	1370.	99.6	45.00
0.50	5586.	103.0	43.50
1.00	11191.	105.7	43.50

PLAN 1 STATION 1400

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.04	1315.	92.3	45.00
0.50	5600.	94.8	44.00
1.00	11159.	96.5	43.50

PLAN 1 STATION 2000

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.04	1252.	76.2	45.00
0.50	5600.	79.3	44.00
1.00	11165.	81.2	43.50

PLAN 1 STATION 3700

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.04	1191.	63.4	45.50
0.50	5581.	67.3	43.50
1.00	11174.	69.9	43.50

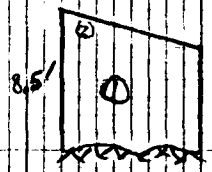
APPENDIX D

STABILITY COMPUTATIONS

RAMBOUILLET LAKE DAM 10/23/79

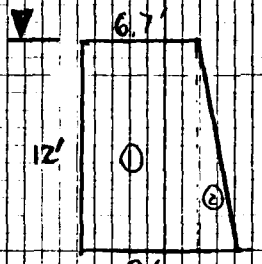
SECTIONS BASED ON 1929 PLANS & FIELD MEASUREMENTS

SPILLWAY SECTION



No.	AREA	DISTANCE TO CENTROID
1	6(8) = 48	4
2	½(2)(8.5) = 8.5	5.33

MAIN DAM SECTION



No.	AREA	DIST TO CENTROID
1	6.7(12) = 80.4	5.65
2	½(2.3)(12) = 13.8	1.53

INPUT TO STABILITY ANALYSIS PROGRAM

INPUT ENTRY	PROGRAM No.
Unit Weight of Dam (K/ft^3)	0
Area of Segment No. 1 (ft^2)	1
Distance from Center of Gravity of Segment No. 1 to Downstream Toe (ft)	2
Area of Segment No. 2 (ft^2)	3
Distance from Center of Gravity of Segment No. 2 to Downstream Toe (ft)	4
Area of Segment No. 3 (ft^2)	5
Distance from Center of Gravity of Segment No. 3 to Downstream Tow (ft)	6
Base Width of Dam (Total) (ft)	7
Height of Dam (ft)	8
Ice Loading (K/L ft.)	9
Coefficient of Sliding	10
Unit Weight of Soil (K/ft^3)	11
Active Soil Coefficient - Ka	12
Passive Soil Coefficient - Kp	13
Height of Water over Top of Dam or Spillway (ft)	14
Height of Soil for Active Pressure (ft)	15
Height of Soil for Passive Pressure (ft)	16
Height of Water in Tailrace Channel (ft)	17
Weight of Water (K/ft^3)	18
Area of Segment No. 4 (ft^2)	19
Distance from Center of Gravity of Segment No. 4 to Downstream Toe (ft)	20
Height of Ice Load or Active Water (ft)	46

MAIN DAM SECTION
NORMAL CONDITIONS

0.15	RCL 1
80.4 80.4	RCL 2
5.65 5.65	RCL 3
13.8 13.8	RCL 4
1.53 1.53	RCL 5
0. 0.	RCL 6
0. 0.	RCL 7
9. 9.	RCL 8
12. 12.	RCL 9
0. 0.	RCL 10
0.65 0.65	RCL 11
0.055 0.055	RCL 12
0.33 0.33	RCL 13
3. 3.	RCL 14
0. 0.	RCL 15
12. 12.	RCL 16
0. 0.	RCL 17
2. 2.	RCL 18
0.0624 0.0624	RCL 19
0. 0.	RCL 20
0. 0.	RCL 46
12.	

1.58388323 —— F.S. VS. OVERTURNING —— .4203983682
2.577607169 —— -6.189403959
1.164566522 —— F.S. VS. SLIDING —— .4274804425

MAIN DAM SECTION
ICE LOADING - 10000 lb/ft

0.15	RCL 1
80.4 80.4	RCL 2
5.65 5.65	RCL 3
13.8 13.8	RCL 4
1.53 1.53	RCL 5
0. 0.	RCL 6
0. 0.	RCL 7
9. 9.	RCL 8
12. 12.	RCL 9
10. 10.	RCL 10
0.65 0.65	RCL 11
0.055 0.055	RCL 12
0.33 0.33	RCL 13
3. 3.	RCL 14
0. 0.	RCL 15
12. 12.	RCL 16
0. 0.	RCL 17
2. 2.	RCL 18
0.0624 0.0624	RCL 19
0. 0.	RCL 20
0. 0.	RCL 46
12.	

MAIN DAM SECTION
½PMF FLOW

0.15	RCL 1
80.4	
80.4	RCL 2
5.65	
5.65	RCL 3
13.8	
13.8	RCL 4
1.53	
1.53	RCL 5
0.	
0.	RCL 6
0.	
0.	RCL 7
9.	
9.	RCL 8
12.	
12.	RCL 9
0.	
0.	RCL 10
0.65	
0.65	RCL 11
0.055	
0.055	RCL 12
0.33	
0.33	RCL 13
3.	
3.	RCL 14
3.81	
3.81	RCL 15
12.	
12.	RCL 16
0.	
0.	RCL 17
2.	
2.	RCL 18
0.0624	
0.0624	RCL 19
0.	
0.	RCL 20
0.	
0.	RCL 46
12.	

MAIN DAM SECTION
PMF FLOW ET,

0.15	RCL 1
80.4	
80.4	RCL 2
5.65	
5.65	RCL 3
13.8	
13.8	RCL 4
1.53	
1.53	RCL 5
0.	
0.	RCL 6
0.	
0.	RCL 7
9.	
9.	RCL 8
12.	
12.	RCL 9
0.	
0.	RCL 10
0.65	
0.65	RCL 11
0.055	
0.055	RCL 12
0.33	
0.33	RCL 13
3.	
3.	RCL 14
6.3	
6.3	RCL 15
12.	
12.	RCL 16
0.	
0.	RCL 17
2.	
2.	RCL 18
0.0624	
0.0624	RCL 19
0.	
0.	RCL 20
0.	
0.	RCL 46
12.	

1.[illegible] —— F.S. VS. OVERTURNING —— .[illegible]

.[illegible]

.[illegible] —— F.S. VS. SLIDING —— .[illegible]

Main Dam Section
Seismic Analysis

	0
0.142	
0.142	RCL 1
80.4	
80.4	RCL 2
5.65	
5.65	RCL 3
13.8	
13.8	RCL 4
1.53	
1.53	RCL 5
0.	
0.	RCL 6
0.	
0.	RCL 7
9.	
9.	RCL 8
12.	
12.	RCL 9
0.	
0.	RCL 10
0.65	
0.65	RCL 11
0.055	
0.055	RCL 12
0.33	
0.33	RCL 13
0.	
3.	RCL 14
0.	
0.	RCL 15
12.	
12.	RCL 16
0.	
0.	RCL 17
2.	
2.	RCL 18
0.0624	
0.0624	RCL 19
0.	
0.	RCL 20
0.	
0.	RCL 46
12.	
12.	RCL 50
0.05	
1.498561179	
2.930629044	
1.000105525	
1.3[illegible]59395	F.S. OVERTURNING
1.0[illegible]5707	
.1[illegible]	F.S. SLIDING

Seismic Analysis

SPILLWAY SECTION
NORMAL CONDITIONS

0.15	RCL 1
48.	
48.	RCL 2
4.	
4.	RCL 3
8.5	
8.5	RCL 4
5.33	
5.33	RCL 5
0.	
0.	RCL 6
0.	
0.	RCL 7
8.	
8.	RCL 8
8.5	
8.5	RCL 9
0.	
0.	RCL 10
0.65	
0.65	RCL 11
0.055	
0.055	RCL 12
0.33	
0.33	RCL 13
3.	
3.	RCL 14
0.	
0.	RCL 15
8.5	
8.5	RCL 16
0.	
0.	RCL 17
2.	
2.	RCL 18
0.0624	
0.0624	RCL 19
0.	
0.	RCL 20
0.	
0.	RCL 46
18.5	

SPILLWAY SECTION
ICE LOADING
10000 PSF

0.15	RCL 1
48.	
48.	RCL 2
4.	
4.	RCL 3
8.5	
8.5	RCL 4
5.33	
5.33	RCL 5
0.	
0.	RCL 6
0.	
0.	RCL 7
8.	
8.	RCL 8
8.5	
8.5	RCL 9
10.	
10.	RCL 10
0.65	
0.65	RCL 11
0.055	
0.055	RCL 12
0.33	
0.33	RCL 13
3.	
3.	RCL 14
0.	
0.	RCL 15
8.5	
8.5	RCL 16
0.	
0.	RCL 17
2.	
2.	RCL 18
0.0624	
0.0624	RCL 19
0.	
0.	RCL 20
0.	
0.	RCL 46
13.5	

.79 [illegible] —— F.S. VS. OVERTURNING —— 0.[illegible]

-1.59 [illegible] -33.[illegible]

.34[illegible] —— F.S. VS. SLIDING —— .18[illegible]

SPILLWAY SECTION
½ PMF

0.15	RCL 1
48. 48.	RCL 2
4. 4.	RCL 3
8.5 8.5	RCL 4
5.33 5.33	RCL 5
0. 0.	RCL 6
0. 0.	RCL 7
8. 8.	RCL 8
8.5 8.5	RCL 9
0. 0.	RCL 10
0.65 0.65	RCL 11
0.055 0.055	RCL 12
0.33 0.33	RCL 13
3. 3.	RCL 14
3.81 3.81	RCL 15
8.5 8.5	RCL 16
0. 0.	RCL 17
2. 2.	RCL 18
0.0624 0.0624	RCL 19
0. 0.	RCL 20
0. 0.	RCL 46
18.5	

.66[illegible] — F.S. VS. OVERTURNING

-3.0[illegible]

0.2[illegible] — F.S. VS. SLIDING

SPILLWAY SECTION
PMF

0.15	RCL 1
48. 48.	RCL 2
4. 4.	RCL 3
8.5 8.5	RCL 4
5.33 5.33	RCL 5
0. 0.	RCL 6
0. 0.	RCL 7
8. 8.	RCL 8
8.5 8.5	RCL 9
0. 0.	RCL 10
0.65 0.65	RCL 11
0.055 0.055	RCL 12
0.33 0.33	RCL 13
3. 3.	RCL 14
6.3 6.3	RCL 15
8.5 8.5	RCL 16
0. 0.	RCL 17
2. 2.	RCL 18
0.0624 0.0624	RCL 19
0. 0.	RCL 20
0. 0.	RCL 46
18.5	

.605[illegible]

-3.[illegible]

.26[illegible]

SPILLWAY-SECTION SEISMIC ANALYSIS

0.142	RCL 1
46. 46.	RCL 2
4. 4.	RCL 3
8.5 8.5	RCL 4
5.33 5.33	RCL 5
0. 0.	RCL 6
0. 0.	RCL 7
8. 8.	RCL 8
8.5 8.5	RCL 9
0. 0.	RCL 10
0.65 0.65	RCL 11
0.055 0.055	RCL 12
0.33 0.33	RCL 13
3. 3.	RCL 14
6.3 6.3	RCL 15
8.5 8.5	RCL 16
0. 0.	RCL 17
2. 2.	RCL 18
0.0624 0.0624	RCL 19
0. 0.	RCL 20
0. 0.	RCL 46
18.5 18.5	RCL 50
0.05	

.5729347073

+4.66.059961

.2[illegible]

SEISMIC ANALYSIS
- F.S. VS. OVERTURNING .5[illegible]
- [illegible]
- F.S. VS. SLIDING [illegible]

APPENDIX E

REFERENCES

APPENDIX E

REFERENCES

1) U.S. Department of Commerce, Technical Paper No. 40, Rainfall Frequency Atlas of the United States, May 1961.

2) H.W. King and E.F. Brater, Handbook of Hydraulics, 5th edition, McGraw-Hill, 1963.

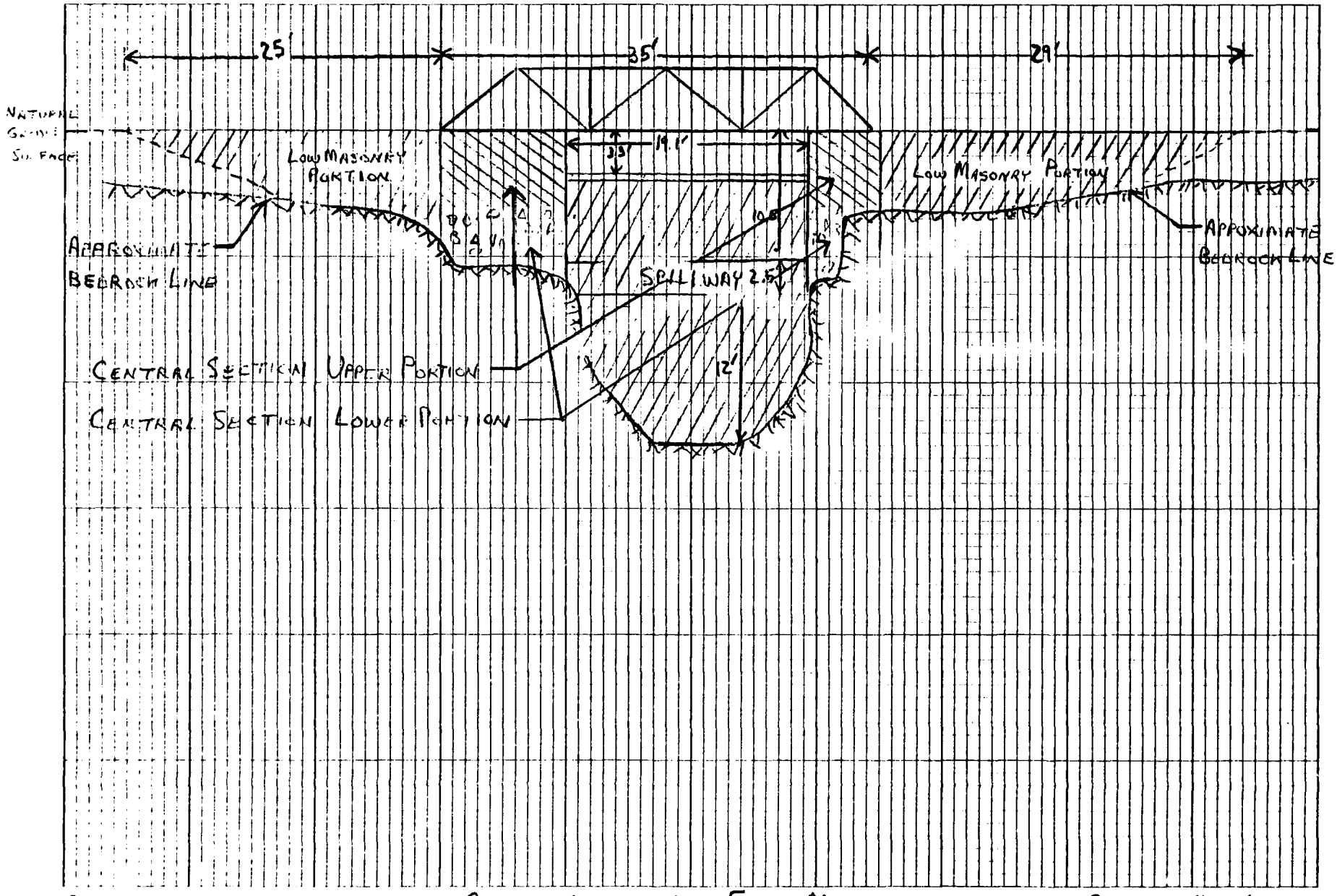
3) University of the State of New York, Geology of New York, Education Leaflet 20, Reprinted 1973.

4) Elwyn E. Seelye, Design, 3rd edition, John Wiley and Sons, Inc., 1960

5) U.S. Department of the Interior, Bureau of Reclamation; Design of Small Dams, 2nd edition (rev. reprint), 1977.

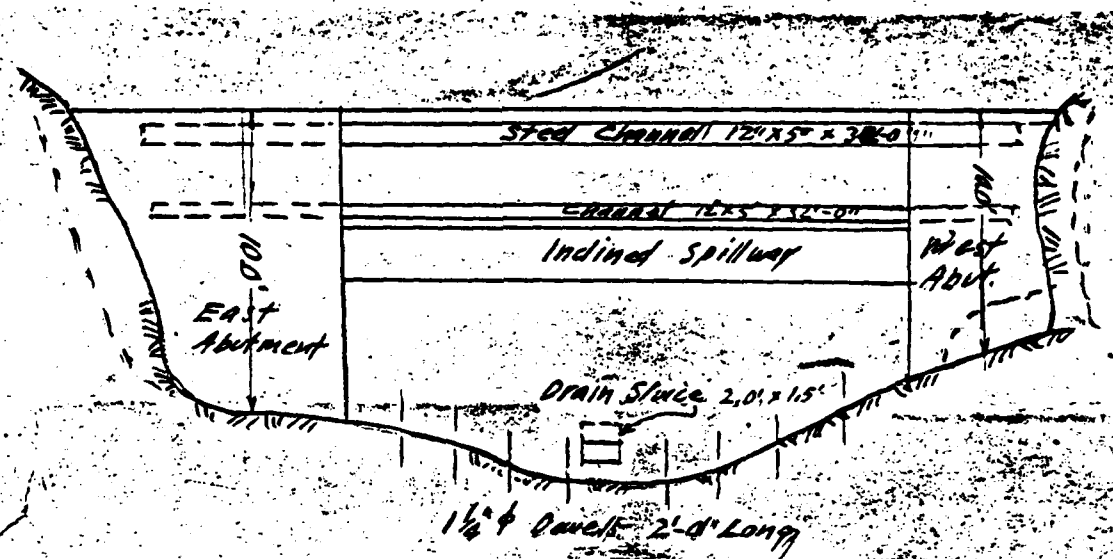
APPENDIX F

DRAWINGS

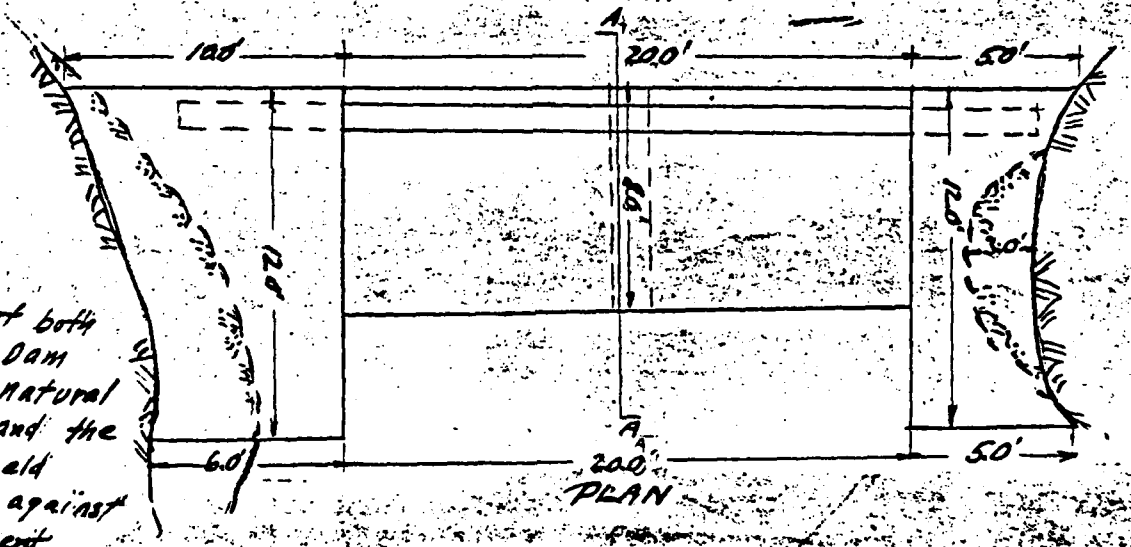


RAINBOW LAKE DAM - N.Y. 18 SKETCH BASED ON FIELD MEASUREMENTS SCALE 1"=10'

Proposed Dam Reconstruction

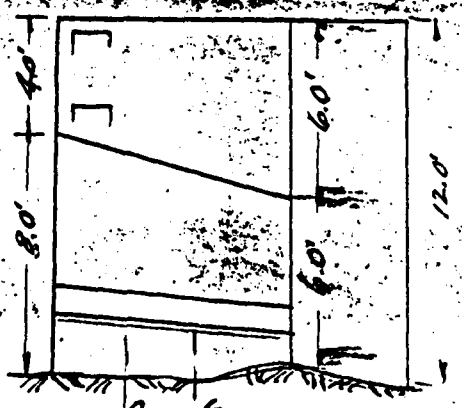


ELEVATION



PLAN

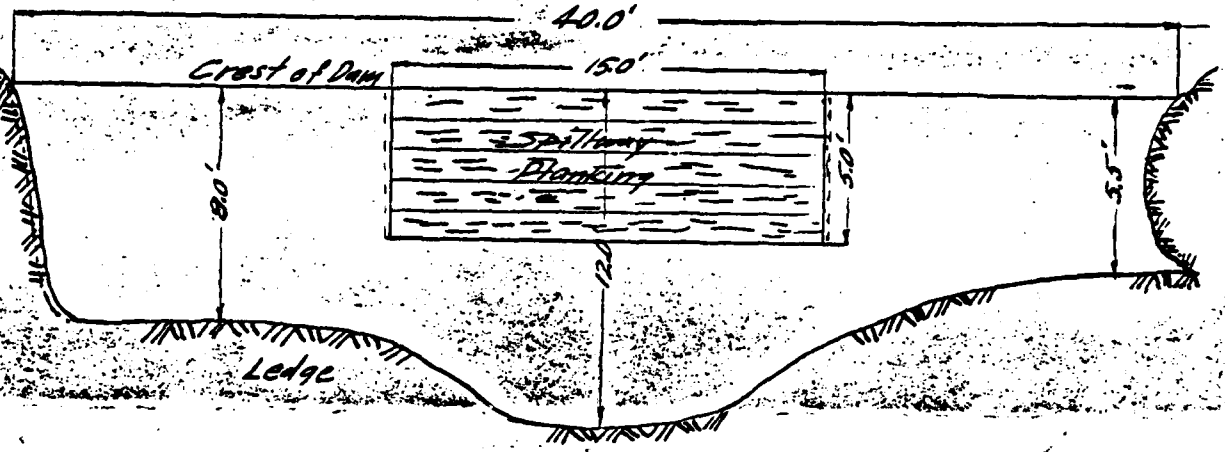
NOTE:
Ledge at both ends of Dam provides natural keyways and the dam is held securely against movement.



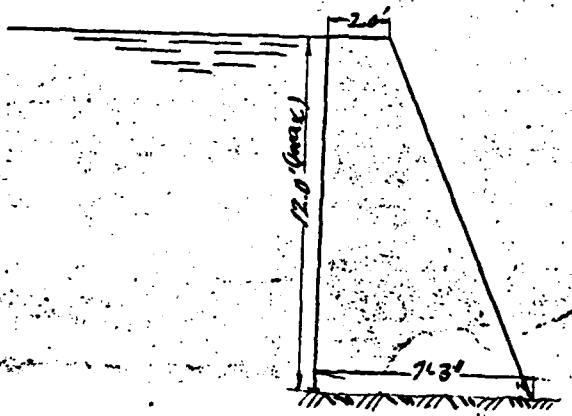
SECTION A-A.

Drawn by: H. Baltimore
7-11-29.

PROPOSED DAM RECONSTRUCTION



FRONT ELEVATION

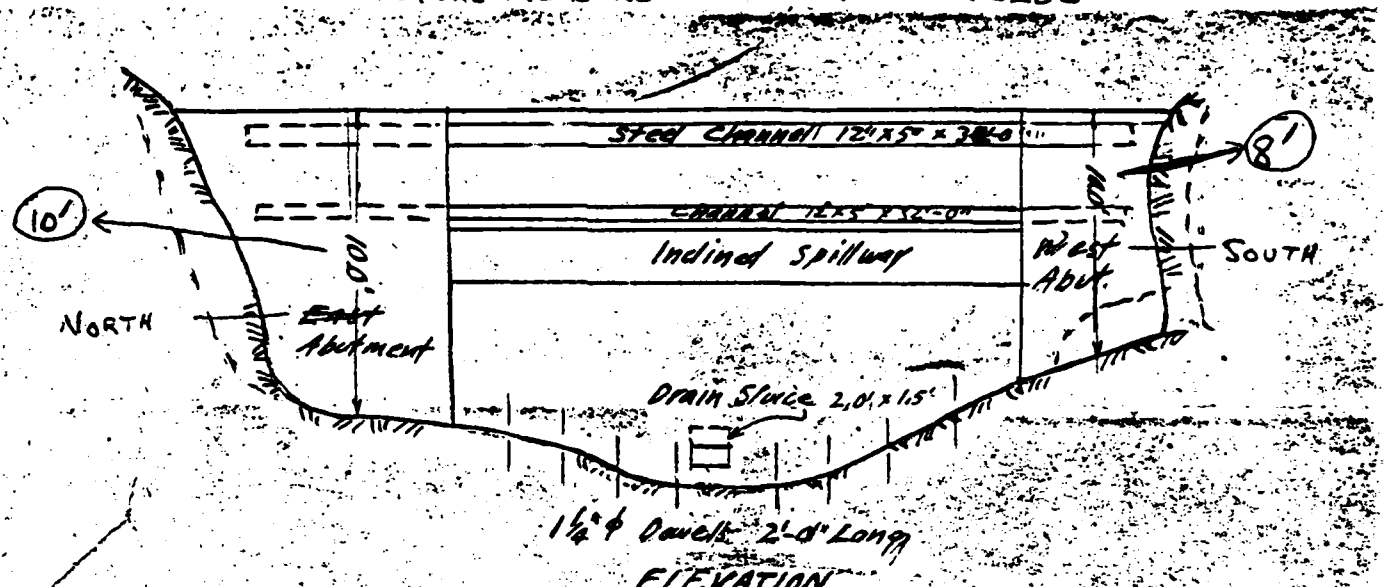


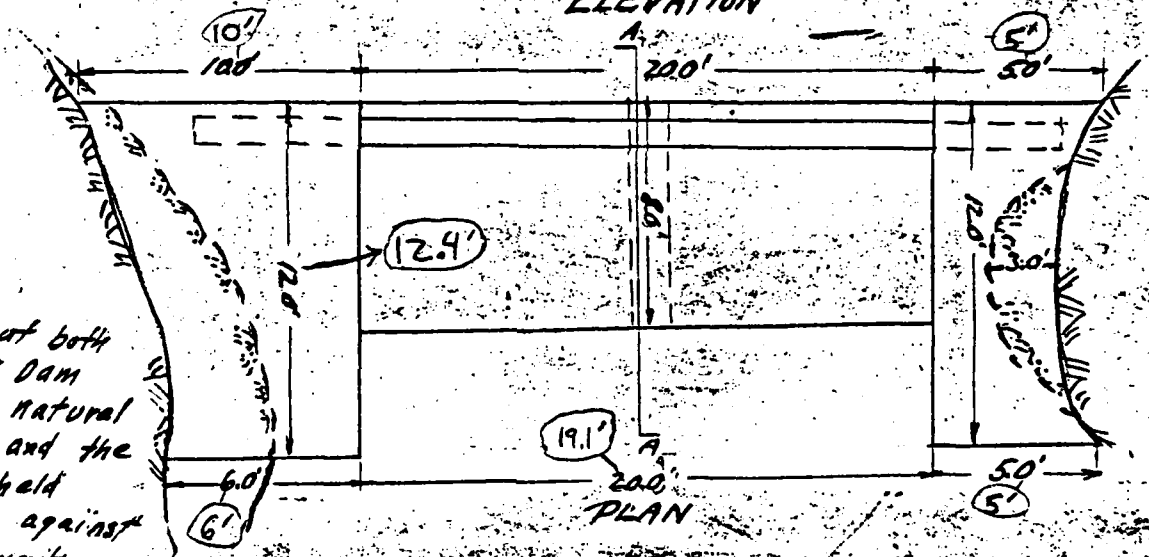
SECTION

Drawn by: H.B. Atkinson
7-2-'29

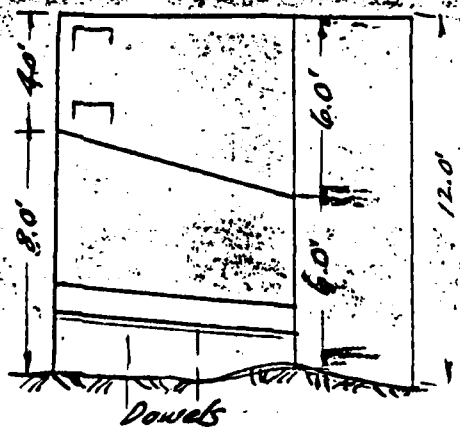
PROPOSED DAM RECONSTRUCTION
FIELD MEASUREMENTS

ACTUAL MEASUREMENTS ARE CIRCLED





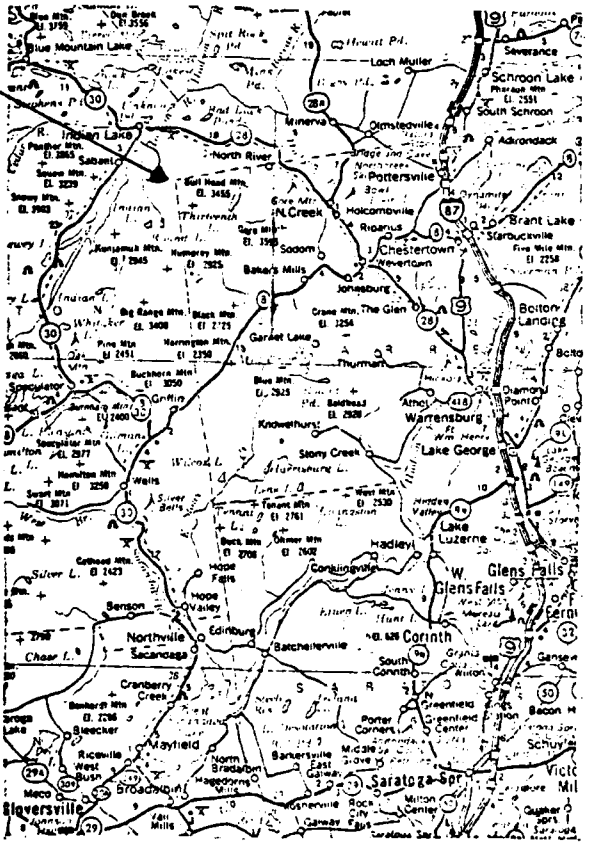
NOTE:
Ledge at both ends of Dam provides natural keyways and the dam is held securely against movement.



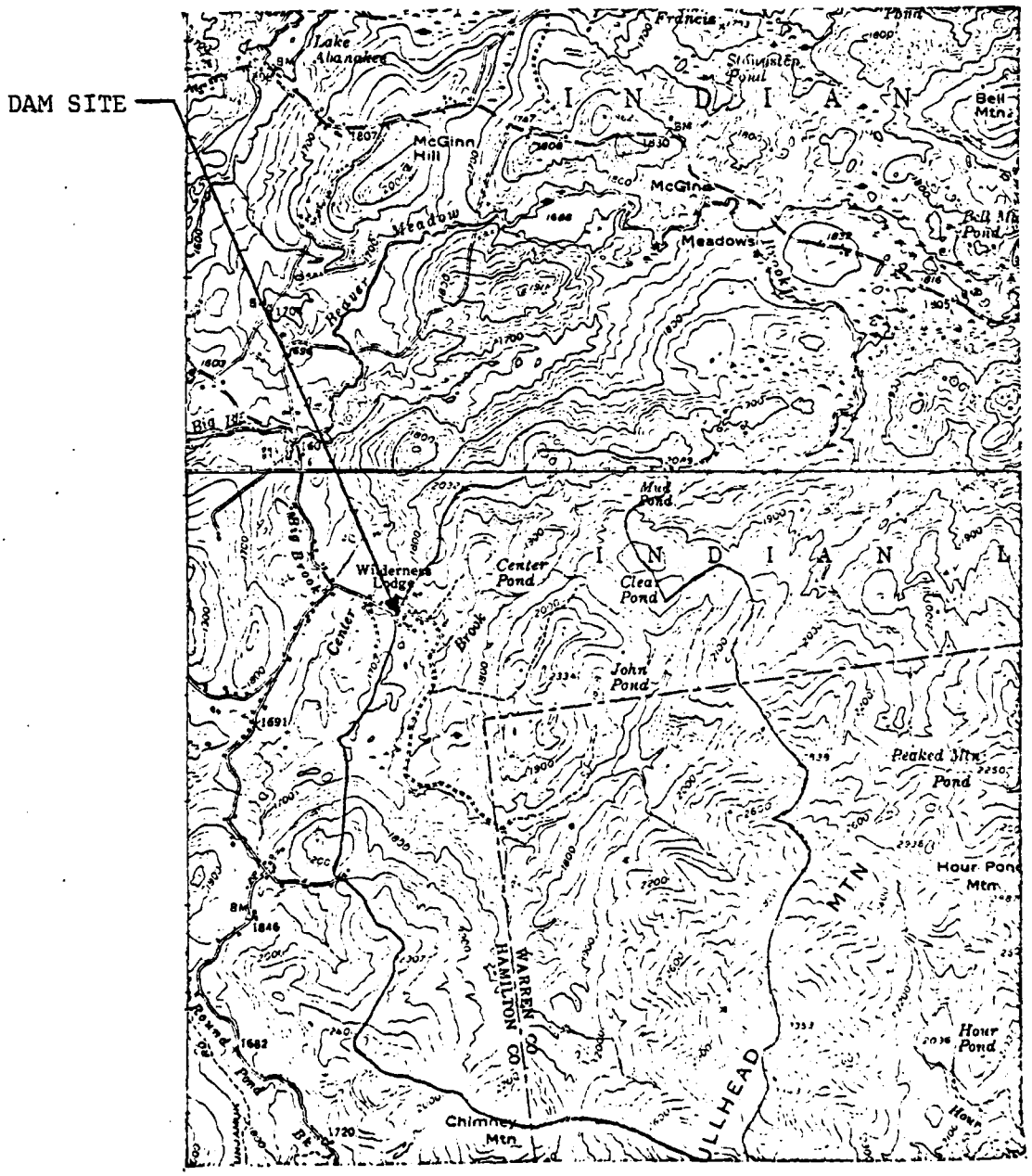
SECTION A-A.

Drawn by: H. Gathmann
2-11-29.

DAM SITE

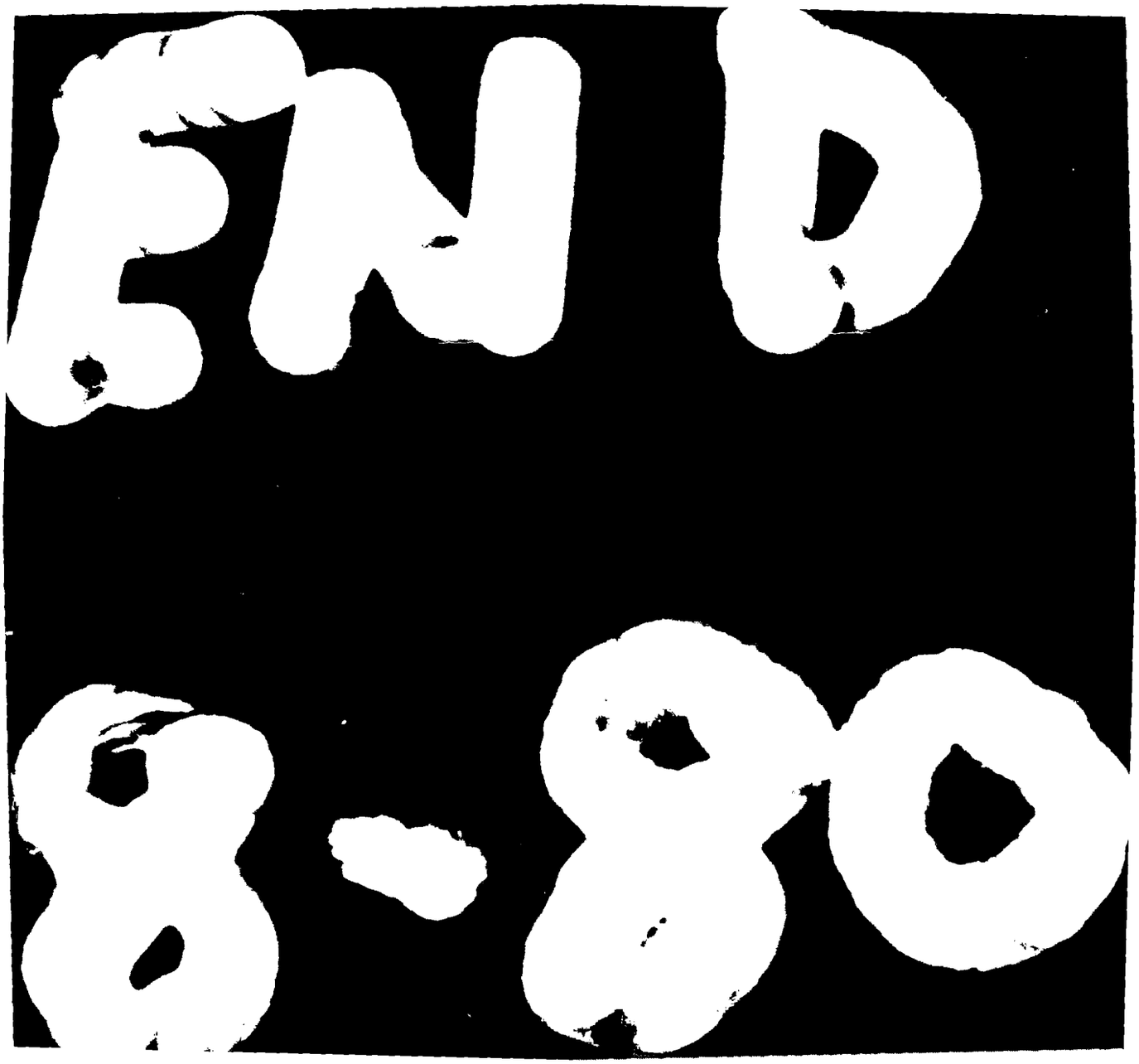


VICINITY MAP
RAINBOW LAKE DAM
I.D. No. N.Y. 18



TOPOGRAPHIC MAP
RAINBOW LAKE DAM
I.D. No. N.Y.18

END


END
8-80