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NATIONAL DAM SAFETY PROGRAM. LAKE FLOWER DAM, INVENTORY NUMBER --ETC(U)
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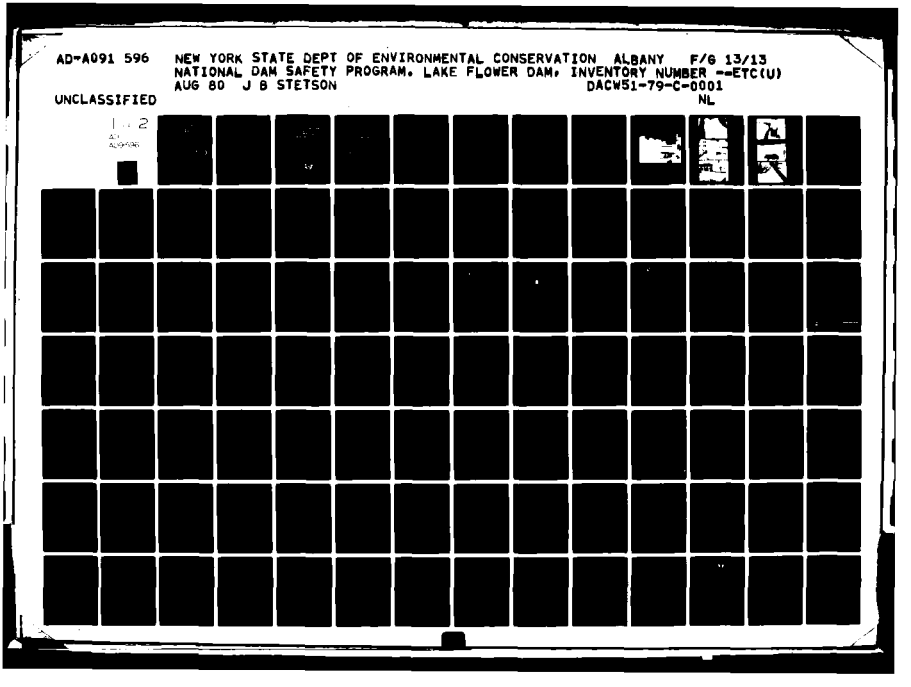

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Lake Flower Dam

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.

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

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The structural stability analysis indicates unsatisfactory stability would result from loadings which could occur during all investigated conditions. A structural stability investigation should be commenced within 6 months to determine the characteristics of the uplift forces acting on the dam, the properties of the existing dam and the effect of these conditions on the stability of the dam. Remedial work should be undertaken depending on the results of this investigation and completed within two years.

The hydrologic/hydraulic analysis indicates that the spillway will pass only 26% of the Probable Maximum Flood (PMF). The dam will be overtopped by 6 feet and 1-1/2 feet by the PMF and 1/2 PMF respectively. Failure of the dam during the 1/2 PMF event would significantly increase the downstream hazard from that which would exist just prior to failure of the dam. The spillway capacity, therefore, is assessed as "seriously inadequate" and the dam is assessed as unsafe, non-emergency.

The classification of "unsafe" applied to a dam because of a "seriously inadequate spillway" is not meant to connote the same degree of emergency as would be associated with an "unsafe" classification applied for a structural deficiency. It does mean, however, that based on an initial screening, and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam would take place, significantly increasing the hazard to loss of life downstream from the dam.

It is, therefore, recommended that within 6 months of notification to the Owner, a detailed hydrologic/hydraulic investigation of the structure should be undertaken to more accurately determine the site specific characteristics of the watershed and their effect upon the overtopping potential of the dam. The results of these investigations will determine the appropriate remedial measures which will be required to achieve a spillway capacity adequate to discharge the outflow from at least the 1/2 PMF. In the interim, a detailed emergency action plan must be developed and implemented during periods of unusually heavy precipitation. Also, around-the-clock surveillance of the structure must be provided during these periods.

The following remedial work should be completed within two years:

1. Seepage near the right abutment should be kept under surveillance and appropriate remedial measures should be taken should the condition worsen.

2. The Owner should repair the seepage through the wall of the Water Company building.

3. The stop plank structure should be modified so that the lake level may be more closely controlled and so that large volumes of water may be discharged during high flow periods.

4. Spalling of concrete overlays should be repaired.

5. A flood warning and emergency evacuation system should be implemented to alert the public in the event conditions occur which could result in failure of the dam.

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

LAKE CHAMPLAIN RIVER BASIN

LAKE FLOWER DAM
FRANKLIN COUNTY
NEW YORK
INVENTORY Nº NY 707

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

(6) Lake Flower Dam, Inventory number NY-707.
Lake Champlain
River Basin.
Franklin County, New York.

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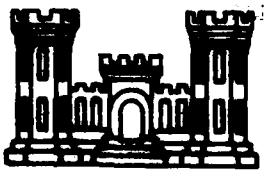
(10) John B. Stetson



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PREFACE

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

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

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

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam Lake Flower Dam, NY 707

State Located New York
County Located Franklin
Stream Saranac River
Date of Inspection June 9, 1980

ASSESSMENT OF GENERAL CONDITIONS

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

The structural stability analysis indicates unsatisfactory stability would result from loadings which could occur during all investigated conditions. A structural stability investigation should be commenced within 6 months to determine the characteristics of the uplift forces acting on the dam, the properties of the existing dam and the effect of these conditions on the stability of the dam. Remedial work should be undertaken depending on the results of this investigation and completed within two years.

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

Dale Engineering Company

26 SEP 1980

John B. Stetson, President

Approved By:
Date:

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

1. Overview of Lake Flower Dam

2. Stop plank structure - note deteriorated concrete at abutment on right of photo

3. View of right abutment showing forebay control to hydro-mechanical equipment in basement of municipal building (red brick building). Beam on walkway is used to support hoist for removing stop planks.

4. Stop plank structure from upstream.

5. Tailrace from municipal building, note displacement of left wall toward the channel.

6. Receiving stream showing downstream hazard.

7. Area of seepage near right abutment.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
NAME OF DAM - LAKE FLOWER DAM ID# - NY 707

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

Authority for this report is provided by the National Dam Inspection Act, Public Law 92-367 of 1972. It has been prepared in accordance with a contract for professional services between Dale Engineering Company and The New York State Department of Environmental Conservation.

b. Purpose of Inspection

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

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

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances

The Lake Flower Dam is located in the Village of Saranac Lake, Town of Harrietstown, New York. The dam is situated approximately 100 feet downstream from the Main Street Bridge across the outlet of Lake Flower. The dam is a concrete gravity structure, 97-1/2 feet long and 19 feet high. The spillway section is an ogee shaped weir 40 feet long. Two, 8 foot wide by 11.5 foot high stop plank openings are located to the right of the principal spillway. Stop planks must be manually placed in the slots to control flow through the openings. The stop planks are 6 inches by 6 inches in the lower portion of the structure while the upper 8 planks are 6 inches wide and 4 inches high. A steel beam is provided on the walkway above the stop plank openings for mounting a hoist mechanism to assist in placement of stop planks. The right abutment of the dam is located on the wall of the Village Municipal Building. Sluice gates along the right abutment regulate flow through hydromechanical equipment used to power

pumps for the village water supply. The left abutment of the dam is founded on the wall of a building owned by Niagara Mohawk Power Corporation. This building formerly housed hydroelectric generating equipment, however, its use has been abandoned for a number of years.

b. Location

The Lake Flower Dam is located in the Village of Saranac Lake, Town of Harrietstown, Franklin County, New York.

c. Size Classification

The maximum height of the dam is approximately 19 feet. The volume of the impoundment is approximately 6200 acre feet. Therefore, the dam is in the Intermediate Size Classification as defined by the Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification

The Saranac River, the receiving stream from Lake Flower, flows through the Village of Saranac Lake. Several residences and commercial establishments are located close to the stream. Therefore, the dam is in the High Hazard Category as defined by the Recommended Guidelines for Safety Inspection of Dams.

e. Ownership

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

Contact: E. John Lawless,
Village Manager
Village of Saranac Lake,
Saranac Lake, New York 12983
Telephone: 518-891-4150

f. Purpose of the Dam

The dam is used to control the level of Lake Flower, Lake Oseetah and Lake Kiwassa for recreational purposes and for the development of hydomechanical power for use in pumping of the village water supply.

g. Design and Construction History

The Dam Reports included in Appendix B indicate that the dam was originally constructed in 1850 and was extensively repaired in 1890. Later correspondence indicates the original dam was constructed in 1827. The dam was reconstructed to its present configuration in approximately 1935 to 1937. The plans for this reconstruction are included as Figures 2 through 10 of the report. In 1977, failure of the stop planks in the structure caused a reduction of the level of Lake Flower and some concern to local officials. These stop planks

were replaced and the structure was returned to proper operating condition. 6 inch x 6 inch planks were used at the bottom of the structure and 6 inch x 4 inch planks at the top.

h. Normal Operational Procedures

The facility is operated by the Village of Saranac Lake. The stop planks in the control structure are manipulated to provide optimum level of Lake Flower and to provide adequate head for developing hydromechanical power for use by the Village water system.

1.3 PERTINENT DATA

a. Drainage Area

The drainage area of Lake Flower Dam is 179 square miles.

b. Discharge at Dam Site

No discharge records are available for this site.

Computed Discharges:

Ungated Spillway, Top of Dam	2,345	cfs
Drawdown Capacity*	2,060	cfs

c. Elevation (Feet Above MSL)

Top of Dam	1,533
Spillway Crest	1,528
Stream Bed at Centerline of Dam	1,513

d. Reservoir

Length of Normal Pool	32,000	FT

e. Storage

Top of Dam	14,740	Acre Feet
Normal Pool	6,200	Acre Feet

f. Reservoir Area

Top of Dam	1,940	Acres
Spillway Pool	1,360	Acres

g. Dam

Type - Concrete Gravity.
Length - 97 Feet, 6 Inches.
Height - 19 Feet.
Freeboard Between Normal Reservoir and Top of Dam - 5 Feet.

* Discharge through stop plank structure with all stop planks removed, water level at crest of spillway.

Top Width - 5 Feet.
Side Slopes - Upstream - Vertical; Downstream - 1.25 Vertical, 1 Horizontal.

h. Spillway

Type - Ogee Shaped.
Length - 40 Feet.
Crest Elevation - 1528.
Gates 2 - 8 Feet Wide x 11.5 Feet High Stop Plank Structures.
U/S Channel - Impoundment.
D/S Channel - Natural.

i. Regulating Outlets

2 - 8 feet wide by 11.5 feet high stop plank structures.

SECTION 2 - ENGINEERING DATA

2.1 GEOTECHNICAL DATA

a. Geology

Geologically, Lake Flower is located in the Adirondack Province.

Although bedrock beneath the dam site is believed to be syenitic gneiss of Precambrian age (See Geologic Map, Figure 11), the dam is sited in glacial debris. According to Buddington (1953, p. 51, "The basin occupied by Lake Flower is a former valley dammed by kame moraine at the present outlet." Kame deposits are of a well-sorted and stratified nature and thus normally permeable. The engineering report of 1937 indicates the dam bed as well as both banks are of a yellow clay hardpan, very hard and impervious. Such description suggests the material to be a glacial lake bottom deposit and would probably be the base upon which the kame would be deposited after the glacial lake had formed. The 1937 report also mentions that "soundings" indicate rock to be present ten feet below the dam base.

b. Subsurface Investigations

No records of subsurface investigations for this structure were available. The 1937 application for reconstruction of the dam states that the foundation material upon which the dam will be placed is "yellow clay hardpan, soundings shows rock 10 feet lower." This information is included in Appendix B.

2.2 DESIGN RECORDS

No records were available from the original design of the dam. The plans for the 1937 reconstruction of the dam is included as Figures 2 through 10 of this report.

2.3 CONSTRUCTION RECORDS

No information was available concerning either the original construction or the reconstruction of this dam.

2.4 OPERATIONAL RECORDS

The water superintendent of the Village of Saranac Lake keeps detailed records of pond elevations and of the height of stop planks in the control structures.

2.5 EVALUATION OF DATA

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

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

The Lake Flower Dam was inspected on June 9, 1980. The Dale Engineering Company Inspection Team was accompanied on the inspection by Thomas Carroll, Water Superintendent of the Village of Saranac Lake.

b. Dam

At the time of the inspection, the water level in the impoundment was approximately 6 inches above the spillway level. The flow over the spillway obscured view of the spillway surface. The downstream face of the spillway, however, appeared to be in good condition when viewed through the flowing water. The entire structure had been surfaced with hydraulic cement in the 1950's. Some spalling and loosening of these surfaces has occurred. There is need for repair on the abutment between the two stop plank structures. Minor seepage was detected on the downstream side of the right stop log structure wall. The left wall of the tailrace from the Water Department Hydrologic Pump Facility has been displaced and is bulging inward towards the channel. The Water Superintendent indicated that this has occurred during the past two years. The Village of Saranac Lake has recently conducted a television inspection of the upstream face of the dam. The video tape of this inspection was viewed by the inspection team. The tapes indicated some cracking of the surface of the upstream face of the dam has occurred. However, no evidence of cracking was detected either at the crest of the spillway or on the downstream face of the structure. Visual inspection did not indicate displacement of the structural elements of the dam itself.

c. Appurtenant Structures

The wall of the Municipal Building which forms the right abutment of the dam was viewed from the basement of this structure. Considerable seepage is taking place through the masonry wall of this structure. The Water Superintendent indicates that this condition has worsened in recent years and that the wall is covered by a layer of ice during the winter season.

d. Control Outlet

The stop planks in the outlet structures have been replaced so that the conditions which caused an emergency during 1977 and 1978 have been remedied. However, the Water Superintendent indicates that it is sometimes quite difficult to remove and replace stop planks in the structure.

e. Reservoir Area

The Main Street Bridge is located approximately 75 feet upstream from the dam. The shores of Lake Flower are heavily developed with residential properties. The dam also controls the level of Lake Oseetah and Lake Kiwassa. There are no known areas of bank instability along the impoundment.

f. Downstream Channel

The downstream channel is formed in glacial till. There are many large boulders evident along and in the downstream channel and there is no evidence of recent erosion downstream from the structure.

3.2 EVALUATION

The visual inspection revealed that the dam is in generally good condition with minor seepage occurring near the right abutment. The wall of the tailrace has recently displaced inward toward the channel. This condition could worsen and create a hazardous condition. Manipulation of the stop planks in the control outlet is cumbersome. Removal of the stop planks during a high water event is difficult under the present arrangement. Seepage through the wall of the Water Department structure on the right abutment could worsen and become a definite hazard. Appropriate steps should be taken to seal off this seepage. The installation of mechanically operated sluice gates is recommended to allow more efficient operation of the control outlet.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

The normal operating procedure for this structure is to control the water level in Lake Flower and the upstream lakes for recreational purposes and to maintain an optimum level for the use of hydromechanical power in operating the Village water supply. Stop planks are removed or replaced in the stop plank structures to maintain optimum level in the lake. The upper planks are removed during high run-off periods to allow greater flow through the structure. During low run-off periods stop planks are replaced thereby restricting overflow to the spillway section.

4.2 MAINTENANCE OF THE DAM

Maintenance and operation of the dam is controlled by the Village of Saranac Lake. Daily visits are made to the site to check on water elevation and conditions at the stop plank structure. Water level and stop plank levels are recorded daily at the site.

4.3 MAINTENANCE OF OPERATING FACILITIES

All of the facilities at the site are presently in operating condition. The stop planks were replaced in 1978 eliminating problems which have occurred in the past. The bulging of the wall of the tailrace has been kept under constant surveillance by the operating personel. The Water Superintendent indicates that remedial action will be taken if the condition worsens.

4.4 DESCRIPTION OF WARNING SYSTEM

No warning system is in effect at present.

4.5 EVALUATION

The dam and appurtenances are normally inspected by Water Department personnel from the Village of Saranac Lake. The facility is presently in operating condition. Conditions at the facility show evidence of adequate maintenance. However, constant surveillance should be maintained on the seepage near the stop plank structure near the right abutment, the bulging of the tailrace wall and the seepage through the wall of the Municipal Building. Immediate action should be taken to remedy these problems, should the conditions worsen. Since the dam is in the High Hazard Classification, a warning system should be implemented to alert the public should conditions occur which could result in failure of the dam.

SECTION 5 - HYDROLOGIC/HYDRAULIC

5.1 DRAINAGE AREA CHARACTERISTICS

The Lake Flower Dam is located in the southern portion of Franklin County. The dam has a drainage area of 179 square miles, which is characterized by numerous interconnecting lakes. These lakes, of which the Upper, Middle and Lower Saranac Lakes are the largest, provide considerable natural storage within the drainage basin. The Lake Flower Dam in essence acts as the control outlet for Lake Flower, Oseetah Lake and Kiwassa Lake as the three are connected and have the same water surface elevation. The impoundment has a surface area of approximately 1360 acres and outlets into the Saranac River, which flows in a northeasterly direction through the Village of Saranac Lake.

5.2 ANALYSIS CRITERIA

The purpose of this investigation is to evaluate the dam and spillway with respect to their flood control potential and adequacy. This has been assessed through the evaluation of the Probable Maximum Flood (PMF) for the watershed and the subsequent routing of the flood through the reservoir and the dam's spillway system. The PMF event is that hypothetical flow induced by the most critical combination of precipitation, minimum infiltration loss and concentration of run-off of a specific location that is considered reasonably possible for a particular drainage area. Since the dam is in the Intermediate Dam Category and is a High Hazard, the Recommended Guidelines for Safety Inspection of Dams (Ref. 1) require that the spillway be capable of passing the Probable Maximum Flood.

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

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

Unit hydrographs were defined by Snyder coefficients, C_t and C_p. Snyder's C_t was estimated to be 2.0 for the drainage area and C_p was estimated to be 0.625. The drainage area was divided into sub-areas to model the variability in hydrologic characteristics within the drainage basin. Run-off, routing and flood hydrograph combining was then performed to obtain the inflow into the reservoir.

In order to model the attenuation of the flood hydrographs due to the storage capacity of the numerous lakes, the flood hydrographs were routed through the major lakes. The data used for the outlet control structures at these lakes was obtained from the New York State Department of Environmental Conservation Dam Safety Section. Storage capacities for these lakes were estimated from U.S.G.S mapping and previous reports.

The Probable Maximum Precipitation (PMP) was 16 inches according to Hydrometeorological Report (HMR #33) for a 24-hour duration storm, 200 square mile basin, while loss rates were set at 1.0 inches initial abstraction and 0.1 inches/hour continuous loss rate. The loss rate function yielded 81 percent run-off from the PMF. The peak for the PMF inflow hydrograph was 33,319 cfs and the 1/2 PMF inflow peak was 16,190 cfs. The storage capacity of the impoundment reduced these peak flows to 9,076 cfs for the PMF and 3,645 cfs for the 1/2 PMF.

5.3 SPILLWAY CAPACITY

The spillway is an ogee-crested weir type structure 40 feet in length. Weir coefficients ranging from 3.35 to 4.15 over the heads encountered in routing the PMF were assigned for the spillway rating curve development. In addition to the ogee shaped spillway, outflow will discharge over the two 8 feet wide stop plank openings, under a relatively low head. The top elevation of these stop planks is normally maintained at six inches above the spillway crest with a maximum of eight to ten inches above the spillway crest. Discharge over these stop planks was considered in determining the total spillway capacity, assuming the crest elevation of the stop planks to be ten inches above the spillway crest and a weir coefficient of 3.3. The crest elevation of the non-overflow section at the southern abutment is approximately 1531, whereas the crest elevation of the main non-overflow section (northern section) is 1533. Overtopping of the southern non-overflow section would not in itself endanger the stability of the dam, therefore, the top of dam elevation was assumed to be 1533 for this analysis. The discharge capacity of the spillway at the top of dam elevation is 2,345 cfs.

SPILLWAY CAPACITY

Flood	Peak Discharge	Capacity as % of Flood Discharge
PMF	9,076 cfs	26%
1/2 PMF	3,645 cfs	64%

5.4 RESERVOIR CAPACITY

The reservoir storage capacity was estimated from USGS mapping and maps obtained from the New York State Conservation Department's Adirondack Fisheries District. Oseetah Lake, Kiwassa Lake, and Lake Flower essentially act as one lake that is controlled by the dam,

therefore these values incorporate the storage capacities of all three lakes. The resulting estimates of the reservoir storage capacity are shown below:

Top of Dam	14,740 Acre Feet
Spillway Crest	6,200 Acre Feet

5.5 FLOODS OF RECORD

There are no records of flood discharges at the dam site.

5.6 OVERTOPPING POTENTIAL

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

Flood	Maximum Depth Over Dam
PMF	6.0 Feet
1/2 PMF	1.5 Feet

It should be noted that the bridge just upstream of the dam may act as a flow restriction under high flows. Under such a condition, the water elevation in the main portion of the lake would be higher than the water elevation of the portion just upstream of the dam. This condition would further utilize the lake's natural storage capacity and reduce the peak discharges from large floods somewhat. The effect of the bridge on flood discharges at the dam was not considered in this analysis.

A dam break analysis was performed to determine the significance of various dam failures on the downstream hazard. This analysis was performed assuming the dam to fail at the maximum elevation resulting from the 1/2 PMF. This condition represents the worst case that could result from the 1/2 PMF, with regards to the flood discharges in the downstream area. The flood elevations, due to various dam failures and the flood elevations that would exist just before the corresponding dam break induced flood wave are shown below. These flood elevations are compared at the Route 86 bridge in the Village of Saranac Lake.

	Flood Elevations @ Route 86 Bridge	
	Just Prior to Dam Break	Due to Dam Break
Failure Time = 0.1 hrs.	1523	1534
Failure Time = 0.3 hrs.	1523	1534
Failure Time = 0.5 hrs.	1523	1533

The above elevations were estimated from USGS quad sheets. These elevations are not exact and their significance is in the difference

between the elevations for the flood levels with and without the dam failure. The maximum difference determined by this analysis is approximately ten feet, indicating that the downstream hazard would be significantly increased by a dam failure under this condition.

5.7 EVALUATION

The hydrologic/hydraulic analysis establishes the spillway capacity as 26% of the Probable Maximum Flood (PMF). The dam will be overtopped by 6 feet by the PMF and 1.5 feet under the 1/2 PMF. The stability analysis indicates unsatisfactory stability for the dam under the 1/2 PMF loading condition and the dam break analysis indicates that failure of the dam under the 1/2 PMF will increase the downstream flood levels on the order of the ten feet. Therefore, the spillway is assessed as seriously inadequate according to the Corps of Engineers screening criteria.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

The concrete dam, approximately 100 feet long, is located within the Village of Saranac Lake, and controls the level of Lake Flower. A designed spillway section forms the dam's southerly segment, but stop plank openings provide another overflow area under relatively low flows. The dam is situated in a developed area of Saranac Lake, and has building structures serving as the abutments. A basement wall for a Niagara Mohawk Power Company building provides the south abutment (left abutment looking downstream) while the Municipal Water Department building facility (a forebay wall for the intake structure) locates the north abutment. The Main Street Bridge structure located a very short distance into the impounding area behind the dam acts as a partial barrier to flow from the lake to the dam.

The dam was inspected under the condition where flow over the spillway was occurring, limiting the physical detail visible for evaluation. Observations indicate the dam retains structural stability. Generally, the dam material appears to be in relatively good condition, although surface cracking and some joint deterioration is visible.

Leakage was occurring through the north non-overflow section, but no ground erosion or other evidence of a structural effect exists. The possibility of underdam seepage could not be determined.

The basement of the Municipal Building acts as part of the water intake facility; intake pipes and related equipment are located in this area. The masonry basement wall adjacent to the reservoir impoundment (pipe wall) is experiencing a significant degree of seepage.

The Municipal Building's open channel tailrace is formed by masonry channel walls. Sections of the wall have recently experienced some lateral movement.

a. Seismic Stability

As shown on the Geologic Map, Figure 11, one known fault exists in the vicinity of the dam, about 1.2 miles east. However, the preliminary Brittle Structures Map (1977) indicates several lineaments present in the immediate area, including one whose trend appears to be in the immediate vicinity of the dam itself. Buddington (1953, p. 93) states, "The northeast joints of the Saranac River belt frequently are slickensided and it is probable that they are related to a fault system which has this strike in the eastern Adirondacks." Although no evidence of a fault line exists, the relatively straight

trend of the Saranac River valley for about six miles northeast of the dam is parallel to the fault trend to the east which makes it topographically suspect; a hidden fault zone which intersects the dam could exist.

The Seismic Probability Map locates the dam near the border of a Zone 2 - Zone 3 Designation.

The area has been subjected to a significant number of earthquakes. Information on some of the larger earthquakes is tabulated below. Many earthquakes of lesser intensity are known to have occurred in the area, some in the vicinity of the dam.

Date	Intensity Modified Mercalli	Location Relative to Dam
1877	VII	13 miles N
1910	III	1 mile W
1926	IV	2 miles SE
1928	V-VI	15 miles NW
1932a	IV	5 miles NE
1932b	III	5 miles N
1977a	V	14 miles NE
1977b	IV-V	12 miles NE

c. Stability Evaluation

Design drawings available for review show the plan alignment and cross-sections for the dam but do not include information on the properties of the dam and foundation materials, nor stability analysis. As part of the present study, stability evaluations have been performed for the main dam spillway section. Actual properties of the dam's construction materials and foundation were not determined as part of this study; where information on properties was necessary for computations but lacking, assumptions felt to be practical were made. The stability computations assumed a structural cross-section based on dimensions indicated by the plans included in this report. It should be considered that, in areas where deterioration has occurred, section dimensions would be less than indicated by the plans, with some adverse effect on the structural strength expected. The analysis also assumed the dam section to be monolithic, possessing necessary internal resistance to shear and bending occurring as a result of loading.

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

The engineering studies indicate satisfactory stability against overturning for the dam subject to forces possible during normal summer-type operation (no ice loading). Satisfactory stability against overturning is also indicated where seismic effects are imposed onto

RESULTS OF STABILITY COMPUTATIONS

	Loading Condition	Factor of Safety* Overturning	Factor of Safety* Sliding**	Location of Resultant Passing through Base***
(1)	Water level at normal stop plank crest elevation, uplift on base, no ice.	1.62	1.7±	0.39b
(2)	Water level at normal stop plank crest elevation, uplift on base, 7.5 kips per lineal foot ice load.	0.96	1.04±	(FS<1)
(3)	Water levels against upstream face and downstream face based on 1/2 PMF elevations, uplift acting on base as computed for the normal operating condition.	1.22	1.1±	0.18b
(4)	Water level against upstream face and downstream face based on PMF elevations, uplift acting on base as computed for the normal operating condition.	1.03	0.9±	0.03b
(5)	Water level at normal stop plank crest elevation, uplift on base, seismic effect applicable to Zone 3.	1.31	1.4±	0.26b

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

** Assuming friction and/or soil cohesion only, no bond between base of dam and its foundation.

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

the normal summer operating condition. However, the factor of safety against sliding under these two loading conditions is unsatisfactory. The analysis indicates unsatisfactory stability against overturning and sliding for the dam subject to forces including ice loading possible during winter operations, according to the Recommended Guidelines for Safety Inspection of Dams (i.e., factors of safety approximately unity, and, where the resultant of forces acting on the dam is located outside the middle third of the base, tensile stresses would develop in the dam section, a condition which is structurally undesirable.)

For the 1/2 PMF and PMF conditions, unsatisfactory stability against overturning and sliding is indicated. Lateral water pressures were computed from the water surface elevations calculated in the hydraulic analysis.

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

Uplift as computed for the normal operating condition was also assigned to the flood conditions studied, assuming that uplift pressures would not increase significantly over a relatively short flood stage time period because of an expected low permeability for the foundation hardpan material.

The dam's resistance to sliding is affected by the embedment elevation and shape of the foundation section, and properties of the foundation earth. The stability against sliding has been computed assuming the dam base is as indicated by the design; however, these drawings also indicate the possibility of a deeper (and probably larger) foundation if necessary to reach earth of "ample and proper bearing power." An "as-built" foundation larger and deeper than the designed foundation is expected to have a resistance to sliding greater than shown in this report's accompanying Table. A corresponding increase in the resistance to overturning would also be expected.

Further investigation is recommended to determine the "as-built" features of this dam and the effects on structural stability. This study should include inspection of the dam with the lake (reservoir) drawn down to permit close examination of the dam's downstream side and downstream foundation area for evidence of underdam seepage, to identify areas of the dam and foundation in need of repair.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety

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

The stability analysis indicates unsatisfactory stability during loadings which could occur during all conditions investigated.

The hydrologic/hydraulic analysis indicates that the spillway will pass only 26% of the PMF. The dam will be overtopped by 6 feet and 1.5 feet by the PMF and 1/2 PMF respectively. Failure of the dam during the 1/2 PMF event would significantly increase the downstream hazard from that which would exist just prior to failure of the dam. The spillway capacity, therefore, is assessed as seriously inadequate.

The following specific safety assessments are based on the Phase 1 Visual Examination and Analysis of Hydrology and Hydraulics and Structural Stability:

1. Minor seepage is occurring near the right abutment.

2. Seepage through the wall of the Water Department structure on the right abutment now exists and has become more severe in recent years.

3. The left wall of the tailrace from the Water Department building has experienced structural failure.

4. Manipulation of the stop planks in the control outlet is cumbersome under the present arrangement.

5. Minor spalling of the concrete overlay on the dam has occurred.

6. No warning system is presently in effect to alert the public should conditions occur which could result in failure of the dam.

b. Adequacy of Information

The information available is adequate for this Phase 1 investigation.

c. Urgency

The Owner should immediately implement a program of surveillance during heavy rainfall conditions. Within three months a flood warning and emergency evacuation plan should be implemented. The remaining items set forth in the Safety Assessment should be addressed by the Owner and appropriate improvements and repairs should be performed within 2 years of this notification. The recommended investigations should begin within six months.

d. Need for Additional Investigation

Further investigations relative to the stability should be performed to determine appropriate remedial measures. A detailed hydrologic/hydraulic investigation should be undertaken to determine the measures necessary to provide adequate spillway capacity.

7.2 RECOMMENDED MEASURES

The following is a list of recommended measures to be undertaken to insure safety of the facility:

1. A structural stability investigation should be performed to determine the characteristics of the uplift forces acting on the dam, the properties of the existing dam and the effect of these conditions on the stability of the dam. Remedial work should be undertaken depending on the results of this investigation.

2. A detailed hydrologic/hydraulic analysis to more accurately determine the site specific characteristics of the watershed should be undertaken to determine the necessary measures to provide adequate spillway capacity. The remedial work necessary to provide this capacity should be undertaken depending on the results of this investigation.

3. The Owner should repair the seepage through the wall of the Water Company building.

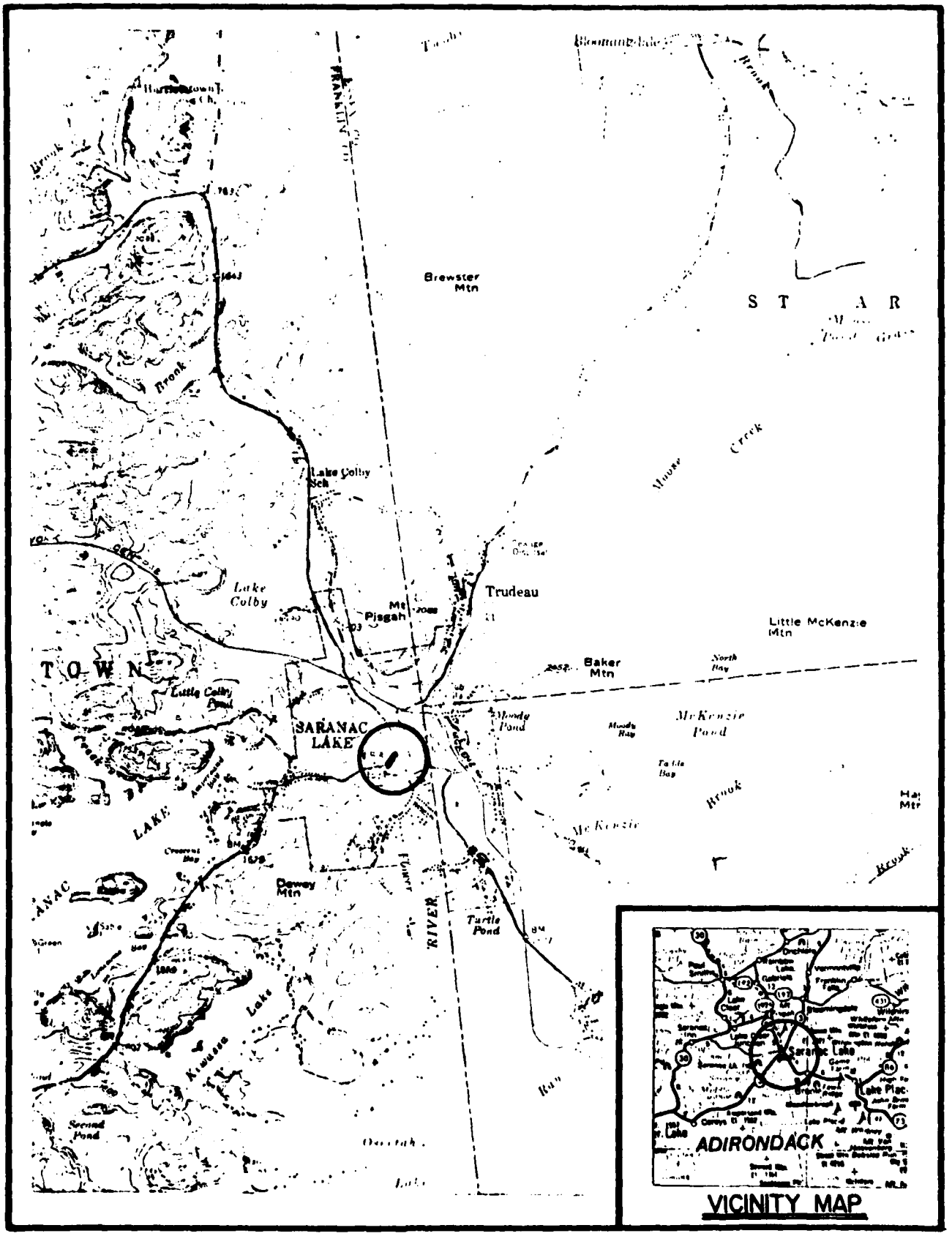
4. The stop plank structure should be modified so that the lake level may be more closely controlled and so that large volumes of water may be discharged during high flow periods.

5. Seepage near the right abutment should be kept under surveillance and appropriate remedial measures should be taken should the condition worsen.

6. Spalling of concrete overlays and structural damage to the tailrace wall should be repaired.

7. A flood warning and emergency evacuation system should be implemented to alert the public in the event conditions occur which could result in failure of the dam.

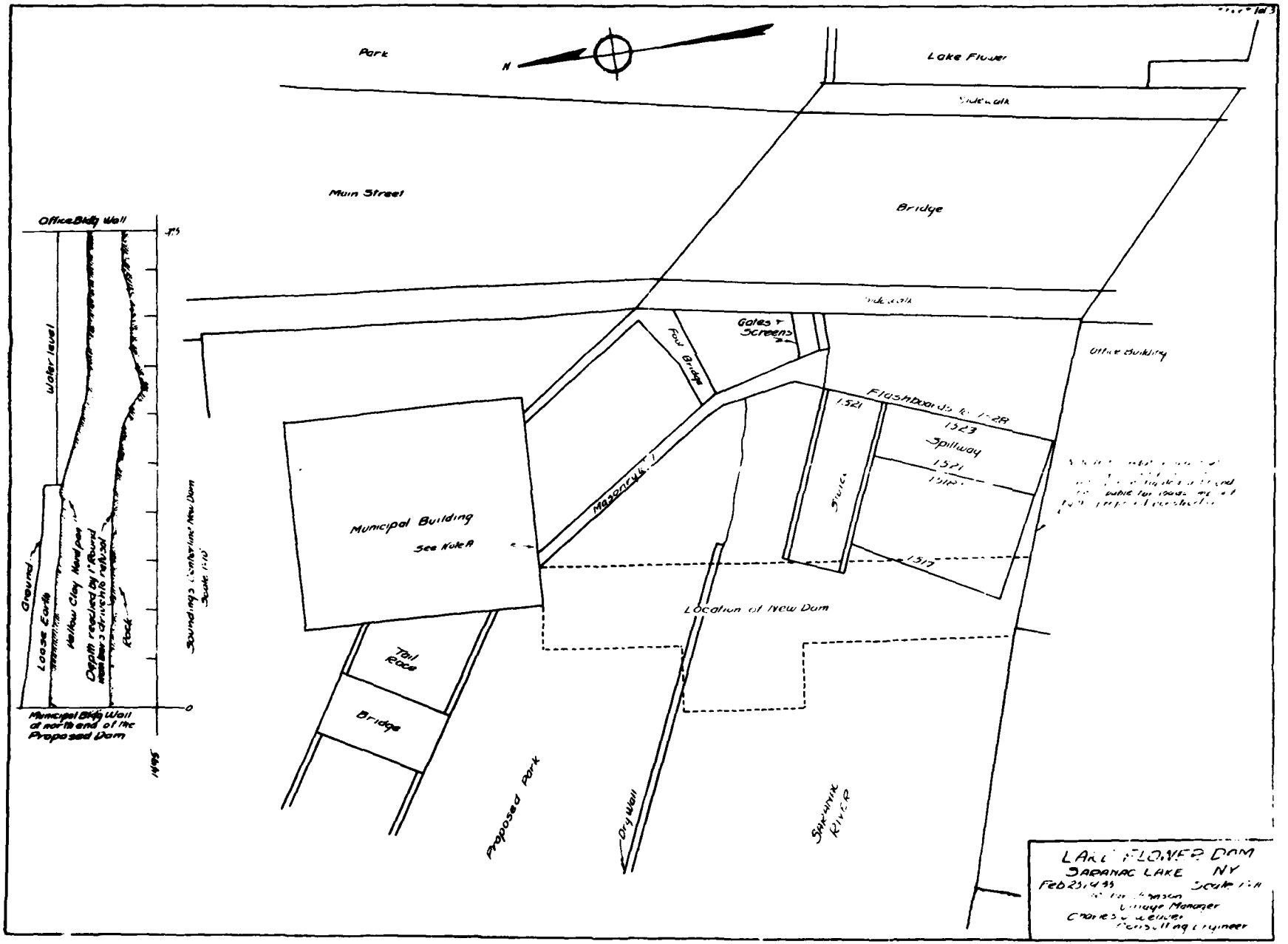
8. A formalized inspection system should be initiated to develop data on the conditions and maintenance operations at the facility.



VICINITY MAP

LOCATION PLAN

FIGURE 1


Park
N
Lake Flower
Main Street
Bridge
Gates & Screens
Foot Bridge
Office Building
Flashboards
1521
1523
Spillway
1521
1519
1517
Sluice
Municipal Building
See Note A
Location of New Dam
Tail Race
Bridge
Proposed Park
Dry Well
Saranac River
Office Bldg Wall
Water level
Ground
Loose Earth
Yellow Clay Hardpan
Depth required by Found weather stratified natural
Rock
Soundings & Elevations New Dam
Scale 1:10
Municipal Bldg Wall at north end of the Proposed Dam
NAVD
LAKE FLOWER DAM
SARANAC LAKE NY
Village Manager
Consulting Engineer
FIGURE 2

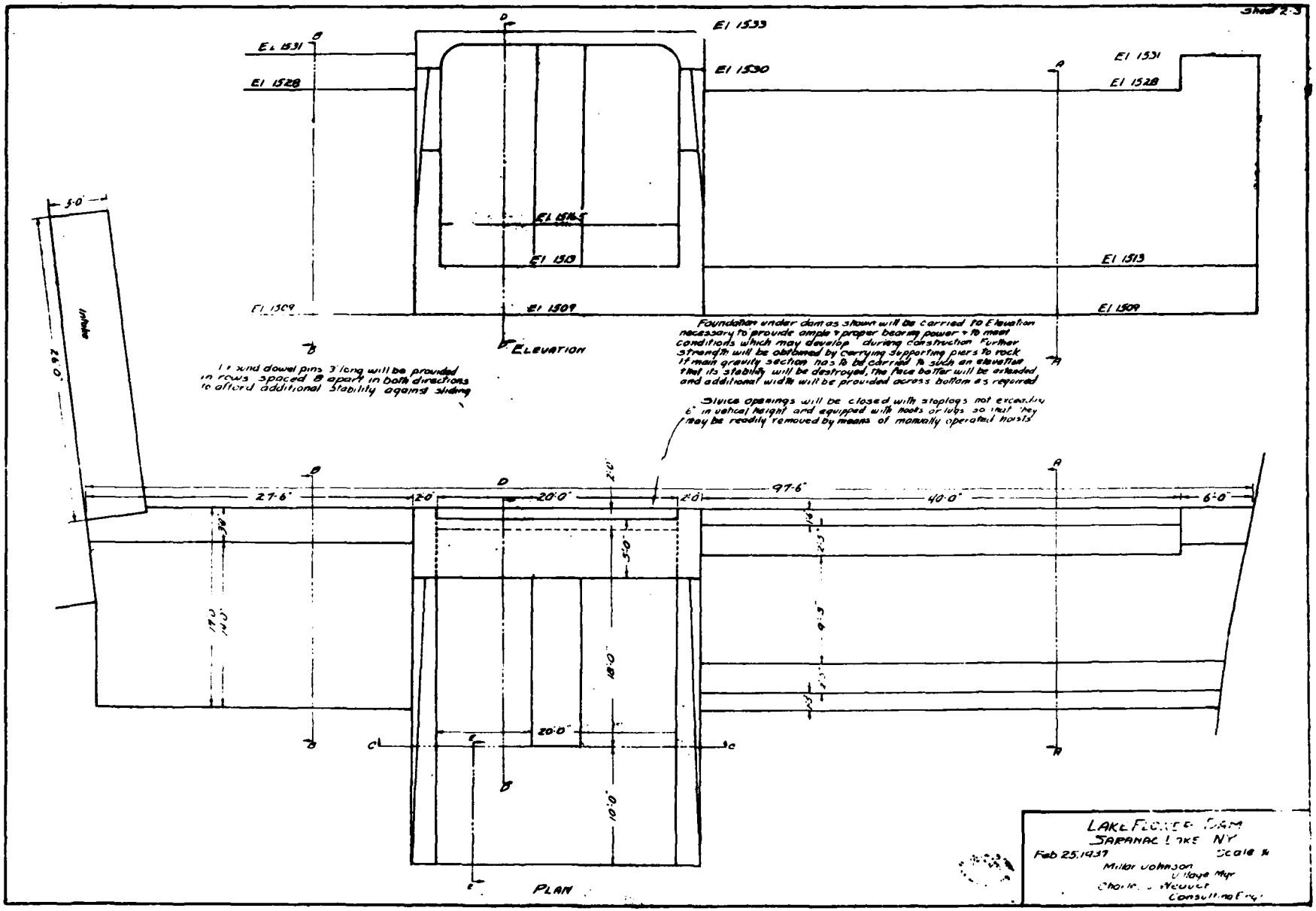

Sheet 2-3
El 1533
El 1531
El 1530
El 1528
El 1513
El 1509
ELEVATION
PLAN
Foundation under dam as shown will be carried to Elevation necessary to provide ample & proper bearing power & to meet conditions which may develop during construction Further strength will be obtained by carrying supporting piers to rock If main gravity section has to be carried to such an elevation that its stability will be destroyed, the face batter will be extended and additional width will be provided across bottom as required
Sluice openings will be closed with stoplogs not exceeding 6" in vertical height and equipped with hooks or lugs so that they may be readily removed by means of manually operated hoists
1" x 3rd dowel pins 3' long will be provided in rows spaced 8' apart in both directions to afford additional stability against sliding
27·6"
20·0"
97·6"
40·0"
6·0"
LAKE FLOWER DAM
SARANAC LAKE NY
Feb 25, 1937
Scale 1/4
Miller Johnson
Village Mgr
Chas. H. Neuvel
Consulting Eng.

FIGURE 3

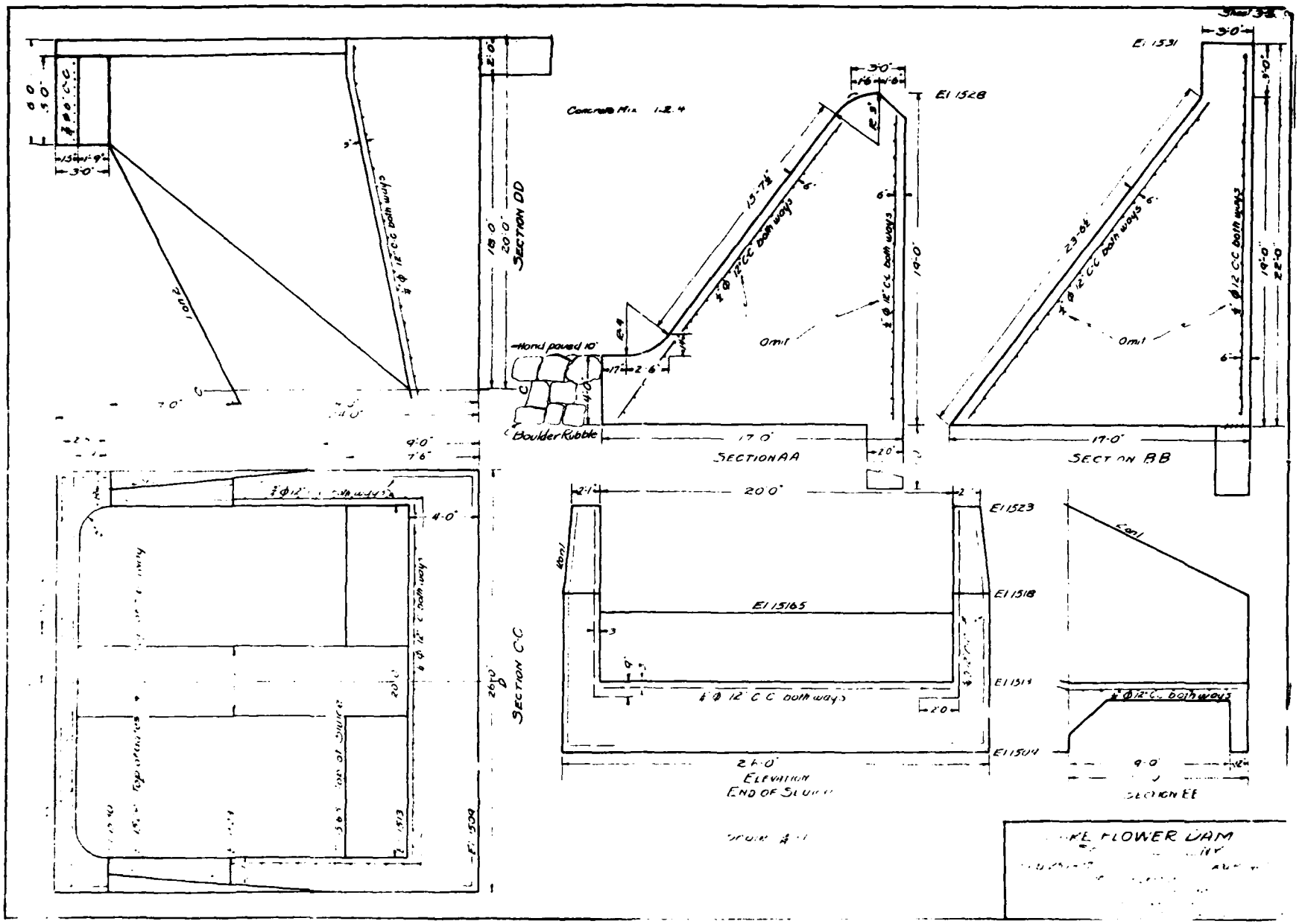

SECTION DD
SECTION AA
SECTION BB
SECTION CC
SECTION EE
Concrete Mix 1:2:4
Hand paved 10"
Boulder Rubble
Omit
17'-0"
20'-0"
19'-0"
22'-0"
EL 1528
EL 1531
EL 1523
EL 1518
EL 1513
EL 1504
EL 1539
24'-0"
ELEVATION
END OF SLUICE
9'-0"

FIGURE 4

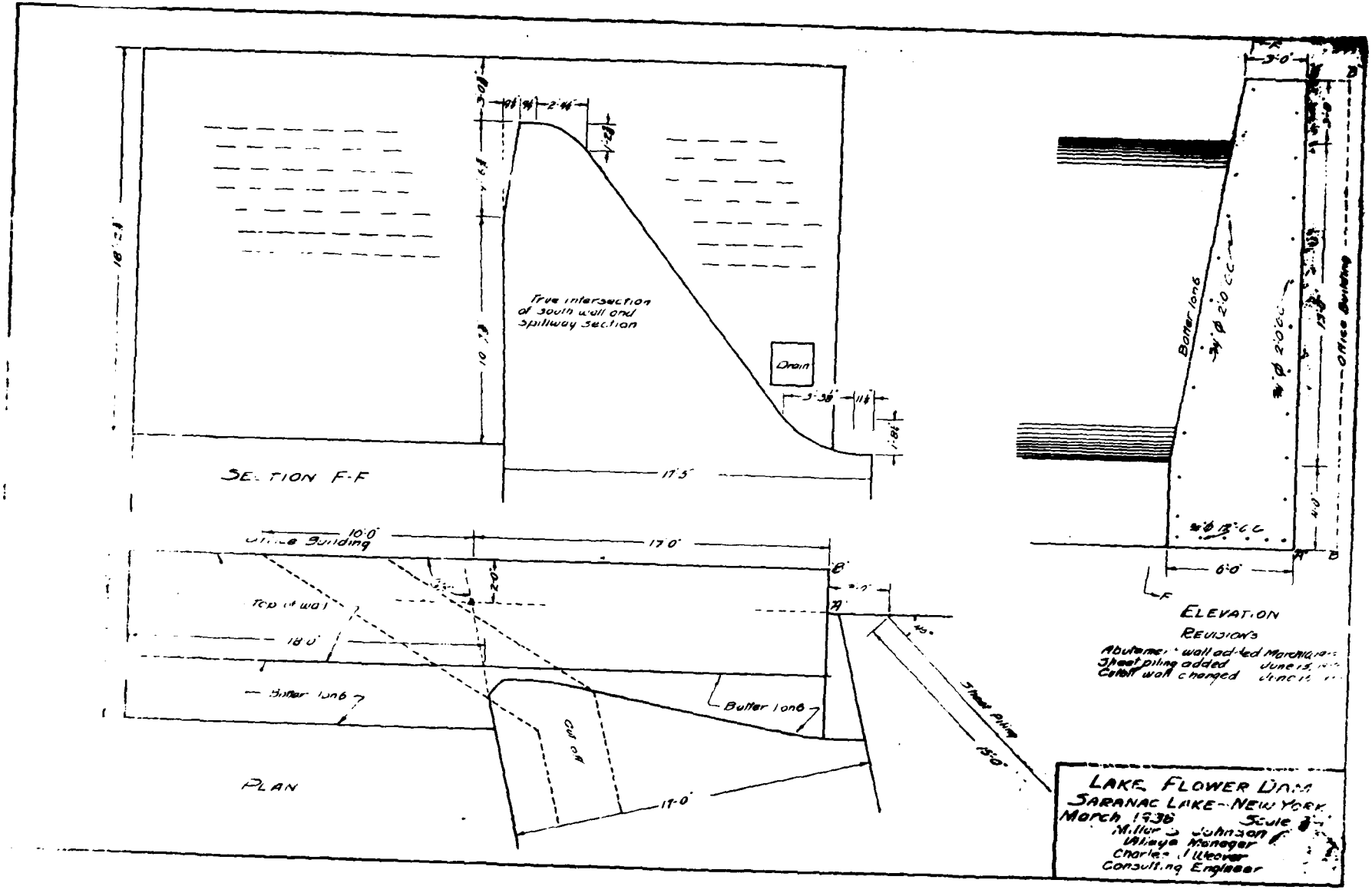

SECTION F-F
True intersection of south wall and Spillway section
Drain
17'3"
Butter lons
Office Building
ELEVATION
6'0"
Revisions
Abutment wall added March
Sheet piling added June
Cutoff wall changed June
Office Building
10'0"
17'0"
18'0"
Top of wall
Butter lons
Cut off
Sheet Piling
15'0"
17'0"
PLAN
LAKE FLOWER DAM
SARANAC LAKE - NEW YORK
March 1938 Scale
Miller & Johnson
Village Manager
Charles I Weaver
Consulting Engineer

FIGURE 5

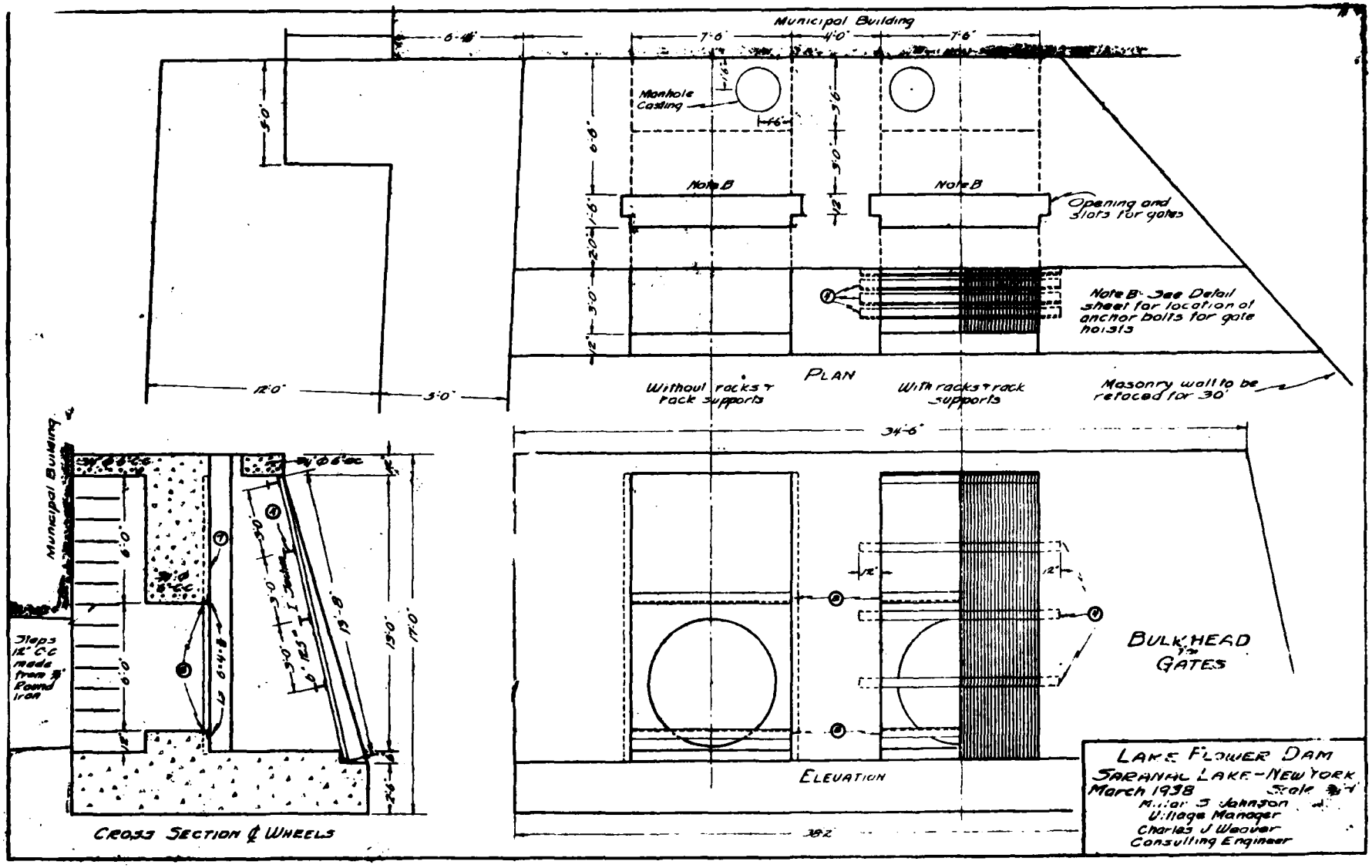

Municipal Building
Manhole Casting
Note B
Opening and slots for gates
Note B: See Detail sheet for location of anchor bolts for gate hoists
PLAN
Without racks & rack supports
With racks & rack supports
Masonry wall to be reraced for 30'
34'-6"
BULKHEAD GATES
ELEVATION
38'2
Municipal Building
Steps 12" CC made from 3/4" Round iron
CROSS SECTION & WHEELS
LAKE FLOWER DAM
SARANAC LAKE - NEW YORK
March 1938 Scale
Major J Johnson
Village Manager
Charles J Weaver
Consulting Engineer

FIGURE 6

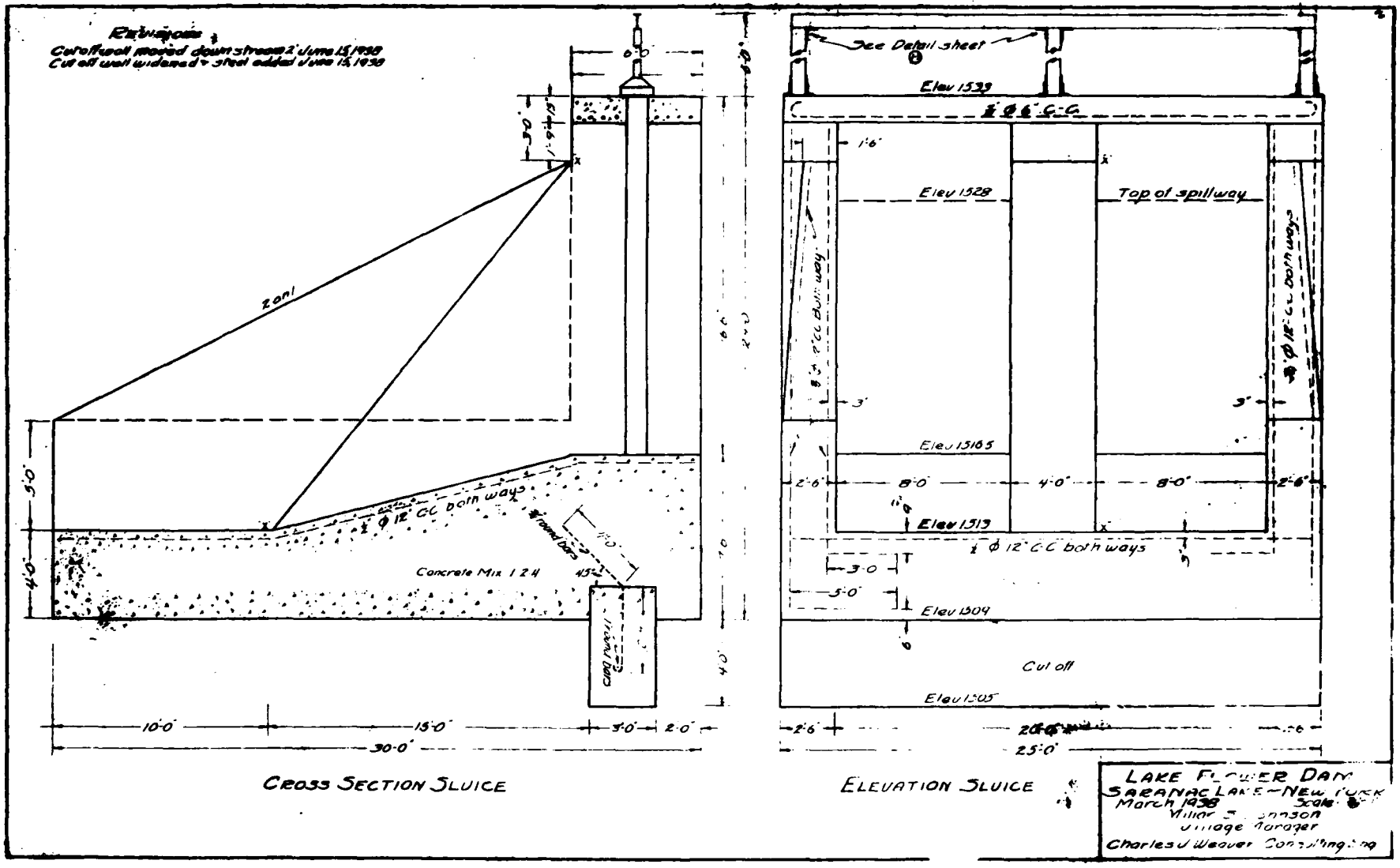

Revisions
Cutoff wall moved down stream 2' June 15, 1938
Cut off wall widened & steel added June 15, 1939
Zone I
1 ϕ 12" C-C both ways
Concrete Mix 1 2 4
Cut off wall
10'-0"
15'-0"
5'-0"
2'-0"
30'-0"
See Detail sheet
Elev 1539
1 ϕ 6" C-C
Elev 1528
Top of spillway
Elev 1516.5
8'-0"
4'-0"
Elev 1513
Elev 1504
Cut off
Elev 1505
25'-0"
CROSS SECTION SLUICE
ELEVATION SLUICE
LAKE FLOWER DAM
SARANAC LAKE - NEW YORK
March 1938
Scale
Village Manager
Charles J Weaver Consulting Eng

FIGURE 7

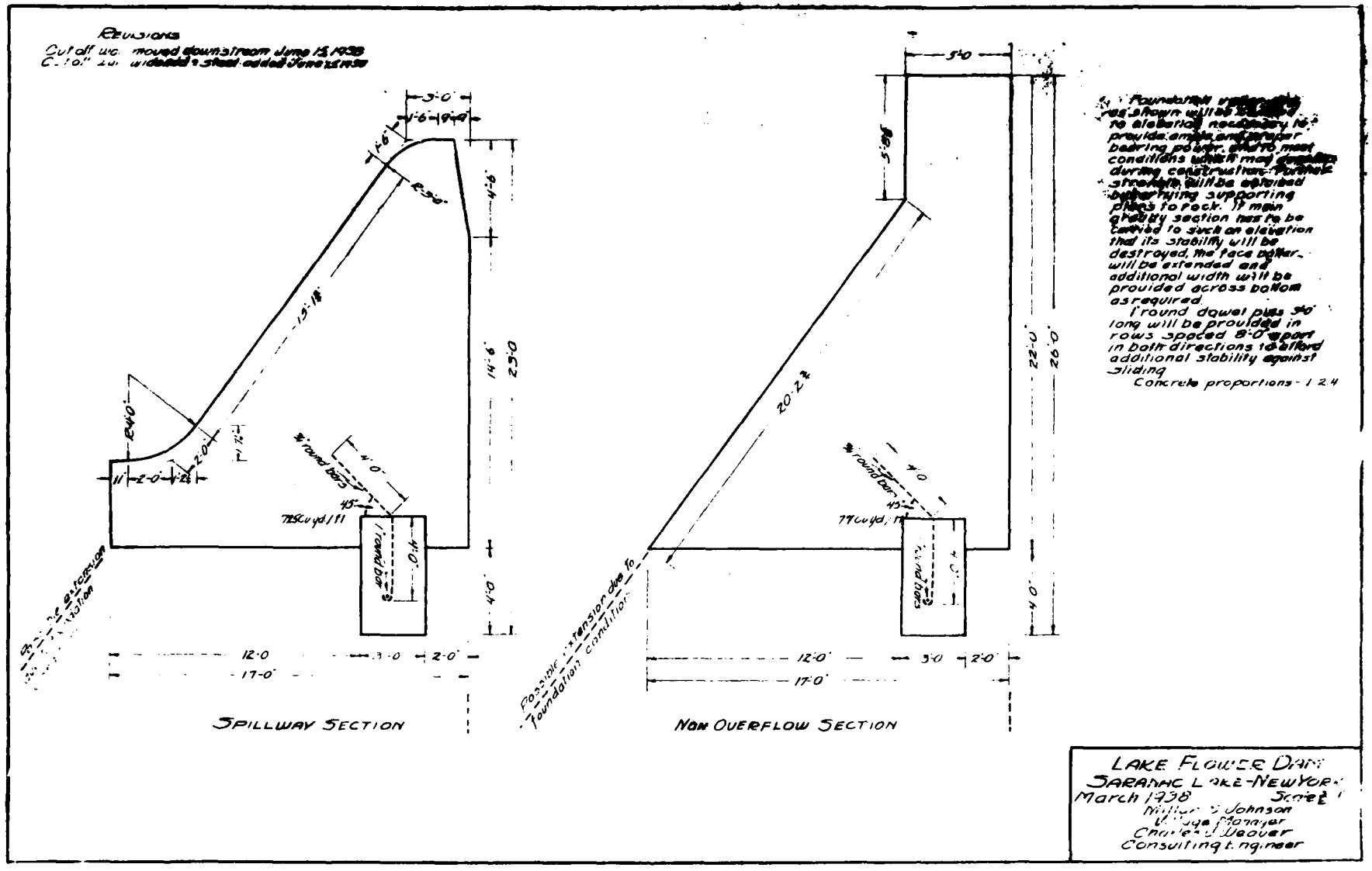
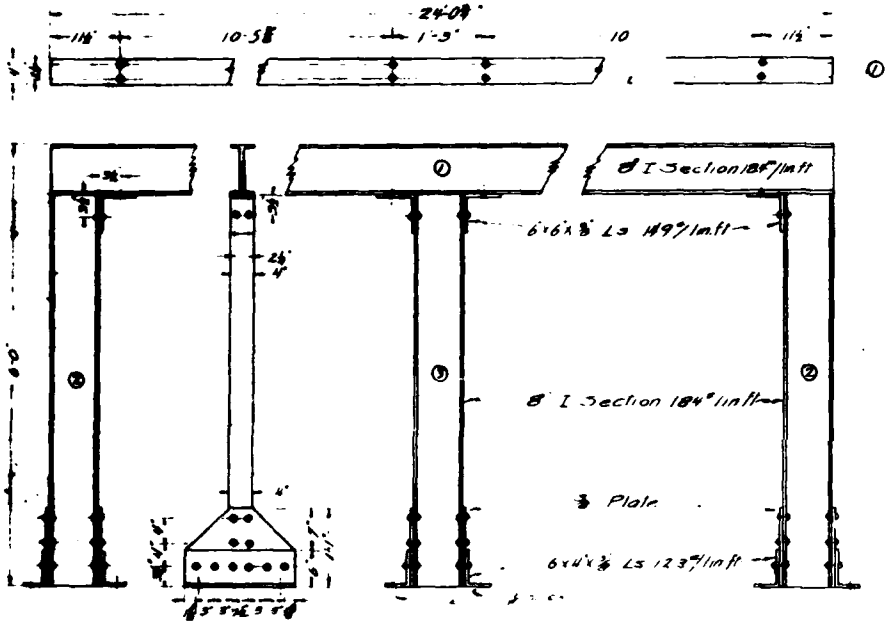
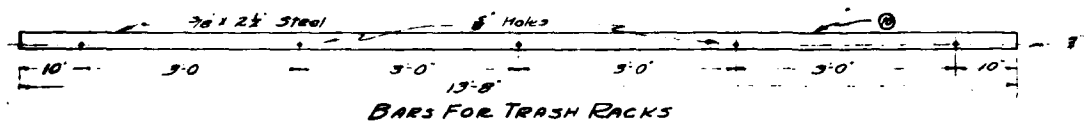

Revisions
Cut off wall moved downstream June 15, 1938
6-10" I.D. widened 1 sheet added June 22, 1938
3'-0"
1'-6"
1'-6"
R 3'-0"
4'-8"
15'-1"
14'-6"
23'-0"
R 10'-0"
2'-0"
11'-2'-0"
2'-0"
1'-2"
4'-0" round dogs
45°
775 cu yd / ft
4'-0"
4'-0"
Possible extension due to foundation condition
12'-0"
3'-0"
2'-0"
17'-0"
SPILLWAY SECTION
5'-0"
5'-8"
20.2'
4'-0" round dogs
45°
79 cu yd / ft
22'-0"
26'-0"
4'-0"
Possible extension due to foundation condition
12'-0"
3'-0"
2'-0"
17'-0"
NON OVERFLOW SECTION
Foundation profile as shown will be changed to elevation necessary to provide ample and proper bearing power, and to meet conditions which may develop during construction. Further strength will be obtained by keying supporting piers to rock. If main gravity section has to be carried to such an elevation that its stability will be destroyed, the face batter will be extended and additional width will be provided across bottom as required.
Round dowel pins 30' long will be provided in rows spaced 8'-0" apart in both directions to afford additional stability against sliding.
Concrete proportions - 1 2 4
LAKE FLOWEE DAM
SARANAC LAKE - NEW YORK
March 1938 Sheet 1
William J. Johnson
Village Manager
Charles J. Weaver
Consulting Engineer

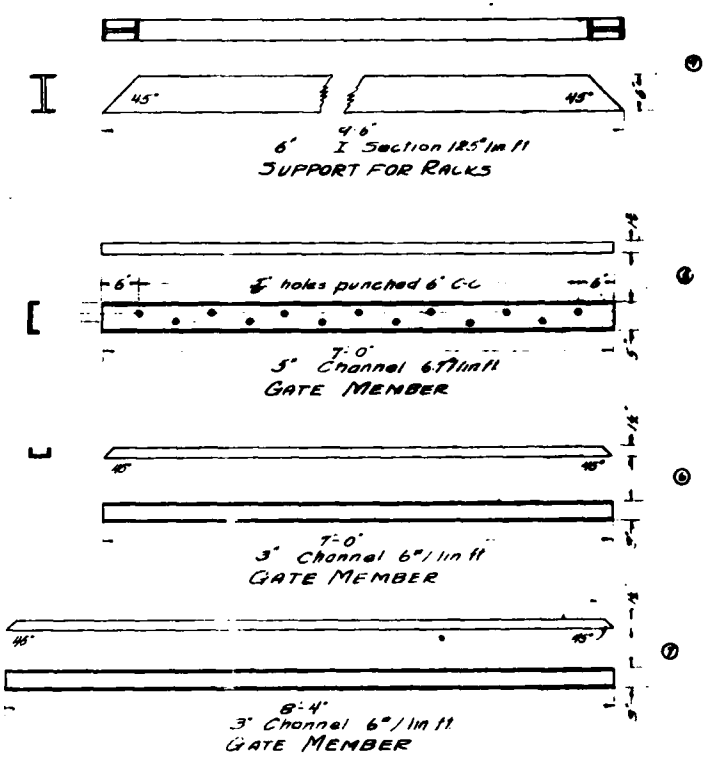
FIGURE 8



STOP LOG HOIST FRAME
Bolts ⅞" diam
Rivets ¾" diam



BARS FOR TRASH RACKS



No.	Description	No required
1	As shown	1
2	As shown	2
3	As shown	1
4	As shown	6
5	As shown	4

No.	Description	No. required
6	As shown	4
7	As shown	4
8	6"x4"x⅜ x 7'0" Angle	4
9	6"x4"x⅜ x 13'0" Angle	4
10	As Shown	80

LAKE FLOWER DAM
SARANAC LAKE NEW YORK
March 1933 Scale 1" = 1'0"
Miller S Johnson
Village Manager
Charles J Weaver
Consulting Engineer

FIGURE 9

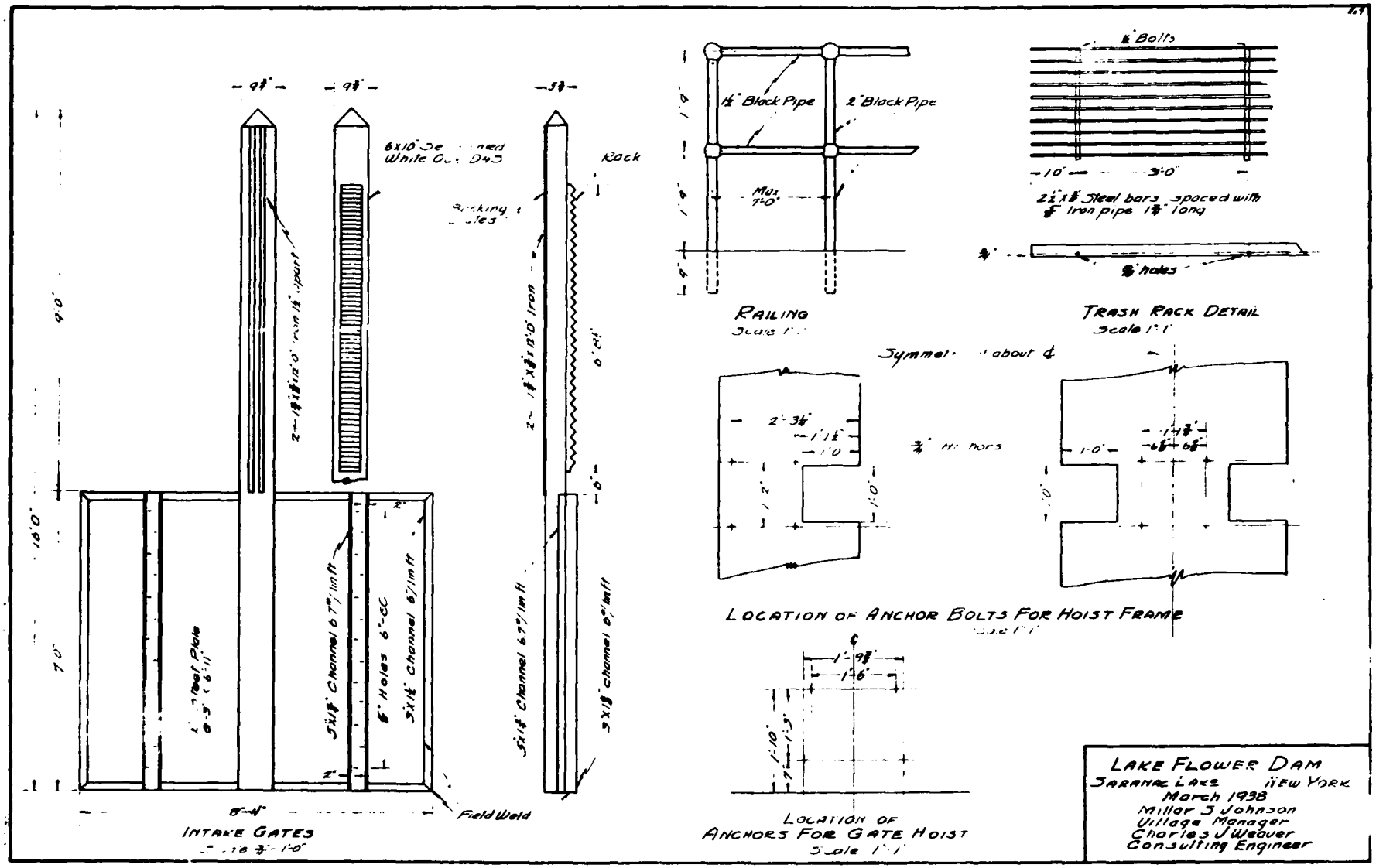
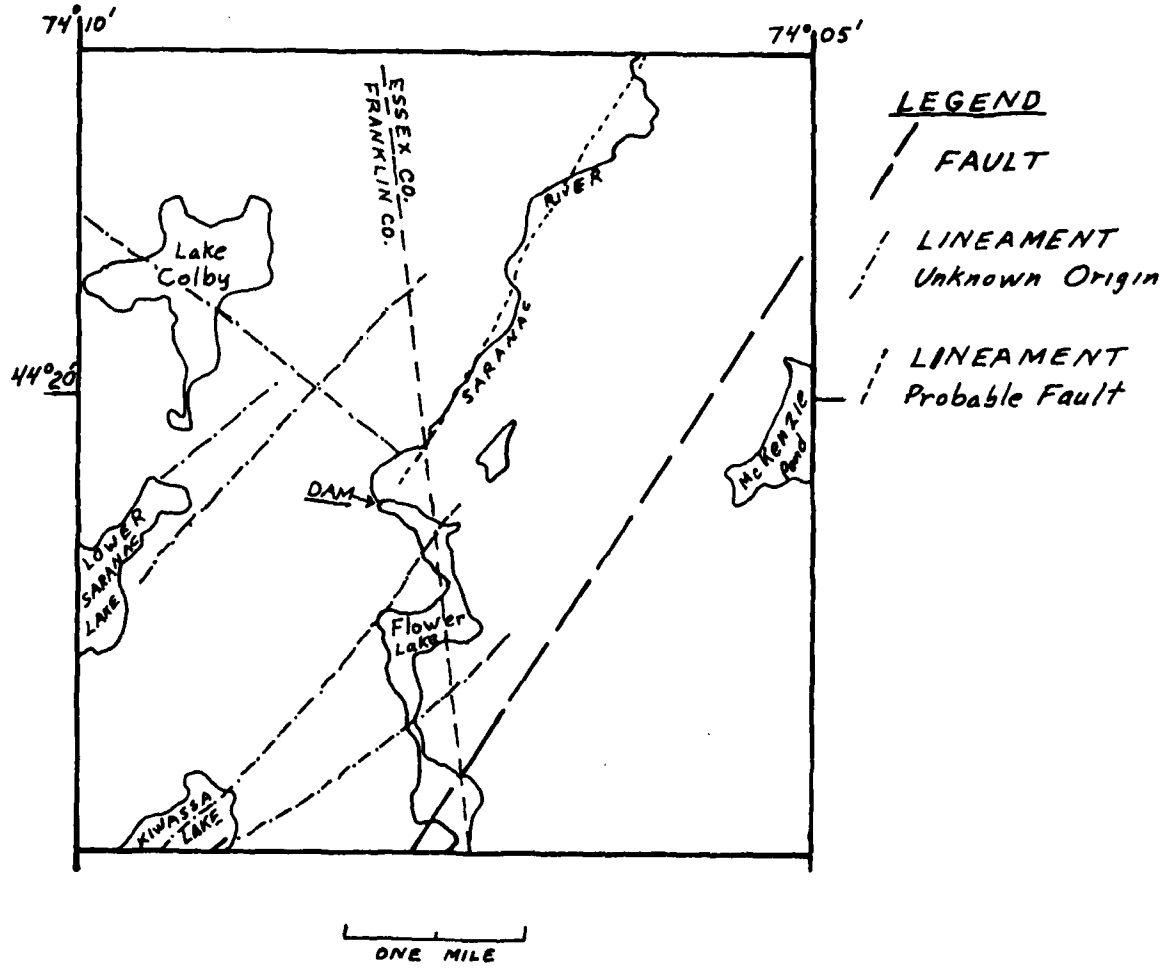

Rack
Field Weld
INTAKE GATES
RAILING
TRASH RACK DETAIL
Scale 1"=1'
Symmetrical about ℄
LOCATION OF ANCHOR BOLTS FOR HOIST FRAME
LOCATION OF ANCHORS FOR GATE HOIST
Scale 1"=1'
LAKE FLOWER DAM
SARANAC LAKE NEW YORK
March 1938
Millar S Johnson
Village Manager
Charles J Weaver
Consulting Engineer

FIGURE 10



GEOLOGIC MAP

STETSON • DALE	DATE 6-27-80	DRAWN H.M.	FIGURE 11
	JOB 2399	APP'D	

APPENDIX A

FIELD INSPECTION REPORT

CHECK LIST
VISUAL INSPECTION

PHASE 1

Name Dam Lake Flower County Franklin State N.Y. ID # NY 707

Type of Dam Concrete Hazard Category High

Date(s) Inspection 6/9/80 Weather Raining lightly Temperature 40-50°

Pool Elevation at Time of Inspection 1528.5+ M.S.L. Tailwater at Time of Inspection Not measured

Inspection Personnel:

J. A. Gomez	Dale Engineering Company	
F. W. Byszewski	Dale Engineering Company	
D. F. McCarthy	Dale Engineering Company	
H. Muskatt	Dale Engineering Company	
Thomas Carroll	Water Superintendent Village of Saranac Lake	

J. A. Gomez Recorder

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	Flow over spillway obscured face, but water surface didn't indicate seepage. Minor seepage downstream side (right of stop plank openings) of wall.	Considerable leakage into pump building and thru downstream wall.
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	Structure abuts against buildings. No Problems noted at junction.	
DRAINS	None	
WATER PASSAGES	Two stop plank openings	
FOUNDATION	Glacial till	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	Downstream of spillway looked pretty good except for crack on left third from end of spillway. Significant deterioration of channel walls, wire mesh showing.	Gunited in 50's. Downstream surface sounded hollow when tapped with hammer
STRUCTURAL CRACKING	Televised inspection of upstream face showed some cracking, no evidence noted in field inspection.	
VERTICAL & HORIZONTAL ALIGNMENT	No displacement evident in field.	
MONOLITH JOINTS	O.K.	
CONSTRUCTION JOINTS	O.K.	
STAFF GAGE OF RECORDER	Located near right abutment.	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	No earthen portion of dam.	Settling - holes in island between outlet channels
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	Not applicable	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Not applicable	
VERTICAL AND HORIZONTAL ALINEMENT OF THE CREST	Not applicable	
RIPRAP FAILURES	Not applicable	

EMBANKMENT

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

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Ogee shaped. Vertical crack at one third from left	
APPROACH CHANNEL	Bridge just upstream with 48' wide opening. 2 ' from low chord to water surface at time of inspection. Therefore low chord about 2.5 above spillway crest.	
DISCHARGE CHANNEL	Stone/masonry wall, right side; rip-rap (1' diameter) left. Masonry missing some pointing, otherwise good condition.	
BRIDGE AND PIERS	Not applicable	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	Not applicable	
APPROACH CHANNEL	Same as ungated spillway.	
DISCHARGE CHANNEL	Same as ungated spillway.	
BRIDGE AND PIERS	Deterioration of pier between openings, wire mesh showing where concrete is spalled.	
GATES AND OPERATION EQUIPMENT	Wood stop planks replaced in 1978.	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Spalling of concrete pier between stop plank openings.	
INTAKE STRUCTURE	2-6'Ø pipes for hydro-mechanical operation. Pipes pass into Water Department building.	Significant seepage through foundation wall of Water Department building on reservoir side. Reportedly worse at present, than during previous years.
OUTLET STRUCTURE	Masonry channel.	
OUTLET CHANNEL	Bulge in left wall just downstream of footbridge.	
EMERGENCY GATE	None.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Clean, much of channel lined with masonry wall	
SLOPES	No unstable slopes noted	
APPROXIMATE NO. OF HOMES AND POPULATION	Number of houses and businesses along banks as river runs through village of Saranac Lake.	

INSTRUMENTATION

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None	
OBSERVATION WELLS	None	
WEIRS	None	
PIEZOMETERS	None	
OTHER	None	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Steep to moderate. Heavily wooded.	
SEDIMENTATION	No substantial amount noted.	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE 1

NAME OF DAM Lake Flower Dam

ID # NY 707

ITEM	REMARKS
AS-BUILT DRAWINGS	None available.
REGIONAL VICINITY MAP	See report. U.S.G.S. Map
CONSTRUCTION HISTORY	No Data available, except from Dam Safety Section files
TYPICAL SECTIONS OF DAM	See plans, dated 1935
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS	See plans, dated 1935.
RAINFALL/RESERVOIR RECORDS	None available.

ITEM	REMARKS
DESIGN REPORTS	None available
GEOLOGY REPORTS	None available
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None available
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	None available
POST-CONSTRUCTION SURVEYS OF DAM	None available
BORROW SOURCES	None available

ITEM	REMARKS
MONITORING SYSTEMS	None.
MODIFICATIONS	None.
HIGH POOL RECORDS	None available.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None available.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	See Appendix B. Problem with stop planks in 1977.
MAINTENANCE OPERATION: RECORDS	None.

ITEM	REMARKS
SPILLWAY PLAN SECTIONS DETAILS	See plans, dated 1935
OPERATING EQUIPMENT PLANS & DETAILS	See plans, dated 1935

CHECK LIST
HYDROLOGIC & HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 179 square miles heavily wooded

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 1528

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 1533

ELEVATION MAXIMUM DESIGN POOL: 1531

ELEVATION TOP DAM: 1533

CREST:

a. Elevation 1528
b. Type Ogee shaped
c. Width Not applicable.
d. Length 40 feet
e. Location Spillover Center of dam
f. Number and Type of Gates None

OUTLET WORKS:

a. Type 2-8' wide x11.5ft. high stop plank structure
b. Location Right abutment
c. Entrance Inverts 1513
d. Exit Inverts 1513
e. Emergency Draindown Facilities Same

HYDROMETEOROLOGICAL GAGES:

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

MAXIMUM NON-DAMAGING DISCHARGE: Unknown

APPENDIX B

PREVIOUS INSPECTION REPORTS/RELEVANT CORRESPONDENCE

Sheet 183 dam 60 Chan

Acc. 382

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

STATE OF NEW YORK

CONSERVATION COMMISSION

ALBANY

DAM REPORT

August 25 (Date), 1917

CONSERVATION COMMISSION,

DIVISION OF WATERS.

GENTLEMEN:

I have the honor to make the following report in relation to the structure known as the Saranac Lake Power Dam Dam.

This dam is situated upon the Saranac River (Give name of stream)

in the Town of ~~Saranac Lake~~ Harrietstown, Franklin County,

about in (State distance) ~~from~~ the Village ~~or City~~ of Saranac Lake

The distance (Up or down) stream from the dam, to the (Give name of nearest important stream or of a bridge);

is about (State distance).

The dam is now owned by Paul Smiths Light Power & R.R. Co. (Give name and address in full) Saranac Lake N.Y.

and was built in or about the year 1850, and was extensively repaired or reconstructed

during the year 1870 15 years ago.

As it now stands, the spillway portion of this dam is built of timber crib (State whether of masonry, concrete or timber)

and the other portions are built of masonry (State whether of masonry, concrete, earth or timber with or without rock fill)

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

foundation is " "

The total length of this dam is 150 feet. The spillway or wa-
weir portion, is about 42 feet long, and the crest of the spillway is
about five feet below the abutment. with flash boards removed

The number, size and location of discharge pipes, waste pipes or gates which may be used for drawing off the water from behind the dam, are as follows: Water is drawn to Village pump house by three gates 5' wide 12' high. Six gates 4½ ft wide 12 ft high lead water to power house. Waste weir is opened by removal of flash boards and

At the time of this inspection the water level above the dam was ft. in.
below is 12 ft wide
above the crest of the spillway. all water was going to power and pump stations

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

This dam is in fair condition Since the water comes from the lakes the flow is very uniform Some water leaks through the base of the forebay walls on each side. Too much lime was used in the mortar in the walls Under the crib near the wasteweir is also a noticable flow of water. None of these leaks endanger the structure at present.

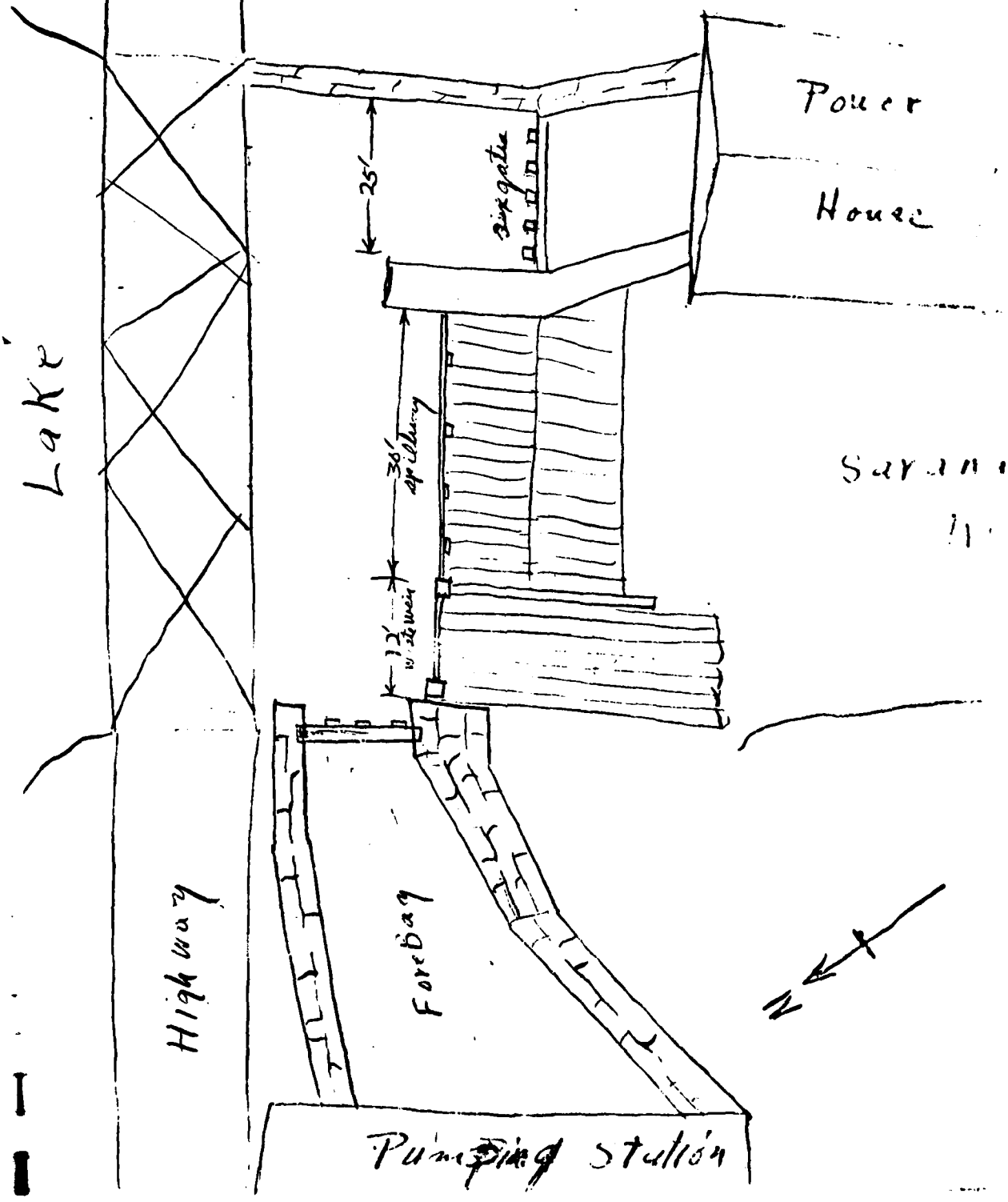
June 4, 1919
In fair condition
Paul A. Callender.

Reported by Vernon Schildt
(Signature)

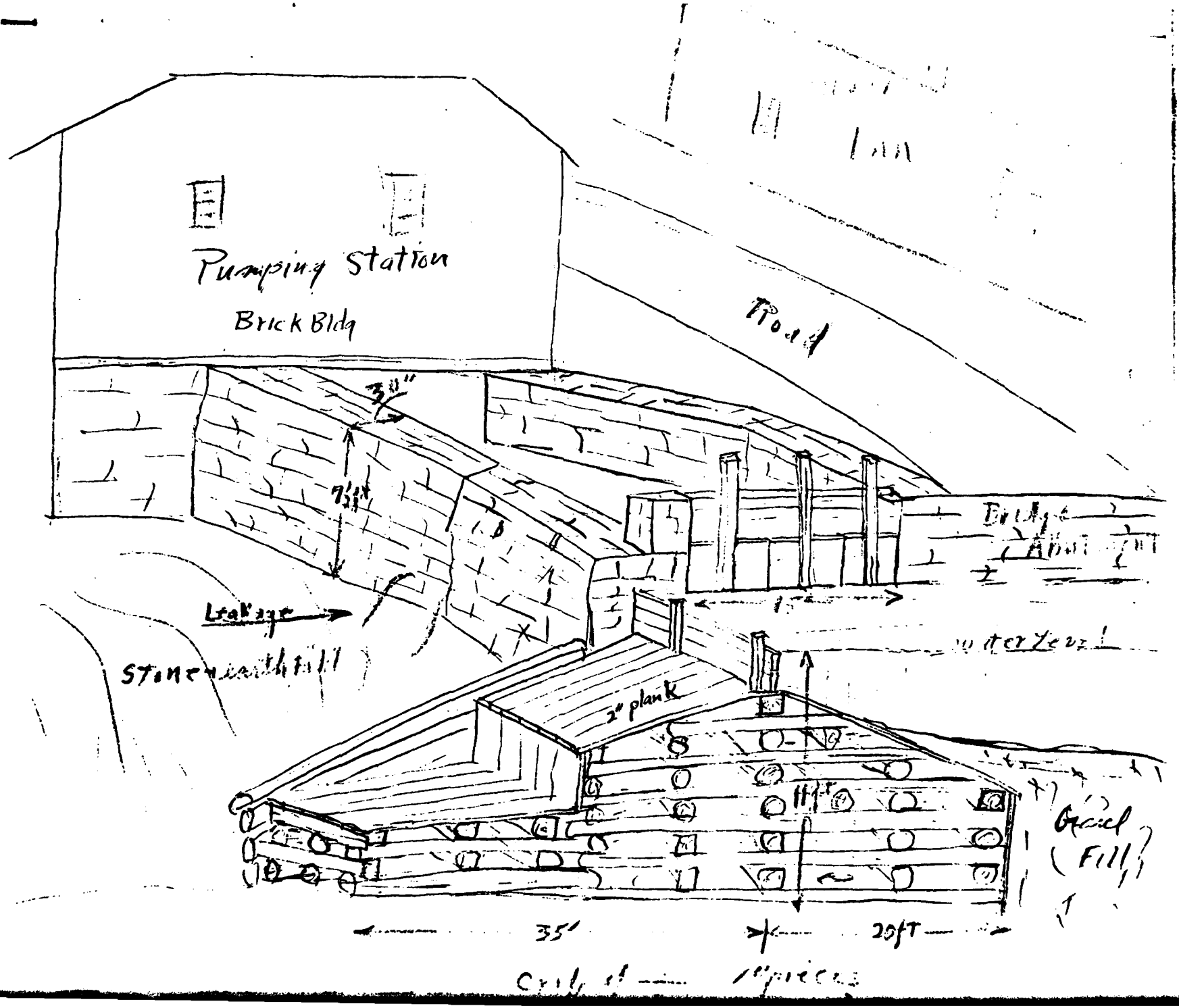
Port Chester N.Y.
(Address—Street and number, P. O. Box or R. F. D. route)

P.O.B. 177
(Name of place)

(In the space below, make one sketch showing the form [illegible] dam and outline the abutment, and a second sketch showing the [illegible] dam. Show particularly the greatest height of the dam above the stream bed, as nearly as you can learn.)



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



JOINT COMMITTEE

INSPECTS DAM

Decide Action Necessary; Legal Status of Water Board Will Be Determined

April 29, 1924

A joint meeting of the Board of Trustees and the Sewer and Water Commissioners with Village Engineer Harry Hall was held on Thursday afternoon in the village offices. It was hoped by the members of the board that Phelps Smith, of the Paul Smith's Electric Light and Power Company would also be able to attend the meeting but it was impossible to locate him.

After a short conference in the offices the members of the commission adjourned to inspect the dam near the Riverside Inn which has been reported to be in a weakened condition.

It was the unanimous verdict of the members that the dam is in a precarious condition and that something will have to be done. The Attorney-General will be conferred with and the exact legal status of the Water Board in the matter will be determined. Should the answer be favorable a special election will be held at which time the voters of the village will have an opportunity to decide upon the project.

In the event of the work being carried on under the direction of the Water Board it has been decided to secure the services of a competent engineer who will draw up a series of plans and specifications to meet the requirements. Competitive bids will then be asked for.

Members of the Water Board expressed the hope that action would be taken before the present dam goes out altogether. In this event Lake Flower would degenerate into a mudhole for the next six months and a tremendous amount of damage would be done to the country below the dam.

Those present at the meeting were: C. L. Dickert, Village President; Trustee P. H. Ryan; H. Ray Williams and E. E. Bellows, of the Water Board; P. A. Gould, of the Paul Smith's Electric Light and Power Company; Wm. Demerse, Supt. of Water Works, and Harry Hull, Village Engineer.

Dam 607 Champlain.

May 3, 1921.

Subject: Reconstruction of Flower Lake Dam, Saranac River.

Mr. [illegible] Hall,
Village Engineer,
Saranac Lake Village,
Franklin County,
N. Y.

Dear Sir:

Information has been furnished this Commission indicating that during the fall of 1920 the water commissioners of the Village of Saranac Lake caused the execution of certain reconstruction work in connection with the dam located in that village which regulates the water surface elevations in Lake Flower. Prior to such reconstruction work it does not appear that notice was given this Commission pursuant to the provisions of section 22 of the Conservation Law (see copy attached).

Recent information further indicates that you have, within a short time, examined such dam in compeny with the Village Sewer and Water Commissioners, and that the unanimous opinion was to the effect that the structure is in a dangerous condition. The report further states that a failure would cause a tremendous amount of damage along the stream-bed below.

The records of this Commission indicate that the dam in question is a timber structure, the maximum exposed height of which is about 12 feet, and further, that the four bridges located below the dam within the corporate limits of the village are from 8 to 31 feet above the ordinary water surface elevation. Below the village, the U.S.G.S. map indicates that the river flows for a considerable distance through a swamp of large area.

Mr. Harry Hull,
May 3, 1921.

Unless the Commission can be satisfied, with reasonable certainty, that a failure of the dam, either in its present condition or after reconstruction, could not endanger life nor cause material damage to the property of others, you should furnish information and data as described in detail in the instructions to applicants appearing upon the back of the enclosed form and upon the typewritten addenda-sheet accompanying same. Such information should be furnished as early as practicable, that ample opportunity may be afforded for a comprehensive study and investigation of the matter without causing unnecessary inconvenience or delay of construction work.

The fact that the village has not previously complied with the provisions of the law relating to this matter would not prejudice the case before the Commission at this time, provided that the information and data is promptly furnished as previously requested herein.

Very truly yours,

ELLIS J. STALEY, Commissioner,

By

DIVISION ENGINEER.

JWH-HB.

Lake Flower Dam; Saranac [illegible]
Village; Harrietstown, [illegible]
Timber crib dam
Jas. Henry, May 3 21
Press clipping stating dam to be unsafe
as noted below.

Apr. 29, 1921 Saranac L. Enterprise:

1. Saranac Lake Sewer and Water Comrs., and Village engineer examined the dam on Thursday (Apr. 28, 1921);
2. Unanimous opinion that dam was in precarious condition
3. Special election will probably be held;
4. Engineer will be engaged to prepare plans and specifications for dam;
5. Failure would do tremendous amount of damage to country below dam

1913 Saranac River Survey:

Top of flashboards at dam, -- 1527.4
Tail water " " -- 1516.2
Head _____ 11'±

Bridge near Sta. P27 (next below) El. 1527.6
Water level near bridge (" ") " 15.5
Clearance " (" ") _____ 12'±

Bridge near Sta P28 (second below) " 1523.34
Water level near bridge (" ") " 15.4
Clearance " (" ") _____ 8'±

R. R. bridge (third below) " 46.4
Water level near bridge (" ") " 15.4
Clearance (" ") _____ 31.4'±

Bridge [illegible] Sta. [illegible] (fourth below)
Water level below bridge (" ") " 13.5
Clearance (" ") _____ 18'±, 19

May 16, 1921.

Mr. Harry Hull,
Village Engr.,
Saranac Lake, N. Y.

Dear Sir:-

Our Inspector of Docks and Dams, Mr. McKim, reports that you are about to reconstruct the dam owned by the village and by the Paul Smith Electric Electric Company.

We enclose herewith a copy of an application form, on the back of which appear printed instructions as to the information which ordinarily accompanies such applications when submitted to this Commission.

Very truly yours,

ELLIS J. STANLEY, Commissioner,

By

Division Engineer.

McZ/C.

Encl.

3

[illegible]
C. L. DICKERT
P. H. RYAN
F. C. CONRAD
D. S. FOSTER
BEAVER A. MILLER, CLERK
M. M. MUNN, TREASURER
HARRY HULL, ENGINEER
JAMES DISCO, STREET COMMISSIONER

VILLAGE OF SARANAC LAKE

I. VOSBURGH, PRESIDENT

COM[illegible]RS
H. RAY WILLIAMS
[illegible]
WILLIAM [illegible]

BOARD OF ASSESSORS
WM. H. MOORE
EUGENE KEET
E. M. BROWN
JAMES W. CROMIE
JAMES KEESE, COLLECTOR

SARANAC LAKE, N. Y.

June 2nd.,1921.

Conservation Commission,
Albany, N.Y.

Gentlemen:-

During the spring of 1920 the dam across the Saranac River in this village became loosened by the great quantity of ice resting against it, and the pillar between the slip and the flume was pushed down the stream a distance of ten or twelve inches. This was repaired by the Village of Saranac Lake and the Paul Smith Electric Light Company at joint expense.

Last spring the dam showed still further signs of weakening, and I am requested by the Saranac Lake Village Board of Water Commissioners to ask if you will send an engineer here to inspeck the property and to make a report and recommendation on same.

Yours very truly,

Beaver A. Miller.

Village Clerk,

Saranac Lake, N.Y.

REC'D		No.
CONSERVATION COMM.		DATE
INFOR.	[illegible]	
REFD.		
CORF.		
FR FET.		
[illegible]		
[illegible]		
FOL. UP		
ANS'D		
FILE		

June 7, 1921

Mr McKim has already been there and [illegible] [illegible] [illegible] [illegible] and we have [illegible] [illegible] have [illegible]

Dam #607 Champlain.

June 11, 1921.

Subject: Reconstruction of Flower Lake Dam
Saranac River.

Mr. Seaver A. Miller,
Village Clerk,
Saranac Lake, N. Y.

Dear Sir:-

By a recent letter you have requested that this Commission send an engineer to Saranac Lake Village to examine the dam across the Saranac River at that point, which regulates the water surface elevations in Lake Flower. In the same connection we respectfully request your attention to the enclosed copy of this Commission's letter dated May 5, 1921, addressed to Village Engineer Harry Hull, no reply to which has been received. Subsequent to such letter dated May 5, 1921, this Commission's Inspector of Docks and Dams, Mr. A. R. Nolin, traveled to Saranac Lake Village and examined such dam in company with the village engineer and discussed matters somewhat in detail with him. Therefore, by communicating with Mr. Hull, it will doubtless be possible to obtain the information desired by your Board of Water Commissioners.

Very truly yours,

ELLIS J. STILLY, Commissioner,

By

Division Engineer.

JEH/C.

Encl.

3

AVI-V

July 5, 1921.

Mr. Seaver A. Miller,
Village Clerk,
Saranac Lake, N. Y.

Dear Sir:

In further answer to your letter of June 2, 1921, in which you ask for an engineer to [illegible] your dam, it is the policy of the State Engineer to [illegible] the work of administration. Section 21 of the Conservation Law has been amended by law, to approve of all dams and docks which are constructed in accordance with well recognized engineering principles, and are in his judgment safe when such principles are applied to their construction. The funds appropriated for the work, however, will not permit of the assignment of engineers to prepare designs or consult with regard to their preparation except as such consultations may be had at the office of the State Engineer.

Very truly yours,

FRANK M. WILLIAMS,
State Engineer,

By

Deputy State Engineer.

ARWcX-F.

April 11, 1928.

Re reconstruction of
Dam 607, Champlain Watershed,
Saranac Lake.

Mr. Paul Smith,
Saranac Lake, N. Y.

Dear Sir:

We enclose a revised application blank to be filled out with data necessary for us in the calculations for the reconstruction of Dam No. 607, Champlain Watershed, Saranac Lake, signed on the last page and submitted to this department for approval to commence the work.

Very truly yours,

FRANK M. WILLIAMS,
State Engineer

By_____
Assistant Deputy

Enclosure

STATE OF NEW YORK
STATE ENGINEER AND SURVEYOR
ALBANY

STATE ENGINEER
FRANK R. LANAGAN
DEPUTY
CHAS. R. WATERS
ASSISTANT DEPUTY

ADDRESS ALL COMMUNICATIONS
ROY G. FINCH, STATE ENGINEER AND SURVEYOR

[illegible], 1926.

Mr. John [illegible]
[illegible]
N. Y.

Dear Sir:-

[illegible] the outlet of Lake Kora[illegible] to the condition of the dam across the outlet together with two blueprints showing an outline of the contemplated construction.

Our records indicate that it has been necessary to repair this dam several times in the last few years but judging from your description of the leakages and consequent settlements, the repairs were not of a permanent character. We have a report also that failure of this dam would cause very great damage downstream.

This Department is much concerned about the present condition of this dam because, under Chapter 82 of the Laws of 1923, plans for the construction or reconstruction of dams are subject to the approval of the State Engineer and he must, when public safety so requires, serve an order directing the reconstruction or repair of dams. We are pleased to learn that the village is about to repair it on its own volition.

The funds appropriated for this Department, however, will not permit of the assignment of an engineer to come to Saranac Lake to consult with you but we shall be glad to discuss the matter with you here.

There is an application form enclosed for the construction or reconstruction of a dam.

Yours very truly,

Roy G. Finch,

By

Deputy State Engineer.

Copy for Mr. Hollim
Hendricks

leakage and settlement. The upstream side of the highway bridge has settled about 6 inches and plans are being prepared to replace same. At the north end of the bridge there appears to be quite some seepage under the street and forebay of the Village pumping plant, causing a settlement in the pavement of from 4 to 6 inches and a horizontal movement of the west wall of the Village forebay of about 2 inches in the direction indicated on the accompanying print. There is also quite some leakage under and through the dam proper and under the masonry wall of the Paul Smith Company. On numerous occasions it has been necessary to fill in above the dam to stop leakage.

The Town of Harrietstown, within which town the dam is located, has engaged Mr. John Sweeney, Consulting Engineer of Saranac Lake, N. Y. to prepare plans for a new bridge to replace the present structure shown on the accompanying print. Mr. Sweeney has suggested that the project be extended to include the reconstruction of the dam. This scheme meets with the approval of the village officials. The Paul Smith Company, however, has not as yet approved the project. This Company, as previously noted, owns half of the present dam.

The present condition of the dam is such that there are numerous leaks located through the dam itself and through the walls of the forebay. The forebay wall on the north end of the dam appears to have moved. This is the forebay owned by the Village of Saranac Lake. An investigation of the dam does not show any immediate danger of failure of such a nature as to cause any great damage to property located below the dam. There is reason to belive, however, that the leaks through the dam itself and through the forebay wall may develop to such an extent that it will not be possible to stop them by any ordinary filling above the dam, with a result that the level of Flower Lake would be lowered and might cause an unhealthful condition, and that the Village of Saranac Lake would be deprived of power developed at the dam with resulting failure of the fire protection system and also with the result that parts of the village would be without water. There is also a possibility though it does not appear to be probable that conditions might arise in the stream above the dam which would produce such a head against this dam and forebay walls that it would result in their sudden destruction, in which case serious damage would result to property downstream from the dam and perhaps result in loss of life. Such conditions, however, and results, do not appear at all probable.

Very truly yours,

(signed) E.D. Hendricks,

Division Engineer.

STATE OF NEW YORK
STATE ENGINEER AND SURVEYOR
ALBANY

ROY G. FINCH, STATE ENGINEER

FRANK R. LANAGAN
DEPUTY

ADDRESS ALL COMMUNICATIONS TO
ROY G. FINCH, STATE ENGINEER

FRL/K.

February 27, 1925.

Mr. E. D. Hendricks,
Division Engineer,
Albany, New York.

Dear Sir:

We have been advised that the dam located at the outlet of Lake Flower in the village of Saranac is in poor condition, that water is leaking badly under, around and through the dam and that there is grave question as to its stability. We understand also that should the dam fail, there might be danger to persons as well as likelihood of damage to a number of the village bridges crossing the stream downstream from the dam.

Will you therefore delegate a qualified engineer to make an inspection of this dam and then report his findings and recommendations to us?

We understand that the dam originally constructed in 1827 is owned jointly by the village of Saranac and the Paul Smith Electric Light, Power and Railroad Company.

If the engineer you delegate to make this inspection, will notify Mr. John Sweeney, Consulting Engineer, Riverside Drive, Saranac Lake of his coming and arrange to see him, Mr. Sweeney will be glad to give him any information he can in reference to the dam. Mr. Sweeney is primarily interested because he has been retained by the town to build a new bridge to replace a present one which crosses the stream just upstream from the dam and the condition of the dam raises a question as to the abutments of the bridge.

Very truly yours,

Roy G. Finch,
State Engineer.

By [illegible]
Deputy State Engineer.

HCK-H

February 28, 1925

Mr. H. L. Clarke,
Assistant Engineer,
Mechanicville, N. Y.

Dear Sir:-

We have been advised that the dam located at the outlet of Lake Flower in the village of Saranac is in poor condition, that water is leaking badly under, around and through the dam and that there is grave question as to its stability. We understand also that should the dam fail there might be danger to persons as well as likelihood of damage to a number of the village bridges crossing the stream downstream from the dam.

We understand that the dam, originally constructed in 1827, is owned jointly by the village of Saranac and the Paul Smith Electric Light, Power and Railroad Company.

Please make an inspection of this dam and report your findings and recommendations to me as soon as possible.

If you will notify Mr. John Sweeney, Consulting Engineer, Riverside Drive, Saranac Lake, when you expect to make the inspection and arrange to see him, Mr. Sweeney will be glad to give you any information he can in reference to the dam. He is primarily interested because he has been retained by the town to build a new bridge to replace a present one which crosses the stream just upstream from the dam and the condition of the dam raises a question as to the abutments of the bridge.

Very truly yours,

Division Engineer

E. D. HENDRICKS, DIVISION ENGINEER

STATE OF NEW YORK
DEPARTMENT OF STATE ENGINEER AND SURVEYOR
EASTERN DIVISION
158 STATE ST.
ALBANY

SUBJECT:

Mechanicville, N. Y.,
March 12, 1925.

Mr. E. D. Hendricks,
Division Engineer,
Albany, N. Y.

Dear Sir:-

In accordance with your instructions of February 28, 1925, I made an inspection of the timber dam in the Saranac River at the outlet of Lake Flower, Saranac Lake, N. Y., on March 6, 1925, and submit the following report:

1. Location.

(1) Town of Harrietstown, County of Franklin.
(2) Stream obstructed, Saranac River.
(3) Fork of Main stream, Main stream.

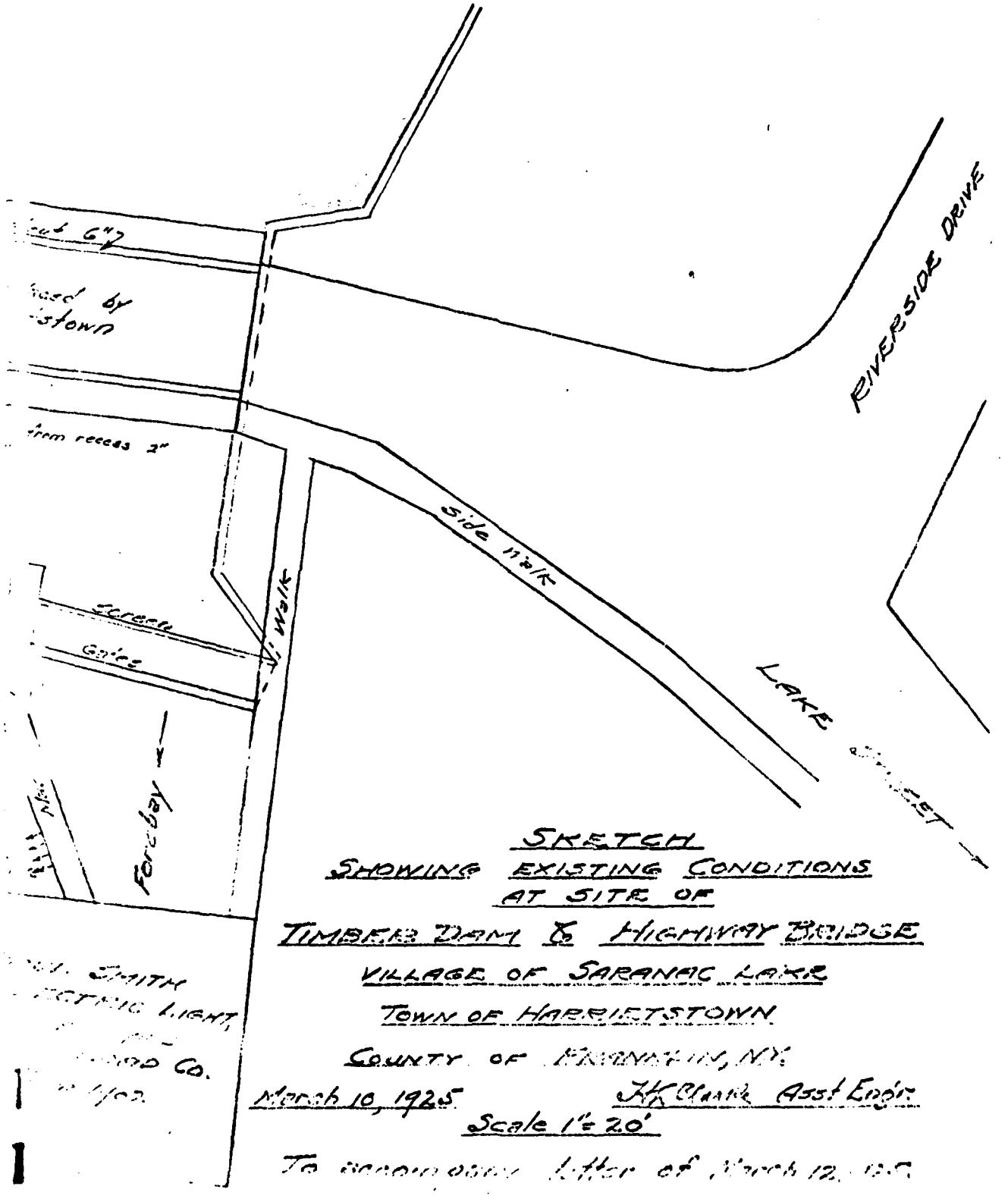
2 Owner, name and address, Village of Saranac Lake and Paul Smith Electric Light, Power and R. R. Company.

3 Physical Features

(1) Drainage area, 202.4 square miles.
(2) Area of Pond, ~~16.2~~ % of drainage area.
(3) Character of Material, Rocky.
(4) Percentage of woods and cultivation, Very little cultivation.
(5) Side slopes, Steep and wooded.
(6) Estimate of flood flow, At Saranac Lake, 52 to 228 c.f.s., 1902 and 1903 only records available. At Plattsburg, min. 15 c.f.s.; max., 6410.

4 Dam

(1) Use, Power and maintaining level of Flower Lake.
(2) Kind, Timber, stone filled; masonry abutments and head walls.
(3) Head, 9'±
(4) Dimensions
(5) Foundation, Large boulders and gravel. No rock in vicinity of dam.
(6) Spillway and apron, Spillway, 46' long. Sluiceway, 12' wide by 3' deep.
(7) Other discharges, Two power flumes about 20' wide, 9'± deep.



SKETCH

SHOWING EXISTING CONDITIONS

AT SITE OF

TIMBER DAM & HIGHWAY BRIDGE

VILLAGE OF SARANAC LAKE

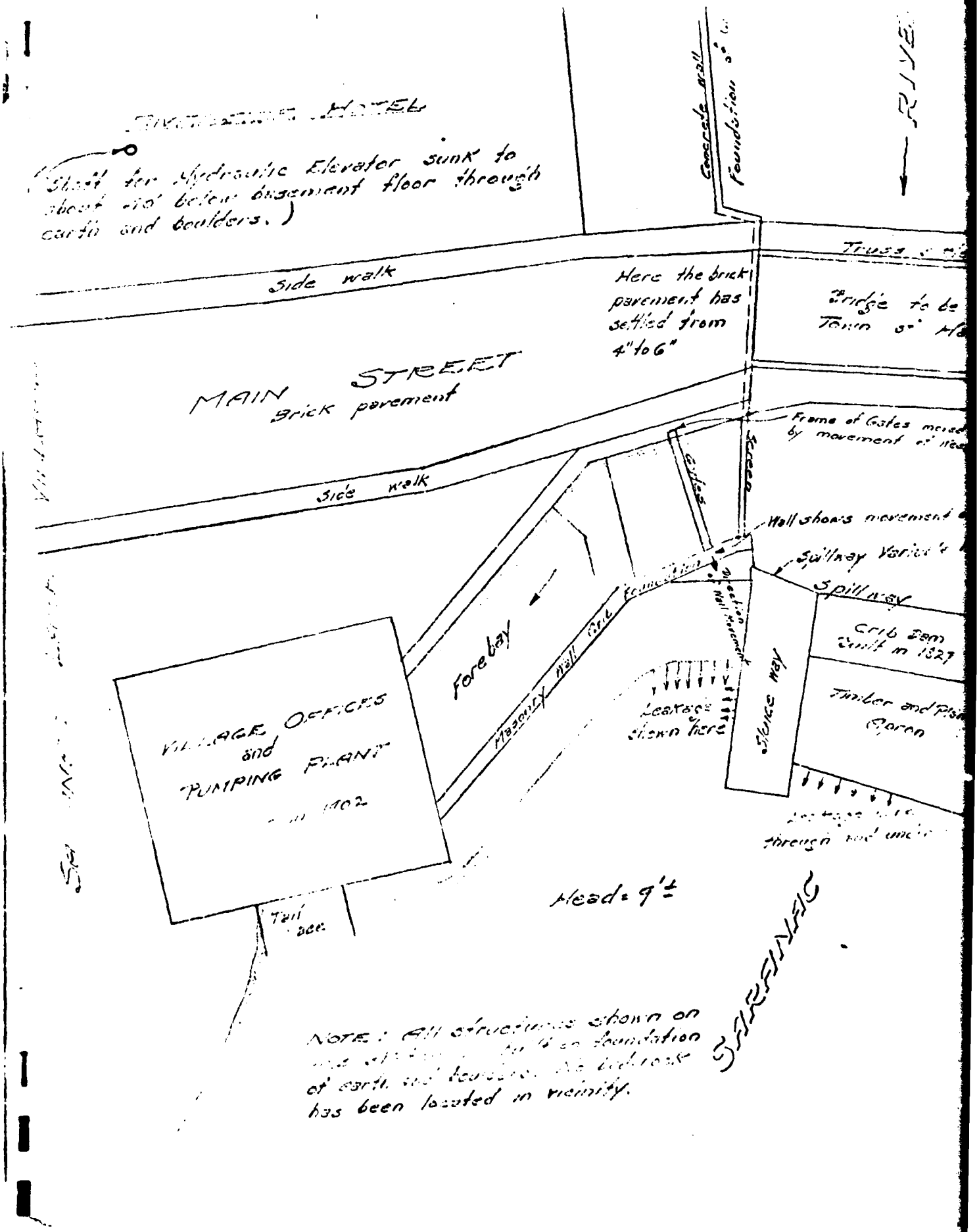
TOWN OF HARRIETSTOWN

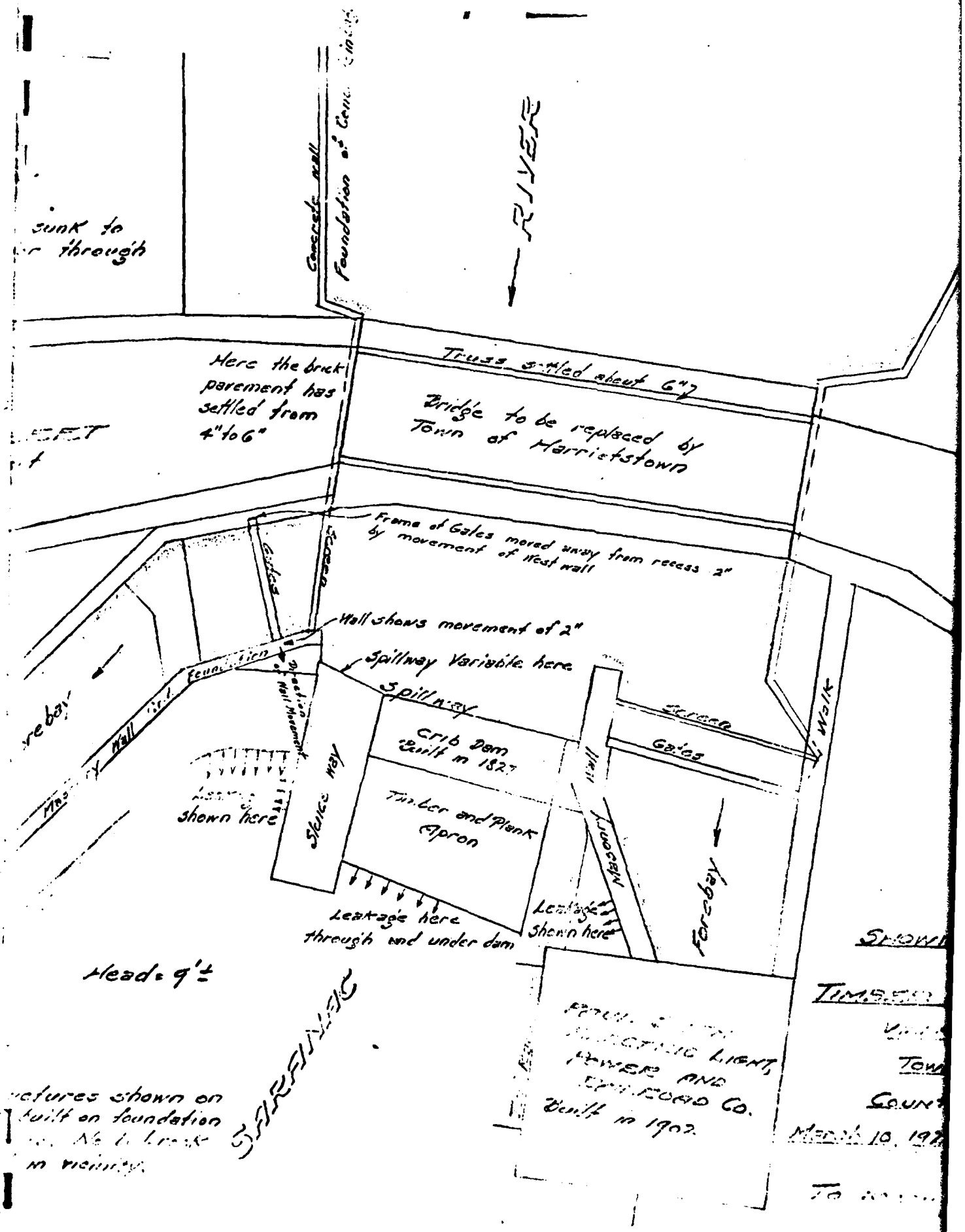
COUNTY OF FRANKLIN, N.Y.

March 10, 1925 J.K. Clark Asst Engr.

Scale 1" = 20'

To accompany letter of March 12, 1925


Shaft for Hydraulic Elevator sunk to about 100' below basement floor through earth and boulders.)
Concrete wall
Foundation
Side walk
Here the brick pavement has settled from 4" to 6"
MAIN STREET
Brick pavement
Side walk
Frame of Gates moved by movement of
Wall shows movement
Spillway
Crib Dam built in 1827
Timber and Plank Apron
Fore bay
Masonry wall and Foundation
Sluice way
Leakage shown here
VILLAGE OFFICES and PUMPING PLANT
Head = 9'±
Tail race
NOTE: All structures shown on this sheet are on foundation of earth and boulders. No bedrock has been located in vicinity.


RIVER
Concrete wall
Foundation of Conc.
sunk to
through
Here the brick
pavement has
settled from
4" to 6"
Truss settled about 6"
Bridge to be replaced by
Town of Harrietstown
Frame of Gates moved away from recess 2"
by movement of West wall
Gates
Recess
Wall shows movement of 2"
Spillway Variable here
Spillway
Crib Dam
Built in 1827
Timber and Plank
Apron
Sluice way
Gates
Walk
Wall
Masonry
Leakage here
through and under dam
Leakage
Shown here
Head 9'±
Electric Light
Power and
Road Co.
Built in 1902
Timber
Tow
Coun
March 10, 19
To
Pictures shown on
built on foundation
in vicinity

EDH-H

[illegible]
Saranac Lake, N. Y.

March 17, 1925

Hon. Roy G. Finch,
State Engineer,
Albany, N. Y.

Dear Sir:-

In accordance with your recent request with reference to inspection of the timber dam in the Saranac River at the outlet of Flower Lake, Saranac Lake, N. Y., I would advise you as follows:

This dam is located in the town of Harrietstown, county of Franklin and the stream dammed is Saranac River. The owners of the dam are the village of Saranac Lake and the Paul Smith Electric Light, Power and Railroad Co. The estimated drainage area above the dam is 202.4 square miles. The area of the pond above the dam is about 2 square miles. The character of the watershed is mountainous, mostly wooded. The estimated flow at the dam is - minimum 15 c.f.s., maximum 500 c.f.s.

The dam is used for developing electric power and maintaining the level of Flower Lake which is a navigable stream. The dam is a timber, stone filled structure with masonry abutments and head wall. The head is about 9 feet. The foundation consists of large boulders and gravel with no bed rock. There is a spillway 46 feet long and a sluiceway 12 feet wide and 8 feet deep, and two power flumes about 20 feet wide and 9 foot deep.

The original dam was built in 1837 and was used by private interests until 1849, when it was deeded to the Village. The property on the south side of the river was acquired by the Saranac Electric Company (subsequently taken over by the Paul Smith Electric Light, Power and R. R. Company), and in 1902 the Village and the Paul Smith Company built power plants, one on the north and the other on the south side of the river. The Village uses power to run its pumping plant, which is necessary for fire protection and to supply that part of the Village situated on high land. The Paul Smith Company uses the remaining [illegible]

Attached is a blueprint showing the layout of dam, power plants and highway bridge; also existing conditions regarding leakage and settlement. The upstream side of the highway bridge has settled about 6 inches and plans are being prepared to replace same. At the north end of the bridge there appears to be [illegible] of the Village pumping plant, causing a settlement in the pavement of from 4 to 6 inches and a horizontal movement of the west wall of the Village forebay of about 2 inches in the direction indicated on the accompanying print. There is also quite some leakage under and through the dam proper and under the masonry wall of the Paul Smith Company. On numerous occasions it has been necessary to fill in above the dam to stop leakage.

The Town of Harrietstown, within which town the dam is located, has engaged Mr. John Sweeney, Consulting Engineer, of Saranac Lake, N. Y. to prepare plans for a new bridge to replace the present structure which [illegible]. Mr. Sweeney has suggested that the project be extended to include the reconstruction of the dam. This scheme meets with the approval of the village officials. The Paul Smith Company, however, has not as yet approved the project. This Company, as previously noted, owns half of the present dam.

The present condition of the dam is such that there are numerous leaks located through the dam itself and through the walls of the forebay. The forebay wall on the north end of the dam appears to have moved. This is the forebay owned by the Village of Saranac Lake. An investigation of the dam does not show any immediate danger of failure of such a nature as to cause any great damage to property located below the dam. There is reason to believe, however, that the leaks through the dam itself and through the forebay wall may develop to such an extent that it will not be possible to stop them by any ordinary filling above the dam, with a result that the level of Flower Lake would be lowered and might cause an unhealthful condition, and that the Village of Saranac Lake would be deprived of power developed at the dam with resulting failure of the fire protection system and also with the result that parts of the village would be without water. There is also a possibility though it does not appear to be probable that conditions might arise in the stream above the dam which would produce such a head against this dam and forebay walls that it would result in their sudden destruction, in which case serious damage would result to property downstream from the dam and perhaps result in loss of life. Such conditions, however, and results, do not appear at all probable.

Very truly yours,

[illegible]

COPY FOR MR. MCNIII

March 21, 1925.

Village Board of Trustees,
Saranac Lake, N. Y.

Paul Smith Electric Light, Power & RR. Co.,
Saranac Lake, N Y/

Dear Sirs:

This letter is addressed to the Village Board of Trustees of Saranac Lake, N. Y. and to the Paul Smith Electric Light, Power and R. R. Company as joint owners of the dam across the Saranac river at the outlet of Flower Lake in the village of Saranac Lake, town of Harrietstown and county of Franklin.

An engineer from this department was detailed the first part of March to make an examination of this dam and he has reported in detail concerning the numerous leaks through and under the dam itself, through the walls of the forebay and under the masonry wall of the Paul Smith Company, and states that the forebay wall on the north end of the dam appears to have moved. He also calls attention to a six-inch settlement of the upstream side of the highway bridge, a pavement settlement of from four to six inches and a horizontal movement of about two inches of the west wall of the Village forebay.

This investigation of the dam does not show immediate danger of failure but it does indicate that it is in very poor repair. Thus, to safeguard life and property from damage which might result through its failure, it becomes my duty under the provisions of Chapter 82 of the Laws of 1923 to take cognizance of the present conditions and to require you to repair and reconstruct the dam and its appurtenances during the present year. The plans for the repair or reconstruction of the dam must be submitted to this department for approval before actual construction. An application blank is enclosed herewith.

Very truly yours,

Roy G. Finch,
State Engineer.

By

Deputy State Engineer.

The original dam was built in 1827 and was used by private interests until 1849, when it was deeded to the Village. The property on the south side of the river was acquired by the Saranac Electric Company (subsequently taken over by the Paul Smith Electric Light, Power and R. R. Company), and in 1902 the Village and the Paul Smith Company built power plants, one on the north and the other on the south side of the river. The Village uses power to run its pumping plant, which is necessary for fire protection and to supply that part of the Village situated on high land. The Paul Smith Company uses the remaining power to augment their main plant at Franklin Falls (during peak load only), located 15 miles downstream.

Attached is a pencil sketch showing the layout of dam, power plants and highway bridge; also existing conditions regarding leakage and settlement. The upstream side of the highway bridge has settled about 6" and plans are being prepared to replace same. At the north end of the bridge there appears to be quite some seepage under the street and forebay of the Village pumping plant, causing a settlement in the pavement of from 4" to 6" and a horizontal movement of the west wall of the Village forebay of about 2" in the direction indicated on the accompanying sketch. There is also quite some leakage under and through the dam proper and under the masonry wall of the Paul Smith Company. On numerous occasions it has been necessary to fill in above the dam to stop leakage.

The Town of Harrietstown has engaged Mr. John Sweeney, Consulting Engineer, Saranac Lake, N. Y., to prepare plans for a new bridge to replace the present structure. Mr. Sweeney has suggested that the project be extended to include reconstruction of the dam. This scheme appears to meet with the approval of the Village officials. The Paul Smith Company, however, has not, as yet, endorsed the project.

From my investigation I do not believe that the dam is in any immediate danger of failure to the extent of causing a great amount of damage by flood to the territory downstream. There is, however, a reasonable chance that leaks might develop at any time, which could not be stopped by ordinary filling in above the dam, under

which condition the Village would be without adequate fire protection; parts of the Village would be without water, and the unwatering of Flower Lake would cause a bad health condition.

There is no doubt as to the poor condition of the dam or the hazard involved. I would therefore recommend that some action be taken to insure the rebuilding of this structure.

Very truly yours,

H.K. Clarke.
Assistant Engineer.

DR 3/17/25

May 20, 1925.

Mr. S. A. Miller,
Village Clerk,
Saranac Lake, New York.

Dear Sir:-

Acknowledgment is made of the receipt of your [illegible] what legal effect the order of the State Engineer of March 21st, to repair the dam across the outlet of ~~Flower~~ Flower Lake, has on the Village in view of the Village not claiming ownership of any part of the land on which the dam rests, although the Village receives a benefit from the dam and after the receipt of such opinion to transmit a copy thereof to you.

When the notice of March 21st was sent, it was our impression that the dam in question was jointly owned by the Village of Saranac Lake and the Paul Smith Electric Light, Power and Railroad Company but if the Village of Saranac Lake denies its ownership, we are perfectly willing to accept such denial and so far as this Department is concerned you may disregard the notice as applying to you. We simply wanted to notify the owner or owners of the dam so there would be due warning given and proper precautions taken to prevent loss of life or property damage through the making of adequate repairs or reconstruction.

In view of the above, we do not feel it necessary to ask an opinion of the Attorney General in this matter. If you would prefer, however, to have this matter reviewed by the Attorney General, for your own satisfaction as to your responsibility for the dam or its appurtenant structures, we shall be glad to submit the matter to him for you.

Very truly yours,

Roy G. Finch,
State Engineer

FRL-C

By

Deputy State Engineer.

Copy for -
Mr. A. R. McKim.

WORK ON DAM IS NEARLY COMPLETE

Structure Reinforced So Danger of Its Going Out Is Eliminated

All danger of the dam at the end of Lake Flower being washed out has been eradicated, according to an announcement made this morning by W. M. Demerse, superintendent at the water works. Work of repairing the dam has been virtually completed with the exception of the laying of an apron floor and a side wall.

As a result of the work done to [illegible], the water in Lake Flower has been about eight inches, bringing the condition of the lake back to normal and doing away with any possible chance of creating disease from the exposed shores, which were covered with refuse. Water has been rising steadily in the lake and residents and campers along the shore are jubilant over the rising.

Two big braces have been placed against the dam preventing it from being washed away, while the entire [illegible] of reinforcing the structure has been completed. A large section of the cradle, 20 feet square, was washed out by the falling waters to a depth of eight feet and this condition undermined the wall of the dam. This has been overcome by the filling in of the space with large stones which were taken from the lower section of the stream. With the filling in of the washed out section a depth of 12 feet of rock was used, which brought the structure high above the danger point.

It is expected the work will be completed this week or there will exist a danger of flooding the section immediately beyond the dam. Work is to be rushed and it is believed this condition will be averted.

More Subscribers for [illegible] Fund

Form E-61
9-11-34-500 (11E-1836)

STATE OF NEW YORK

DEPARTMENT OF PUBLIC WORKS

DIVISION OF ENGINEERING

ALBANY

Received Feb. 26, 1937 Dam No. 183-1107

Disposition Mar. 1, 1937 Watershed Lake Champlain

Foundation inspected

Structure inspected

Application for the Construction or Reconstruction of a Dam

Application is hereby made to the Superintendent of Public Works, Albany, N. Y., in compliance with the provisions of Section 948 of the Conservation Law (see last page of this application) for the approval of specifications and detailed drawings, marked Lake Lower Dam, Saranac Lake, N. Y.

herewith submitted for the { construction / ~~reconstruction~~ } of a dam herein described. All provisions of law will be complied with in the erection of the proposed dam. It is intended to complete the work covered by the application about Oct. 1, 1937.
(Date)

1. The dam will be on Saranac River flowing into Lake Flower in the town of Harrietstown, County of Franklin and 50 ft. westerly of Main St. Bridge, Village of Saranac Lake, N. Y.
(give exact distance and direction from a well-known bridge, dam, village main cross-roads or mouth of a stream)

2. Location of dam is shown on the Saranac quadrangle of the United States Geological Survey.

3. The name of the owner is Village of Saranac Lake, N. Y.

4. The address of the owner is Saranac Lake, N. Y.

5. The dam will be used for impounding water for operation of village pumps

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

7. The watershed above the proposed dam is 1.5 square miles.

8. The proposed dam will create a pond area at the spillcrest elevation of 1800 acres and will impound 10,000,000 cubic feet of water.

9. The maximum height of the proposed dam above the bed of the stream is [illegible] feet [illegible] inches.

10. The lowest part of the natural shore of the pond is [illegible] feet vertically above the spillcrest, and everywhere else the shore will be at least 5 feet above the spillcrest.

11. State if any damage to life or to any buildings, roads or other property could be caused by any possible failure of the proposed dam [illegible] possibly slight flooding of one or two cellars

12. The natural material of the bed on which the proposed dam will rest is (clay, sand, gravel, boulders, granite, shale, slate, limestone, etc.) Yellow clay hardpan, soundings show rock 10' lower.

13. Facing down stream, what is the nature of material composing the right bank? Yellow clay hardpan with rock 10 ft. lower.

14. Facing down stream, what is the nature of the material composing the left bank? Yellow clay hardpan with rock 10 feet lower.

15. State the character of the bed and the banks in respect to the hardness, perviousness, water bearing, effect of exposure to air and to water, uniformity, etc. Very hard, impervious [illegible] water bearing. Not affected by exposure to water. Might be somewhat disintegrated by exposure to air.

16. Are there any porous seams or fissures beneath the foundation of the proposed dam? No

17. WASTES. The spillway of the above proposed dam will be 60 feet long in the clear; the waters will be held at the right end by a concrete bulkhead the top of which will be 2 feet above the spillcrest, and have a top width of 2 feet; and at the left end by a [illegible] the top of which will be 3 feet above the spillcrest, and have a top width of 3 feet.

18. The spillway is designed to safely discharge 360 cubic feet per second.

19. Pipes, sluice gates, etc., for flood discharge will be provided through the dam as follows: 2 sluice openings, having a total capacity of 14 c.f.s. will be installed. Under normal conditions, these will be closed by suitable stop-logs, which can be removed readily and quickly by means of iron

20. What is the maximum height of flash boards which will be used on this dam? None

21. APRON. Below the proposed dam there will be an apron built of Boulder rubble, 40 feet long across the stream, 60 feet wide and [illegible] feet thick.

22. Does this dam constitute any part of a public water supply? [illegible] to [illegible] Water Works, [illegible] water [illegible]

INSTRUCTIONS

Read carefully on the last page of this application the law setting forth the requirements to be complied with in order to construct or reconstruct a dam.

Each application for the construction or reconstruction of a dam must be made on this standard form, copies of which will be furnished upon request to the Chief Engineer, Division of Engineering, Department of Public Works, Albany, N. Y. The application must be accompanied by three sets of plans, and specifications. The information furnished must be in sufficient detail in order that the stability and safety of the dam can be determined. In cases of large and important dams assumptions made in calculating stresses and stability should be given.

Samples of materials to be used in the dam and of the material on which the dam is to be founded may be asked for, but need not be furnished unless requested.

If the dam constitutes a part of a public water supply, application should be made to the Water Power and Control Commission under Article XI of the Conservation Law.

An application for the construction or reconstruction of a dam must be signed by the prospective owner of the dam or his duly authorized agent. The address of the signer and the date must be given as provided for on the last page of the application form.

SECTION 948 OF THE CONSERVATION LAW

§ 948. **Structures for impounding water; inspection of docks; penalties.** No structure for impounding water and no dock, pier, wharf or other structure used as a landing place on waters shall be erected or reconstructed by any public authority or by any private person or corporation without notice to the superintendent of public works, nor shall any such structure be erected, reconstructed or maintained without complying with such conditions as the superintendent of public works may by order prescribe for safeguarding life or property against danger therefrom. No order made by the superintendent of public works shall be deemed to authorize any invasion of any property rights, public or private, by any person in carrying out the requirements of such order. The superintendent of public works shall have power, whenever in his judgment public safety shall so require, to make and serve an order directing any person, corporation, officer or board, constructing, maintaining or using any structure hereinbefore referred to, remove, repair or reconstruct the same within such reasonable time and in such manner as shall be specified in such order, and it shall be the duty of every such person, corporation, officer or board, to obey, observe and comply with such order and with the conditions prescribed by the superintendent of public works for safeguarding life or property against danger therefrom, and every person, corporation, officer or board failing, omitting or neglecting so to do, or who hereafter erects or reconstructs any such structure hereinbefore referred to without submitting to the superintendent of public works and obtaining his approval of plans and specifications for such structures when required so to do by his order or who hereafter fails to remove, erect or to reconstruct the same in accordance with the plans and specifications so approved shall forfeit to the people of this state a sum not to exceed five hundred dollars to be fixed by the court for each and every offense; every violation of any such order shall be a separate and distinct offense, and, in case of a continuing violation, every day's continuance thereof shall be and be deemed to be a separate and distinct offense. This section shall not apply to a dam where the area draining into the pond formed thereby does not exceed one square mile, unless the dam is more than ten feet in height above the natural bed of the stream at any point or unless the quantity of water which the dam impounds exceeds one million gallons; nor to a dock, pier, wharf or other structure under the jurisdiction of the department of docks, if any, in a city of over one hundred and seventy-five thousand population. This section as hereby amended shall not impair the effect of an order heretofore made by the conservation commission or commissioner under this section prior to the taking effect of chapter four hundred and ninety-nine of the laws of nineteen hundred and twenty-one, nor require the approval by the superintendent of public works of plans and specifications heretofore approved by such commission or commissioner under this section.

The foregoing information and accompanying plans and specifications are correct to the best of my knowledge and belief.

Village of Saranac Lake, N. Y. Owner

By C. J. Deaver, C. E., authorized agent of owner.
C. J. Deaver, C. E., Consulting Engr.,

Address of signer Saranac Lake, N. Y. Date Feb. 8th, 1927.

DNR DAM INSPECTION REPORT W. FLOWER SALVAGE LA

04	12	37	041107	092721	003	4
NR	CTY	NR AP Reserv.	DAM NO.	INS. DATE	USE	TYPE

AS BUILT INFORMATION

1	Location of Sp'way and outlet	1	Elevations
1	Size of Sp'way and Outlet	1	Geometry of Non-overflow section

1 GENERAL CONDITION OF NON-OVERFLOW SECTION

1	Settlement	2	Cracks	1	Deflections
2	Joints	2	Surface of Concrete	1	Leakage
1	Undermining	1	Settlement of Embankment	1	Crest of Dam
1	Downstream Slope	1	Upstream Slope	1	Toe of Slope

1 GENERAL COND. OF SP'WAY AND OUTLET WORKS

2	Auxiliary Spillway	2	Service or Concrete Sp'way	1	Stilling Basin
2	Joints	2	Surface of Concrete	1	Spillway Toe
2	Mechanical Equipment	1	Plunge Pool	1	Drain

1	Maintenance	4 → C KOH	Hazard Class
3	Evaluation	4	Inspector

COMMENTS:

1. River Basin - Nos. 1-23 on computation sheet
2. County - Nos. 1-62 Alphabetically
3. Year Approved -
4. Inspection Date - Month, Day, Year
5. Apparent use -
   1. Fish & Wildlife Management
   2. Recreation
   3. Water Supply
   4. Power
   5. Farm
   6. No Apparent Use
6. Type -
   1. Earth with Aux. Service Spillway
   2. Earth with Single Conc. Spillway
   3. Earth with Single non-conc. Spillway
   4. Concrete
   5. Other
7. As-Built Inspection - Built substantially according to approved plans and specifications

Location of Spillway and Outlet Works

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

Elevations

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

Size of Spillway and Outlet Works

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

Geometry of Non-overflow Structures

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

General Conditions of Non-Overflow Section

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

For boxes listed on condition under non-overflow section.

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

General Condition of Spillway and Outlet Works

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

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

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

Maintenance

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

(S.C.S.) Hazard Classification Downstream

CLASSIFICAT
CORPS. ENGR
(III)
(II)
(I)

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

Evaluation - Based on Judgment and Classification in Box Nos.

Evaluation for Unsafe Dam

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

RIVER BASINS

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

COUNTIES

STATE NAME: NEW YORK

STATE ABBREVIATION: NY

STATE CODE: 36

CODE	COUNTY NAME
1	ALBANY
2	ALLEGANY
3	BRONX
4	BROOME
5	CATTARAUGUS
6	CAYUGA
7	CHAUTAUQUA
8	CHEMUNG
9	CHENANGO
10	CLINTON
11	COLUMBIA
12	CORTLAND
13	DELAWARE
14	DUTCHESS
15	ERIE
16	ESSEX
17	FRANKLIN
18	FULTON
19	GENESEE
20	GREENE
21	HAMILTON
22	HERKIMER
23	JEFFERSON
24	KINGS
25	LEWIS
26	LIVINGSTON
27	MADISON
28	MONROE
29	MONTGOMERY
30	NASSAU
31	NEW YORK
32	NIAGARA
33	ONEIDA
34	ONONDAGA
35	ONTARIO
36	ORANGE
37	ORLEANS
38	OSWEGO
39	OTSEGO
40	PUTNAM
41	QUEENS
42	RENSSELAER
43	RICHMOND
44	ROCKLAND
45	ST LAWRENCE
46	SARATOGA
47	SCHENECTADY
48	SCHOHARIE
49	SCHUYLER
50	SENECA
51	STEUBEN
52	SUFFOLK
53	SULLIVAN
54	TIOGA
55	TOMPKINS
56	ULSTER
57	WARREN
58	WASHINGTON
59	WAYNE
60	WESTCHESTER
61	WYOMING
62	YATES

POLICE DEPT. 891-4422
POLICE JUSTICE 891-4500

VILLAGE OFFICE 891-4150

HIGHWAY DEPT 891-4160
WATER AND [illegible] DEPT 891-3037

VILLAGE OF SARANAC LAKE, INC.
SARANAC LAKE, N.Y. 12983
TELEPHONE: 518-891-4150

MEMO

TO: Village Manager
FROM: Thomas M. Carroll, Water Treatment Plant Operator
SUBJECT: Lake Flower Dam Analysis
DATE: June 20, 1977

I would like to express my views regarding the importance of the Lake Flower Dam to the residents of Saranac Lake and the entire area, and to express the urgent need of both technical and financial aid in restoring and improving the facility.

This dam has a twofold purpose. First, it retains the water for Lake Flower. This lake is directly connected to Lake Kiwassa and Lower, Middle and Upper Saranac Lake. The chain of lakes are known for their recreational facilities and also for the abundance of fish and wildlife in the area. The water which is let over the dam or through the two spillways feeds approximately 90% of the water in the Saranac River, which flows directly into Lake Champlain. Secondly, the water going through the spillway powers the turbines that pump the Village's water supply from its source at McKenzie Pond to the reservoir on View Street.

The dam is in very poor condition. On May 20th of this year, the Village employees had to make emergency repairs to the dam to the best of our ability. The water going through the spillways is regulated by timbers ranging in size from 6" x 4" x 10' to 6" x 6" x 10'. During this year's spring run - off, ice and other debris started to break the timbers, which is a common occurrence. However, the emergency was created when a tree trunk completely broke out two of the bottom timbers causing extremely high waters downstream threatening flooding conditions, and a severe loss of water upstream. In previous years, both the Village and the State of New York have had law suits brought against them, because the only means of controlling the water at this point is to raise or lower the timbers by hand in an attempt to maintain the flow at an acceptable level. This year all of the timbers had to be removed to make the emergency repairs creating an extremely hazardous condition both for the men doing the work and the

residents living below the dam. The water was racing through the spillway with a head of fifteen feet, and grappling poles had to be secured to remove the swollen timbers. We were able to remove the old timbers, but because of the urgency of the repairs and the time element involved, we had to use untreated pine and some hemlock for replacement timbers as there were no treated logs available in the area for our immediate need. We attempted to jack the logs down to the bottom of the spillway, and noticed that much of the gunite surface along the bottom and sides of the spillway has worn away due to the force of the water. In this one month since the repairs were made, the lower timbers are already beginning to show wear.

There are no flood gates to control this water, and in effect the Lake Flower Dam is the only flood control device between Lower Saranac Lake and Lake Champlain. The need for long term repairs or restoration is of the utmost urgency as we cannot expect the present untreated timbers to last but a very short time.

Any assistance that you can provide to the Village of Saranac Lake will be most appreciated. Please keep me informed of any action taken, so that the efforts of the Water Department employees can be coordinated with your plans.

cc Community Development Officer

HUD COMMUNITY DEVELOPMENT BLOCK GRANT PROG.

SEC 312 LOAN PROGRAM

SEC 8 HOUSING ASSISTANCE PLAN

VILLAGE OF SARANAC LAKE
SARANAC LAKE, N Y 12983

Dam # 183-1107
Lk Champlain.

October 20, 1977

Mr. George Koch
Dam Safety Officer
N.Y.S. Department Environmental Conservation
50 Wolf Road
Albany, New York 12233

Dear Mr. Koch:

I would take this opportunity to acquaint you with a condition that exists on the Lake Flower Dam located on Main Street in the Village of Saranac Lake.

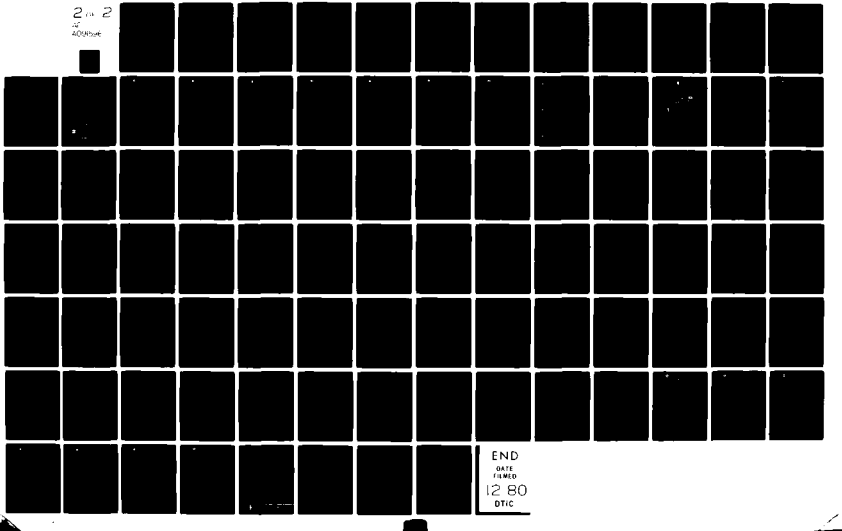
On May 20, 1977, the lower flash boards of the water gate control broke. Emergency repairs were immediately instituted by Village employees with what materials were available. At this time we requested maximum technical assistance from the U. S. Department of Agriculture Soil Conservation Service.

On June 3, 1977, Mr. Steven Maurice and Mr. Steven Payne of the Soil Conservation Service came to Saranac Lake and made a visual inspection of the dam site. As a result of this inspection, an application for assistance has been presented to and approved by the Franklin County Soil and Water Conservation District Board. This application has been forwarded to the Black River - St. Lawrence Soil and Water Conservation District for approval by their executive council.

Mr. Maurice mentioned that you had made an inspection of the dam in December of 1971, and at this time, the dam appeared to be in good condition with the flash boards being considered as being only a minor problem.

On May 20, 1977, 85 sand bags were installed to protect the flash boards and 150 sand bags were also

AD-A091 596 NEW YORK STATE DEPT OF ENVIRONMENTAL CONSERVATION ALBANY F/G 13/13
NATIONAL DAM SAFETY PROGRAM. LAKE FLOWER DAM, INVENTORY NUMBER --ETC(U)
AUG 80 J B STETSON DACW51-79-C-0001
UNCLASSIFIED NL



installed on July 5. It is the opinion of the Village Water Plant Operator that a submerged log might have struck the lower flash boards or that possibly some of the concrete base of the dam below the flash boards may have eroded. At the present time there is a 6-8 inch crest of water flowing over the entire dam due to the runoff of water in the surrounding watershed area.

We would take this opportunity to request that you, or someone in your office, make another inspection of the dam and would welcome any suggestions or supportive data (past and present) that you might be able to supply.

Very truly yours,

Fred Neese

Fred Neese
Community Development Officer

FN/cm

November 1, 1977

Mr. Fred Neese
Community Development Officer
Office of Community Development
10 Main Street
Saranac Lake, NY 12983

RE: Dam #183-1107, Lake Champlain
Lake Flower Dam

Dear Mr. Neese:

Reference is made to your letter of October 20, 1977 concerning the above referenced dam.

We will be available to inspect the dam and review your problem with the lower flash boards. However, in order to inspect this structure at the proper time, the water surface should be lowered so that we can properly observe the problem area. We therefore request that you contact us at (518) 457-1216 when the runoff has decreased.

Yours truly,

George Koch
Supervisor of Dam Safety Section

SEC. 312 LOAN PROGRAM

NEW YORK STATE DEPT. OF ENVIRON... 1978 ... 17 ...

SEC. 8 HOUSING ASSISTANCE PLAN

VILLAGE OF SARANAC LAKE

CONSTRUCTION SARANAC LAKE, N.Y. 12983

March 16, 1978

Mr. George Koch
Dam Safety Officer
N.Y.S. Department Environmental Conservation
50 Wolf Road
Albany, New York 12233

Dear Mr. Koch:

Please be advised that the Village Board of Trustees has not been receptive to the idea of lowering the water level in Lake Flower in order to inspect the dam. At the present time the dam is still heavily coated with ice. They also feel that the lowering of the lake during the summer season should be done only as a last resort.

We have proposed an alternate inspection plan that would include a visual inspection by diver personnel of our rescue squad and an underwater t.v. camera. We had a sanitary sewer line inspection by a t.v. camera prior to the rehabilitation of certain sections of the lines. This type of inspection proved very effective. The camera, with its monitoring equipment, would be supplied by Penetryn Systems of Latham, New York, and our own divers would provide underwater support. Additionally, our divers could perform an exploratory dive prior to the inspection to ascertain special conditions that might be encountered.

I would appreciate your comments concerning the feasibility of this method of inspection. We would anticipate that you or someone from your office would be on hand to monitor the camera inspection and provide direction toward the areas of inspection.

Due to heavy ice buildup on both sides of the dam and particularly in the area of the control gate it has been deemed hazardous and inadvisable for the divers to enter the water at this time. We are therefore postponing the inspection until after the spring runoff. More ideal conditions would

exist during the last two weeks of June. We will attempt to coordinate the inspection at that time.

Very truly yours,

Fred Neese

Fred Neese
Community Development Officer

FN/cm

April 7, 1978

Mr. Fred Neese
Community Development Officer
Office of Community Development
10 Main Street
Saranac Lake, NY 12983

Re: #183-1107 Lake Champlain
Lake Flower Dam

Dear Mr. Neese:

Reference is made to your letter of March 16, 1978 in regard to the Lake Flower Dam.

I am not familiar with the use of underwater T.V. camera for the inspection of dams. I am interested in knowing more about this method for our own application. We will have someone from our Dam Safety Section at the site during the inspection. Please contact our office (518) 457-1216 a week before the inspection so that we can make the proper arrangements.

Thank you.

Very truly yours,

George Koch
Supervisor, Dam Safety Section

GK:bt

HUD COMMUNITY DEVELOPMENT BLOCK GRANT PROGRAM

SEC. 312 LOAN PROGRAM

SEC. 8 HOUSING ASSISTANCE PLAN

VILLAGE OF SARANAC LAKE
SARANAC LAKE, N.Y. 12983

RECEIVED
MAY 3 1978
COMMISSIONER OF ENVIRONMENTAL CONSERVATION

April 28, 1978

Mr. Peter A. A. Berle, Commissioner
New York State Department Environmental Conservation
50 Wolf Road
Albany, New York 12233

Dear Commissioner Berle:

At this time I would take the opportunity to acquaint you with a potentially dangerous condition that exists here in the Village of Saranac Lake. Holding back a water shed area of approximately 118,000 sq. acres and controlling its flow into the Saranac River, is the basic function of a small concrete dam located in the center of our Village. This dam was constructed in 1937 as a WPA-WPA works project. Over the years it has functioned successfully and accomplished its purpose. A resurfacing project in 1954 rehabilitated the structure and substantially lengthed its service.

One of the components of the dam is a water control gate facility. At the present time it appears that this control gate needs modification or replacement. Ice, floating and submerged logs and the extreme water pressure caused by the spring runoff have all contributed to the yearly damage that occurs. Mr. William Kirshbaum, of your departments' Ray Brook office, has contributed much time, effort and materials to the never ending job of maintenance required.

We are planning an underwater divers inspection and an underwater TV camera inspection of the entire dam early this summer. We expect to have Mr. George Koch of your departments' Dam Safety Section in attendance at this time also.

As the water shed area involved supports much of the fish and wildlife in this region, and provides a substantial part of the tourism base of our economic development, we would respectfully request your personal support in those areas where your departments' technical assistance or financial assistance might be utilized.

Very truly yours,

Charles R Keough

Charles R. Keough, Mayor
Village of Saranac Lake

PETER A. A. BERLE
COMMISSIONER

STATE OF NEW YORK
DEPARTMENT OF
ENVIRONMENTAL CONSERVATION
ALBANY, NEW YORK 12233

Dear Mayor Keough:

Thank you for your letter of April 28, 1978 in regard to the dam at Lake Flower (Dam #183-1107, Lake Champlain Basin).

Mr. George Koch of our Dam Safety Section will be available to visit the dam during your underwater TV camera inspection of the structure. Please contact his office (518) 457-1216 a week before the inspection in order to make arrangements for the inspection.

It is my understanding that most of the stop-logs in the structure were damaged during the high water on April 20, 1978. The stop-logs that were replaced were furnished by Mr. William Krichbaum of our Ray Brook office.

If your underwater inspection reveals that extensive remedial repair work is necessary, the Village should secure the services of a licensed professional engineer experienced in the design of hydraulic structures. Engineers from our Dam Safety Section will review plans for the remedial work. However, the Dam Safety Section will not be able to provide extensive design assistance because of their small staff and the large number of dams that are under their surveillance.

There are no State funds available for the reconstruction of dams that are privately owned or owned by a municipality. Mr. Fred Niese, your Community Development Officer, is aware of the fact that funds may be available from the Federal Government through the Soil Conservation Service of the Department of the Interior. This source of financial and technical aid should be explored.

Sincerely,

Peter A.A. Berle

The Honorable Charles R. Keough
Mayor, Village of Saranac Lake
Saranac Lake, NY 12983

(By Visual Inspection)

Dam Number	River Basin	Town	County	Hazard Class	Date & Inspector
183-1107	L. Champlain	~~Franklin~~ Harrietstown	Franklin	C	6/7/78 KDH-Bd

Stream = LK Flower Owner = Vil. of Saranac Lake

Type of Construction

- ☐ Earth w/Concrete Spillway
- ☐ Earth w/Drop Inlet Pipe
- ☐ Earth w/Stone or Riprap Spillway
- ☑ Concrete
- ☐ Stone
- ☐ Timber
- ☐ Other _____

Use

- ☐ Water Supply
- ☑ Power
- ☑ Recreation - ☑ High Density
- ☐ Fish and Wildlife
- ☐ Farm Pond
- ☐ No Apparent Use-Abandoned
- ☐ Flood Control
- ☐ Other _____

~~Estimated~~ Impoundment Size 1500 Acres ~~Estimated~~ Height of Dam above Streambed 19 Ft.

Condition of Spillway

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

Explain: Stop logs won't out - Concrete slots questionable.

Condition of Non-Overflow Section

- ☐ Satisfactory
- ☑ In need of repair or maintenance

Explain: Concrete work needed downstream of stop logs

Condition of Mechanical Equipment

- ☑ Satisfactory
- ☐ In need of repair or maintenance

Explain: Poor stop-log control.

Siltation ☐ High ☑ Low

Explain: _____

Remarks: Structure must be dewatered to evaluate upstream face.

Evaluation (From Visual Inspection)

- ☐ Repairs req'd. beyond normal maint.
- ☐ No defects observed beyond normal maint.

June 1, 1978

The Honorable Charles R. Keough
Mayor, Village of Saranac Lake
Saranac Lake, NY 12983

RE: Dam #183-1107
Champlain River Basin
Lake Flower

Dear Mayor Keough:

In accordance with this Department's Dam Inspection Program, an inspection of the referred-to structure was conducted on May 31, 1978.

The concrete structure was found to be in disrepair. Deteriorated concrete was evident near the stop-logs on the downstream face and wing walls. The past stop-log failures as dexcribed to Department inspectors by village personnel, indicate that the stop-log slots are also in need of repair as are the stop-logs themselves.

This office recommends that the condition of the concrete on the upstream face and in the stop-log slots be evaluated either with the use of divers or in the dry by means of a cofferdam. After an evaluation of the condition of the concrete by a competent engineer, those areas needing repairs should be repaired and the stop-logs replaced. If any changes to the existing design are to be made, please submit change plans to this office.

Because the condition of the upstream concrete is unknown, it is impossible to evaluate the safety of the structure. However, the stop-log failures indicate that a serious condition does exist. Therefore, it would be in the best interest of the Village to initiate remedial work as soon as possible, thus, avoiding a possible failure of the outlet portion and the subsequent draining of the lake.

Please inform this office as to your intentions regarding the above within 30 days.

Sincerely,

Kenneth D. Harmer
Dam Safety Program

NGHAMTON EVENING PRESS
NGHAMTON SUNDAY PRESS
FALO COURIER EXPRESS
FALO EVENING NEWS
IG ISLAND NEW
NEW YORK TIMES
OSWEGO PALLADIUM TIMES
PLATTSBURGH PRESS REPUBLICAN
POUGHKEEPSIE JOURNAL
DEMOCRAT-CHRONICLE
SYRACUSE POST STANDARD
TROY TIMES RECORD
WALL STREET JOURNAL
WATERTOWN DAILY TIMES
WHITE PLAINS REPORTER
DISPATCH
GE 1 DATE 5/31/.

Dam patched, water rising, but pressure low

SARANAC LAKE — The breaks in the village dam have been partially patched, and the water level had gone up four inches by this morning.

The level is still four inches below normal, however, and water pressure to run turbines for the village water system is not at full capacity.

The water department is awaiting the arrival and suggestions of two Department of Environmental Conservation engineers from Albany.

The water department closed much of the gap, which occurred when six logs washed out of the dam, by placing boards vertically over the hole. Thomas M. Carroll, water supervisor, said yesterday four of the 6-inch by six-inch and 9-foot-long logs had washed away.

While the crew repaired the gap yesterday two more were swept away, he said today.

The crew tried unsuccessfully to lower the existing logs to close the opening.

Carroll called the repair "temporary" and is hoping state or federal funds will be provided to rehabilitate or reconstruct the dam.

Yesterday, when the water level was eight inches below normal, village manager E. John Lawless asked residents to use water only if necessary because water pressure was low. — James M. Gaato

WATCHING THE RIVER FLOW — E. John Lawless, village manager, supervisor, discuss the hole in the dam on the Saranac River. (Odato and Thomas M. Carroll, village water Photo)

[ ] KNICKERBOCKER NEWS
[ ] TIMES UNION
AMTON EVENING PRESS
AMTON SUNDAY PRESS
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LO ..VENING NEWS
ISLAND NEWSDAY
NEW YORK [illegible]
NEW YORK POST
NEW YORK TIMES
OSWEGO PALLADIUM TIMES
PLATTSBURGH PRESS REPUBLICAN
POUGHKEEPSIE JOURNAL
ROCHESTER DEMOCRAT-CHRONICLE
SYRACUSE POST STANDARD
TROY TIMES RECORD
WALL STREET JOURNAL
WATERTOWN DAILY TIMES
WHITE PLAINS REPORTER
DISPATCH

PAGE 1 DATE 6-1-78

State engineers say ime to repair dam

By JAMES M. ODATO

SARANAC LAKE — After onsulting with two engineers ..om the State Department of Conservation yesterday, illage officials decided it is me to repair the village dam.

"If this thing goes, it's liable to flood out residents along the waterway all the way to Lake hamplain," Mayor Charles . Keough said.

However, the DEC said it has no money to offer the illage since the present ituation does not pose a threat to downstream properties or lives. The ngineers suggested im-nediate repair to the dam though.

Mayor Keough said the six ogs which have been swept way since last Friday and the tew dozen lost since April are breaking up because they are veak. He said they are second growth pine and have "no strength whatsoever."

"They never should have been put in there," Keough said. He recommends oak.

Keough said for a temporary repair, he suggests placing a wooden door on the Lake Flower side of the dam o keep water from the "junk logs." Then the logs can be taken out and replaced, he said.

The level of Lake Flower — the site for the 1978 National Stock Hydroplane Races in August — dropped about eight nches from Friday to Tuesday. Yesterday the village water department placed wood planks over the gaping hole in the dam, and the level has held at four inches below the normal.

Keough said "We have to fix this thing soon, temporarily. We'll seek federal money for a permanent repair. . . so that when that gun sounds that morning for the hydroplane races they'll have water rather than a mudflat."

Thomas M. Carroll, water department supervisor, said he had been swamped with calls from lakeside residents and boaters who say they cannot operate their boats on the lake.

Keough said money may be available from the Community Development Office for the repairs.

E. John Lawless, village manager, said if a stone coffer dam — a temporary dam — were constructed in front of the present dam, the grates which catch water to turn the turbines for the village water system would be obstructed and useless. He said electricity would have to be used to turn the turbines at a cost of about $130 a day.

Saranac's Dam: Tough Problem

By DAVE RYAN

In Saranac Lake currently, the most obnoxious but potentially the most dangerous topic in sight is what Mayor Charles Keough and everyone else is calling the "damn dam" which restrains the waters of Lake Flower.

As was recently reported in The NEWS, an underwater investigation of the damage to the dam, complete with television cameras, is in the offing. What the mayor hopes will result from this is in his words, "an assessment of the extent of the damage done."

Until this is done the village will be forced to live with the makeshift devices, such as the two-by-twelve inch timbers which have been shoved in the gap in the dam to prevent further erosion of the dam's base.

On the question of who is liable should the whole thing burst, Mayor Keough intimated that "a particular insurance company would be liable in this situation." This is, of course, assuming that a downstream landowner has flood insurance. Equally important, the mayor emphasized, is the fact that such insurance is available at a low cost locally since the entire region is classified as a "flood disaster area."

Elaborating further, the mayor suggested that should an insurance company contest a claim for compensation they, legally, would have to prove, "negligence" on the part of the village which, incidentally, does have its own liability insurance.

A matter of confusion arose also among village residents to the plea by Tom Carroll of the water department that people in the village stop their excessive use of drinking water. Many citizens of Saranac Lake were confused as to the link between the McKenzie Pond reservoir and Lake Flower, since the fresh drinking water comes out of McKenzie Pond.

"What is missing in this perception," the mayor points out, "is the drinking water is pumped hydraulically so that residents of, say, Park Avenue, can obtain water." To further elaborate upon his point, Mayor Keough explained that when the dam's leak was first discovered the "head" became exposed and the prime for the pumps was weakened, thus necessitating the request for water conservation.

As Mayor Keough tells it, "When the head goes down, the loss in horsepower to pump water requires the village to purchase electrical power from Niagara Mohawk at a cost of $150 per day."

So the village is in the position of being damned if it does and damned if it doesn't, if you'll excuse the play on words. All parties involved, including the inspectors from the New York State Office of Dam Safety agree that something should be done to avert widespread chaos, especially in the Lake Kiwassa area.

However, the ever-present bottom line question of who will pay for the repairs is apparently what is stalling any immediate action. I, for one, am not in favor of castigating the village board or the mayor, for it is difficult to see what exactly they can do right now. But make no mistake about it, if anything should happen there will be a massive, collective howl, from the stricken populace to the effect that the village should have done "more."

To complete this column it should also be added that the current Main St. dam, which is eroding, was a 1938 WPA project, which means Works Projects Administration, and was an effort to relieve unemployment in the 1930's.

183-1107

ALBANY TIMES UNION
HAMILTON EVENING PRESS
HAMILTON SUNDAY PRESS
BUFFALO COURIER EXPRESS
BUFFALO EVENING NEWS
LONG ISLAND NEWSDAY
NEW YORK POST
NEW YORK TIMES
OSWEGO PALLADIUM TIMES
PLATTSBURGH PRESS REPUBLICAN
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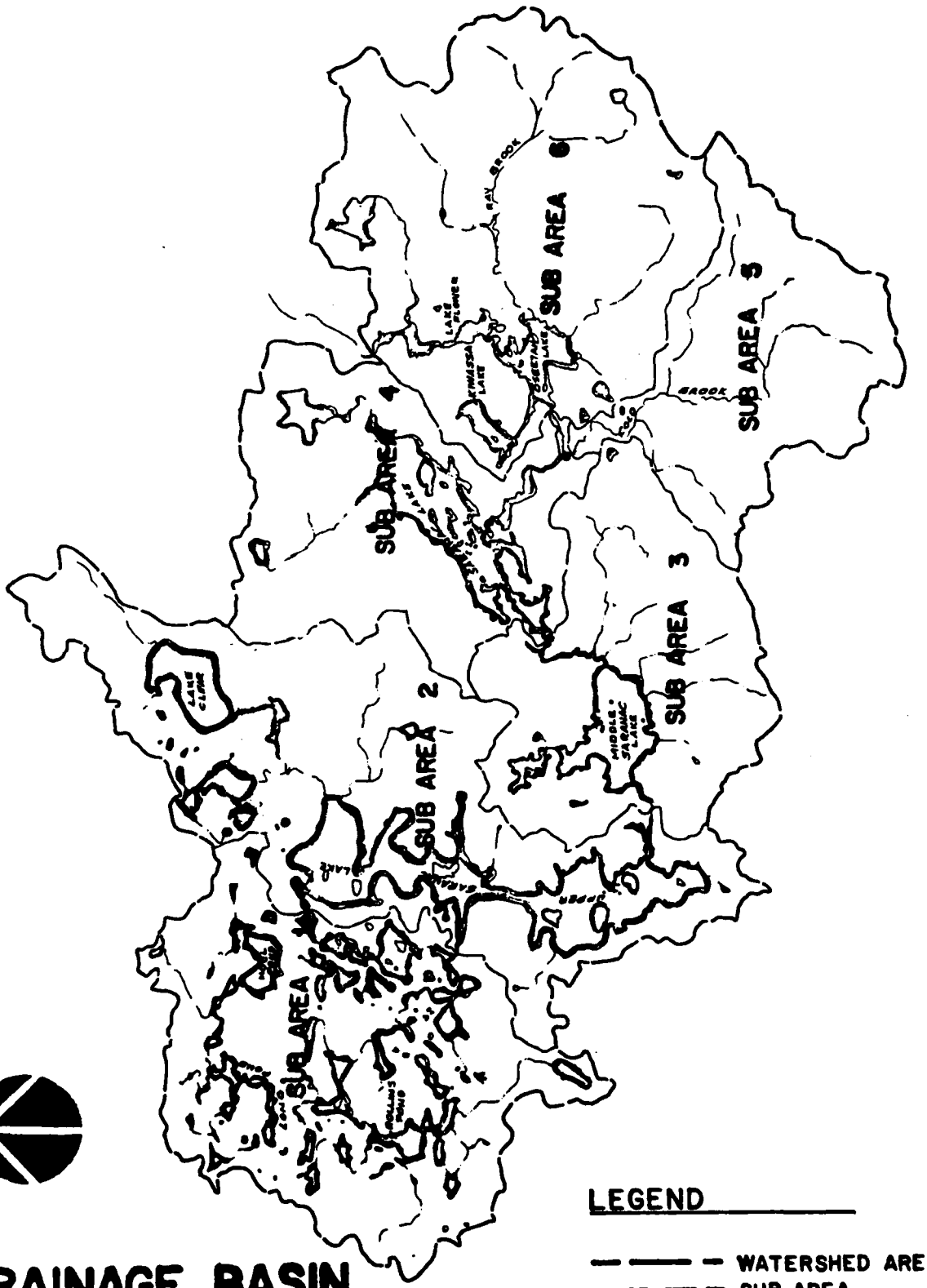
Lake Placid News
TROY TIMES RECORD
WATERTOWN DAILY TIMES
WHITE PLAINS REPORTER DISPATCH

PAGE 4 DATE 6/15/78

APPENDIX C

HYDROLOGIC AND HYDRAULIC COMPUTATIONS



DRAINAGE BASIN

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TEL 315-797-5800

DESIGN BRIEF

PROJECT NAME N.Y.S. Dam Inspections DATE

SUBJECT Lake Ilion PROJECT NO.

Sub-Area Areas DRAWN BY

Sub-Area	Area*	Area of Lakes	
1	32.9 mi²	4.47 mi²	= 13.6%
2	41.5	10.54	= 25.4%
3	24.0	2.54	= 10.6%
4	23.7	3.4	= 14.3%
5	19.2		
6	37.8	2.55	= 6.7%
Total =	179.1 mi²		

* Including Area of Lakes

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DESIGN BRIEF

PROJECT NAME N.Y.S. Dam Inspections DATE

SUBJECT Lake Flower PROJECT NO.

DRAWN BY

Snyder Parameters

$C_t = 2.0$, all areas (assumed)
$C_p = 0.625$, " "

Sub-Area	L, mi	L_{CA}, mi	t_p (hr.) *
1	11.8	3.6	6.2
2	7.8	2.05	4.6 + .4 = 5.0
3	5.3	2.4	4.3
4	3.25	1.1	2.9 + .3 = 3.2
5	8.1	3.45	5.4
6	6.6	1.9	4.3 + .5 = 4.8

* Adjusted for travel time through lake

Additional Lag due to travel time through lakes

$$t = \frac{\text{travel distance}}{V_w}$$

$V_w = \sqrt{g D_m}$ $g = 32.2$ ft/sec^2

D_m = avg. depth of lake

Lake	Hydrograph	D_m	dist.	V_w	t (hrs.)
Upper Saranac	1	40'	5.9 mi	35.9 fps	0.24
	2		8.6		0.35
Middle Saranac	2	30'	3.75	31.1	0.18
Lower Saranac	3	30'	4.55	31.1	0.21
	4		5.45		0.26
	5		0.85		0.04
Oseetah-Flower	4	5'	4.15	12.7	0.48
	6		4.5		0.52

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DESIGN BRIEF

PROJECT NAME NEW YORK STATE DAM INSPECTIONS DATE 7-2-80

SUBJECT LAKE FLOWER DAM PROJECT NO. 2399

DEPTH - AREA - DURATION DRAWN BY D.M.E.

P.M.F.

INDEX RAINFALL - 16.0"; 24 HR. DURATION
200 SQ. MI.

LAT. ~ 44°30' LONG. ~ 74°07'

DURATION	% INDEX *	DEPTH
6 HR	77	12.3"
12 HR	91	14.6
24 HR	102	16.3
48 HR	108	17.3

* for 179 mi^2 drainage basin

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DESIGN BRIEF

PROJECT NAME N.Y.S. Dam Inspections - 1980 DATE

SUBJECT Lake Flower PROJECT NO.

Spillway Rating DRAWN BY

Spillway geometry approaches that of an ogee shaped with a design head of 3'

$Q = C L H^{3/2}$

$L = 40'$

C From Fig. 14-4 "Open Channel Hydraulics" - Chow - for $C_d = 4.03$ $h/H_d > 1.33$

Elev.	H	H/H_d	C/C_d	C	Q (cfs)
1528	0				0
1529	1	.33	.835	3.37	135
1530	2	.67	.94	3.79	430
1531	3	1.0	1.0	4.03	838
1532	4	1.33	1.025	4.13	1322
1534	6	2.0	1.03	4.15	2440
1536	8	2.67	↓	↓	3755
1538	10	3.33			5250
1540	12	4.0			6900
1542	14	4.67			8695
1544	16	5.33			10,625
1546	18	6.0			12,675
1548	20	6.67			14,850
1550	22	7.33			17,130

Flow over stoplogs — Crest normally ~0.5' above spillway crest with max. up to ~.83' above spillway crest. Assumed crest elev. @ 1528.8
For the range of heads encountered C ~ 3.3
Length: 8' + 8' = 16'

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DESIGN BRIEF

PROJECT NAME N.Y.S. Dam Inspections - 1980 DATE

SUBJECT Lake Flower PROJECT NO.

DRAWN BY

Discharge Capacity @ Dam

Elev.	$Q_{Stop\ logs}$	Q_{Spill}	Q_{Total}
1528		0	0
1529	5	135	140
1530	70	430	500
1531	172	838	1010
1532	302	1322	1625
1534	626	2440	3065
1536	1020	3755	4775
1538	1473	5250	6725
1540	1980	6900	8880
1542	2532	8695	11,225
1544	3129	10,625	13,755
1546	3766	12,675	16,440
1548	4442	14,850	19,290
1550	5154	17,130	22,285

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DESIGN BRIEF

PROJECT NAME N.Y.S. Dam Inspections - 1980 DATE

SUBJECT Lake Flower PROJECT NO.

Tailwater Depths DRAWN BY

Tailwater depths for PMF & ½ PMF based on theoretical velocity of flow at toe of an overflow spillway. This method gives a lower bound on depths - which is the most critical case for stability purposes.

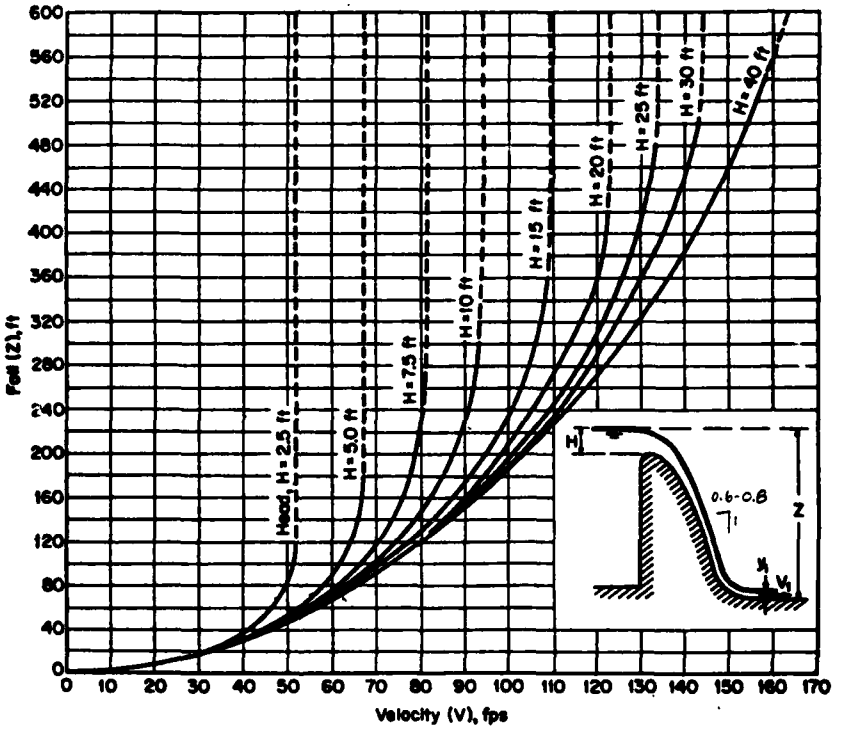

FIG. 14-15. Curves for determination of velocity at the toe of spillways with slopes 1 on 0.6 to 0.8. – Ref.: Open Channel Hydraulics, by Chow

PMF H.W. Elev. = 1539.0 $Q_{spillway} = 6056$ cfs $q = \frac{6056 cfs}{40'} = 151.4 \frac{ft^3}{sec}$

$H = 11'$ $Z = 26'$ $\therefore V_1 \sim 41$ fps

$y_1 = q/V_1 = \frac{151.4 ft^2/sec}{41 ft/sec} \sim 3.7'$

½ PMF H.W. Elev. = 1534.5 $Q_{spwy} = 2750$, $q = 68.8$, $H = 6.5'$, $Z = 21.5'$

$V_1 \cong 34$ $y_1 \sim 2'$

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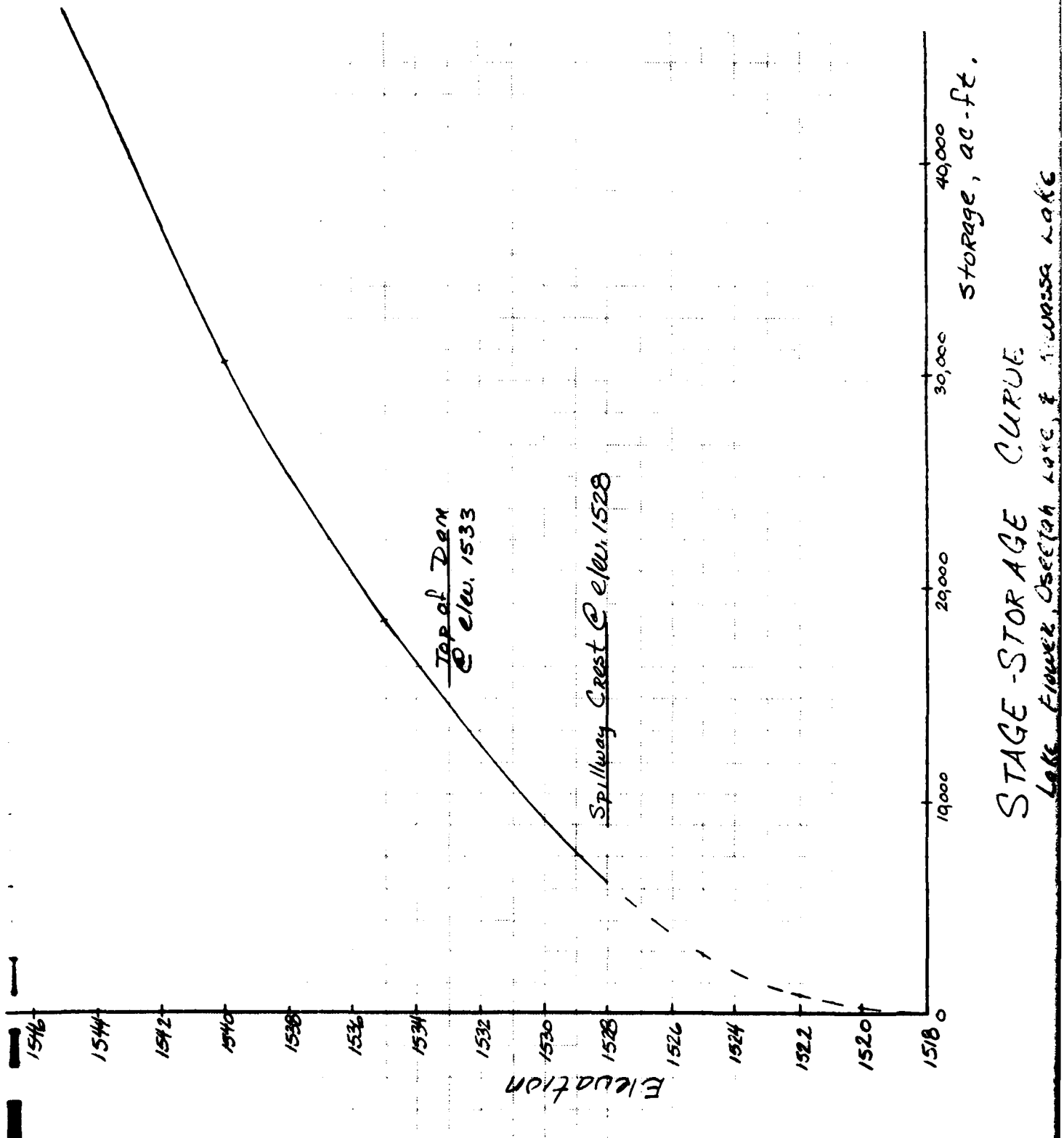
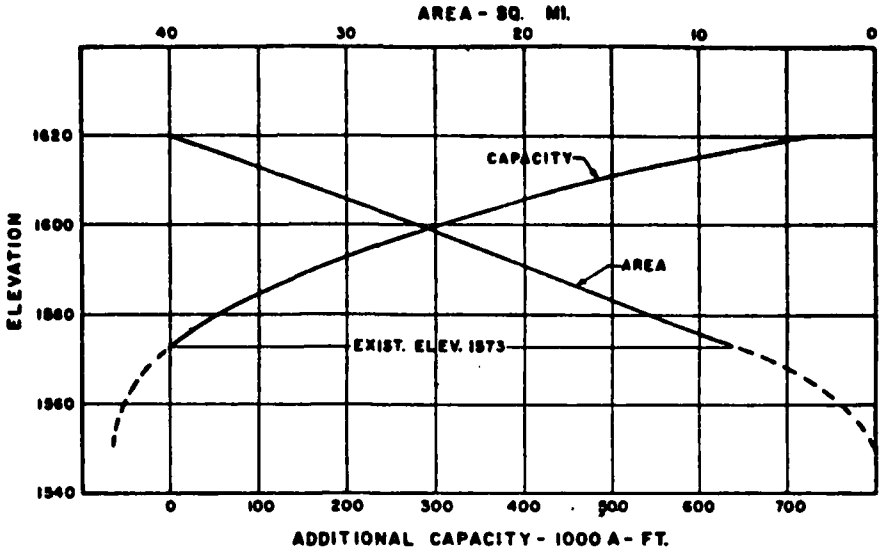
DESIGN BRIEF

PROJECT NAME N.Y.S. Dam Inspections - 1980 DATE

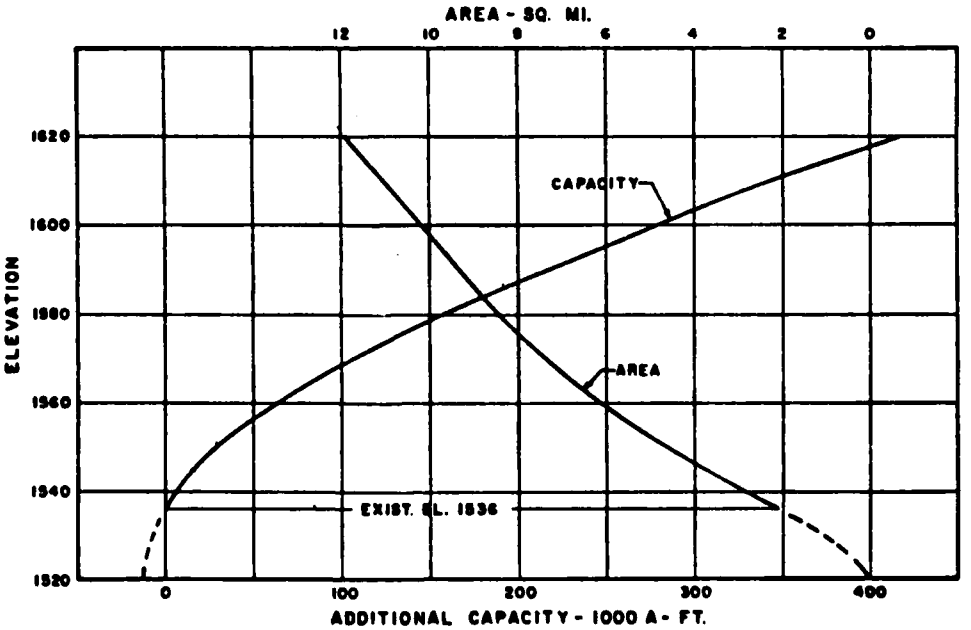
SUBJECT PROJECT NO.

DRAWN BY





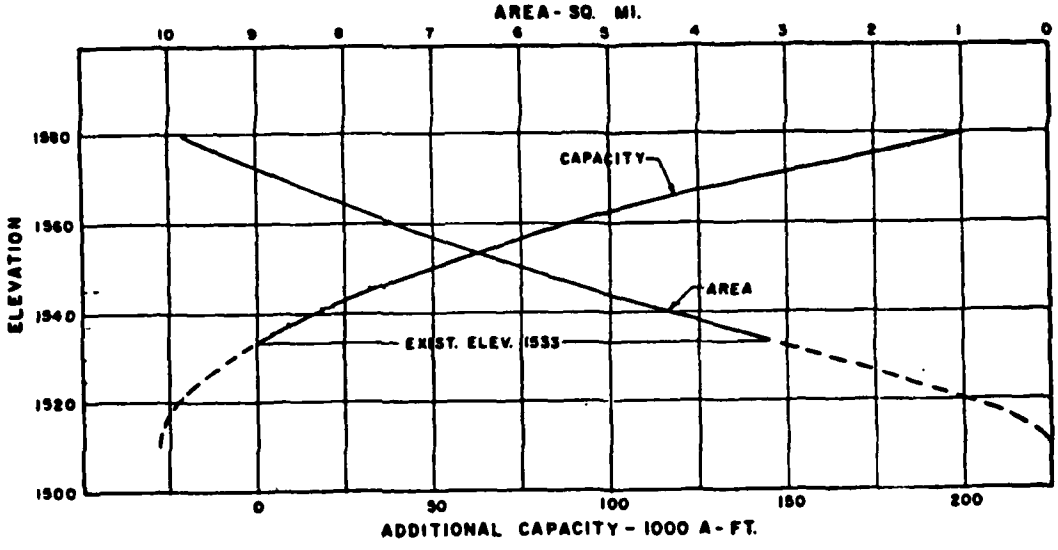
UPPER SARANAC LAKE



MIDDLE SARANAC LAKE
EXCLUDING UPPER SARANAC CASE

From: Reference # 18 - Uhl, Hall, & Rich

(See next sheet)



LOWER SARANAC LAKE

EXCLUDING MIDDLE & UPPER LAKES

STATE OF NEW YORK
WATER RESOURCES COMMISSION
CONSERVATION DEPARTMENT - DIVISION OF WATER RESOURCES

RECONNAISSANCE STUDY OF WATER RESOURCES
DELAWARE - BLACK - ST. LAWRENCE & LAKE CHAMPLAIN BASINS

LAKE CHAMPLAIN BASIN

EXISTING LAKES & RESERVOIRS

AREA - CAPACITY CURVES

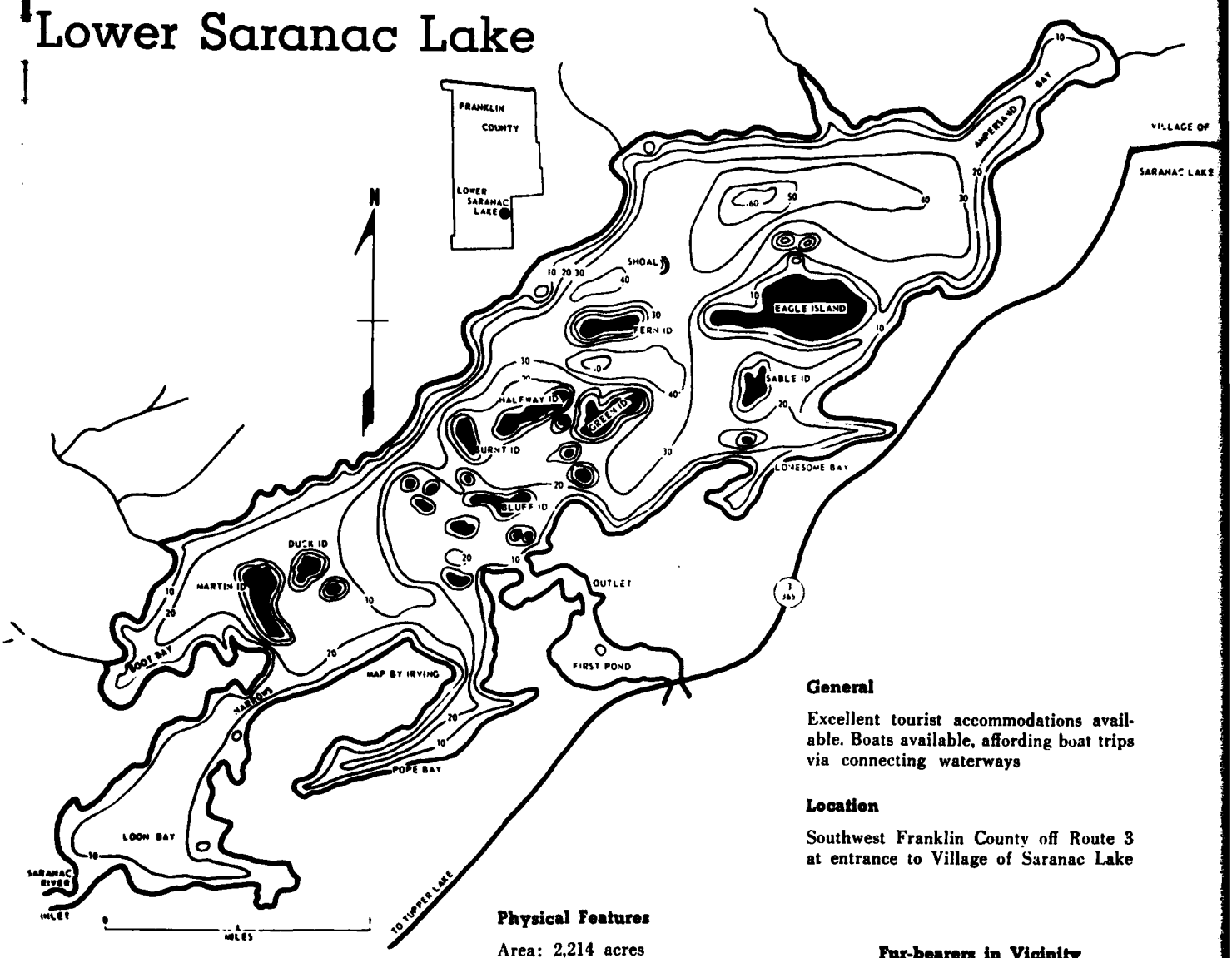
SHEET NO. 1

UHL, HALL & RICH, ENGINEERS
BOSTON MASSACHUSETTS

INFORMATION LEAFLET

NEW YORK STATE
DEPT. OF ENVIRONMENTAL CONSERVATION
CONSERVATION EDUCATION

Lower Saranac Lake



by Robert G. Zilliox,
District Fisheries Manager,
Adirondack Fisheries District

General

Excellent tourist accommodations available. Boats available, affording boat trips via connecting waterways

Location

Southwest Franklin County off Route 3 at entrance to Village of Saranac Lake

Physical Features

Area: 2,214 acres
Maximum Depth: 65 feet
Elevation: 1,534 feet

Chemical Characteristics

p.H.: Acid
Transparency: White to light brown

Hunting in Vicinity

Deer
Bear
Grouse
Snowshoe Rabbit
Bobcat
Coyotes
Waterfowl

Fur-bearers in Vicinity

Beaver
Otter
Mink
Fisher
Raccoon
Muskrat

Fish Present

Rainbow Trout
Whitefish
Smelt
Smallmouth Bass
Northern Pike
Yellow Perch
Brown Bullhead
Sunfish
Suckers
Minnows

DECEMBER-JANUARY, 1960-61
J-42

UPPER SARANAC LAKE

Location
Southern Franklin County
off Route 30 (Old Route 10)

General
Tourist accommodations available. Boats available. State Campsite at Northwest end.

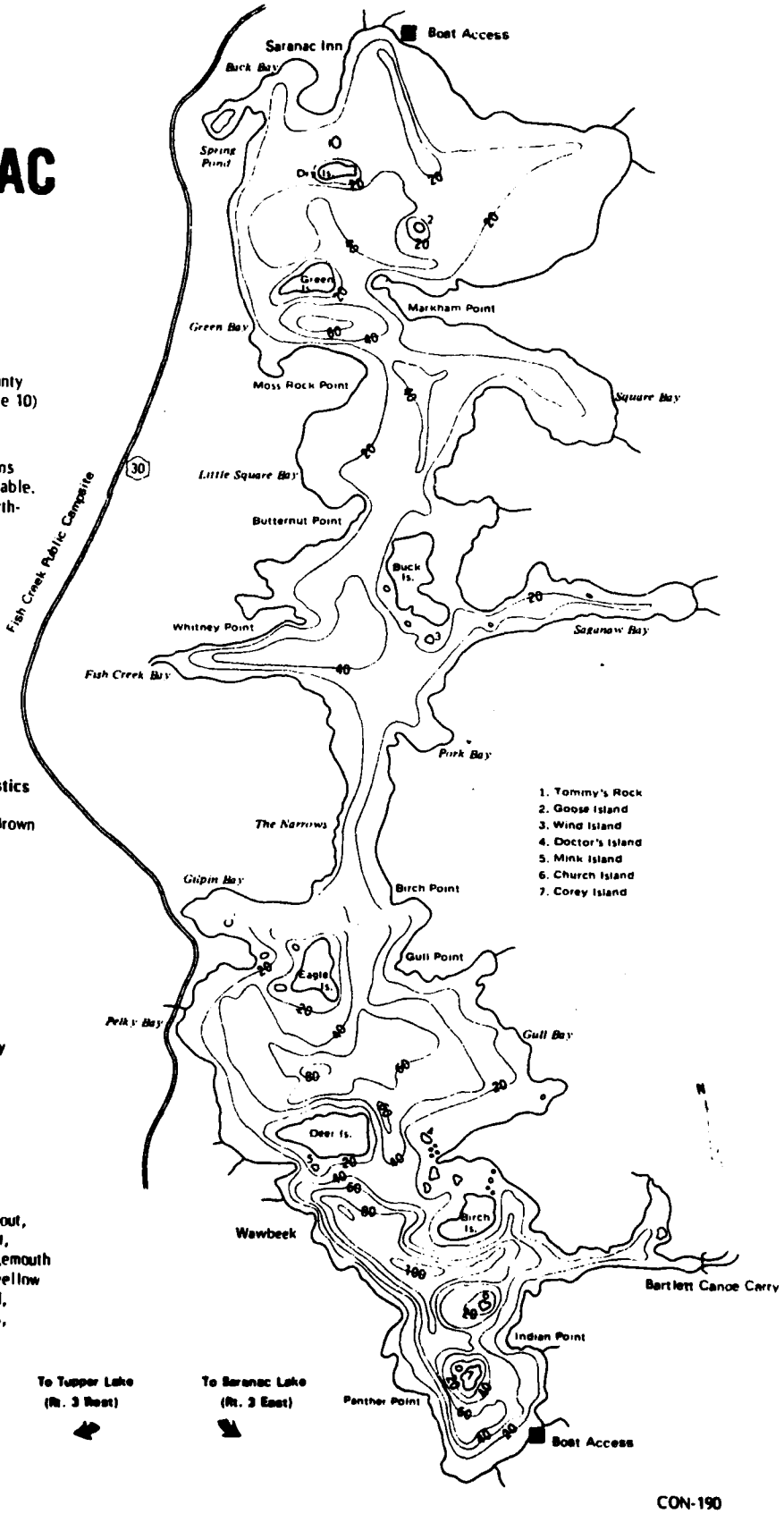
Physical Features
Area: 5056 acres
Maximum Depth: 105'
Elevation: 1573'

Chemical Characteristics
p.H.: Acid
Transparency: Light Brown

Hunting in Vicinity
Deer
Bear
Grouse
Snowshoe Rabbit
Bobcat
Coyotes, Waterfowl

Fur-bearers in vicinity
Beaver
Otter
Mink
Fisher
Raccoon
Muskrat

Fish Present
Lake trout, rainbow trout, whitefish (rare), smelt, smallmouth bass, largemouth bass, northern pike, yellow perch, brown bullhead, pumpkinseed, suckers, minnows.



CON-190

STETSON • DALE BANKERS TRUST BUILDING UTICA • NEW YORK • 13501
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DESIGN BRIEF

PROJECT NAME N.Y.S. Dam Inspections 1980 DATE

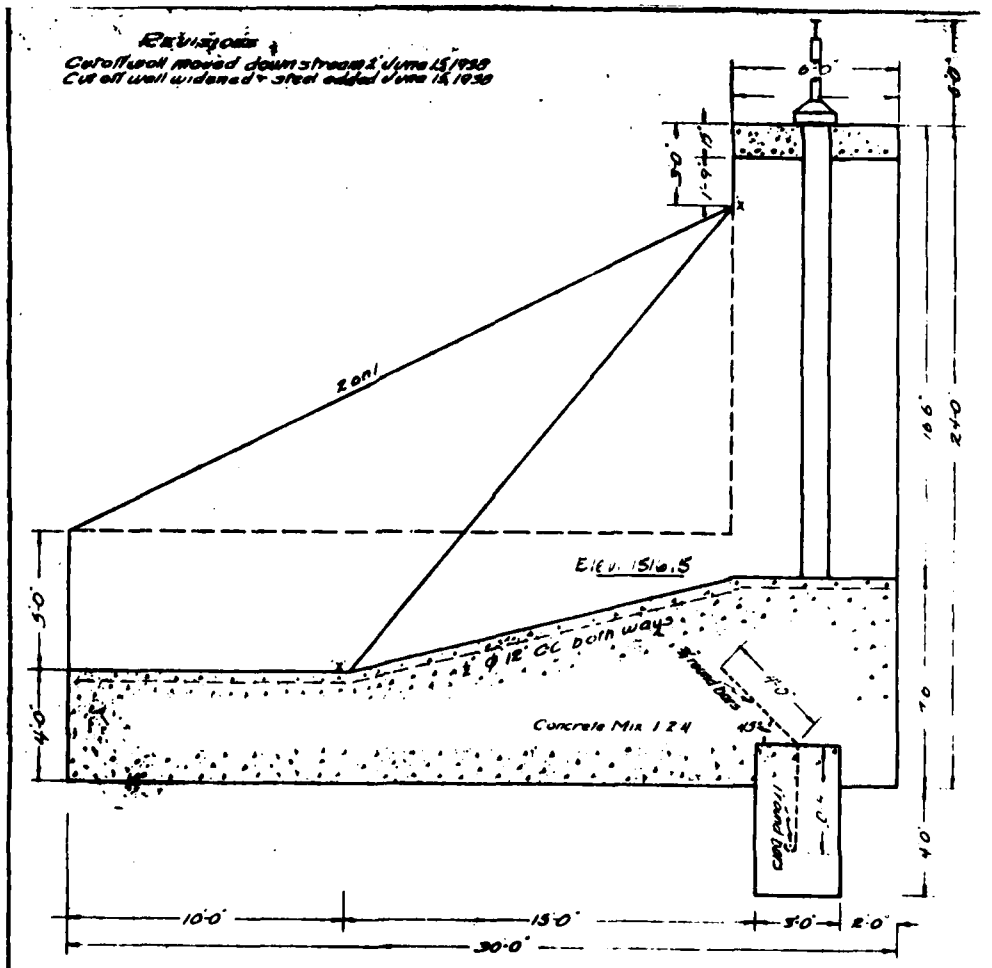
SUBJECT Lake Flower PROJECT NO.

DRAWN BY

Low Level Outlet Discharge Capacity

Discharge thru stop plank openings w/ all stop planks removed. Note: may be difficult to remove all stop planks under head of water. Assumed Reservoir elev = 1528 ∴ h = 11.5'. From King & Brater "Handbook of Hydraulics" 6th ed. Table 5-9 C ~ 3.3 for similarly shaped weir

$Q = CLH^{3/2} = 3.3\,(16')(11.5')^{3/2} = 2060$ cfs



CROSS SECTION SLUICE

```
(0001)   A1       LAKE FLOWER
(0002)   A2       HEC-1DB (SNYDER PARAMETERS)
(0003)   A3       PMF - DAM OVERTOPPING ANALYSIS
(0004)   B    300         0        20         C         C         C         C         C         4
(0005)   B1     5
(0006)   J      1         7         1
(0007)   J1   0.2       0.3       0.4       0.5       0.6       0.8       1.0
(0008)   K      0       100         0         0         0         0         1
(0009)   K1       RUNOFF SUBAREA 1
(0010)   M      1         1      32.9         0     179.1         0         0         0         1
(0011)   P      0       16.        77        91       102       108
(0012)   T      0         0         0         0         0         0       1.0       0.1         0      .136
(0013)   W    6.2     0.625
(0014)   X   -2.0     -0.10       1.6
(0015)   K      1       200         0         0         0         0         1
(0016)   K1       ROUTE THRU UPPER SARANAC
(0017)   Y      0         0         0         0         1
(0018)   Y1     0         3         1
(0019)   K      0       201         0         0         0         0         1
(0020)   K1       RUNOFF SUBAREA 2
(0021)   M      1         1      41.5         0     179.1         0         0         0         1
(0022)   P      0       16.        77        91       102       108
(0023)   T      0         0         0         0         0         0       1.0       0.1         0      .254
(0024)   W    5.0     0.625
(0025)   X   -2.0     -0.10       1.6
(0026)   K      2       200         0         0         0         0         1
(0027)   K1       COMBINE 2 HYDROGRAPHS AT UPPER SARANAC LAKE  1+2=2
(0028)   K      1       200         0         0         0         0         1
(0029)   K1       ROUTE OVER UPPER SARANAC LAKE DAM
(0030)   Y      0         0         0         1         1
(0031)   Y1     1         0         0         0         0         0     -1573         0
(0032)   $S     0     26000     55000    105000    163000
(0033)   $E  1573      1577      1580      1585      1590
(0034)   $$  1573       175      2.65       1.5
(0035)   $D  1575      2.65       1.5        10
(0036)   K      1       301         0         0         0         0         1
(0037)   K1       ROUTE THRU MIDDLE SARANAC LAKE
(0038)   Y      0         0         0         0         1
```

```
(0039)   Y1      0       3       1
(0040)   K       0     300       0       0       0       0       1
(0041)   K1       RUNOFF SUBAREA 3
(0042)   M       1       1    24.0       0   179.1       0       0       0       1
(0043)   P       3     16.      77      91     102     108
(0044)   T       0       0       0       0       0       0     1.0     0.1       0    .106
(0045)   W     4.3   0.625
(0046)   X    -2.3   -0.10     1.6
(0047)   K       2     300       0       0       0       0       1
(0048)   K1       COMBINE 2 HYDROGRAPHS  3+2=3
(0049)   K       1     300       0       0       0       0       1
(0050)   K1       ROUTE OVER OUTLET CONTROL AT MIDDLE SARANAC
(0051)   Y       0       0       0       1       1
(0052)   Y1      1       0       0       0       0       0   -1536       0
(0053)   $S      0    6000   15000   29000
(0054)   $E   1536    1540    1545    1550
(0055)   $$   1536      35    2.65     1.5
(0056)   $D   1540    2.65     1.5       6
(0057)   K       1     400       0       0       0       0       1
(0058)   K1       ROUTE THRU SARANAC LAKE (LOWER)
(0059)   Y       0       0       0       0       1
(0060)   Y1      0       3       1
(0061)   K       0     402       0       0       0       0       1
(0062)   K1       RUNOFF SUBAREA 4
(0063)   M       1       1    23.7       0   179.1       0       0       0       1
(0064)   P       0     16.      77      91     102     108
(0065)   T       0       0       0       0       0       0     1.0     0.1       0    .143
(0066)   W     3.2   0.625
(0067)   X    -2.0   -0.10     1.6
(0068)   K       0     500       0       0       0       0       1
(0069)   K1       RUNOFF SUBAREA 5
(0070)   M       1       1    19.2       0   179.1       0       0       0       1
(0071)   P       3     16.      77      91     102     108
(0072)   T       0       0       0       0       0       0     1.0     0.1       0     .01
(0073)   W     5.4   0.625
(0074)   X    -2.0   -0.10     1.6
(0075)   K       3     400       0       0       0       0       1
(0076)   K1       COMBINE 3 HYDROGRAPHS - INFLOW TO LOWER SARANAC  3+4+5=4
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```
(0077)   K       1      400        0        0        0        0        1
(0078)   K1        ROUTE OVERDAM AT OUTLET TO LOWER SARANAC
(0079)   Y       0        0        0        1        1
(0080)   Y1      1        0        0        0        0        0    -1533        0
(0081)   $S      0    15000    30000    51000
(0082)   $E   1533     1540     1545     1550
(0083)   $$   1533       60      3.5      1.5
(0084)   $D   1537     2.65      1.5       12
(0085)   K       1      600        0        0        0        0        1
(0086)   K1        ROUTE THRU OSEETAH & LAKE FLOWER
(0087)   Y       0        0        0        0        1
(0088)   Y1      0        3        2
(0089)   K       0      601        0        0        0        0        1
(0090)   K1        RUNOFF SUBAREA 6
(0091)   M       1        1     37.8        0    179.1        0        0        0        1
(0092)   P       0      16.       77       91      102      108
(0093)   T       0        0        0        0        0        0      1.0      0.1        0     .067
(0094)   b     4.8    0.625
(0095)   x    -2.0    -0.10      1.6
(0096)   K       2      600        0        0        0        0        1
(0097)   K1        COMBINE 2 HYDROGRAPHS - INFLOW HYDROGRAPH FOR LAKE FLOWER  6+4=6
(0098)   K       1      600        0        0        0        0        1
(0099)   K1        ROUTE OVER LAKE FLOWER DAM
(0100)   Y       0        0        0        1        1
(0101)   Y1      1        0        0        0        0        0    -1528       -1
(0102)   Y4   1528     1529     1530     1531     1532     1534     1536     1538     1540     1542
(0103)   Y4   1544     1546     1548     1550
(0104)   Y5      0      140      500     1010     1625     3065     4775     6725     8880    11225
(0105)   Y5  13755    16440    19290    22285
(0106)   $S      0      820     2800     6200     9160    18460    30560    47000
(0107)   $E   1513     1522     1525     1528     1530     1535     1540     1545
(0108)   $$   1528
(0109)   $D   1533     2.65      1.5       32
(0110)   K     99
(0111)   A
(0112)   A
(0113)   A
(0114)   A
```

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT	100
ROUTE HYDROGRAPH TO	200
RUNOFF HYDROGRAPH AT	201
COMBINE 2 HYDROGRAPHS AT	200
ROUTE HYDROGRAPH TO	200
ROUTE HYDROGRAPH TO	301
RUNOFF HYDROGRAPH AT	300
COMBINE 2 HYDROGRAPHS AT	300
ROUTE HYDROGRAPH TO	300
ROUTE HYDROGRAPH TO	400
RUNOFF HYDROGRAPH AT	402
RUNOFF HYDROGRAPH AT	500
COMBINE 3 HYDROGRAPHS AT	400
ROUTE HYDROGRAPH TO	400
ROUTE HYDROGRAPH TO	600
RUNOFF HYDROGRAPH AT	601
COMBINE 2 HYDROGRAPHS AT	600
ROUTE HYDROGRAPH TO	600

END OF NETWORK

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

RUN  DATE?WED, JUL 3[illegible] 1980
     TIME?16:27:54
```

LAKE FLOWER
HEC-1DF (SNYDER PARAMETERS)
PMF - DAM OVERTOPPING ANALYSIS

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
500	0	20	0	0	0	0	0	4	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

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

RTIOS= 0.20 0.30 0.40 0.50 0.60 0.80 1.00

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

SUB-AREA RUNOFF COMPUTATION

RUNOFF SUBAREA 1

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	I-UTO
100	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	32.90	0.00	179.10	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	16.00	77.00	91.00	102.00	108.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS 0.88[illegible]

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.10	0.00	0.14

UNIT HYDROGRAPH DATA
TP= 6.20 CP=0.63 NTA= 0

RECESSION DATA

STRTG= -2.... GRCSN= -0.10 RTIOR= 1.60

UNIT HYDROGRAPH 100 END-OF-PERIOD ORDINATES, LAG= 6.18 HOURS, CP= 0.63 VOL= 0.99

28.	105.	214.	346.	496.	655.	823.	998.	1176.	1363.
1546.	1712.	1855.	1974.	2071.	2144.	2194.	2219.	2216.	2178.
2091.	1975.	1806.	1768.	1661.	1568.	1481.	1398.	1319.	1245.
1174.	1110.	1047.	989.	933.	881.	832.	785.	741.	700.
660.	623.	588.	555.	524.	495.	467.	441.	416.	393.
371.	350.	331.	312.	295.	278.	262.	246.	234.	221.
208.	197.	186.	175.	165.	156.	147.	139.	131.	124.
117.	111.	104.	98.	93.	88.	83.	78.	74.	70.
66.	62.	59.	55.	52.	49.	47.	44.	41.	39.
37.	35.	33.	31.	29.	28.	26.	25.	23.	22.

C

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	END-OF-PERIOD FLOW MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	15.21	12.40	2.81	799168.
										(386.)	(315.)	(71.)	(22629.89)

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

HYDROGRAPH ROUTING

ROUTE THRU UPPER SARANAC

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
2 0	1	0	0	0	0	1	0	0

ROUTING DATA

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

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
0	3	1	0.000	0.000	0.000	0.	0

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

SUB-AREA RUNOFF COMPUTATION

RUNOFF SUBAREA 2

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
201	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	41.50	0.00	179.10	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	16.00	77.00	91.00	102.00	106.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS 0.680

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.10	0.00	0.05

UNIT HYDROGRAPH DATA

TP= 5.00 CP=0.65 NTA= 0

RECESSION DATA

STRTQ= -2.00 QRCSN= -0.10 RTIOR= 1.60

UNIT HYDROGRAPH 54 END-OF-PERIOD ORDINATES, LAG= 4.98 HOURS, CP= 0.62 VOL= 1.0

59.	221.	455.	727.	1029.	1353.	1692.	2043.	2392.	2706.
2966.	3171.	3321.	3416.	3451.	3416.	3275.	3063.	2853.	2657.
2475.	2305.	2146.	1999.	1862.	1734.	1615.	1504.	1401.	1305.
1215.	1132.	1054.	981.	914.	851.	793.	738.	688.	640.
597.	556.	517.	482.	449.	418.	389.	363.	338.	314.
293.	273.	254.	237.	220.	205.	191.	178.	166.	154.
144.	134.	125.	116.	108.	101.	94.	87.	81.	76.
71.	66.	61.	57.	53.	49.	46.	43.	40.	37.
35.	32.	30.	28.						

C

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	15.21	12.78	2.42	1051542.
										(386.)	(325.)	(62.)	(29776.32)

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

COMBINE HYDROGRAPHS

COMBINE 2 HYDROGRAPHS AT UPPER SARANAC LAKE 1+2=2

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
200	2	0	0	0	0	1	0	0

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

HYDROGRAPH ROUTING

ROUTE OVER UPPER SARANAC LAKE DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
200	1	0	0	0	0	1	0	0

ROUTING DATA

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

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT

			1	0	0	0.000	0.000	0.000	-1573.	0

CAPACITY=	0.	26000.	55000.	115000.	163000.
ELEVATION=	1573.	1577.	1580.	1585.	1590.

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
1573.0	175.0	2.6	1.5	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1575.0	2.6	1.5	10.

PEAK OUTFLOW IS 728. AT TIME 61.00 HOURS

PEAK OUTFLOW IS 1326. AT TIME 60.00 HOURS

PEAK OUTFLOW IS 19[illegible]. AT TIME 59.33 HOURS

PEAK OUTFLOW IS 27[illegible]. AT TIME 58.67 HOURS

PEAK OUTFLOW IS 3547. AT TIME 58.00 HOURS

PEAK OUTFLOW IS 4881. AT TIME 58.00 HOURS

PEAK OUTFLOW IS 6251. AT TIME 58.00 HOURS

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

HYDROGRAPH ROUTING

ROUTE THRU MIDDLE SARANAC LAKE

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
301	1	0	0	0	0	1	0	0

ROUTING DATA

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

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
0	3	1	0.000	0.000	0.000	0.	0

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

SUB-AREA RUNOFF COMPUTATION

RUNOFF SUBAREA 3

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
300	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUNG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	24.00	0.00	179.10	0.00	0.000	0	1	0

PRECIP DATA

SPFE	[illegible]	R6	R12	R24	R48	R72	R96
0.00	10.[illegible]	77.00	91.00	102.00	108.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS [illegible].8

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
1	0.00	[illegible].0	1.00	0.00	0.00	1.00	1.00	0.10	0.00	0.11

UNIT HYDROGRAPH DATA

TP= 4.30 CP=0.63 NTA= 0

RECESSION DATA

STRTQ= -2.00 QRCSN= -0.10 RTIOR= 1.60

UNIT HYDROGRAPH 72 END-OF-PERIOD ORDINATES, LAG= 4.29 HOURS, CP= 0.62 VOL= 1.0

49.	163.	373.	595.	840.	1100.	1371.	1637.	1870.	2053.
2186.	2274.	2330.	2275.	2155.	1988.	1831.	1686.	1553.	1430.
1317.	1213.	1118.	1029.	948.	873.	804.	741.	682.	628.
579.	533.	491.	452.	416.	384.	353.	325.	300.	276.
254.	234.	216.	199.	183.	169.	155.	143.	132.	121.
112.	103.	95.	87.	80.	74.	68.	63.	58.	53.
49.	45.	42.	38.	35.	33.	30.	28.	25.	23.
22.	20.								

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	15.21	12.30	2.91	591025.
										(386.)	(312.)	(74.)	(16735.95)

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

COMBINE HYDROGRAPHS

COMBINE 2 HYDROGRAPHS 3+2=3

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
300	2	0	0	0	0	1	0	0

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

HYDROGRAPH ROUTING

ROUTE OVER OUTLET CONTROL AT MIDDLE SARANAC

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
300	1	0	0	0	0	1	0	0

ROUTING DATA

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

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	3	0	0.000	0.000	0.000	-1536.	0

CAPACITY=	0.	6000.	15000.	29000.
ELEVATION=	1530.	1540.	1545.	1550.

CREL	SPWID	COGW	EXPW	ELEVL	COGL	CAREA	EXPL
1536.0	35.0	2.6	1.5	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COGD	EXPD	DAMWID
1540.0	2.6	1.5	6.

PEAK OUTFLOW IS [illegible] AT TIME 1[illegible] HOURS

PEAK OUTFLOW IS 846. AT TIME 100.00 HOURS

PEAK OUTFLOW IS 1265. AT TIME 97.33 HOURS

PEAK OUTFLOW IS 1795. AT TIME 93.33 HOURS

PEAK OUTFLOW IS 2559. AT TIME 93.33 HOURS

PEAK OUTFLOW IS 3302. AT TIME 93.00 HOURS

PEAK OUTFLOW IS 4201. AT TIME 93.67 HOURS

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HYDROGRAPH ROUTING

ROUTE THRU SARANAC LAKE (LOWER)

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
400	1	0	0	0	0	1	0	0

ROUTING DATA

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

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
0	3	1	0.000	0.000	0.000	0.	0

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

SUB-AREA RUNOFF COMPUTATION

RUNOFF SUBAREA 4

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
402	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	23.70	0.00	179.10	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.0	10.00	77.00	91.00	102.00	108.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS 0.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.10	0.00	0.14

UNIT HYDROGRAPH DATA

TP= 3.20 CP=0.63 NTA= 0

RECESSION DATA

STRTQ= -2.00 QRCSN= -0.10 RTIOR= 1.60

UNIT HYDROGRAPH 52 END-OF-PERIOD ORDINATES, LAG= 3.18 HOURS, CP= 0.63 VOL= 1.00

79.	366.	743.	1174.	1638.	2111.	2527.	2831.	3020.	3087.
2943.	2744.	2446.	2180.	1943.	1732.	1544.	1377.	1227.	1094.
975.	869.	775.	691.	616.	549.	489.	436.	389.	347.
309.	275.	245.	219.	195.	174.	155.	138.	123.	110.
98.	87.	78.	69.	62.	55.	49.	44.	39.	35.
31.	28.								

C

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	15.21	12.42	2.79	601774.
										(386.)	(316.)	(71.)	(17040.32)

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SUB-AREA RUNOFF COMPUTATION

RUNOFF SUBAREA 5

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
500	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	19.20	0.00	179.10	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96

[illegible] 1.0 16.00 [illegible] 91.00 [illegible] 168.00 0.00 0.00

TRSPC COMPUTED BY THE PROGRAM IS 0.000

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	FRAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.10	0.00	0.1

UNIT HYDROGRAPH DATA

TP= 5.40 CP=0.63 NTA= 0

RECESSION DATA

STRTQ= -2.00 QRCSN= -0.10 RTIOR= 1.60

UNIT HYDROGRAPH 95 END-OF-PERIOD ORDINATES, LAG= 5.44 HOURS, CP= 0.63 VOL= 1.00

22.	84.	173.	276.	394.	519.	651.	787.	927.	1062.
1182.	1281.	1361.	1421.	1460.	1478.	1472.	1432.	1356.	1269.
1166.	1111.	1046.	974.	911.	853.	798.	747.	699.	655.
615.	575.	537.	502.	470.	440.	412.	385.	361.	338.
316.	296.	277.	259.	243.	227.	212.	199.	186.	174.
165.	155.	145.	134.	125.	117.	110.	103.	96.	90.
84.	79.	74.	69.	65.	60.	57.	53.	50.	46.
43.	41.	38.	36.	33.	31.	29.	27.	26.	24.
22.	21.	20.	18.	17.	16.	15.	14.	13.	12.

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	15.21	11.99	3.22	454831.
										(386.)	(305.)	(82.)	(12879.37)

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

COMBINE HYDROGRAPHS

COMBINE 3 HYDROGRAPHS - INFLOW TO LOWER SARANAC 3+4+5=4

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
400	3	0	0	0	0	1	0	0

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HYDROGRAPH ROUTING

ROUTE OVERDAM AT OUTLET TO LOWER SARANAC

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
400	1	0	0	0	0	1	0	0

ROUTING DATA

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

	NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
	1	0	0	0.000	0.000	0.000	-1533.	0

CAPACITY=	0.	15000.	30000.	51000.
ELEVATION=	1533.	1540.	1545.	1550.

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
1533.0	60.0	3.5	1.5	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1537.0	2.6	1.5	12.

PEAK OUTFLOW IS 747. AT TIME 57.33 HOURS

PEAK OUTFLOW IS 1559. AT TIME 57.33 HOURS

PEAK OUTFLOW IS 2430. AT TIME 56.67 HOURS

PEAK OUTFLOW IS 2821. AT TIME 56.00 HOURS

PEAK OUTFLOW IS 3679. AT TIME 55.67 HOURS

PEAK OUTFLOW IS 4211. AT TIME 55.67 HOURS

PEAK OUTFLOW IS 4791. AT TIME 55.33 HOURS

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HYDROGRAPH ROUTING

ROUTE THRU OSEETAH & LAKE FLOWER

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
630	1	0	0	0	0	1	0	0

ROUTING DATA

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

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
0	3	2	0.000	0.000	0.000	0.	0

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SUB-AREA RUNOFF COMPUTATION

RUNOFF SUBAREA 6

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
601	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	[illegible]	[illegible]	179.1[illegible]	[illegible]	0.000	[illegible]	1	[illegible]

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
[illegible]	[illegible]	77.0	91.3[illegible]	[illegible]	108.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .[illegible]

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
[illegible]	[illegible]	[illegible]	1.[illegible]	0.00	[illegible]	1.00	1.00	0.10	0.00	[illegible].7

UNIT HYDROGRAPH DATA

TP= 4.80 CP=0.63 NTA= 0

RECESSION DATA

STRTQ= -2.[illegible] QRCSN= -0.10 RTIOR= 1.60

UNIT HYDROGRAPH [illegible] END-OF-PERIOD ORDINATES, LAG= 4.[illegible] HOURS, CP= 0.63 VOL= 1.[illegible]

[illegible].	[illegible]26.	4[illegible]2.	740.	1047.	1375.	1717.	2070.	2409.	2702.
2957.	3115.	3236.	3296.	3290.	3185.	2989.	2773.	2572.	2386.
2213.	[illegible]53.	1964.	1766.	1636.	1520.	1410.	1307.	1213.	1125.
1[illegible]43.	[illegible]86.	[illegible]9[illegible].	833.	772.	717.	665.	617.	572.	530.
49[illegible].	456.	423.	[illegible]93.	364.	336.	313.	291.	270.	250.
23[illegible].	215.	2[illegible].	185.	17[illegible].	159.	148.	137.	127.	118.
1[illegible]9.	101.	94.	87.	[illegible]1.	75.	70.	65.	[illegible]0.	56.
52.	48.	44.	41.	3[illegible].	35.	33.	30.	28.	

END-OF-PERIOD FLOW

M.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	AC.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	15.21	12.17	3.03	916210.
										(386.)	(309.)	(77.)	(25944.15)

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COMBINE HYDROGRAPHS

COMBINE 2 HYDROGRAPHS - INFLOW HYDROGRAPH FOR LAKE FLOWER 6+4=6

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
600	2	0	0	0	0	1	0	0

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HYDROGRAPH ROUTING

ROUTE OVER LAKE FLOWER DAM

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
400	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.[illegible]	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1528.	-1

STAGE	1524.00	1526.00	1530.00	1532.00	1534.00	1536.00	1538.00	1540.00	
	1544.00	1546.00	1548.00	1550.00					
FLOW	0.00	140.00	500.00	1010.00	1625.00	3065.00	4775.00	6725.00	8880.00
	13755.00	16440.00	19290.00	22285.00					
CAPACITY=	0.	860.	2800.	6200.	9160.	18460.	30560.	47000.	
ELEVATION=	1515.	1522.	1525.	1528.	1530.	1535.	1540.	1545.	

CREL	SPWID	COGW	EXPW	ELEVL	COQL	CAREA	EXPL
1528.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1533.0	2.6	1.5	32.

PEAK OUTFLOW IS 956. AT TIME 62.67 HOURS

PEAK OUTFLOW IS 1709. AT TIME 61.67 HOURS

PEAK OUTFLOW IS 2591. AT TIME 61.00 HOURS

PEAK OUTFLOW IS 3645. AT TIME 59.67 HOURS

PEAK OUTFLOW IS 4705. AT TIME 59.67 HOURS

PEAK OUTFLOW IS 6805. AT TIME 58.67 HOURS

PEAK OUTFLOW IS 9176. AT TIME 57.67 HOURS

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

OPERATION	STATION	AREA	PLAN	RATIO 1	RATIO 2	RATIO 3	RATIO 4	RATIO 5	RATIO 6	RATIO 7
				RATIOS APPLIED TO FLOWS						
				0.20	0.30	0.40	0.50	0.60	0.80	1.00
HYDROGRAPH AT	1[illegible]	32.9[illegible]	1	4400.	6600.	8800.	11000.	13200.	17600.	22000.
		(85.21)		(124.60)(	186.89)(	249.19)(	311.49)(	373.79)(	498.38)(	622.98)(
ROUTED TO	200	32.90	1	4387.	6581.	8775.	10968.	13162.	17549.	21937.
		(85.21)		(124.24)(	186.35)(	248.47)(	310.59)(	372.71)(	496.94)(	621.18)(
HYDROGRAPH AT	201	41.50	1	6536.	9803.	13071.	16339.	19607.	26142.	32678.
		(107.48)		(185.07)(	277.60)(	370.13)(	462.66)(	555.20)(	740.26)(	925.33)(
2 COMBINED	200	74.40	1	10723.	16085.	21446.	26808.	32169.	42892.	53615.
		(192.69)		(303.64)(	455.46)(	607.28)(	759.10)(	910.93)(	1214.57)(	1518.21)(
ROUTED TO	2[illegible]	74.40	1	728.	1306.	1980.	2738.	3547.	4880.	6251.
		(192.69)		(20.61)(	36.97)(	56.07)(	77.53)(	100.44)(	138.20)(	177.00)(
ROUTED TO	301	74.40	1	728.	1306.	1980.	2738.	3547.	4880.	6250.
		(192.69)		(20.61)(	36.97)(	56.06)(	77.53)(	100.43)(	138.19)(	176.99)(
HYDROGRAPH AT	30[illegible]	24.00	1	4137.	6205.	8273.	10342.	12410.	16547.	20683.
		(62.16)		(117.14)(	175.70)(	234.27)(	292.84)(	351.41)(	468.54)(	585.68)(
2 COMBINED	30[illegible]	98.40	1	4267.	6446.	8645.	10865.	13100.	17609.	22168.
		(254.85)		(120.82)(	182.54)(	244.80)(	307.66)(	370.94)(	498.62)(	627.71)(
ROUTED TO	300	98.40	1	460.	846.	1285.	1793.	2359.	3302.	4201.
		(254.85)		(13.01)(	23.96)(	36.39)(	50.79)(	66.79)(	93.49)(	118.96)(
ROUTED TO	4[illegible]	98.40	1	459.	846.	1285.	1793.	2359.	3302.	4201.
		(254.85)		(13.00)(	23.96)(	36.39)(	50.79)(	66.79)(	93.49)(	118.96)(
HYDROGRAPH AT	402	23.70	1	4998.	7497.	9996.	12495.	14994.	19993.	24991.
		(61.38)		(141.53)(	212.30)(	283.06)(	353.83)(	424.59)(	566.12)(	707.66)(
HYDROGRAPH AT	50[illegible]	19.20	1	2806.	4209.	5612.	7015.	8418.	11224.	14030.
		(49.73)		(79.46)(	119.19)(	158.92)(	198.65)(	238.38)(	317.84)(	397.30)(
3 COMBINED	400	141.30	1	7472.	11226.	14989.	18760.	22537.	30109.	37701.
		(365.96)		(211.59)(	317.90)(	424.45)(	531.23)(	638.19)(	852.58)(	1067.57)(

ROUTED TO	400	141.30 (365.96)	1	747. (21.16)(	1339. 37.93)(	2030. 57.49)(	2821. 79.87)(	3679. 104.19)(	5211. 147.56)(	6791. 192.30)(
ROUTED TO	60	141.30 (365.96)	1	747. (21.16)(	1339. 37.92)(	2030. 57.48)(	2820. 79.86)(	3679. 104.18)(	5211. 147.55)(	6790. 192.28)(
HYDROGRAPH AT	601	37.80 (97.90)	1	6084. 172.28)(	9126. 258.42)(	12166. 344.56)(	15210. 430.70)(	18252. 516.84)(	24336. 689.11)(	30420. 861.39)(
2 COMBINED	60	179.10 (463.86)	1	6325. 179.10)(	9573. 270.99)(	12862. 364.21)(	16190. 458.44)(	19548. 553.53)(	26366. 746.59)(	33319. 943.49)(
ROUTED TO	60	179.10 (463.86)	1	956. 27.06)(	1709. 48.40)(	2591. 73.37)(	3645. 103.22)(	4703. 133.18)(	6803. 192.65)(	9076. 257.01)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1573.00	1573.00	1575.00
STORAGE	0.	0.	13000.
OUTFLOW	0.	0.	1312.

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
0.20	1574.35	0.00	8779.	728.	0.00	61.00	0.00
0.30	1574.99	0.00	12960.	1306.	0.00	60.00	0.00
0.40	1575.62	0.62	17032.	1980.	48.00	59.33	0.00
0.50	1576.24	1.24	21044.	2738.	54.00	58.67	0.00
0.60	1576.83	1.83	24919.	3547.	55.00	58.00	0.00
0.80	1577.72	2.72	32997.	4880.	56.33	58.00	0.00
1.00	1578.56	3.56	41040.	6251.	57.00	58.00	0.00

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1536.00	1536.00	1540.00
STORAGE	0.	0.	6000.
OUTFLOW	0.	0.	742.

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
0.20	1538.91	0.00	4359.	460.	0.00	100.00	0.00
0.30	1540.35	0.35	6639.	846.	30.33	100.00	0.00
0.40	1541.67	1.67	8999.	1285.	49.00	97.33	0.00
0.50	1542.98	2.98	11370.	1793.	53.00	93.00	0.00
0.60	1544.30	4.30	13736.	2359.	54.67	90.33	0.00
0.80	1546.27	6.27	18553.	3302.	56.00	93.00	0.00
1.00	1547.97	7.97	23328.	4201.	57.00	93.67	0.00

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1533.00	1533.00	1537.00
STORAGE	0.	0.	8571.
OUTFLOW	0.	0.	1680.

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
0.20	1535.33	0.00	4995.	747.	0.00	58.33	0.00
0.30	1536.44	0.00	7370.	1339.	0.00	57.33	0.00
0.40	1537.52	0.52	9686.	2030.	37.00	56.67	0.00
0.50	1538.57	1.57	11929.	2821.	54.67	56.00	0.00
0.60	1539.58	2.58	14107.	3679.	56.00	55.67	0.00
0.80	1541.21	4.21	18619.	5211.	57.33	55.67	0.00
1.00	1542.71	5.71	23139.	6791.	58.00	55.33	0.00

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1528.00	1528.00	1533.00
STORAGE	6200.	6200.	14740.
OUTFLOW	0.	0.	2345.

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
0.20	1530.69	0.00	10822.	956.	0.00	62.67	0.00
0.30	1532.12	0.00	13098.	1709.	0.00	61.67	0.00
0.40	1533.32	0.32	15336.	2591.	27.00	61.00	0.00
0.50	1534.50	1.50	17525.	3645.	52.67	59.67	0.00
0.60	1535.52	2.52	19717.	4703.	54.33	59.67	0.00
0.80	1537.30	4.30	24035.	6803.	56.00	58.67	0.00
1.00	1539.02	6.02	28188.	9076.	56.67	57.67	0.00

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(C001)   A1       LAKE FLOWER
(0002)   A2       HEC-1DB (SNYDER PARAMETERS)
(0003)   A3       PMF - DAM BREAK ANALYSIS
(0004)   B     300         0        20         0         0         0         0         0         4
(0005)   B1      5
(0006)   J       3         1         1
(0007)   J1    0.5
(0008)   K       0       100         0         0         0         0         1
(0009)   K1        RUNOFF SUBAREA 1
(0010)   M       1         1      32.9         0     179.1         0         0         0         1
(0011)   P       0       16.        77        91       102       108
(0012)   T       5         0         0         0         0         0       1.0       0.1         0      .136
(0013)   W     6.2     0.625
(0014)   X    -2.0     -0.10       1.6
(0015)   K       1       200         0         0         0         0         1
(0016)   K1        ROUTE THRU UPPER SARANAC
(0017)   Y       0         0         0         0         1
(0018)   Y1      0         3         1
(0019)   K       0       201         0         0         0         0         1
(0020)   K1        RUNOFF SUBAREA 2
(0021)   M       1         1      41.5         0     179.1         0         0         0         1
(0022)   P       0       16.        77        91       102       108
(0023)   T       0         0         0         0         0         0       1.0       0.1         0      .254
(0024)   W     5.0     0.625
(0025)   X    -2.0     -0.10       1.0
(0026)   K       2       200         0         0         0         0         1
(0027)   K1        COMBINE 2 HYDROGRAPHS AT UPPER SARANAC LAKE  1+2=2
(0028)   K       1       200         0         0         0         0         1
(0029)   K1        ROUTE OVER UPPER SARANAC LAKE DAM
(0030)   Y       0         0         0         1         1
(0031)   Y1      1         0         0         0         0         0     -1573         0
(0032)   $S      0     26000     55000    105000    163000
(0033)   $E   1573      1577      1580      1585      1590
(0034)   $$   1573       175      2.65       1.5
(0035)   $D   1575      2.65       1.5        10
(0036)   K       1       301         0         0         0         0         1
(0037)   K1        ROUTE THRU MIDDLE SARANAC LAKE
(0038)   Y       0         0         0         0         1
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(0039)   Y1      0       3       1
(0040)   K       0     300       0       0       0       0       1
(0041)   K1       RUNOFF SUBAREA 3
(0042)   M       1       1    24.0       0   179.1       0       0       0       1
(0043)   P       0     16.      77      91     102     108
(0044)   T       0       0       0       0       0       0     1.0     0.1       0    .106
(0045)   W     4.3   0.625
(0046)   X    -2.0   -0.10     1.6
(0047)   K       2     300       0       0       0       0       1
(0048)   K1       COMBINE 2 HYDROGRAPHS  3+2=3
(0049)   K       1     300       0       0       0       0       1
(0050)   K1       ROUTE OVER OUTLET CONTROL AT MIDDLE SARANAC
(0051)   Y       0       0       0       1       1
(0052)   Y1      1       0       0       0       0       0   -1536       0
(0053)   $S      3    6000   15000   29000
(0054)   $E   1536    1540    1545    1550
(0055)   $$   1536      35    2.65     1.5
(0056)   $D   1540    2.65     1.5       6
(0057)   K       1     400       0       0       0       0       1
(0058)   K1       ROUTE THRU SARANAC LAKE (LOWER)
(0059)   Y       0       0       0       0       1
(0060)   Y1      0       3       1
(0061)   K       3     402       0       0       0       0       1
(0062)   K1       RUNOFF SUBAREA 4
(0063)   M       1       1    23.7       0   179.1       0       0       0       1
(0064)   P       0     16.      77      91     102     108
(0065)   T       0       0       0       0       0       0     1.0     0.1       0    .143
(0066)   W     3.2   0.625
(0067)   X    -2.0   -0.10     1.6
(0068)   K       0     500       0       0       0       0       1
(0069)   K1       RUNOFF SUBAREA 5
(0070)   M       1       1    19.2       0   179.1       0       0       0       1
(0071)   P       0     16.      77      91     102     108
(0072)   T       0       0       0       0       0       0     1.0     0.1       0    .01
(0073)   W     5.4   0.625
(0074)   X    -2.0   -0.10     1.6
(0075)   K       3     400       0       0       0       0       1
(0076)   K1       COMBINE 3 HYDROGRAPHS - INFLOW TO LOWER SARANAC  3+4+5=4
```

```
(0077)   K       1     40C        C        C        C        C        1
(0078)   K1        ROUTE OVERDAM AT OUTLET TO LOWER SARANAC
(0079)   Y       C        C        C        1        1
(0080)   Y1      1        C        C        C        C        C    -1533        C
(0081)   $S      C    15000    30000    51000
(0082)   $E   1533     1540     1545     1550
(0083)   $$   1533       60      3.5      1.5
(0084)   $D   1537     2.65      1.5       12
(0085)   K       1      600        C        C        C        0        1
(0086)   K1        ROUTE THRU OSEETAH & LAKE FLOWER
(0087)   Y       C        C        C        0        1
(0088)   Y1      0        3        2
(0089)   K       C      601        C        C        C        0        1
(0090)   K1        RUNOFF SUBAREA 6
(0091)   M       1        1     37.8        C    179.1        C        C        C        1
(0092)   P       C      16.       77       91      102      108
(0093)   T       C        0        0        0        C        0      1.0      0.1        0     .067
(0094)   W     4.8    0.625
(0095)   X    -2.0    -0.10      1.6
(0096)   K       2      600        0        0        0        0        1
(0097)   K1        COMBINE 2 HYDROGRAPHS - INFLOW HYDROGRAPH FOR LAKE FLOWER  6+4=6
(0098)   K       1      600        0        C        C        C        1
(0099)   K1        ROUTE OVER LAKE FLOWER DAM
(0100)   Y       0        C        0        1        1
(0101)   Y1      1        C        0        0        C        C    -1528       -1
(0102)   Y4   1528     1529     1530     1531     1532     1534     1536     1538     1540     1542
(0103)   Y4   1544     1546     1548     1550
(0104)   Y5      C      140      500     1010     1625     3065     4775     6725     8880    11225
(0105)   Y5  13755    16440    19290    22285
(0106)   $S      0      820     2800     6200     9160    18460    30560    47000
(0107)   $E   1513     1522     1525     1528     1530     1535     1540     1545
(0108)   $$   1520
(0109)   $D   1533     2.65      1.5       32
(0110)   $B     40        0     1515       .1     1528   1534.4
(0111)   $B     40        0     1515       .3     1528   1534.4
(0112)   $B     40        0     1515       .5     1528   1534.4
(0113)   K       1      700        0        C        C        2        1
(0114)   K1        ROUTE THRU VILLAGE BELOW DAM
```

```
(0115)   Y        3        0        3        1        1
(0116)   Y1       1        0        0        0        0        0       -1
(0117)   Y6   0.050    0.035    0.050     1513     1550     1350   0.0006
(0118)   Y7      50     1550      200     1525      220     1523      230     1513      300     1513
(0119)   Y7     310     1525      330     1525      380     1550
(0120)   K       99
(0121)   A
(0122)   A
(0123)   A
(0124)   A
(0125)   A
```

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT	100
ROUTE HYDROGRAPH TO	200
RUNOFF HYDROGRAPH AT	201
COMBINE 2 HYDROGRAPHS AT	200
ROUTE HYDROGRAPH TO	200
ROUTE HYDROGRAPH TO	301
RUNOFF HYDROGRAPH AT	300
COMBINE 2 HYDROGRAPHS AT	300
ROUTE HYDROGRAPH TO	300
ROUTE HYDROGRAPH TO	400
RUNOFF HYDROGRAPH AT	402
RUNOFF HYDROGRAPH AT	500
COMBINE 3 HYDROGRAPHS AT	400
ROUTE HYDROGRAPH TO	400
ROUTE HYDROGRAPH TO	600
RUNOFF HYDROGRAPH AT	601
COMBINE 2 HYDROGRAPHS AT	600
ROUTE HYDROGRAPH TO	600
ROUTE HYDROGRAPH TO	700

END OF NETWORK

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

RUN  DATE?FRI, AUG 01 1980
     TIME?09:54:19
```

LAKE FLOWER
HEC-1DE (SNYDER PARAMETERS)
PMF - DAM BREAK ANALYSIS

JOB SPECIFICATION

NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
3.0	0	20	0	0	0	0	0	4	0

JOPER	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 5 NRTIO= 1 LRTIO= 1

RTIOS= 0.50

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

SUB-AREA RUNOFF COMPUTATION

RUNOFF SUBAREA 1

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
100	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	32.90	0.00	179.10	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	16.30	77.00	91.00	102.00	108.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS 0.887

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
3	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.10	0.00	0.14

UNIT HYDROGRAPH DATA
TP= 6.20 CP=0.63 NTA= 0

RECESSION DATA

STRTG= -21.0 DRCSN= -0.10 RTIOR= 1.00

UNIT HYDROGRAPH 100 END-OF-PERIOD ORDINATES, LAG= 6.1c HOURS, CP= 0.63 VOL= 0.99

23.	105.	216.	348.	496.	655.	823.	998.	1178.	1363.
1546.	1712.	1855.	1974.	2071.	2144.	2194.	2219.	2216.	2178.
2091.	1975.	1869.	1760.	1661.	1568.	1481.	1398.	1319.	1245.
1176.	1110.	1047.	989.	933.	881.	832.	785.	741.	700.
660.	623.	588.	555.	524.	495.	467.	441.	416.	393.
371.	350.	331.	312.	295.	278.	262.	248.	234.	221.
208.	197.	186.	175.	165.	156.	147.	139.	131.	124.
117.	111.	104.	98.	93.	88.	83.	78.	74.	70.
66.	62.	59.	55.	52.	49.	47.	44.	41.	39.
37.	35.	33.	31.	29.	28.	26.	25.	23.	22.

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	15.21	12.40	2.81	799168.
										(386.)	(315.)	(71.)	(22629.89)

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HYDROGRAPH ROUTING

ROUTE THRU UPPER SARANAC

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
200	1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME ROUTING DATA

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

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
3	3	1	0.000	0.000	0.000	0.	0

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SUB-AREA RUNOFF COMPUTATION

RUNOFF SUBAREA 2

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
201	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	41.50	0.00	179.10	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.0	10.00	77.00	91.00	102.00	108.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS 0.800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.10	0.00	0.25

UNIT HYDROGRAPH DATA

TP= 5.00 CP=0.63 NTA= 0

RECESSION DATA

STRTQ= -2.00 QRCSN= -0.10 RTIOR= 1.60

UNIT HYDROGRAPH 64 END-OF-PERIOD ORDINATES, LAG= 4.92 HOURS, CP= 0.62 VOL= 1.00

59.	221.	453.	727.	1029.	1353.	1692.	2043.	2392.	2706.
2966.	3171.	3321.	3416.	3451.	3416.	3275.	3063.	2853.	2657.
2475.	2305.	2148.	1999.	1862.	1734.	1615.	1504.	1401.	1305.
1215.	1132.	1054.	981.	914.	851.	793.	738.	688.	640.
597.	556.	517.	482.	449.	418.	389.	363.	338.	314.
293.	273.	254.	237.	221.	205.	191.	178.	166.	154.
144.	134.	125.	116.	108.	101.	94.	87.	81.	76.
71.	66.	61.	57.	53.	49.	46.	43.	40.	37.
35.	32.	30.	28.						

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	15.21	12.78	2.42	1051542.
										(386.)	(325.)	(62.)	(29776.32)

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COMBINE HYDROGRAPHS

COMBINE 2 HYDROGRAPHS AT UPPER SARANAC LAKE 1+2=2

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
200	2	0	0	0	0	1	0	0

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HYDROGRAPH ROUTING

ROUTE OVER UPPER SARANAC LAKE DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
200	1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.50	1	1	2	0	0

	NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
	1	[illegible]	0	0.000	0.00	0.000	-1573.	0

CAPACITY=	0.	26000.	55000.	105000.	163000.
ELEVATION=	1573.	1577.	1580.	1585.	1590.

CREL	SPWID	COGW	EXPW	ELEVL	COGL	CAREA	EXPL
1573.0	175.0	2.6	1.5	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COGD	EXPD	DAMWID
1575.0	2.6	1.5	10.

PEAK OUTFLOW IS 2738. AT TIME 54.67 HOURS

PEAK OUTFLOW IS 2738. AT TIME 54.67 HOURS

PEAK OUTFLOW IS 2736. AT TIME 54.67 HOURS

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HYDROGRAPH ROUTING

ROUTE THRU MIDDLE SARANAC LAKE

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
301	1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME ROUTING DATA

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

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
0	3	1	0.000	0.000	0.000	0.	0

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SUB-AREA RUNOFF COMPUTATION

RUNOFF SUBAREA 3

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
300	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	24.00	0.00	179.10	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	16.00	77.00	91.00	102.00	108.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS 0.000

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.10	0.00	0.11

UNIT HYDROGRAPH DATA

TP= 4.30 CP=0.63 NTA= 0

RECESSION DATA

STRTQ= -2.00 QRCSN= -0.10 RTIOR= 1.60

UNIT HYDROGRAPH 72 END-OF-PERIOD ORDINATES, LAG= 4.29 HOURS, CP= 0.62 VOL= 1.00

49.	183.	373.	595.	840.	1100.	1371.	1637.	1870.	2053.
2168.	2274.	2330.	2275.	2155.	1988.	1831.	1686.	1553.	1430.
1317.	1213.	1116.	1029.	948.	873.	804.	741.	682.	628.
579.	533.	491.	452.	416.	384.	353.	325.	300.	276.
254.	234.	216.	199.	183.	169.	155.	143.	132.	121.
112.	103.	95.	87.	80.	74.	68.	63.	58.	53.
49.	45.	42.	38.	35.	33.	30.	28.	25.	23.
22.	20.								

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	15.21	12.30	2.91	591025.
										(386.)	(312.)	(74.)	(16735.95)

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COMBINE HYDROGRAPHS

COMBINE 2 HYDROGRAPHS 3+2=3

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
300	2	0	0	0	0	1	0	0

****

HYDROGRAPH ROUTING

ROUTE OVER OUTLET CONTROL AT MIDDLE SARANAC

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
300	1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME ROUTING DATA

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

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1536.	0

CAPACITY=	0.	6000.	15000.	29000.
ELEVATION=	1536.	1540.	1545.	1550.

CREL	SPWID	COOW	EXPW	ELEVL	COQL	CAREA	EXPL
1536.0	35.0	2.6	1.5	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1540.0	2.6	1.5	0.

PEAK OUTFLOW IS 1793. AT TIME 93.00 HOURS

PEAK OUTFLOW IS 1793. AT TIME 93.00 HOURS

PEAK OUTFLOW IS 1793. AT TIME 93.00 HOURS

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HYDROGRAPH ROUTING

ROUTE THRU SARANAC LAKE (LOWER)

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
400	1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME ROUTING DATA

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

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
0	3	1	0.000	0.000	0.000	0.	0

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SUB-AREA RUNOFF COMPUTATION

RUNOFF SUBAREA 4

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
402	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	23.70	0.00	179.10	0.00	0.000	0	1	0

PRECIP DATA

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
[illegible]	16.00	77.00	91.00	102.00	108.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS 0.000

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
	0.00	[illegible]	1.00	0.00	0.00	1.00	1.00	0.10	0.00	0.14

UNIT HYDROGRAPH DATA

TP= 3.20 CP=0.63 NTA= 0

RECESSION DATA

STRTQ= -2.00 QRCSN= -0.10 RTIOR= 1.60

UNIT HYDROGRAPH 52 END-OF-PERIOD ORDINATES, LAG= 3.18 HOURS, CP= 0.63 VOL= 1.00

99.	366.	745.	1174.	1638.	2111.	2527.	2831.	3020.	3087.
2995.	2744.	2446.	2180.	1943.	1732.	1544.	1377.	1227.	1094.
975.	869.	775.	691.	616.	549.	489.	436.	389.	347.
309.	275.	245.	219.	195.	174.	155.	138.	123.	110.
98.	87.	78.	69.	62.	55.	49.	44.	39.	35.
31.	28.								

0 END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	15.21	12.42	2.79	601774.
										(386.)	(316.)	(71.)	(17040.32)

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SUB-AREA RUNOFF COMPUTATION

RUNOFF SUBAREA 5

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
500	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	19.20	0.00	179.10	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	16.00	77.00	91.00	102.00	108.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS 0.000

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.10	0.00	0.1

UNIT HYDROGRAPH DATA

TP= 5.40 CP=0.63 NTA= 0

RECESSION DATA
STRTQ= -2.0 QRCSN= -0.10 RTIOR= 1.60

UNIT HYDROGRAPH 91 END-OF-PERIOD ORDINATES, LAG= 5.44 HOURS, CP= 0.63 VOL= 1.00

22.	84.	179.	278.	394.	519.	651.	787.	927.	1062.
1166.	1281.	1361.	1421.	1460.	1478.	1472.	1432.	1356.	1269.
1166.	1111.	1040.	974.	911.	853.	798.	747.	699.	655.
613.	573.	537.	502.	470.	440.	412.	385.	361.	338.
316.	296.	277.	259.	243.	227.	212.	199.	186.	174.
163.	153.	143.	134.	125.	117.	110.	103.	96.	90.
84.	79.	74.	69.	65.	60.	57.	53.	50.	46.
43.	41.	38.	36.	33.	31.	29.	27.	26.	24.
22.	21.	20.	18.	17.	16.	15.	14.	13.	12.

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	15.21	11.99	3.22	454831.
										(386.)	(305.)	(82.)	(12879.37)

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COMBINE HYDROGRAPHS

COMBINE 3 HYDROGRAPHS - INFLOW TO LOWER SARANAC 3+4+5=4

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
400	3	0	0	0	0	1	0	0

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HYDROGRAPH ROUTING

ROUTE OVERDAM AT OUTLET TO LOWER SARANAC

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
400	1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME ROUTING DATA

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

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1533.	0

CAPACITY=	0.	15000.	30000.	51000.
ELEVATION=	1533.	1540.	1545.	1550.

CREL	SPWID	COGW	EXPW	ELEVL	COGL	CAREA	EXPL
1535.0	6[illegible].0	3.5	1.5	0.0	3.0	[illegible].3	0.0

DAM DATA

TOPEL	COOD	EXFD	DAMWID
1537.0	2.6	1.5	12.

PEAK OUTFLOW IS [illegible]2821. AT TIME 56.[illegible] HOURS

PEAK OUTFLOW IS 2[illegible]821. AT TIME 56.00 HOURS

PEAK OUTFLOW IS 2821. AT TIME 56.00 HOURS

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

HYDROGRAPH ROUTING

ROUTE THRU OSEETAH & LAKE FLOWER

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
6 [illegible]	1	0	[illegible]	0	0	1	0	0

ALL PLANS HAVE SAME ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.[illegible]0	0.00	0	1	3	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
0	3	2	0.[illegible]00	0.000	0.000	0.	0

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

SUB-AREA RUNOFF COMPUTATION

RUNOFF SUBAREA 6

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
6[illegible]1	0	0	[illegible]	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	37.60	0.00	179.10	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	16.00	77.00	91.00	102.00	108.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS 0.[illegible]00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
[illegible]	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.10	0.00	0.[illegible]7

UNIT HYDROGRAPH DATA
TP= 4.80 CP=0.63 NTA= 0

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

UNIT HYDROGRAPH 79 END-OF-PERIOD ORDINATES, LAG= 4.78 HOURS, CP= 0.63 VOL= 1.00

81.	226.	466.	740.	1047.	1375.	1717.	2070.	2429.	2702.
2937.	3115.	3236.	3296.	3290.	3185.	2989.	2773.	2572.	2386.
2213.	2053.	1904.	1766.	1638.	1520.	1410.	1307.	1213.	1125.
1043.	968.	898.	833.	772.	717.	665.	617.	572.	530.
492.	456.	423.	393.	364.	338.	313.	291.	270.	250.
232.	215.	200.	185.	172.	159.	148.	137.	127.	118.
109.	101.	94.	87.	81.	75.	70.	65.	60.	56.
52.	48.	44.	41.	38.	35.	33.	30.	28.	

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	15.21	12.17	3.03	916210.
										(386.)	(309.)	(77.)	(25944.15)

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

COMBINE HYDROGRAPHS

COMBINE 2 HYDROGRAPHS - INFLOW HYDROGRAPH FOR LAKE FLOWER 6+4=6

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
600	2	0	0	0	0	1	0	0

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

HYDROGRAPH ROUTING

ROUTE OVER LAKE FLOWER DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
600	1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME ROUTING DATA

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

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1528.	-1

STAGE	1525.00	1529.00	1530.00	1531.00	1532.00	1534.00	1536.00	1538.00	1540.00
	1544.00	1546.00	1548.00	1550.00					

	13755.0	16440.0	19290.0	22285.0					
CAPACITY=	0.	800.	2800.	6200.	9160.	18400.	30500.	47000.	
ELEVATION=	1513.	1522.	1525.	1528.	1530.	1535.	1540.	1545.	

CREL	SPILD	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
1528.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1533.0	2.6	1.5	32.

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
40.	0.00	1515.00	0.10	1528.00	1534.40

BEGIN DAM FAILURE AT 55.00 HOURS

PEAK OUTFLOW IS 14342. AT TIME 55.10 HOURS

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
40.	0.00	1515.00	0.30	1528.00	1534.40

BEGIN DAM FAILURE AT 55.00 HOURS

PEAK OUTFLOW IS 13964. AT TIME 55.30 HOURS

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
40.	0.00	1515.00	0.50	1528.00	1534.40

BEGIN DAM FAILURE AT 55.00 HOURS

PEAK OUTFLOW IS 13926. AT TIME 55.51 HOURS

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HYDROGRAPH ROUTING

ROUTE THRU VILLAGE BELOW DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
7.0	1	0	0	0	2	1	0	0

ALL PLANS HAVE SAME ROUTING DATA

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

NSTPS	NSTDL	LAG	AMSKK	X	ISK	SIGNA	ISPRAT
1	0	0	0.000	0.000	0.000	-1.	0

NORMAL DEPTH CHANNEL ROUTING

GN(1)	GN(2)	GN(3)	ELNVT	ELMAX	RLNTH	SEL
.050	.0350	0.0500	1513.	1550.0	1350.	0.0004

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

5	.0	1553.00	200.00	1525.00	265.00	1523.00	280.00	1513.00	300.00	1513.00
31	.0	1525.00	330.00	1525.00	360.00	1550.00				

STAGE	0.0	4.34	9.92	15.73	19.76	24.01	30.17	37.51	47.61
	0.00	97.53	93.43	117.23	131.47	137.66	154.6	170.7	190.35
OUTFLW	0.	62.0	698.65	1372.56	2219.44	3227.22	4529.0	6139.59	7976.22
	12542.74	15549.43	18423.33	21625.67	25567.73	29660.73	34119.7	39140.0	44155.40
STAGE	1513.0	1514.9	1516.89	1518.84	1520.79	1522.74	1524.	1526.0	1528.50
	1530.47	1534.43	1536.37	1538.31	1540.26	1542.21	1544.16	1546.1	1548.05
FLOW	0.	62.0	698.65	1372.56	2219.44	3227.22	4529.0	6139.59	7976.22
	12542.74	15549.43	18423.33	21625.67	25567.73	29660.73	34119.7	39140.0	44155.40

STATION 700, PLAN 1, RTIO 1

OUTFLOW

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.	1.	1.	1.	1.	1.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	3.	3.	3.	3.	3.	3.
3.	3.	4.	4.	4.	4.	4.	4.	4.	4.
5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
5.	5.	5.	5.	6.	6.	6.	6.	6.	6.
6.	6.	7.	7.	7.	8.	8.	9.	10.	11.
12.	14.	16.	18.	21.	24.	27.	31.	35.	39.
43.	48.	53.	59.	65.	73.	81.	90.	101.	113.
127.	154.	199.	269.	342.	414.	496.	590.	693.	813.
921.	1043.	1177.	1313.	1449.	1578.	1710.	1845.	1971.	2090.
2201.	2307.	2404.	2499.	2589.	2675.	2755.	2839.	2900.	2965.
3026.	3082.	3134.	3187.	3239.	3287.	3329.	3368.	3403.	3435.
3463.	3488.	3511.	3531.	3549.	11177.	15024.	12656.	13542.	12750.
12043.	12482.	12365.	12129.	11962.	11769.	11599.	11424.	11256.	11089.
10926.	10765.	10607.	10452.	10300.	10158.	10023.	9888.	9756.	9626.
9498.	9372.	9248.	9127.	9007.	8891.	8783.	8679.	8575.	8474.
8375.	8275.	8177.	8082.	7988.	7896.	7804.	7715.	7623.	7528.

```
   7455.      7341.      7251.      7162.      7074.      6988.      6904.      6822.      6741.      6661.
   6576.      6523.      6464.      6444.      6366.      6288.      6232.      6176.      6121.      6067.
   6013.      5960.      5908.      5857.      5806.      5755.      5702.      5650.      5599.      5548.
   5499.      5450.      5402.      5355.      5309.      5263.      5218.      5173.      5130.      5087.
   5043.      5003.      4963.      4922.      4883.      4844.      4805.      4767.      4730.      4693.
   4657.      4622.      4587.      4552.      4516.      4484.      4451.      4419.      4387.      4355.
   4324.      4294.      4264.      4234.      4205.      4176.      4148.      4120.      4092.      4065.
   4035.      4012.      3980.      3950.      3935.      3910.      3877.      3837.      3796.      3757.
   3719.      3682.      3646.      3611.      3576.      3542.      3509.      3477.      3440.      3416.

                                                  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.
      0.         0.         0.         0.         0.         0.         1.         1.         1.         1.
      1.         1.         1.         1.         1.         1.         2.         2.         2.         2.
      2.         3.         4.         5.         6.         6.         7.         8.         9.        10.
     11.        11.        12.        13.        14.        15.        16.        17.        17.        18.
     19.        19.        20.        20.        21.        21.        22.        22.        22.        23.
     23.        23.        24.        24.        24.        24.        25.        25.        25.        25.
     25.        25.        25.        26.        26.        62.        79.        69.        73.        69.
     70.        66.        66.        67.        66.        65.        64.        63.        63.        62.
     61.        60.        63.        59.        58.        58.        57.        56.        56.        55.
     55.        54.        53.        53.        52.        52.        51.        51.        50.        50.
     49.        49.        49.        48.        48.        47.        47.        46.        46.        45.
     45.        44.        44.        44.        43.        43.        42.        42.        42.        41.
     41.        40.        40.        40.        40.        39.        39.        39.        39.        38.
     38.        38.        37.        37.        37.        37.        36.        36.        36.        36.
     35.        35.        35.        35.        34.        34.        34.        34.        33.        33.
     33.        33.        33.        32.        32.        32.        32.        32.        31.        31.
     31.        31.        31.        31.        30.        30.        30.        30.        30.        30.
     29.        29.        29.        29.        29.        29.        29.        28.        28.        28.
     28.        28.        28.        28.        27.        27.        27.        27.        27.        27.
     26.        26.        26.        26.        26.        26.        25.        25.        25.        25.

                                                  STAGE
   1513.0     1513.0     1513.0     1513.0     1513.0     1513.0     1513.0     1513.0     1513.0     1513.0
   1513.0     1513.0     1513.0     1513.0     1513.0     1513.0     1513.0     1513.0     1513.0     1513.0
   1513.0     1513.0     1513.0     1513.0     1513.0     1513.0     1513.0     1513.0     1513.0     1513.0
   1513.0     1513.0     1513.0     1513.0     1513.0     1513.0     1513.0     1513.0     1513.0     1513.0
   1513.0     1513.0     1513.0     1513.0     1513.0     1513.0     1513.0     1513.0     1513.0     1513.0
   1513.0     1513.0     1513.0     1513.0     1513.0     1513.0     1513.0     1513.0     1513.0     1513.0
   1513.0     1513.0     1513.0     1513.0     1513.0     1513.0     1513.0     1513.0     1513.0     1513.0
   1513.0     1513.0     1513.0     1513.0     1513.0     1513.0     1513.0     1513.0     1513.0     1513.0
```

1513.[illegible]	1513.[illegible]	1513.[illegible]	1513.	1513.[illegible]	1513.[illegible]	1513.1	1513.1	1513.1	1513.1
1513.1	1513.1	1513.1	1513.1	1513.1	1513.1	1513.1	1513.1	1513.1	1513.1
1513.1	1513.1	1513.1	1513.2	1513.2	1513.2	1513.2	1513.3	1513.3	1513.3
1513.4	1513.4	1513.5	1513.5	1513.6	1513.6	1513.7	1513.8	1513.9	1514.[illegible]
1514.1	1514.4	1514.[illegible]	1515.1	1515.4	1515.7	1516.1	1516.5	1516.9	1517.2
1517.5	1517.9	1518.[illegible]	1518.7	1519.0	1519.3	1519.6	1519.9	1520.2	1520.5
1520.7	1521.0	1521.1	1521.3	1521.5	1521.7	1521.8	1522.0	1522.1	1522.2
1522.3	1522.5	1522.6	1522.7	1522.8	1522.8	1522.9	1522.9	1523.0	1523.0
1523.1	1523.1	1523.2	1523.2	1523.2	1531.3	1534.2	1532.5	1533.1	1532.6
1532.6	1532.4	1532.3	1532.1	1532.0	1531.8	1531.7	1531.5	1531.4	1531.3
1531.1	1531.0	1530.9	1530.8	1530.7	1530.5	1530.4	1530.3	1530.2	1530.1
1529.9	1529.8	1529.7	1529.6	1529.5	1529.4	1529.3	1529.2	1529.1	1529.0
1528.9	1528.8	1528.8	1528.7	1528.6	1528.5	1528.4	1528.3	1528.2	1528.1
1528.0	1527.9	1527.8	1527.7	1527.6	1527.5	1527.5	1527.4	1527.3	1527.2
1527.1	1527.1	1527.0	1526.9	1526.9	1526.8	1526.8	1526.7	1526.6	1526.6
1526.5	1526.4	1526.4	1526.3	1526.3	1526.2	1526.1	1526.1	1526.0	1525.9
1525.9	1525.8	1525.8	1525.7	1525.6	1525.6	1525.5	1525.5	1525.4	1525.4
1525.3	1525.3	1525.2	1525.2	1525.1	1525.1	1525.0	1525.0	1524.9	1524.9
1524.8	1524.8	1524.8	1524.7	1524.7	1524.6	1524.6	1524.5	1524.5	1524.4
1524.4	1524.3	1524.3	1524.2	1524.2	1524.2	1524.1	1524.1	1524.0	1524.0
1524.0	1523.9	1523.9	1523.8	1523.8	1523.8	1523.7	1523.7	1523.6	1523.5
1523.5	1523.4	1523.4	1523.3	1523.3	1523.2	1523.2	1523.1	1523.1	1523.0

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	15024.	12060.	8739.	4653.	1[illegible]05194.
CMS	425.	340.	247.	132.	28464.
INCHES		0.62	1.82	2.90	2.90
MM		15.83	46.11	73.66	73.67
AC-FT		5951.	17333.	27686.	27691.
THOUS CU M		7340.	21380.	34150.	34157.

MAXIMUM STORAGE = 79.

MAXIMUM STAGE IS 1534.2

STATION /CO/ PLAN 2/ RTIO 1

OUTFLOW

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.	1.	1.	1.	1.	1.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	3.	3.	3.	3.	3.	3.
3.	3.	4.	4.	4.	4.	4.	4.	4.	4.
5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
5.	5.	5.	5.	6.	6.	6.	6.	6.	6.
6.	6.	7.	7.	7.	8.	8.	9.	10.	11.
12.	14.	16.	18.	21.	24.	27.	31.	35.	39.
43.	48.	53.	59.	65.	73.	81.	90.	101.	113.
127.	154.	199.	269.	342.	414.	496.	590.	693.	813.

```
     921.    1043.    1177.    1313.    1449.    1576.    1710.    1845.    1971.    2090.
    2231.    2307.    2404.    2499.    2589.    2675.    2755.    2830.    2900.    2965.
    3026.    3082.    3134.    3187.    3239.    3287.    3329.    3368.    3403.    3435.
    3463.    3488.    3511.    3531.    3549.   11269.   15161.   12762.   13652.   12847.
   12941.   12574.   12457.   12217.   12047.   11850.   11677.   11500.   11330.   11162.
   10997.   10834.   10675.   10519.   10365.   10216.   10080.    9945.    9811.    9680.
    9553.    9424.    9299.    9176.    9056.    8937.    8826.    8721.    8616.    8514.
    8413.    8313.    8215.    8119.    8024.    7931.    7839.    7749.    7659.    7565.
    7469.    7376.    7285.    7195.    7107.    7020.    6935.    6852.    6770.    6690.
    6611.    6545.    6486.    6426.    6367.    6309.    6252.    6195.    6140.    6086.
    6032.    5979.    5926.    5875.    5824.    5773.    5721.    5668.    5617.    5566.
    5516.    5467.    5419.    5371.    5324.    5279.    5233.    5189.    5145.    5102.
    5060.    5016.    4977.    4936.    4896.    4857.    4818.    4780.    4743.    4706.
    4670.    4634.    4599.    4564.    4530.    4496.    4463.    4430.    4398.    4366.
    4335.    4304.    4274.    4244.    4215.    4186.    4157.    4129.    4101.    4074.
    4047.    4020.    3994.    3969.    3943.    3918.    3891.    3853.    3811.    3772.
    3733.    3696.    3659.    3624.    3589.    3555.    3522.    3489.    3458.    3427.
                                              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.
      0.       0.       0.       0.       0.       0.       1.       1.       1.       1.
      1.       1.       1.       1.       1.       1.       2.       2.       2.       2.
      2.       3.       4.       5.       6.       6.       7.       8.       9.      10.
     11.      11.      12.      13.      14.      15.      16.      17.      17.      18.
     19.      19.      20.      20.      21.      21.      22.      22.      22.      23.
     23.      23.      24.      24.      24.      24.      25.      25.      25.      25.
     25.      25.      25.      26.      26.      63.      80.      69.      73.      70.
     70.      69.      68.      67.      66.      65.      65.      64.      63.      62.
     61.      61.      60.      59.      59.      58.      57.      57.      56.      56.
     55.      54.      54.      53.      53.      52.      52.      51.      51.      50.
     50.      49.      49.      48.      48.      47.      47.      46.      46.      46.
     45.      45.      44.      44.      43.      43.      43.      42.      42.      41.
     41.      41.      40.      40.      40.      39.      39.      39.      39.      38.
     38.      38.      38.      37.      37.      37.      36.      36.      36.      36.
     35.      35.      35.      35.      34.      34.      34.      34.      34.      33.
     33.      33.      33.      32.      32.      32.      32.      32.      31.      31.
     31.      31.      31.      31.      30.      30.      30.      30.      30.      30.
     29.      29.      29.      29.      29.      29.      29.      28.      28.      28.
     28.      28.      28.      28.      28.      27.      27.      27.      27.      27.
     27.      26.      26.      26.      26.      26.      25.      25.      25.      25.
                                              STAGE
```

```
  1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0
  1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0
  1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0
  1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0
  1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0
  1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0
  1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0
  1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0
  1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.1    1513.1    1513.1    1513.1
  1513.1    1513.1    1513.1    1513.1    1513.1    1513.1    1513.1    1513.1    1513.1    1513.1
  1513.1    1513.1    1513.1    1513.2    1513.2    1513.2    1513.2    1513.3    1513.3    1513.3
  1513.4    1513.4    1513.5    1513.5    1513.6    1513.6    1513.7    1513.8    1513.9    1514.0
  1514.1    1514.4    1514.8    1515.1    1515.4    1515.7    1516.1    1516.5    1516.9    1517.2
  1517.5    1517.9    1518.3    1518.7    1519.0    1519.3    1519.6    1519.9    1520.2    1520.5
  1520.7    1521.0    1521.1    1521.3    1521.5    1521.7    1521.8    1522.0    1522.1    1522.2
  1522.3    1522.5    1522.6    1522.7    1522.8    1522.8    1522.9    1522.9    1523.0    1523.0
  1523.1    1523.1    1523.2    1523.2    1523.2    1531.4    1534.3    1532.6    1533.2    1532.7
  1532.7    1532.5    1532.4    1532.2    1532.0    1531.9    1531.7    1531.6    1531.5    1531.3
  1531.2    1531.1    1530.9    1530.8    1530.7    1530.6    1530.5    1530.3    1530.2    1530.1
  1530.0    1529.9    1529.8    1529.7    1529.5    1529.4    1529.3    1529.2    1529.1    1529.1
  1529.0    1528.9    1528.8    1528.7    1528.6    1528.5    1528.4    1528.3    1528.2    1528.1
  1528.0    1527.9    1527.8    1527.8    1527.7    1527.6    1527.5    1527.4    1527.3    1527.2
  1527.1    1527.1    1527.0    1527.0    1526.9    1526.8    1526.8    1526.7    1526.7    1526.6
  1526.5    1526.5    1526.4    1526.3    1526.3    1526.2    1526.1    1526.1    1526.0    1526.0
  1525.9    1525.8    1525.8    1525.7    1525.7    1525.6    1525.6    1525.5    1525.4    1525.4
  1525.3    1525.3    1525.2    1525.2    1525.1    1525.1    1525.0    1525.0    1524.9    1524.9
  1524.9    1524.8    1524.8    1524.7    1524.7    1524.6    1524.6    1524.5    1524.5    1524.4
  1524.4    1524.4    1524.3    1524.3    1524.2    1524.2    1524.1    1524.1    1524.0    1524.0
  1524.0    1523.9    1523.9    1523.8    1523.8    1523.8    1523.7    1523.7    1523.6    1523.6
  1523.5    1523.4    1523.4    1523.3    1523.3    1523.2    1523.2    1523.1    1523.1    1523.0

                                PEAK    6-HOUR    24-HOUR    72-HOUR    TOTAL VOLUME
                      CFS     15161.    12088.      8787.      4673.        1009482.
                      CMS       429.      342.       249.       132.          28585.
                   INCHES                 0.63       1.83       2.91            2.91
                       MM                15.95      46.37      73.97           73.99
                    AC-FT                 5994.     17429.     27804.          27809.
               THOUS CU M                 7393.     21498.     34296.          34302.

                                  MAXIMUM STORAGE =        80.

MAXIMUM STAGE IS     1534.3

                                  STATION     700, PLAN 3, RTIO 1

                                              OUTFLOW
        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.        1.        1.        1.        1.        1.        2.        2.        2.        2.
        2.        2.        2.        2.        2.        2.        2.        2.        2.        2.
```

```
     2.      2.      2.      2.      3.      3.      3.      3.      3.      3.
     3.      3.      4.      4.      4.      4.      4.      4.      4.      4.
     5.      5.      5.      5.      5.      5.      5.      5.      5.      5.
     5.      5.      5.      5.      6.      6.      6.      6.      6.      6.
     6.      6.      7.      7.      7.      8.      8.      9.     10.     11.
    12.     14.     16.     18.     21.     24.     27.     31.     35.     39.
    43.     48.     53.     59.     65.     73.     81.     90.    101.    113.
   127.    154. [illegible]  269.    342.    414.    496.    590.    693.    813.
   921.   1043.   1177.   1313.   1449.   1578.   1710.   1845.   1971.   2090.
  2201.   2307.   2404.   2499.   2589.   2675.   2755.   2830.   2900.   2965.
  3026.   3062.   3134.   3167.   3239.   3267.   3329.   3368.   3403.   3435.
  3463.   3466.   3511.   3531.   3549.   7964.  13550.  13740.  13269.  13166.
 12895.  12712.  12492.  12302.  12103.  11917.  11735.  11559.  11386.  11217.
 11051.  10887.  10726.  10569.  10414.  10263.  10122.   9988.   9852.   9721.
  9591.   9463.   9336.   9214.   9093.   8973.   8859.   8752.   8645.   8544.
  8443.   8343.   8244.   8147.   8052.   7959.   7867.   7775.   7686.   7592.
  7496.   7403.   7311.   7220.   7132.   7045.   6959.   6875.   6793.   6712.
  6633.   6563.   6502.   6442.   6383.   6325.   6268.   6211.   6155.   6100.
  6047.   5993.   5941.   5889.   5837.   5787.   5735.   5682.   5630.   5579.
  5529.   5479.   5431.   5383.   5336.   5290.   5245.   5200.   5156.   5113.
  5070.   5026.   4987.   4946.   4906.   4867.   4828.   4790.   4752.   4715.
  4679.   4643.   4607.   4572.   4538.   4504.   4471.   4438.   4406.   4374.
  4342.   4312.   4281.   4251.   4222.   4193.   4164.   4136.   4108.   4081.
  4054.   4027.   4001.   3975.   3949.   3924.   3899.   3862.   3819.   3780.
  3741.   3703.   3666.   3630.   3595.   3561.   3528.   3495.   3464.   3432.

                                 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.
     0.      0.      0.      0.      0.      0.      1.      1.      1.      1.
     1.      1.      1.      1.      1.      1.      2.      2.      2.      2.
     2.      3.      4.      5.      6.      6.      7.      8.      9.     10.
    11.     11.     12.     13.     14.     15.     16.     17.     17.     18.
    19.     19.     20.     20.     21.     21.     22.     22.     22.     23.
    23.     23.     24.     24.     24.     24.     25.     25.     25.     25.
    25.     25.     25.     26.     26.     46.     73.     74.     72.     71.
    70.     69.     68.     67.     66.     66.     65.     64.     63.     62.
    62.     61.     60.     60.     59.     58.     58.     57.     56.     56.
    55.     54.     54.     53.     53.     52.     52.     51.     51.     50.
    50.     49.     49.     48.     48.     47.     47.     47.     46.     46.
    45.     45.     44.     44.     43.     43.     43.     42.     42.     41.
    41.     41.     40.     40.     40.     40.     39.     39.     39.     38.
    38.     38.     38.     37.     37.     37.     37.     36.     36.     36.
```

```
      34.       33.       33.       33.       33.       34.       34.       34.       34.       33.
      33.       33.       33.       33.       32.       32.       32.       32.       32.       31.
      31.       31.       31.       31.       30.       30.       30.       30.       30.       30.
      29.       29.       29.       29.       29.       29.       29.       28.       28.       28.
      28.       28.       28.       28.       28.       27.       27.       27.       27.       27.
      27.       26.       26.       26.       26.       26.       26.       25.       25.       25.

                                            STAGE
    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0
    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0
    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0
    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0
    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0
    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0
    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0
    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0
    1513.0    1513.0    1513.0    1513.0    1513.0    1513.0    1513.1    1513.1    1513.1    1513.1
    1513.1    1513.1    1513.1    1513.1    1513.1    1513.1    1513.1    1513.1    1513.1    1513.1
    1513.1    1513.1    1513.1    1513.2    1513.2    1513.2    1513.2    1513.3    1513.3    1513.3
    1513.4    1513.4    1513.5    1513.5    1513.6    1513.6    1513.7    1513.8    1513.9    1514.0
    1514.1    1514.4    1514.8    1515.1    1515.4    1515.7    1516.1    1516.5    1516.9    1517.2
    1517.5    1517.9    1518.3    1518.7    1519.0    1519.3    1519.6    1519.9    1520.2    1520.5
    1520.7    1521.0    1521.1    1521.3    1521.5    1521.7    1521.8    1522.0    1522.1    1522.2
    1522.3    1522.5    1522.6    1522.7    1522.8    1522.8    1522.9    1522.9    1523.0    1523.0
    1523.1    1523.1    1523.2    1523.2    1523.2    1528.6    1533.1    1533.3    1533.0    1532.9
    1532.7    1532.6    1532.4    1532.2    1532.1    1531.9    1531.8    1531.7    1531.5    1531.4
    1531.2    1531.1    1531.0    1530.9    1530.7    1530.6    1530.5    1530.4    1530.3    1530.1
    1530.0    1529.9    1529.8    1529.7    1529.6    1529.5    1529.4    1529.3    1529.2    1529.1
    1529.0    1528.9    1528.8    1528.7    1528.6    1528.5    1528.5    1528.4    1528.3    1528.2
    1528.1    1528.0    1527.9    1527.8    1527.7    1527.6    1527.5    1527.4    1527.3    1527.3
    1527.2    1527.1    1527.0    1527.0    1526.9    1526.6    1526.8    1526.7    1526.7    1526.6
    1526.5    1526.5    1526.4    1526.4    1526.3    1526.2    1526.2    1526.1    1526.0    1526.0
    1525.9    1525.9    1525.8    1525.7    1525.7    1525.6    1525.6    1525.5    1525.5    1525.4
    1525.4    1525.3    1525.2    1525.2    1525.1    1525.1    1525.1    1525.0    1525.0    1524.9
    1524.9    1524.8    1524.6    1524.7    1524.7    1524.7    1524.6    1524.6    1524.5    1524.5
    1524.4    1524.4    1524.3    1524.3    1524.2    1524.2    1524.1    1524.1    1524.1    1524.0
    1524.0    1523.9    1523.9    1523.9    1523.8    1523.8    1523.7    1523.7    1523.6    1523.6
    1523.5    1523.4    1523.4    1523.3    1523.3    1523.2    1523.2    1523.1    1523.1    1523.0

                                PEAK    6-HOUR    24-HOUR    72-HOUR   TOTAL VOLUME
                      CFS     13740.    11998.      8762.      4667.       1008199.
                      CMS       389.      340.       248.       132.         28549.
                   INCHES                 0.62       1.82       2.91           2.91
                       MM                15.83      46.24      73.88          73.89
                    AC-FT                 5950.     17378.     27769.         27774.
               THOUS CU M                 7339.     21436.     34252.         34259.

                                  MAXIMUM STORAGE =        74.

MAXIMUM STAGE IS     1533.3
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PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS

FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 0.50
HYDROGRAPH AT	100	32.90	1	11000.
		(85.21)		(311.49)(
			2	11000.
				(311.49)(
			3	11000.
				(311.49)(
ROUTED TO	2[illegible]	32.90	1	10968.
		(85.21)		(310.59)(
			2	10968.
				(310.59)(
			3	10968.
				(310.59)(
HYDROGRAPH AT	201	41.50	1	16339.
		(107.48)		(462.66)(
			2	16339.
				(462.66)(
			3	16339.
				(462.66)(
2 COMBINED	200	74.40	1	26808.
		(192.69)		(759.11)(
			2	26808.
				(759.11)(
			3	26808.
				(759.11)(
ROUTED TO	200	74.40	1	2738.
		(192.69)		(77.53)(
			2	2738.
				(77.53)(
			3	2738.
				(77.53)(
ROUTED TO	301	74.40	1	2738.
		(192.69)		(77.53)(
			2	2738.
				(77.53)(

			3	[illegible]
			(	7[illegible].53)(
HYDROGRAPH AT	300	24.00	1	10342.
	(	62.16)	(	292.84)(
			2	10342.
			(	292.84)(
			3	10342.
			(	292.84)(
2 COMBINED	301	98.40	1	10865.
	(	254.85)	(	307.66)(
			2	10865.
			(	307.66)(
			3	10865.
			(	307.66)(
ROUTED TO	301	98.40	1	1793.
	(	254.85)	(	50.79)(
			2	1793.
			(	50.79)(
			3	1793.
			(	50.79)(
ROUTED TO	40	98.40	1	1793.
	(	254.85)	(	50.79)(
			2	1793.
			(	50.79)(
			3	1793.
			(	50.79)(
HYDROGRAPH AT	402	23.70	1	12495.
	(	61.38)	(	353.83)(
			2	12495.
			(	353.83)(
			3	12495.
			(	353.83)(
HYDROGRAPH AT	500	19.20	1	7015.
	(	49.73)	(	198.65)(
			2	7015.
			(	198.65)(
			3	7015.
			(	198.65)(
3 COMBINED	400	141.30	1	18760.
	(	365.96)	(	531.23)(
			2	18760.
			(	531.23)(
			3	18760.
			(	531.23)(

ROUTED T	4[illegible]	141.36	1	2821.
		(365.96)		(79.87)(
			2	2821.
				(79.87)(
			3	2821.
				(79.87)(
ROUTED T.	600	141.30	1	2820.
		(365.96)		(79.86)(
			2	2820.
				(79.86)(
			3	2820.
				(79.86)(
HYDROGRAPH AT	601	37.80	1	15210.
		(97.90)		(430.70)(
			2	15210.
				(430.70)(
			3	15210.
				(430.70)(
2 COMBINED	600	179.10	1	16190.
		(463.86)		(458.44)(
			2	16190.
				(458.44)(
			3	16190.
				(458.44)(
ROUTED TO	600	179.10	1	13837.
		(463.86)		(391.81)(
			2	13959.
				(395.28)(
			3	13799.
				(390.75)(
ROUTED TO	700	179.10	1	15024.
		(463.86)		(425.45)(
			2	15161.
				(429.30)(
			3	13740.
				(389.06)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1573.00	1573.00	1575.00
STORAGE	0.	0.	13000.
OUTFLOW	0.	0.	1312.

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
0.50	1576.24	1.24	21044.	2738.	54.00	58.67	0.00

PLAN 2 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1573.00	1573.00	1575.00
STORAGE	0.	0.	13000.
OUTFLOW	0.	0.	1312.

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
0.50	1576.24	1.24	21044.	2738.	54.00	58.67	0.00

PLAN 3 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1573.00	1573.00	1575.00
STORAGE	0.	0.	13000.
OUTFLOW	0.	0.	1312.

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
0.50	1576.24	1.24	21044.	2738.	54.00	58.67	0.00

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1536.00	1536.00	1540.00
STORAGE	0.	0.	6000.
OUTFLOW	0.	0.	742.

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
0.50	1542.98	2.98	11370.	1793.	53.00	93.00	0.00

PLAN 2 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1536.00	1536.00	1540.00
STORAGE	0.	0.	6000.
OUTFLOW	0.	0.	742.

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
0.50	1542.98	2.98	11370.	1793.	53.00	93.00	0.00

PLAN 3 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1536.00	1536.00	1540.00
STORAGE	0.	0.	6000.
OUTFLOW	0.	0.	742.

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
0.50	1542.98	2.98	11370.	1793.	53.00	93.00	0.00

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1533.00	1533.00	1537.00
STORAGE	0.	0.	8571.
OUTFLOW	0.	0.	1680.

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
0.50	1538.57	1.57	11929.	2821.	54.67	56.00	0.00

PLAN 2 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1533.00	1533.00	1537.00
STORAGE	0.	0.	8571.
OUTFLOW	0.	0.	1680.

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
0.50	1538.57	1.57	11929.	2821.	54.67	56.00	0.00

PLAN 3 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1533.00	1533.00	1537.00
STORAGE	0.	0.	8571.
OUTFLOW	0.	0.	1680.

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
0.50	1538.57	1.57	11929.	2821.	54.67	56.00	0.00

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1528.00	1528.00	1533.00
STORAGE	6200.	6200.	14740.
OUTFLOW	0.	0.	2345.

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
0.50	1534.40	1.40	17352.	14042.	11.00	55.10	55.00

PLAN 2 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1528.00	1528.00	1533.00
STORAGE	6200.	6200.	14740.
OUTFLOW	0.	0.	2345.

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
0.50	1534.40	1.40	17352.	13984.	11.33	55.30	55.00

PLAN 3 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1528.00	1528.00	1533.00
STORAGE	6200.	6200.	14740.
OUTFLOW	0.	0.	2345.

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
0.50	1534.40	1.40	17353.	13926.	11.33	55.51	55.00

PLAN 1 STATION 700

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.50	15024.	1534.2	55.67

PLAN 2 STATION 700

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.50	15161.	1534.3	55.67

PLAN 3 STATION 700

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.50	13740.	1533.3	56.00

APPENDIX D

STABILITY ANALYSIS

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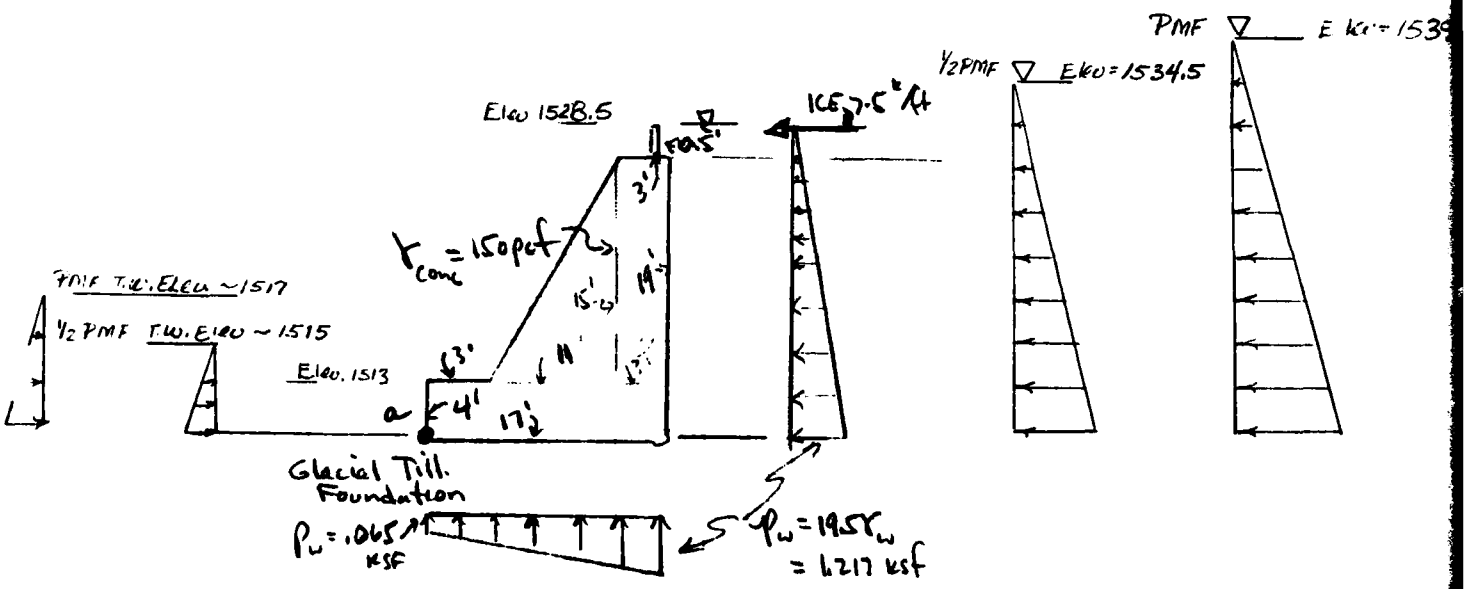
DESIGN BRIEF

PROJECT NAME FLOWER LAKE DAM (SARANAC LAKE) DATE 7/22/80

SUBJECT STABILITY ANALYSIS PROJECT NO.

DRAWN BY DFM

Assumed Cross-Section For Analysis



Weight Dam = $(0.150)\left[(17\times4) + (15\times3) + \left(\tfrac{1}{2}\times11\times15\right)\right]$ = 29.33 k/ft.

M_a due to weight of dam = $(0.15)\left[(17\times4\times\tfrac{17}{2}) + (15\times3)(14+\tfrac{3}{2}) + \left(\tfrac{1}{2}\times11\times15\right)\left(3+\tfrac{2\times11}{3}\right)\right]$

= 319.2 k

Location of c.g. from toe, $\bar{x}$ = $\frac{319.2\ k}{29.33\ k}$ = 10.9'

Location of c.g. from toe: $M\bar{y}$ = $(.15)\left[(4\times17\times\tfrac{4}{2}) + \left(\tfrac{1}{2}\times11\times15\right)\left(4+\tfrac{15}{3}\right) + (15\times3)\left(\tfrac{15}{2}+\right.\right.$

= 1396 k

$\bar{y}$ = $\frac{209.4}{29.33}$ = 7.14'

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DESIGN BRIEF

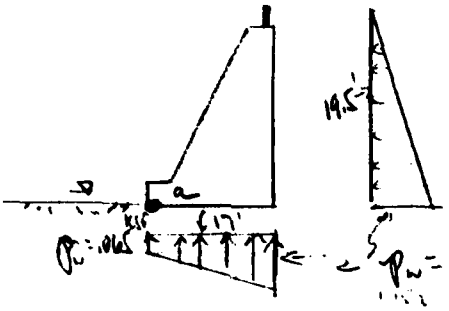
PROJECT NAME FLOWER LAKE DATE 7/23/80

SUBJECT PROJECT NO.

DRAWN BY

Case I. Normal operations (No Ice)

a) Overturning



M_a resisting = 319.2 ^{1k}

uplift, U = $\left(\frac{.065+1.147}{2}\right)(17')$ = 10.9 ^{k}

M_a causing overturning due to upst. lateral H_2O, uplift

$= \left(\frac{1}{2} \times 19.5 \times 1.217 \times \frac{19.5}{3}\right) + \left[\left(.065 \times 17 \times \frac{17}{2}\right) + \left(\frac{1}{2} \times 17 \times 1.152 \times \frac{2 \times 17}{3}\right)\right]$

$= 77.13 + 9.39 + 110.98 = 197.5$ ^{1k}

FS against overturning = $\frac{319.2 \text{ }^{1k}}{197.5 \text{ }^{1k}} = \underline{1.62}$

Position of Resultant measured from toe, $d = \frac{\Sigma M_a}{\Sigma V}$

$d = \frac{319.2 - 197.5}{29.33 - 10.9} = \frac{121.7}{18.43} = 6.60' = \underline{0.39\ b}$

wt. b uplift

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SUBJECT _____ PROJECT NO. _____

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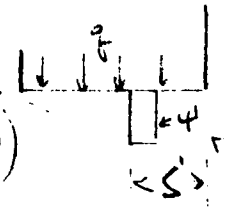
(xi) Sliding

Dam base founded on hard/compact glacial till (hardpan), properties unknown

(1) assume $\phi = 36°$, $c = 0$

(2) assume $c = 1000$ psf, $\phi = 16°$

(a) Assume lateral resistance to sliding due to passive pressure in front of key, friction or cohesion between soil/base at heel ($\phi = 16°, c = 0$)



assume effective wt. of dam has effect of surcharge on passive zone

$q = \frac{18^k}{12 \text{ft}^2} \approx 1.5$ ksf

use $\phi_{soil} = 16°$ psf

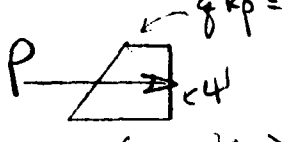
$K_p = \tan^2(45 + \frac{\phi}{2}) + 2c\tan(45 + \frac{\phi}{2}) = 2.4$

$P_p = (\frac{4+5}{2})(4') = 18^k$

friction @ heel, assume 90% of ΣV, say $20^k \times 18^k = 3^k$

$\mu(3^k) = 0.6(3) \approx 2^k$

Total resistance $= 18^k + 2^k = 20^k$



passive pressure diagram

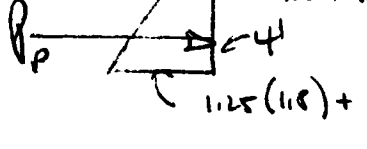
$k_p(q + (4 \times .065)) = 5^{ksf}$

(b) As for (a) above, with $\phi = 16°$, $c = 1000$ psf

$P_p = (\frac{4.7 + 4.95}{2})(4') = 19^k$

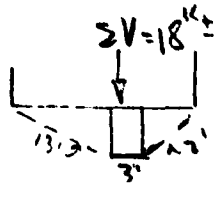
CL @ heel $= 1.0^{ksf} \times 5' = 5^k$

Total resistance $= 19^k + 5^k = 24^k$



$1.25(11.8) + 1.3(20) = 44.5^{ksf}$

c) Sliding along rupture plane shown in sketch for $\phi = 16°$, $c = 1000$ psf



Resistance $\approx \mu V + CL$ where $\mu = \tan\phi = 0.3$

$= 0.3(18^k) + (1.0^{ksf} \times 18') = 23^k$

— Use resistance to sliding from (a)

FS against sliding $= \frac{20}{1.2 \times \frac{1}{2} \times 19.5} = \frac{20^k}{11.9^k} = 1.7 \pm$

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DESIGN BRIEF

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Case II : Normal Operation plus Ice

assume 7.5"/ft ice load

(i) Overturning

FS against overturning = $\frac{319.2^{1K}}{197.5 + (7.5 \times 18')^{1K}} = \frac{319.2^{1K}}{332.5^{1K}} = 0.96$ - unsatisfactory

Position of Resultant outside base since FS < 1

(ii) Sliding

FS against sliding = $\frac{20.0}{11.9 + 7.5} = \frac{20.1}{19.4} = 1.04$ - low -

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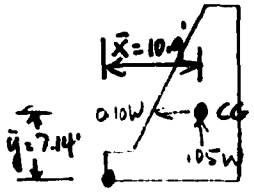
Case III. Normal Operations (No Ice) plus seismic effect applicable to Zone 3

(i) Overturning

Zone 3 seismic coef. —
α (horiz) = 0.10
α (vertical) = 0.05



Additional overturning M_a due to seismic effects on mass of dam =

$= (.10 \times 29.33^{k}/ft \times 7.14') + (.05 \times 29.33^{k}/ft \times 10.9') = 36.93^{ft\text{-}k}$

Additional M_a due to dam-reservoir interaction =

$= (0.30)(.73 \times .10 \times .0624 \times 19 \times 19 \times 19) = 9.4^{ft\text{-}k}$

FS against overturning = $\frac{319.2^{k}}{197.5 + 36.93 + 9.4} = \frac{319.2}{243.84} = 1.31$ [OK since > 1.0]

Position of Resultant measured from toe, $d = \frac{\Sigma M_a}{\Sigma V}$

$d = \frac{319.2 - 243.84}{18.43 - (.05 \times 29.33)} = \frac{75.35}{16.95} = 4.45' = 0.26\,b$

(ii) Sliding

Additional lateral force due to dam-reservoir interaction =

$= (0.73)(.73 \times .10 \times .0624 \times 19 \times 19) = 1.20^{k}/ft$

Add'l lat. force due to acceleration of dam mass = .05(29.33) = 1.47

FS against sliding = $\frac{20.0^{k}}{1.5 + 11.9 + 1.2} = \frac{20.0}{14.6} = 1.4\pm$ — OK —

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IV. Loading Conditions

Additional overturning moment due to 4/5 ratio

$= (1534.5' - 1528.5')(.0624 ksf)(11')\left(\frac{11'}{2}\right) = 67.6^{l-k}$

Additional resisting moment due to [illegible]

$= 6'(.0624 ksf)\left(\frac{6'}{2}\right)\left(\frac{6'}{3}\right) = 2.2^{l-k}$

$F.S._{OVT} = \frac{319.2^{l-k} + 2.2^{l-k}}{197.5^{l-k} + 67.6^{l-k}} = 1.22$

Position of Resultant, from toe

$d: \frac{\Sigma M}{\Sigma V} = \frac{121.7 + 2.2 - 67.6}{18.4} = 3.1' = 0.18b < 1/3\,b$

N.G.

Sliding: $F.S. = \frac{30^k + \frac{1}{2}(6 \times .062\not{4})(6')}{11.9^k + (6' \times .062\not{4})(19')} = \frac{21.1}{19} = 1.11$

Low

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V PMF Conditions

Add'l overturning moment due to U/S water

$= (1534 - 1528.5)(.0624 ksf)(19')(19'/2) = 118.3^{1-k}$

Force of add'l U/S water

$= 10.5'(.0624 ksf)(19') = 12.4^k$

Add'l resisting moment due to D/S water

$= \underbrace{8'(.0624 ksf)\left(\frac{8'}{2}\right)}_{2.0^k} \quad \frac{8'}{3} = 5.3^{1-k}$

Overturning

$F.S._{ovt} = \frac{319.2 + 5.3}{192.5 + 118.3} = 1.03$

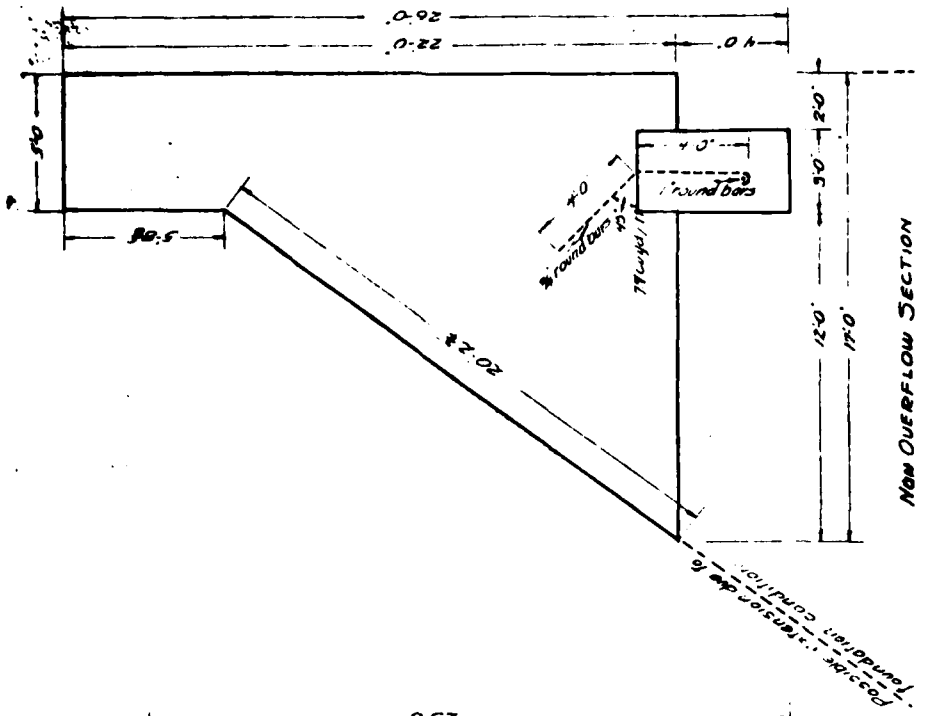
Position of resultant $d = \frac{324.5 - 315.8}{18.4} = 0.5' = .03b$

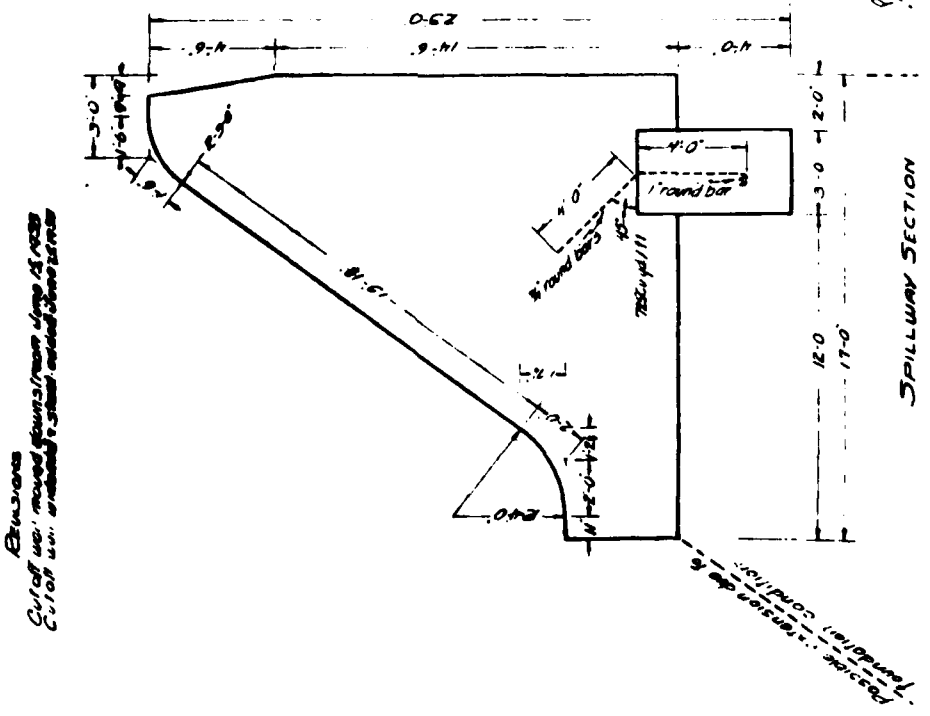
$< 1/3b$

N.G.

Sliding.

$F.S. = \frac{20^k + 2^k}{11.9^k + 12.4^k} = 0.9$ N.G.





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APPENDIX E

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APPENDIX E

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