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NATIONAL DAM SAFETY PROGRAM. OGDENSBURG WATER POWER COMPANY DAM--ETC(U)
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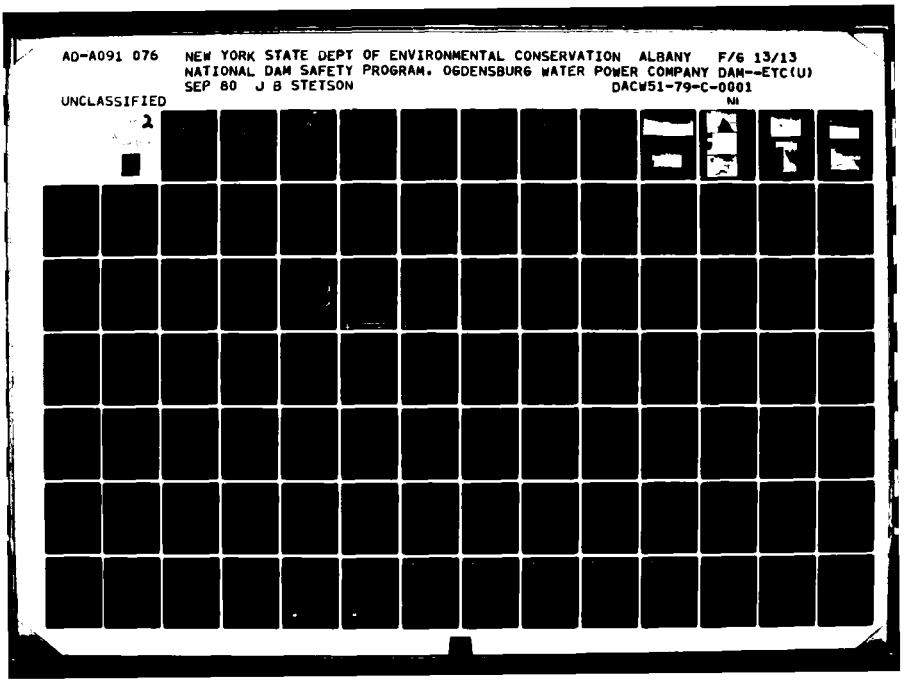

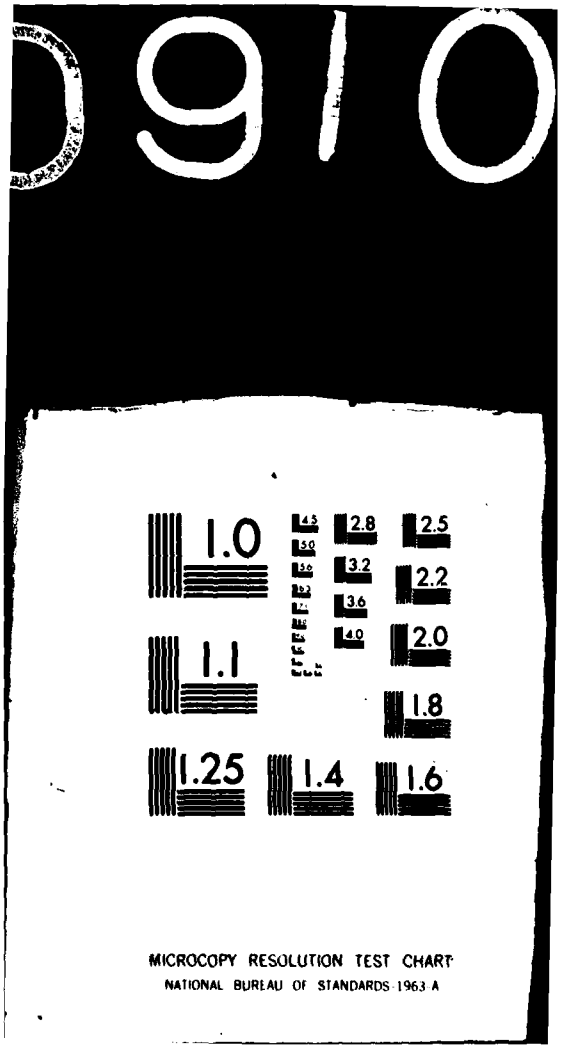
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OSWEGATCHIE RIVER BASIN

OGDENSBURG WATER POWER CO. DAM

ST. LAWRENCE COUNTY
NEW YORK

INVENTORY Nº NY 400

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

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NEW YORK DISTRICT CORPS OF ENGINEERS
AUGUST 1980

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St. Lawrence County
Oswegatchie River
Ogdensburg Water Power Company 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 surveillance and remedial work.

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The structural stability analysis of the spillway section indicates unsatisfactory stability under loadings which could occur under normal winter operations. Marginal stability against overturning is indicated under loading which could occur during the Probable Maximum Flood (PMF) flow. A structural stability investigation should be commenced within six 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.

The source of seepage near the right abutment should be investigated and immediate repair measures should be taken to eliminate this seepage.

The hydrologic/hydraulic analysis indicates that the spillway will pass only 20% of the Probable Maximum Flood (PMF). The dam will be overtopped by 11.8 feet and 5.0 feet by the PMF and 1/2 PMF respectively. The stability analysis indicates satisfactory stability under loadings which would occur during the 1/2 PMF. Therefore, the spillway is assessed as inadequate according to the Corps of Engineers Screening Criteria.

The following is a list of recommended measures to be undertaken to insure safety of the facility. These measures should be completed within two years.

1. The existing sluice gate structure has suffered structural damage so as to render the gates inoperable. Repairs should be undertaken to place the sluice gate structure in proper operating condition.

2. Repairs should be undertaken on the deteriorated concrete surfaces of the abutments and spillway.

3. 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.

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

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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APPENDIX

(15) DACW51-79-C-0001

Inventory Number

(6) ~~PHASE I REPORT~~
NATIONAL DAM SAFETY PROGRAM

Name of Dam Ogdensburg Water Power Company Dam (NY400) Oswegatchie River Basin

State Located ~~New York~~
County Located St. Lawrence County, New York.
Stream ~~Oswegatchie River~~
Date of ~~Inspection~~ ~~June 10, 1980~~ Phase I Inspection Report.

(10) John B. Station (11) 26 Sep 80

ASSESSMENT OF
GENERAL CONDITIONS

(12) 255

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 surveillance and remedial work.

The structural stability analysis of the spillway section indicates unsatisfactory stability under loadings which could occur under normal winter operations. Marginal stability against overturning is indicated under loading which could occur during the Probable Maximum Flood (PMF) flow. A structural stability investigation should be commenced within six 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.

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2. Repairs should be undertaken on the deteriorated concrete surfaces of the abutments and spillway.

3. 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.

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

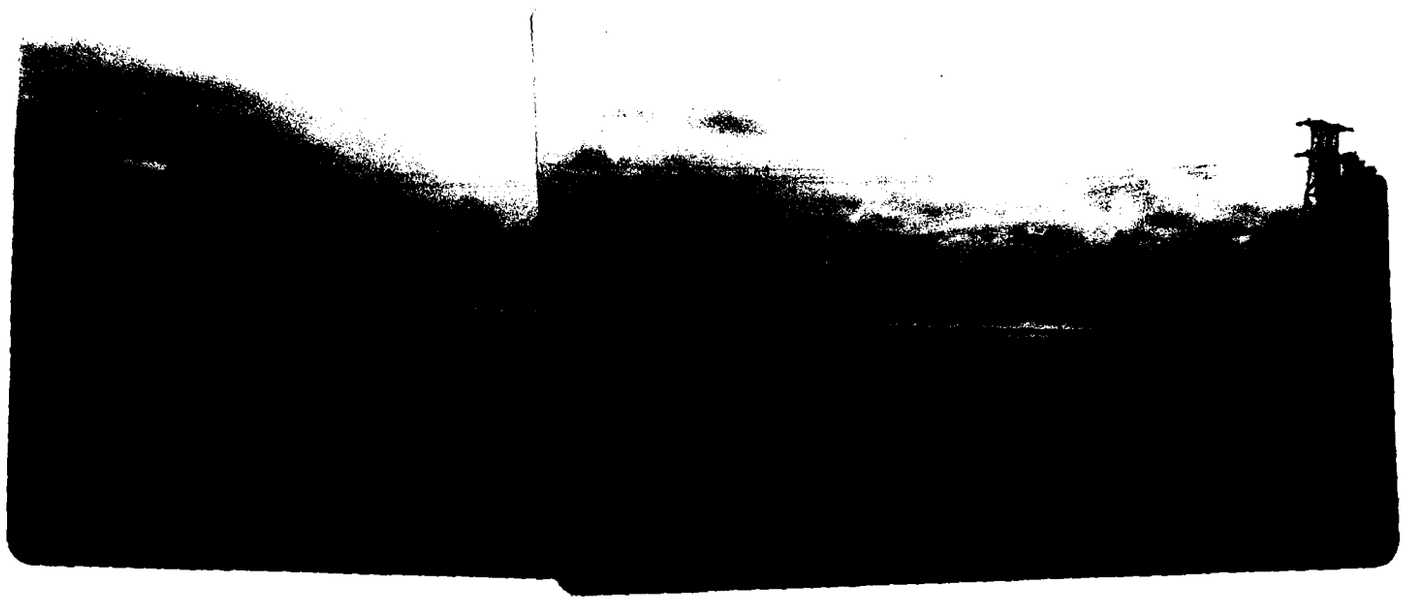
Dale Engineering Company

John B. Stetson, President

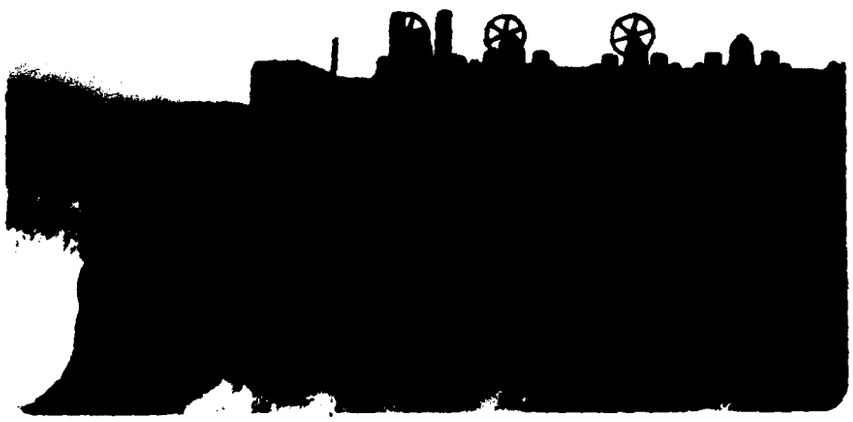
26 SEP 1980

Approved By:
Date:

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



1. Overview of Ogdensburg Water Company Dam



2. Sluice gate structure on left abutment. Note severe spalling, exposed reinforcing and crack showing daylight under walkway.

3. Cracked walkway with rail lashed to operating mechanism at sluice gate structure.

4. Cracking and severe deterioration at spillway end of sluice gate structure.

5. Tailrace of water company pumping station. Wall in background is right abutment of spillway. Close-up in Photo #6 is at concrete section near center of abutment wall.

6. Area of substantial seepage at rear of right abutment.

7. View of spillway from left abutment. Seepage area in Photo #6 is located opposite red door in low roof section of Water Company pump station.

8. Commercial development and marina downstream of dam showing high hazard potential.

9. End of training wall downstream of left abutment.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
NAME OF DAM - OGDENSBURG WATER POWER COMPANY DAM ID# - NY 400

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 Ogdensburg Water Power Company Dam and appurtenant structures, owned jointly by the Niagara Mohawk Power Corporation (90% share) and the City of Ogdensburg (10% share), 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 Ogdensburg Water Power Company Dam is located in the City of Ogdensburg, approximately 800 feet downstream from the LaFayette Bridge. The dam is a run-of-river structure which formerly provided an impoundment for hydropower for the City of Ogdensburg Water Department as well as several industries formerly located on the left bank of the river. The dam is a 19 foot high concrete gravity structure with an ogee shaped spillway spanning approximately 350 feet across the Oswegatchie River. A sluice gate structure consisting of six wooden sluice gates, 6 feet wide and 8 feet high is situated on the left abutment. The pumping station of the Ogdensburg Water Company is located on the right abutment. This structure is not presently in use by the Water Department. The structure is situated on bedrock foundation.

b. Location

The Ogdensburg Water Power Company Dam is located in the City of Ogdensburg, St. Lawrence County, New York.

c. Size Classification

The maximum height of the dam is approximately 19 feet. The volume of the impoundment is approximately 1450 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 Oswegatchie River, the receiving stream from the impoundment flows through the City of Ogdensburg. Several commercial establishments are located on the bank of the river downstream from the dam. A marina is also located a short distance downstream. 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 jointly owned by the Niagara Mohawk Power Corporation (90% share) and the City of Ogdensburg (10% share.)

Contact: Niagara Mohawk Power Corporation
300 Erie Boulevard, West
Syracuse, New York 13202
Engineer - Robert J. Levett
Telephone: 315-474-1511

Contact: City Engineer
City of Ogdensburg
330 Ford Street
Ogdensburg, New York 13669
Telephone: 315-393-7900

f. Purpose of the Dam

The dam is used to control the level of the impoundment for recreational purposes.

g. Design and Construction History

Dam Reports included in Appendix B indicate that a dam was originally constructed on the site in approximately 1825. The present dam was constructed in approximately 1910. The dam originally provided water for industrial power on both the left and right banks of the river. However, the use of this impoundment as a source of power has been abandoned. No data was available to determine the date of the abandonment of the power facilities. No data was available regarding the

design or the construction of the present dam and no plans of the dam were found.

h. Normal Operational Procedures

The facility is presently used to maintain the water level in the impoundment for recreational purposes. The sluice gates which control flow from the impoundment are in such poor condition as to be inoperative. No manipulation of these gates is presently made.

1.3 PERTINENT DATA

a. Drainage Area

The drainage area of Ogdensburg Water Power Company Dam is approximately 1,607 square miles.

b. Discharge at Dam Site

No discharge records are available for this site.

Computed Discharges:

Ungated Spillway, Top of Dam	26,600	cfs
Gated Drawdown, 6' x 8' gates	2,050	cfs*

c. Elevation (Feet Above MSL) - based on pool elevations shown on USGS Map

Top of Dam	265
Spillway Crest	258
Stream Bed at Centerline of Dam	246

d. Reservoir

Length of Normal Pool	21,000	FT

e. Storage

Top of Dam	4,175	Acre Feet
Normal Pool	1,450	Acre Feet

* Assuming all gates fully open and reservoir elevation at spillway crest.

f. Reservoir Area

Top of Dam	490 Acres
Spillway Pool	290 Acres

g. Dam

Type - Concrete Gravity Dam.
Length - 400 Feet.
Height - 19 Feet.
Freeboard Between Normal Reservoir and Top of Dam - 7 feet.

h. Spillway

Type - Concrete Ogee Shaped.
Length - 350 Feet.
Crest Elevation - 258 (Estimated from USGS Map)

i. Regulating Outlets

Six, 6 feet wide x 8 feet high wooden sluice gates.

SECTION 2 - ENGINEERING DATA

2.1 GEOTECHNICAL DATA

a. Geology

Geologically, Ogdensburg is located in the St. Lawrence Valley Province.

According to early state reports (1913 through 1925, see Appendix B) the foundation bed of the dam and its right bank is bedrock; the left bank is "clay loam."

Bedrock at the dam site is Lower Ordovician Ogdensburg Dolostone of the Beekmantown Group. The dolostone is light to medium-gray, fine-to medium-grained crystalline rock with scattered medium-to coarse-grained quartz grains in places. The rock weathers to a tan to grayish-tan color. Bedding thickness varies from 4 to 12 inches in thickness. A few thin-bedded, medium-and coarse-grained, calcareous and dolomitic sandstones, weathering tan, are interlayered with the more predominant dolostone.

Dolostone, albiet a calcareous sedimentary rock, does not go into solution as readily as would a pure limestone; nevertheless, it does dissolve. Thus, in time, solution along joints and bedding planes could create conduits for water flow.

The left bank is in the Rhinebeck soils type which has formed from glacio-lacustrine deposits. These materials have a low to very low permeability and seepage generally presents no problem, particularly when the soils are compacted.

Rock bedding in the area is essentially horizontal. Three prominent joint sets are present and are as follows:

Set	Orientation		Spacing
1	Strike N80E-N-N85W	Dip 90°	8"-5' Av. 2-1/2'
2	N5-10E	90°	4'
3	N60W	90°	20'

The last joint set is parallel to the dam.

b. Subsurface Investigations

No records of subsurface investigations for this structure were available. The only information regarding the foundation materials are found in the Dam Reports included in Appendix B. A 1925 Report indicates that the foundation material for the dam is a limestone rock.

2.2 DESIGN RECORDS

No records were available from the original design of the dam.

2.3 CONSTRUCTION RECORDS

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

2.4 OPERATIONAL RECORDS

There are no operational records available from this dam.

2.5 EVALUATION OF DATA

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

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

The Ogdensburg Water Power Company Dam was inspected on June 10, 1980. The Dale Engineering Company Inspection Team was accompanied on the inspection by Brad Upson, City Engineer of the City of Ogdensburg and by Robert Levett of the Niagara Mohawk Power Corporation.

b. Dam

At the time of the inspection, the water level in the impoundment was approximately 8 inches above the spillway level. Flow over the spillway obscured view of the spillway surface. The irregular pattern of flow on the spillway surface indicates that some materials attrition has occurred. Deterioration at horizontal joints was evident through the flow. Visual observation did not disclose physical displacement of the alignment of the structure. Seepage was noted at the right abutment of the dam (see Photograph No. 6). The concrete in both abutments shows signs of significant deterioration.

c. Appurtenant Structures

The Ogdensburg Water Company pumping station is situated near the right abutment of the dam. The use of this facility has been abandoned and no inspection of the structure was made.

d. Control Outlet

Flow from the impoundment is controlled by a series of 6 sluice gates situated on the left abutment of the dam. The concrete in this structure shows significant deterioration with reinforcing exposed in many areas and with cracking of structural members evident in the abutments between the sluice gates (See Photographs). The walkway supporting the operating mechanism for the sluice gates is severely cracked and displacement of the structural elements of the walkway has occurred. No attempt was made to manipulate the gates at the time of the inspection. The displacement of the foundations of the operating mechanisms would indicate that attempts to operate the gates at this time could cause malfunction of the gate system. Although there was severe structural misalignment in the walkway of the sluice gate structure, there was no misalignment or displacement of the structural elements which form the seats for the sluice gates. The upstream face of the sluice gate structure shows no sign of misalignment below the level of the walkway.

e. Reservoir Area

The reservoir area extends approximately 4 miles to the south to another run-of-river dam on the Oswegatchie. There are no known areas of bank instability along this impoundment.

f. Downstream Channel

The downstream channel is formed in bedrock and extends approximately 1/2 mile to the mouth of the river at its confluence with the St. Lawrence River. There are no signs of recent erosion in the downstream channel.

3.2 EVALUATION

The visual inspection revealed a number of problem areas which require further investigation and remedial action. The seepage on the right abutment should be closely monitored and remedial action should be taken as soon as possible to eliminate this seepage. Repairs should be undertaken on the deteriorated surfaces of the abutments. The sluice gate structure should be repaired by replacing the walkway slab, re-aligning the operating mechanism and placing the sluice gates in operating condition. An investigation should be undertaken to determine the condition of the concrete in the spillway and the existence of any leakage which may occur through or under the spillway structure. Remedial action should then be taken depending on the results of this investigation.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

The normal operating procedure for this structure is to control the water level in the impoundment for recreational purposes. The deteriorated condition of the sluice gate structure prevents manipulation of the sluice gates so that the water level in the impoundment is controlled only by the volume of flow in the river.

4.2 MAINTENANCE OF THE DAM

Maintenance and operation of the dam is controlled jointly by Niagara Mohawk Power Corporation and the City of Ogdensburg. No formal reporting system is in effect at this site.

4.3 MAINTENANCE OF OPERATING FACILITIES

The sluice gates controlling flow from the impoundment are presently in poor condition as a result of severe structural damage to the foundations of the operating mechanisms for the gates. Operation of the gates is difficult if not impossible under the present conditions.

4.4 DESCRIPTION OF WARNING SYSTEM

No warning system is in effect at present.

4.5 EVALUATION

Conditions at the dam indicate that the facility has been poorly maintained in the past. A periodic inspection procedure should be instituted and a formal reporting system adopted to detect signs of further deterioration. This system should be continued after repairs are made at the facility. Special attention should be given to the surveillance of the seepage at the right abutment. Since the dam is in a 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 Ogdensburg Water Power Company Dam is located in the northern portion of St. Lawrence County. The dam spans the Oswegatchie River just upstream of the confluence of the Oswegatchie and St. Lawrence Rivers. The Oswegatchie has a drainage area of approximately 1607 square miles upstream of the dam, which is rather sparsely populated and wooded over most of its area. The Oswegatchie River Basin is a rather complex river network of many miles of rivers and streams. Numerous control structures span these rivers. The principal storage areas in the basin are provided by Cranberry Lake, Black Lake, and the numerous swamps and ponds. The impoundment created by the Odgensburg dam backs up to the dam at Eel Weir creating a reservoir area of approximately 290 acres.

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.

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 was used to evaluate the dam, spillway capacity, and downstream hazard. Unit hydrographs were defined by Snyder coefficients C_t and C_p. The drainage area was divided into sub-areas to model the variability in hydrologic characteristics within the drainage basin. The Muskingum routing method was used for river routing, whereas the Modified Puls method of flood routing was used for reservoir routing. In order to model the attenuation of the flood hydrographs due to the storage capacity of Cranberry Lake and Black Lake, the flood hydrographs were routed thrugh these lakes. The data used for the outlet control structures of these lakes was obtained from the New York State Department of Environmental Conservation Dam Safety Section and Niagara Mohawk Power Corporation. Storage capacities for these lakes were estimated from U.S.G.S. mapping and previous reports.

Due to the size and complexity of the basin, Snyder's parameters, loss rate parameters and routing parameters were adjusted to attempt to calibrate the model to predicted discharges at some of the gages in the basin. These parameters were adjusted to obtain the peak discharges at the selected gages for the 100 year storm derived from the discharge-frequency curves obtained from the USGS data. Using a C_t of 3.0 and C_p of 0.55 and an SCS curve number of 69 essentially reproduced the 100 year peak discharge at Eel Weir (just upstream of the dam) and came within 3% of the corresponding discharges predicted at the gages at Heuvelton, Harrisville, and Oswegatchie. Running the model for a 500 year storm produced a peak discharge at Eel Weir that was 22% higher than predicted and 14% high at Heuvelton. The period of record spans over 58 years at Heuvelton and only 12 years at Eel Weir, therefore, the data for Heuvelton should be more reliable in predicting the discharge for a flood with such low probability of occurring as a 500 year storm. A refinement of this model might determine the various parameters based on the reconstitution of the hydrographs of a few major storms.

The developed computer model was then utilized to analyse the Probable Maximum Flood. The Probable Maximum Precipitation (PMP) was 18 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 73 percent run-off from the PMF. The peak for the PMF inflow hydrograph was 135,044 cfs and the 1/2 PMF inflow peak was 65,207 cfs. The storage capacity of the reservoir only reduced these peak flows to 134,957 cfs for the PMF and 65,167 cfs for the 1/2 PMF.

5.3 SPILLWAY CAPACITY

The spillway is an ogee-crested weir type structure 350 feet in length. Weir coefficients ranging from 3.14 to 4.15 over the heads encountered in routing the PMF were assigned for the spillway rating curve development. The discharge capacity of the spillway at the top of dam elevation is 26,640 cfs.

SPILLWAY CAPACITY

Flood	Peak Discharge	Capacity as % of Flood Discharge
PMF	134,957 cfs	20%
1/2 PMF	65,167 cfs	41%

5.4 RESERVOIR CAPACITY

The reservoir storage capacity was estimated from USGS mapping. The resulting estimates of the reservoir storage capacity are shown below:

Top of Dam	4175 Acre Feet
Spillway Crest	1450 Acre Feet

5.5 FLOODS OF RECORD

There are no accurate records of flood discharges at the site. A review of pertinent publications revealed the maximum discharges shown below for sites on the Oswegatchie River upstream of the dam site (Ref. 15).

Gage Location	Drainage Area (Sq. Mi.)	Period of Record	Date	Maximum Discharge(cfs)
Near Ogdensburg, New York	1580	1904-1916	3/31/05	15,800
Heuvelton, New York	973	1917-1975	4/06/60	19,600

These gage records are not truly representative of the flows experienced at the dam site due to the limited period of record at the gage near Ogdensburg and the substantially smaller drainage area for the Heuvelton gage (this gage is located upstream of the confluence with the Indian River drainage basin). However, these flood discharges do give an indication of the magnitude of previous flood flows for the river.

5.6 OVERTOPPING POTENTIAL

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

Flood	Maximum Depth Over Dam
PMF	11.8 Feet
1/2 PMF	5.0 Feet

5.7 EVALUATION

The hydrologic/hydraulic analysis establishes the spillway capacity as 20% of the Probable Maximum Flood (PMF). The dam will be overtopped by 11.8 and 5.0 feet by the PMF and 1/2 PMF respectively. However, results of the stability analysis indicate satisfactory stability under the 1/2 PMF. Therefore, the spillway is assessed as inadequate according to the Corps of Engineers screening criteria.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

This concrete dam, extending across the width of the Oswagatchie River, currently functions as a spillway for nearly its full length. A three-bay gated outlet structure, 2 gates per bay, forms the dam's westerly (left) section. The dam's easterly (right) abutment consists of a concrete headwall on the river's eastern bank. A large pump house building situated adjacent to this abutment has its intake just upstream from the dam.

The dam was inspected under the condition where flow over the dam and through-the-gate spillway was occurring. The physical detail visible for evaluation was limited, particularly for the in-river section. Information relating to possible deterioration, erosion or seepage in the dam's toe region could not be obtained. The field observations indicate the main river section of the dam retains structural stability although some significant materials attrition of the surface, crack development and joint erosion has occurred throughout.

The gated spillway structure of the dam is generally in poor structural condition, with the upper section in particularly poor condtion. The concrete walls dividing the spillway bays and the thick concrete abutment headwall joining the main dam to the spillway sections are spalled with some cracking. The horizontal slab walkway forming the top of the gated spillway (for workmen operating the spillway gates) is severely fractured, and generally has sections separated from the underlying supporting bay walls.

The dam's eastern concrete abutment wall is presently structurally stable but has experienced cracking and materials attrition, some severe. Leakage through the abutment section above the ground line is evident, with some underground leakage/seepage also possible.

A concrete retaining wall situated along the river's west bank extends downstream starting from the spillway. This wall has sections which are in poor structural condition. It appears that the primary function of this wall was to establish or protect land area on the river's west shore.

b. Seismic Stability

Although no known faults exist in the vicinity of the dam site, several earthquakes have been recorded in the immediate area. Speculation that the St. Lawrence River may follow a fault line in this portion of the river has been suggested by some authorities but evidence is lacking. The Seismic Probability map locates the dam

site at the border of a Zone 3 designation. Some of the earthquakes for the area are tabulated below:

Date	Intensity Modified Mercalli	Location Relative to Dam
1874	II	0 miles
1903	V	0 miles
1911	III	0 miles
1927	IV	8 miles SE
1938	IV-V	13 miles E-NE
1964	IV-V	10 miles E
1980	IV-V	11 miles NE

c. Stability Evaluation

No design drawings were available for review. Previous dam reports show plan alignment and the cross-section 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 dam's spillway section. Actual properties of the dam's construction materials and foundations were not determined as part of this study; where information on properties was necessary for computations but lacking, assumptions felt to be practical were made. The stability computations assumed a structural cross-section based on dimensions indicated in the previous dam reports included in this report. It should be considered that, in areas where deterioration has occurred, section dimensions would be less than indicated by the plans, with some adverse effect on the structural strength expected. The analysis also assumed the dam section to be monolithic, possessing necessary internal resistance to shear and bending occurring as a result of loading.

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

The engineering studies indicate satisfactory stability against overturning and sliding effects for the dam when subjected to forces possible during normal summer-type operation (no ice loading). Satisfactory stability is also indicated where seismic effects are imposed onto the normal summer operating condition. The analysis indicates unsatisfactory stability against overturning for the dam subject to forces including ice loading possible during winter operations, according to the Recommended Guidelines for Safety Inspection of Dams (i.e., factor of safety less than 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.)

The stability analysis indicates satisfactory stability against overturning and sliding for the dam under the 1/2 PMF loading condition.

RESULTS OF STABILITY COMPUTATIONS

	Loading Condition	Factor of Safety* Overturning	Factor of Safety* Sliding**	Location of Resultant Passing through Base***
(1)	Water level at spillway elevation, uplift on base (no ice).	2.13	50±	0.51b
(2)	Water level at spillway elevation, uplift on base plus 7.5 kip per lineal foot ice load acting.	1.01	19±	0.01b
(3)	Water elevations against upstream face and downstream face based on 1/2 PMF levels, uplift acting on base as computed for normal operating condition.	1.42	17±	0.33b
(4)	Water elevations against upstream face and downstream face based on PMF levels, uplift acting on base as computed for normal operating condition.	1.3	12±	0.30b
(5)	Water level at spillway elevation, uplift on base, seismic effect applicable to Zone 3.	1.73	34±	0.44b

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

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

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

For the PMF loading condition, the analysis indicates satisfactory stability against sliding but marginal stability against overturning. Lateral water pressures were calculated from the water surface elevations computed in the hydrologic/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 rock. For the "normal operating conditions" case, the analysis uplift force was based on a full headwater hydrostatic pressure acting on the dam's upstream corner and a zero tailwater hydrostatic pressure acting on the dam's downstream corner. Uplift pressures were assumed to vary linearly between the dam's upstream and downstream corners, and to act upon 100 percent of the dam base. The resulting uplift force represents a condition that is significant to indications of instability.

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

The discussed analysis applies to a dam in structurally good condition. The field observations indicate some materials attrition including cracking and surface deterioration, has occurred. Although this analysis indicates generally satisfactory stability under normal operating conditions, there is a lack of information regarding the condition of many of the structural elements of the facility and the uplift forces acting on the base. Therefore, further investigations are recommended. Evaluation of existing structural conditions should be based upon inspection of the dam and abutment structures with the reservoir drawn down. Because of the influence on the dam's stability under flood and winter operating conditions, means to evaluate the presence and magnitude of uplift acting on the base should be undertaken. This study should also investigate and evaluate the structural condition of the rock underlying the dam and immediately downstream for determining the resistance to displacement. Dam stability studies based on actual existing conditions should be performed and if necessary, recommendations to improve the stability should be developed. As a minimum, it should be anticipated that some structural repair to the surficial zones of the dam section will be required. Meanwhile, repair should be provided for the spillway to return it to a structurally sound and operationally proper condition. Similarly, means to correct the leakage/seepage occurring at the easterly abutment should be undertaken.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety

The Phase I inspection of the Ogdensburg Water Power Company Dam did not indicate conditions which would constitute an immediate hazard to human life or property.

The hydrologic/hydraulic analysis indicates that the spillway will pass only 20% of the PMF. The dam will be overtopped by 11.8 feet and 5.0 feet by the PMF and the 1/2 PMF respectively. The stability analysis indicates satisfactory stability under loadings which could occur during the 1/2 PMF. Therefore, the spillway is assessed as inadequate according to the Corps of Engineers screening criteria.

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

1. The stability analysis of the spillway section indicates unsatisfactory stability under loadings which could occur during normal winter operations. Marginal stability against overturning is indicated under loadings which could occur during the PMF flow.

2. Seepage is occurring near the right abutment of the dam.

3. The sluice gate structure is in a deteriorated condition rendering the facility inoperable from a practical standpoint.

4. The surfaces of both the spillway and the abutments are severely deteriorated as evidenced by extensive surface spalling of concrete.

5. No formal inspection system is in effect at the facility.

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 items in the safety assessment should be addressed by the owner and appropriate repairs should be completed within two years. The recommended investigations should be started within six months.

d. Need for Additional Investigation

Further investigation relative to the stability of the spillway section should be performed to determine appropriate remedial measures. Further investigation should also be undertaken to determine the source of the seepage on the right abutment and the appropriate remedial measures necessary to eliminate the seepage.

7.2 RECOMMENDED MEASURES

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

1. A structural stabilty investigation of the spillway section 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.

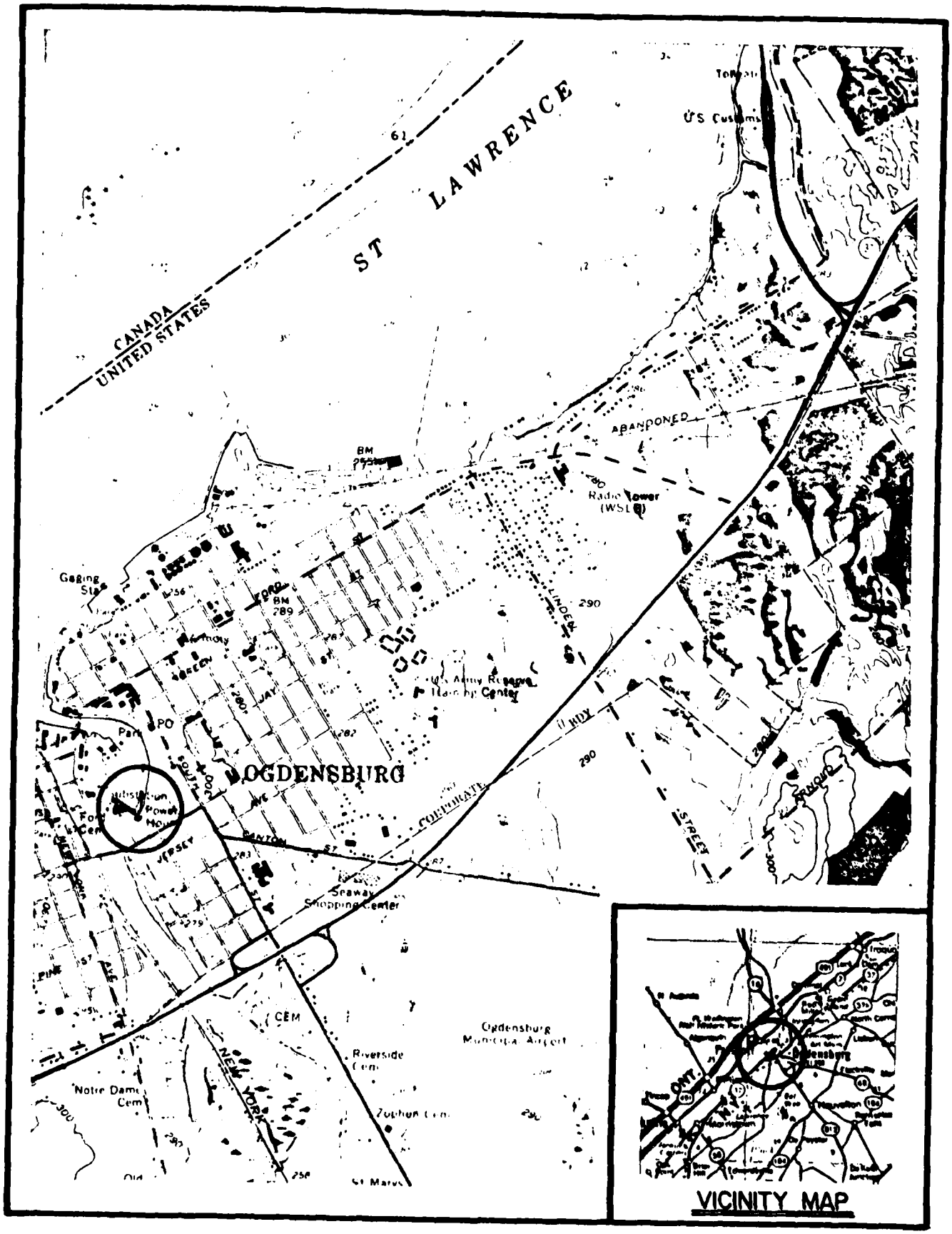
2. The source of seepage near the right abutment should be investigated and immediate repair measures should be taken to eliminate this seepage.

3. Repairs should be undertaken to place the sluice gate structure in proper operating condition.

4. Structural repairs to the surficial zones of the spillway and abutments should be undertaken.

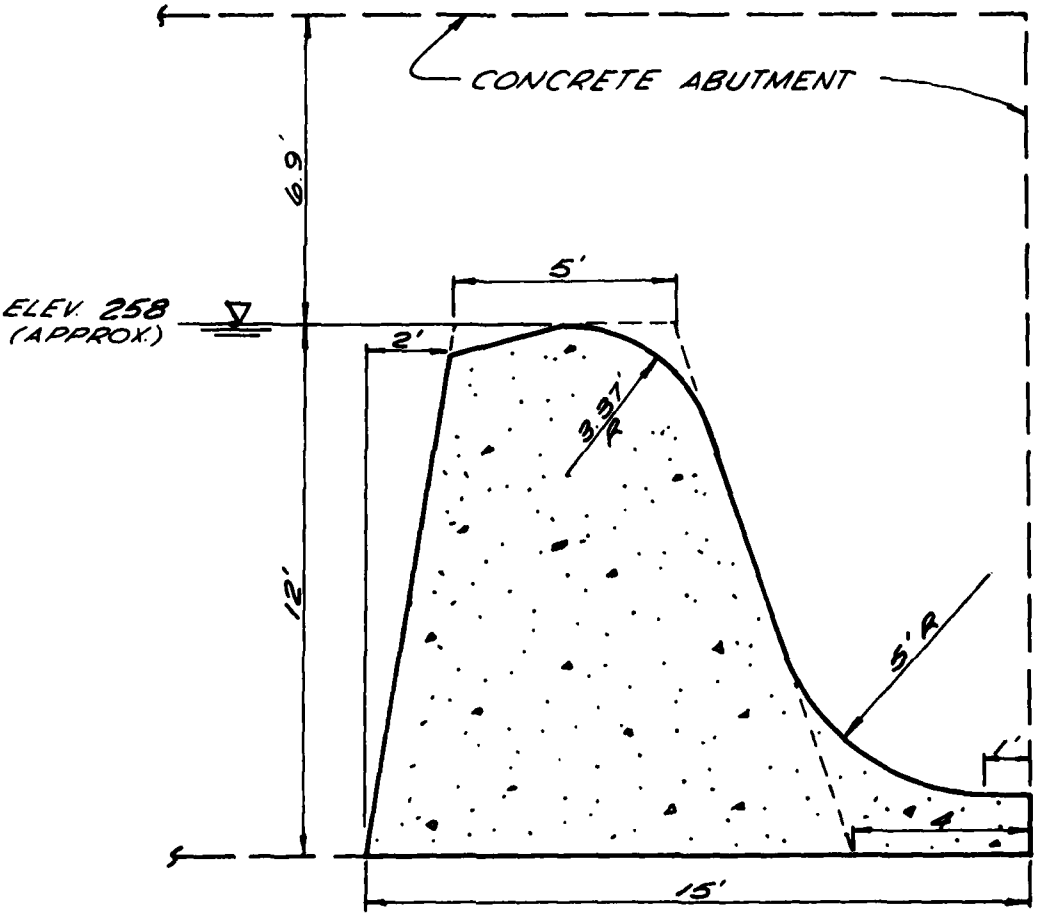
5. A flood warning and emergency evacuation system should be implemented to alert the public in the event conditions occur which could result in failure of the dam.

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



LOCATION PLAN

FIGURE 1



SCALE: 1"=40'

STETSON • DALE	DATE 6-25-80	DRAWN D.M.E.	TYPICAL SECTION
	JOB 2399	FIGURE 2	

APPENDIX A

FIELD INSPECTION REPORT

CHECK LIST
VISUAL INSPECTION

PHASE 1

Name Dam Ogdensburg Water Power Company Dam County St. Lawrence State N.Y. ID # NY 400

Type of Dam Concrete Gravity Hazard Category High

Date(s) Inspection 6/10/80 Weather Partially cloudy Temperature 40-50°

Pool Elevation at Time of Inspection 258.7± 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	
R. Levett	Niagara Mohawk	
B. Upsom	Ogdensburg City Engineer	

J. A. Gomez Recorder

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	Appears to be flow through cracks in concrete of east abutment wall of easterly gate and through east abutment wall. Quite noticeable leakage 3-5 gpm. East abutment wall also wet along 4' x 12' area. Seepage through foundation wall of pumping station.	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	No problems observed.	
DRAINS	Flow out of drain on east abutment.	
WATER PASSAGES	None.	
FOUNDATION	Bedrock	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	Numberous and very significant deterioration of gate structure/abutments	
STRUCTURAL CRACKING	Numerous and very significant structural cracks. Horizontal and vertical slab on gate structure.	
VERTICAL & HORIZONTAL ALIGNMENT	Middle of slab (over middle gate opening) displaced towards upstream 2 inches. (Tilted towards upstream)	
MONOLITH JOINTS	Some deterioration detected when viewed through the flow.	
CONSTRUCTION JOINTS	Separation of structural elements at construction joints for gate abutments/ structure.	
STAFF GAGE OF RECORDER	None.	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	Not applicable.	
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	Flow pattern indicates some deterioration of surface. Horizontal joints evident through flow. Deterioration of 6" or so on east end of spillway.	
APPROACH CHANNEL	Oswegatchie River (natural)	
DISCHARGE CHANNEL	Oswegatchie. Concrete wall on west side for 150' downstream. Couple sections on end tipped over. Concrete and masonry wall on east. Stones misplaced in masonry section. Samll section of masonry wall in ruins.	
BRIDGE AND PIERS	None.	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	3 wooden sluice gate openings 2 gates each opening = 6 gates	
APPROACH CHANNEL	Oswegatchie River	
DISCHARGE CHANNEL	Receiving stream Training wall badly deteriorated	
BRIDGE AND PIERS	Significant structural cracks in piers, abutments and top slab, especially in two most easterly openings. Easterly pier allows water to leak through crack. Cracks vertical (3" wide) and horizontal 2". Severe deterioration of pier/abutment. Easterly abutment deteriorated 18" upstream.	
GATES AND OPERATION EQUIPMENT	6 gates, one wheel missing. Don't appear to have been operated recently.	
	Upstream side of middle of slab raised 1" and moved upstream. Tilted towards upstream. Top of east of 2 piers popped off. Upstream east corner of slab up 5".	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Old outlets to mills, etc. blocked off (west side).	
INTAKE STRUCTURE	Old intake shows deterioration. (fairly significant) (west side)	
OUTLET STRUCTURE	Some flow also was diverted through Water Power Co. Building on east side in past.	
OUTLET CHANNEL	Masonry walls (west side -tailrace) have some displacement of units missing . Some pointing etc. - general lack of maintenance.	
EMERGENCY GATE	See gated spillway section.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Flows relative short distance to St. Lawrence.	
SLOPES	Fairly shallow	
APPROXIMATE NO. OF HOMES AND POPULATION	Marina and business buildings along bank just downstream. Significant recreational use of downstream river.	

INSTRUMENTATION

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	NOT APPLICABLE	
OBSERVATION WELLS	NOT APPLICABLE	
WEIRS	NOT APPLICABLE	
PIEZOMETERS	NOT APPLICABLE	
OTHER	NOT APPLICABLE	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	~15% east ~3% west No known areas of instability.	
SEDIMENTATION	Signs of sedimentation of east side.	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE 1

NAME OF DAM: Ogdensburg Water Power Company Dam

ID #: NY 400

ITEM	REMARKS
AS-BUILT DRAWINGS	None available.
REGIONAL VICINITY MAP	See report.
CONSTRUCTION HISTORY	No data, except from Dam Safety files.
TYPICAL SECTIONS OF DAM	From old dam reports
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS	No data
RAINFALL/RESERVOIR RECORDS	Not available.

ITEM	REMARKS
DESIGN REPORTS	Not available.
GEOLOGY REPORTS	Not available.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	Not available.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Not available.
POST-CONSTRUCTION SURVEYS OF DAM	Not available.
BORROW SOURCES	Not available.

ITEM	REMARKS
MONITORING SYSTEMS	Not available.
MODIFICATIONS	Not available.
HIGH POOL RECORDS	Not available.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Not available.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	Not available.
MAINTENANCE OPERATION: RECORDS	Not available.

ITEM	REMARKS
SPILLWAY PLAN SECTIONS DETAILS	Not available.
OPERATING EQUIPMENT PLANS & DETAILS	Not available.

CHECK LIST
HYDROLOGIC & HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 1607 square miles

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 258

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 265

ELEVATION MAXIMUM DESIGN POOL: Unknown

ELEVATION TOP DAM: 265

CREST:

a. **Elevation** 258 (based on USGS map pool elevation)
b. **Type** Ogee crested
c. **Width** Not applicable
d. **Length** 350 feet
e. **Location Spillover** Center of dam
f. **Number and Type of Gates** None

OUTLET WORKS:

a. **Type** 6 - 6 feet wide x 8 feet high wooden sluice gates
b. **Location** Left abutment.
c. **Entrance Inverts** Not available.
d. **Exit Inverts** Not available.
e. **Emergency Draindown Facilities** Same.

HYDROMETEOROLOGICAL GAGES:

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

MAXIMUM NON-DAMAGING DISCHARGE: No data.

APPENDIX B

PREVIOUS INSPECTION REPORTS/RELEVANT CORRESPONDENCE

ADDRESS ALL COMMUNICATIONS TO THE CONSERVATION COMMISSION

STATE OF NEW YORK

CONSERVATION COMMISSION

Dexter N. Y.

July 26th. 1912

Conservation Commission

Albany N. Y.

Gentlemen:-

On April 6th. 1912, the Fishway in the dam on the Oswegatchie river, at Ogdensburg, went out, and I notice that the owners have not done anything toward replacing the same. Iam reporting this as I understand it is one of my duties.

Respectfully Yours.

F. C. Mullin

Division Chief Protector.

July 29, 1912.

W. E. C. [illegible],

Dexter, N. Y.

Dear Sir:-

Yours of July 26th concerning the fishway in the dam at Ogdensburg received, and we thank you exceedingly for the information.

Yours truly,

Conservation Commission,

By

McK/F

Inspector of Docks & Dams.

July 29, 1913.

Ogdensburg Water Company,

Ogdensburg, N. Y.

Gentlemen:-

The fishway for your dam at Ogdensburg having been carried out, we submit to you our pamphlet on fishways as a suggestion for a new one, plans of which should be sent for the approval of this Commission.

Kindly send us any prints of the dam which you may have for our files.

Yours very truly,

Conservation Commission,

By

McK/F

Inspector of Docks & Dams.

November 19, 1912.

Ogdensburg Water Company,

Ogdensburg, N. Y.

Gentlemen:-

I wrote you on July 29th concerning the replacement of the fishway for your dam, which was carried out, but have received no reply from you in regard to same.

Very truly yours,

Conservation Commission,

By

Inspector of Docks and Dams.

McK/C.

OGDENSBURG CITY WATER WORKS

OGDENSBURG, NEW YORK

December 10, 1912.

Mr. Alexander McKim, Inspector,
Docks and Dams,
Conservation Commission,
Albany, New York.

Dear Sir:-

I have received from the City Clerk's office your inquiry of November 14th, addressed to Ogdensburg Water Company, relative to the replacement of the fishway at the Ogdensburg dam.

While this matter is something we have nothing to do with and, no doubt your letter was intended for some other commission, I am able to state at this time that it would be impossible to do anything about replacing this fishway as the Oswegatchie has been extraordinarily high this Fall and at present is running at flood mark.

We note you have written a former letter regarding this matter but we have no recollection of having received the same.

Very respectfully yours,

H. A. Lord

Superintendent.

Dic. HAL/F.

January 3, 1913.

Mr. Harry A. Lord, Superintendent,

Ogdensburg City Water Works,

Ogdensburg, N. Y.

Dear Sir:-

Yours of December 10th received concerning dam No. ~~11~~ 9 Oswegatchie watershed.

I understand from your letter that the City of Ogdensburg is the owner of said dam. I enclose a sketch as a suggestion for the replacement of the fishway which was washed out sometime ago, plans for which should be sent to this Commission for its approval. I also send a blank to be filled out with data concerning the dam.

Very truly yours,

Conservation Commission,

By

Inspector of Docks and Dams.

McK/C.

Encls.

OGDENSBURG CITY WATER WORKS

OGDENSBURG, NEW YORK

January 8, 1913.

11 Copies

Mr. Alexander Rice McKim,
Inspector Docks & Dams,
Conservation Commission,
Albany, New York.

Dear Sir:-

Yours of January 3rd relative to the dam in the Oswegatchie River at Ogdensburg is at hand together with the sketch as a suggestion for the replacement of the fishway and also a blank to fill out with data concerning the dam.

The Ogdensburg dam does not belong to the City of Ogdensburg nor is it in any way controlled by the City. The government of all water power matters is vested in a commission established by the courts of three members consisting at this time of Messrs. John Hannan, Frank Chapman and Chas. O. R. Bell with whom you should communicate in regard to water power matters in connection with this dam and canal.

Yours very truly,

Superintendent.

Dic. HAL/P

January 9, 1913.

Messrs. John Hannan, Frank Chapman & Chas. O. F. Bell,

Ogdensburg, N. Y.

Gentlemen:-

Concerning dam No. 11 Oswegatchie Watershed at Ogdensburg which is under the jurisdiction of your Commission.

The fishway for this dam having been carried away, I enclose a sketch as a suggestion for a new fishway, plans of which should be submitted to this Commission for approval. I also enclose a blank for data concerning your dam, which I wish you would kindly fill out and return to this Commission.

Very truly yours,

Conservation Commission,

By

Inspector of Docks and Dams.

McK/C.

Encls.

February 24, 1914.

Ogdensburg Water Power Co.,

Ogdensburg, N. Y.

Gentlemen:-

Concerning your dam on the Oswegatchie River, kindly advise us whether anything has been done in the matter of a fishway in regard to which we wrote you the following on January 9, 1913:

> "Concerning dam No. 6 Oswegatchie Watershed at Ogdensburg which is under the jurisdiction of your Commission.
>
> "The fishway for this dam having been carried away, I enclose a sketch as a suggestion for a new fishway, plans of which should be submitted to this Commission for approval. I also enclose a blank for data concerning your dam, which I wish you would kindly fill out and return to this Commission."

Very truly yours,

Conservation Commission,

By

Commissioner.

JDM/C.

CAPITAL $100 000. SURPLUS $250 000.

OGDENSBURG BANK.

FRANK CHAPMAN, PREST.
THOMAS SPRATT, VICE PREST.
SAMUEL W. LEONARD, CASHIER.

Ogdensburg, N.Y. Feby 26 1914.

Conservation Commission,
Albany, N.Y.

Gentlemen:-

I have this day received, through the hands of the Ogdensburg City Water Works, your favor of the 24th., inst. addressed to the Ogdensburg Water Power Company, relative to Fishway at the Dam on the Oswegatchie River at Ogdensburg, N.Y., and asking more particularly if anything has been done in regard to the same, along the lines of your letter dated January 9th., 1913. I fail to find among my files any such letter.

Nothing has been done in the matter of a Fishway at this dam, for the following reasons. The Dam is a part of the Ogdensburg Water Power Property, so called and distinguished in a decree of the Supreme Court, dated April 2, 1872. The affairs of this property, so far as the use of the water for water power purposes, and certain specific duties relative to the maintenance of the dam etc., was placed in the hands of three referees appointed by the said Court, and in conformity therewith the old timber dam, built early in 1800, was replaced by a concrete dam, built in the year 1910. The referees did, either in that year, or in the year 1911, construct what was regarded as an extra strong, and well secured Fishway, in compliance with the request of your commission. This structure

SURPLUS $250000

OGDENSBURG BANK.

AN. PREST.
ATT. VICE PREST.
ONARD. CASHIER

Ogdensburg. N.Y.

2.

dam, and swept away. We are satisfied from our past experience, that nothing in the form of a Fishway will stand, unless it be built of re-inforced concrete. Such a structure will cost a large sum of money, and the referees can find no authority given them to make any such expenditure. Such authority, I presume, would have to proceed from the Court having jurisdiction in this matter.

I submit this for your consideration, and for your further advice and suggestion,

Very truly yours,

Ogdensburg Water Power Property,

by _____
Referee.

February 28, 1914.

Frank Chapman, Esq., Referee,

Ogdensburg Water Power Property,

Ogdensburg, N. Y.

Dear Sir:-

Yours of February 26, 1914 received, having crossed our letter of February 24th containing a copy of our letter of January 9, 1913, which you requested in yours of February 26th.

We agree with you that it will be wise to replace the fishway by one of concrete and have same well anchored to the foundation ledge.

We enclose a pamphlet on fishways, which describes just such a fishway as we would recommend for your purpose.

Very truly yours,

Conservation Commission,

By

Commissioner.

WcK/C.

Encl.

Jo. W. Hoyt for action at executive

STATE OF NEW YORK

IN REPLYING PLEASE REFER TO FILE NUMBER
508

CONSERVATION COMMISSION

ALBANY March 15, 1914.

C. E. V'K.

onservation Commission,

Hon. George E. Van Kennen, Chairman,

Albany, N.Y.

entlemen:-

On the subject of a fishway in the dam of the Ogdensburg Water Power ompany, mentioned in a letter of Mr. Frank Chapman, Feb. 26, 1914, I am of the opinion that it is not necessary for any purpose of fish culture to construct a fishway in the dam.

I have examined a large portion of the Oswegatchie including the site of the dam in question, and have expressed to the Forest, Fish nd Game Commission my belief that the Oswegatchie can be best treated fish culturally as a series of ponds. The river above the dam of the Ogdensburg Water Power Company is very well stocked with valuable ood and game fish, and it has in Black Lake a reservoir in which good fish of various species abound. At one point on the stream there is natural rock dam which, of itself, effectually prevents the passage of fish of all kinds, except eels, upstream at ordinary stages of flow.

For the reasons stated, that is, the presence of Black Lake, which rich in fish, and the fact that nature has divided the stream so as to form what constitutes in reality a series of ponds, I suggest that the iver be handled without a fishway in the dam at Ogdensburg and stocked in sections with species adapted to the region.

Very respectfully,

Tarleton H. Bean,
Fish Culturist.

Address all communications to the Conservation Commission.

March 21, 1914.

Mr. Frank Chapman,
Ogdensburg, N. Y.

Dear Mr. Chapman:

Your favor of February 26th, 1914 to this commission, with respect to fishway and dam on Oswegatchie river at Ogdensburg, N. Y., finally came to my attention a few days ago.

I immediately took the matter up with our fish culturist and asked for a report. After giving the matter full consideration he made a report to the commission in which he stated that he did not consider it essential that a fishway be constructed at the dam; that inasmuch as Black Lake was tributary to the section of the river immediately above the dam and that such lake was well stocked with all kinds of game fish, he did not feel that it was necessary at this time to require the construction of a fishway. In other words, he felt that the cost of constructing and maintaining a fishway at that point was disproportionate to the benefits to be derived therefrom under the conditions that exist at the present time.

Dr. Bean's report was considered by the commission and I was authorized to advise you that the commission

FC2 In re Fishway in Oswegatchie

had determined that for the present, at least, a fishway would not be required.

With kind regards, I remain

Respectfully yours,

VK/B Chairman

GEORGE D. PRATT
COMMISSIONER
ALEXANDER MACDONALD
DEPUTY COMMISSIONER
WARWICK S. CARPENTER
SECRETARY
MARSHALL McLEAN
SPECIAL DEPUTY ATTORNEY GENERAL

IN REPLYING PLEASE REFER TO FILE NUMBER

STATE OF NEW YORK

DIVISION OF FISH AND GAME
LLEWELLYN LEGGE CHIEF
DIVISION OF LANDS AND FORESTS
C. R. PETTIS, SUPERINTENDENT
DIVISION OF WATERS
A. H. PERKINS DIVISION ENGINEER
DIVISION OF SARATOGA SPRINGS
J. G. JONES, SUPERINTENDENT
SARATOGA SPRINGS, N.Y.

CONSERVATION COMMISSION

ALBANY April 24, 1918.

Mr. A. H. Perkins,

Division Engineer.

Dear Mr. Perkins:

Referring to the accompanying petition from the residents of Ogdensburg that this commission have a fishway erected in the dam on the Oswegatchie River in the city of Ogdensburg, I have to say that at the present time experts on fishways have not been able to plan an effective one. In other words, I know of no fishways in this part of the country which are on dams like that across the Oswegatchie which will induce the pikeperch to ascend them.

Undoubtedly the applicants desire to facilitate the ascent of the pikeperch which run the river at the city of Ogdensburg at this season of the year for the purpose of spawning.

You have doubtless seen the leaflet of the United States Bureau of Fisheries on this subject. The author of it is an engineer who has been identified with the United States Bureau of Fisheries for a great many years, and has planned quite a few fishways; he has also inspected fishways planned by others. His conclusions, as given on page 5 of the accompanying circular, in which he states, "The Bureau lacks information as to the efficient operation of any existing

fishway in the United States at dams more than 20 feet in height," could probably be applied with equal force to many dams no higher than the one at Ogdensburg. However, I am not informed as to the height of the dam there.

I hesitate about recommending constructions which cause the dam owners large expense, unless the commission is prepared to demonstrate that the proposed constructions will facilitate the passage of valuable food fishes to the upper waters, and is also prepared to furnish plans for such proposed fishways.

Yours very truly,

John W. Titcomb

Fish Culturist.

JWT
CAP

Encl.

Ogdensburg City Engineer Dec. 1 '20. Also built by Commission of the Oswegatchie Water Power Co. Trus C O R Bell, Joseph Hall and John Dorsey, Commissioners

Form 1W51 6 18 13 2000 (14 15288)

(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

February 19 (Date), 1913

6 Oswg. ?

CONSERVATION COMMISSION,

DIVISION OF INLAND WATERS.

GENTLEMEN:

I have the honor to make the following report in relation to the structure known as the Ogdensburg Water Power Co. ? Dam.

This dam is situated upon the Oswegatchie River (Give name of stream) in the Town of Oswegatchie, St Lawrence County, about center (State distance) from the Village or City of Ogdensburg.

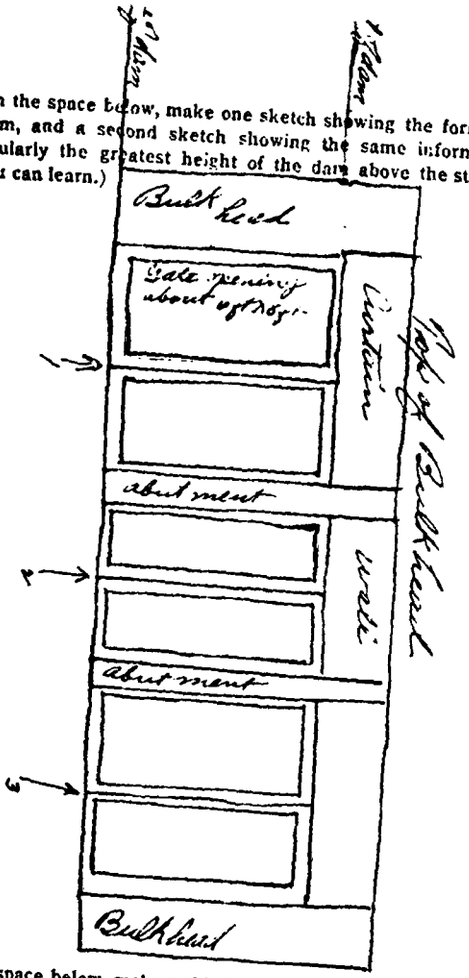
The distance down (Up or down) stream from the dam, to the St Lawrence river (Give name of nearest important stream or of a bridge), is about 1/4 mile (State distance).

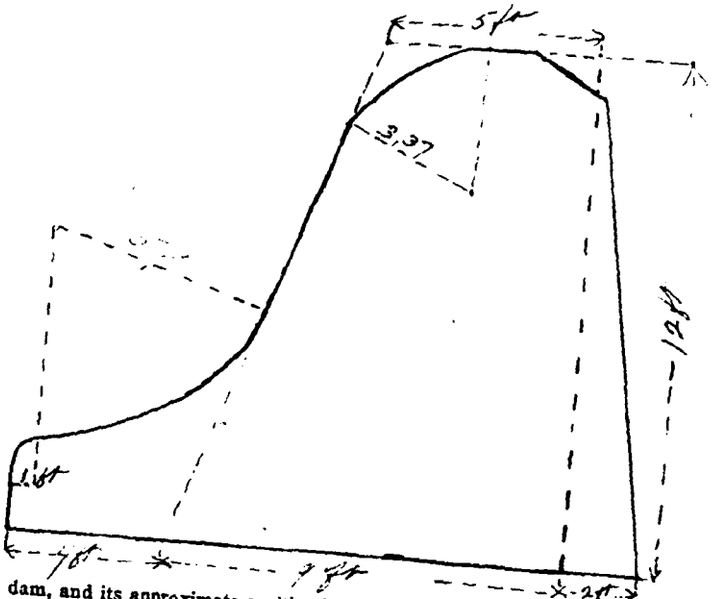
The dam is now owned by Ogdensburg Water Power Co. (Frank Chapman, John Hannan, C.O.R. Bell — referees) (Give name in full), and was built in or about the year 1910, and was extensively repaired or reconstructed during the year 1910.

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

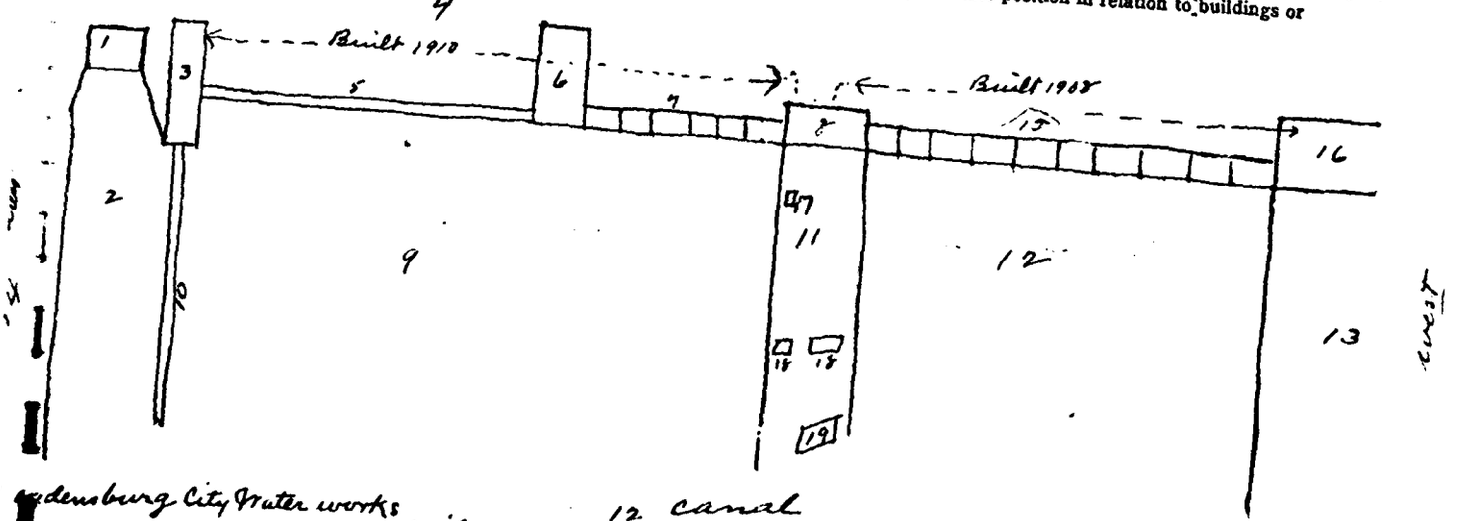
As nearly as I can learn, the character of the foundation bed under the spillway portion of the dam is Bedrock and under the remaining portions such foundation bed is Bed rock.

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





(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.)



1 Ogdensburg City Water works
2 " " " " tail race
3 Bulk head
4 Oswegatchie river 9 Oswegatchie R.
5 Dam
6 Bulk head
7 Spillway
8 Abutment
10 Strip of Land
12 Canal
13 Land
14 Land
15 Canal bulk head gates 18 in number each gate 7 X 6ft 4½ in
16 Abutment
17 Small building, used to put tools in.
18 Hydraulic valves
19 Proctor Mfg Co. Lumber

The total length of this dam is about 410 feet. The spillway or waste-weir portion, is about 36 feet long, and the crest of the spillway is about 12 feet below the top of the dam.

The number, size and location of discharge pipes, waste pipes or gates which may be used for drawing off the water from behind the dam, are as follows: 6

6 X 8 ft West end of dam

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

The dam in my judgment is in good condition

The dam was built about 6 or 8 ft below the old timber dam which was left in place It was earth filled as near as I can learn

Reported by John H. Mallette
(Signature)

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

Ogdensburg, N.Y.
(Name of place)

(SEE OTHER SIDE)

SEP 21 1914

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

STATE OF NEW YORK

CONSERVATION COMMISSION

ALBANY

6

DAM REPORT

September 17, 1914
(Date)

CONSERVATION COMMISSION,

DIVISION OF INLAND WATERS.

GENTLEMEN:

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

This dam is situated upon the Oswegatchie River (Give name of stream) in the Town of Oswegatchie, St. Lawrence County, ~~[illegible]~~ in (State distance) ~~[illegible]~~ the ~~[illegible]~~ City of Ogdensburg.

The distance down (Up or down) stream from the dam, to the Ogdensburg Bridge (Tower, (Give name of nearest important stream or of a bridge) is about 1/4 miles (State distance).

The dam is now owned by Ogdensburg Water Power Owners, Ogd., N.Y. (Give name in full) and was built in or about the year 1911, and was extensively repaired or reconstructed during the year ———.

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

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

The total length of this dam is 500 feet. The spillway or waste-weir portion, is about 350 feet long, and the crest of the spillway is about 6 feet below the top of the dam.

The number, size and location of discharge pipes, waste pipes or gates which may be used for drawing off the water from behind the dam, are as follows: six waste gates, each 6 ft. wide & 8 ft. deep (see general view)

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

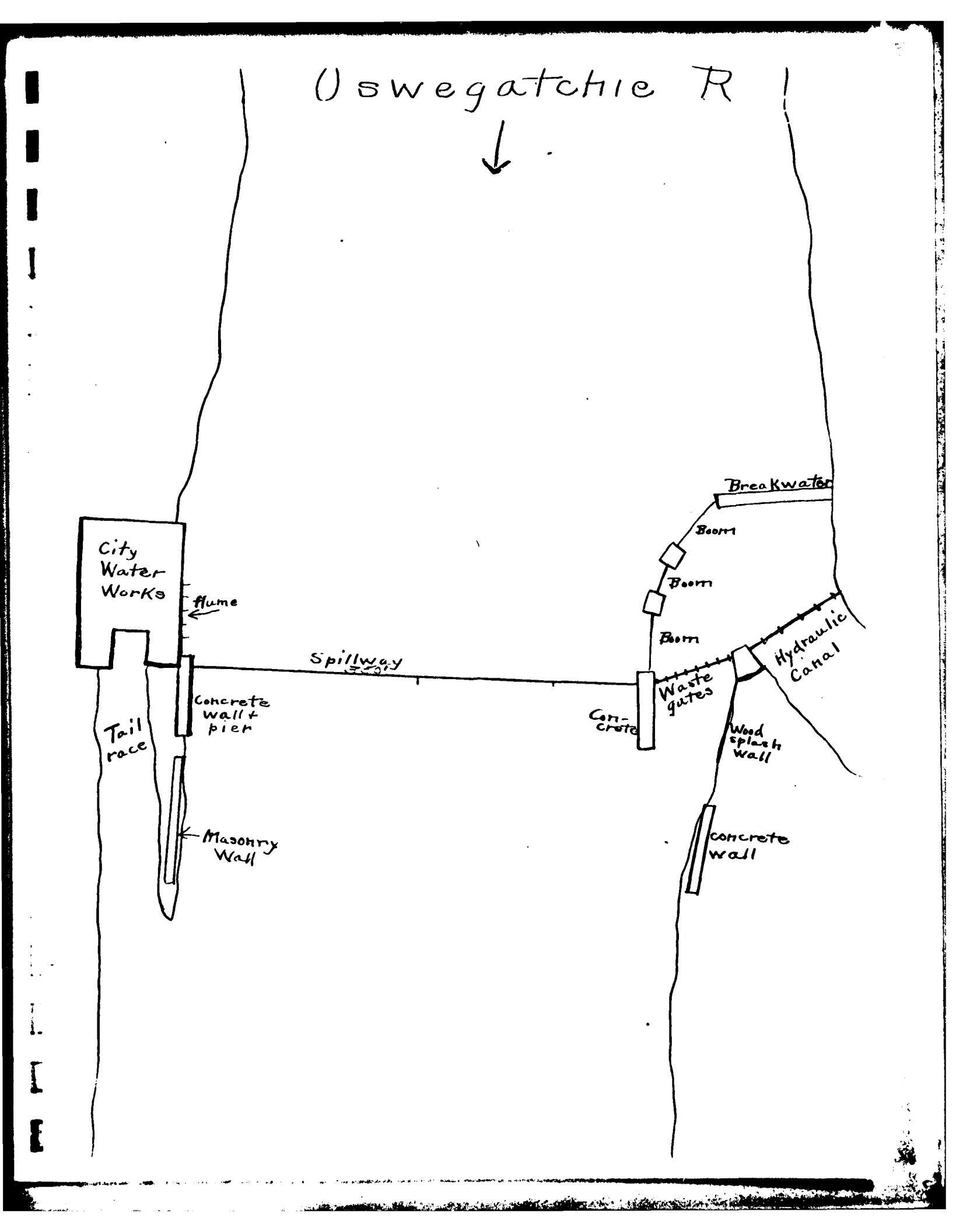
This dam is in good condition and does not leak. The fishway which was built with the dam has been taken out by the ice.

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

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

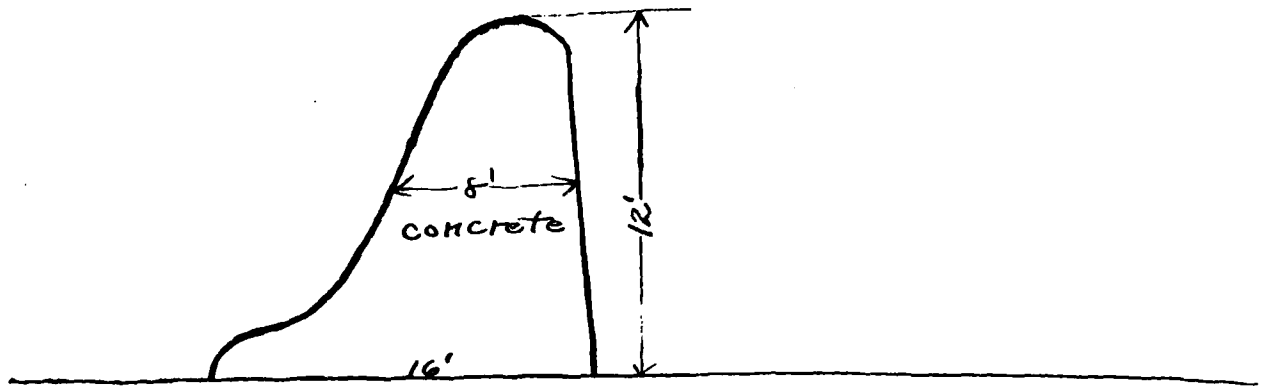
Syracuse, N. Y.
(Name of place)

(SEE OTHER SIDE)


Oswegatchie R
Breakwater
Boom
Boom
Boom
City Water Works
flume
Spillway
Hydraulic Canal
Waste gates
Concrete wall + pier
Tail race
Wood splash wall
Masonry Wall
concrete wall

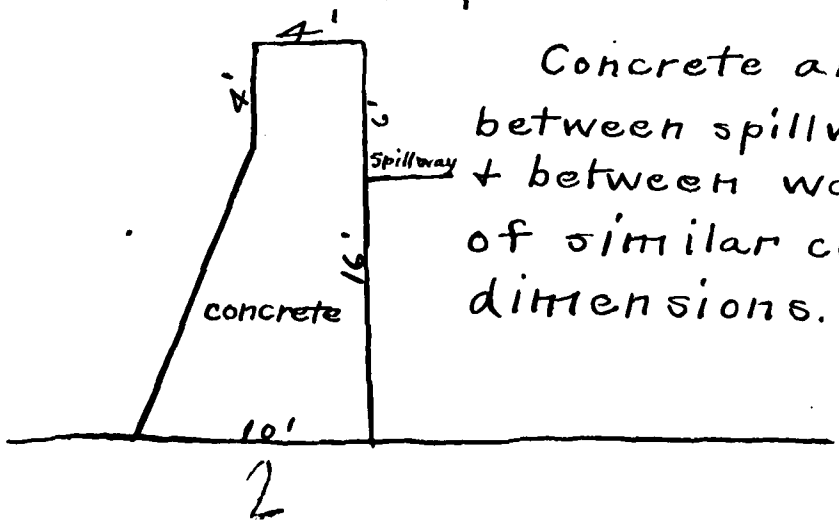
(In the space below, make one sketch showing the form and dimensions of a cross section through the spillway or waste-weir of this dam, and a second sketch showing the same information for a cross section through the other portion of the dam. Show particularly the greatest height of the dam above the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

Spillway section



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

Section through
concrete wall + pier



Concrete abutments in center between spillway + waste gates + between wastegates + canal, of similar construction and dimensions.

2

16 Use che

(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

July 1 (Date), 1916.

CONSERVATION COMMISSION,

DIVISION OF INLAND WATERS.

GENTLEMEN:

I have the honor to make the following report in relation to the structure known as the Ogdensburg Water Power Property Dam.

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

in the Town of Ogdensburg, St. Lawrence County,

about in ft. (State distance) from the ~~Village or City~~ of Ogdensburg.

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

is about 1000 feet (State distance).

The dam is now owned by Ogdensburg Light and Power Co. (Give name and address in full)

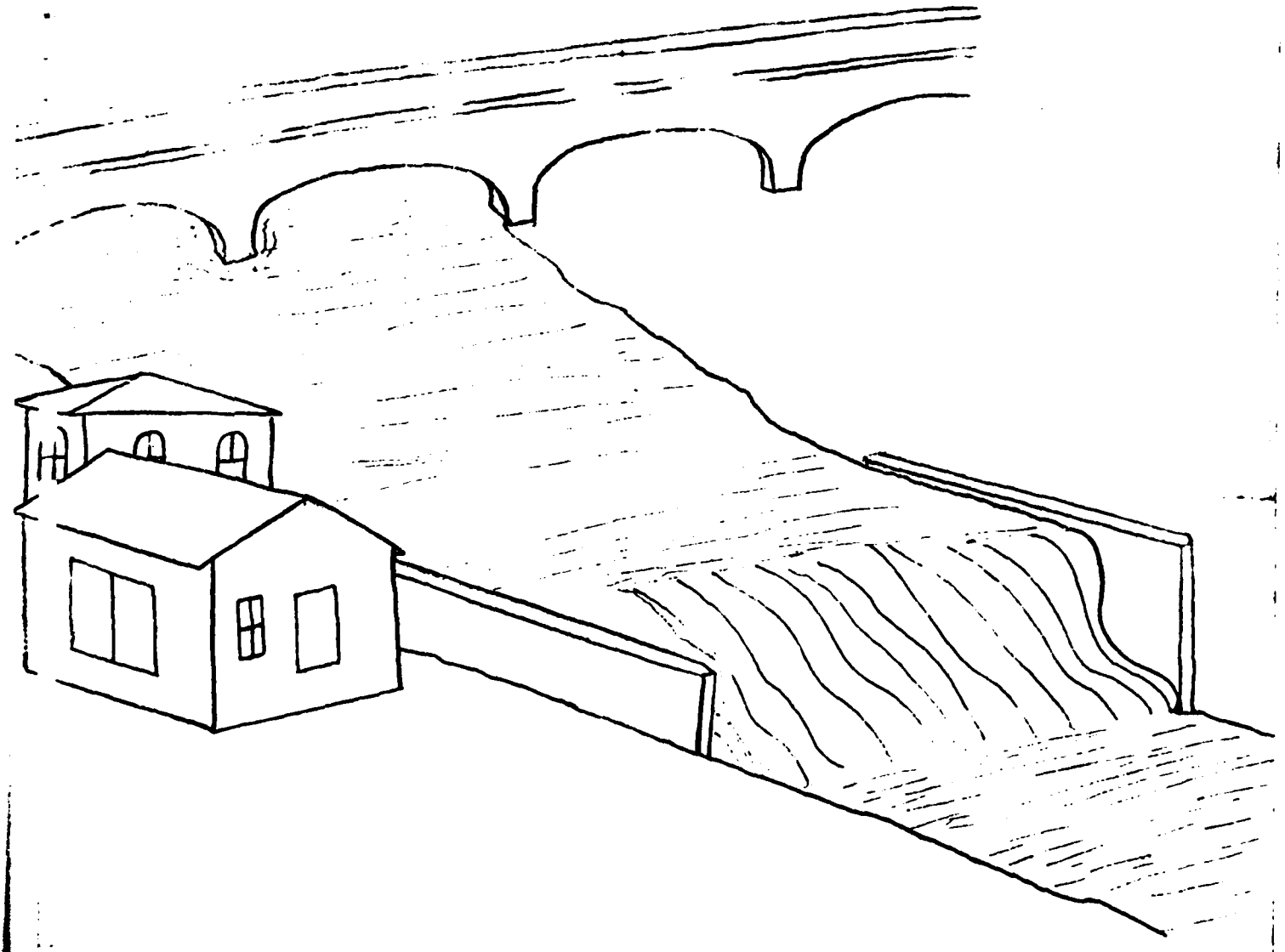
and was built in or about the year 1855, and was extensively repaired or reconstructed during the year 1903.

As it now stands, the spillway portion of this dam is built of No spillway. Water flows over entire length of dam (State whether of masonry, concrete or timber)

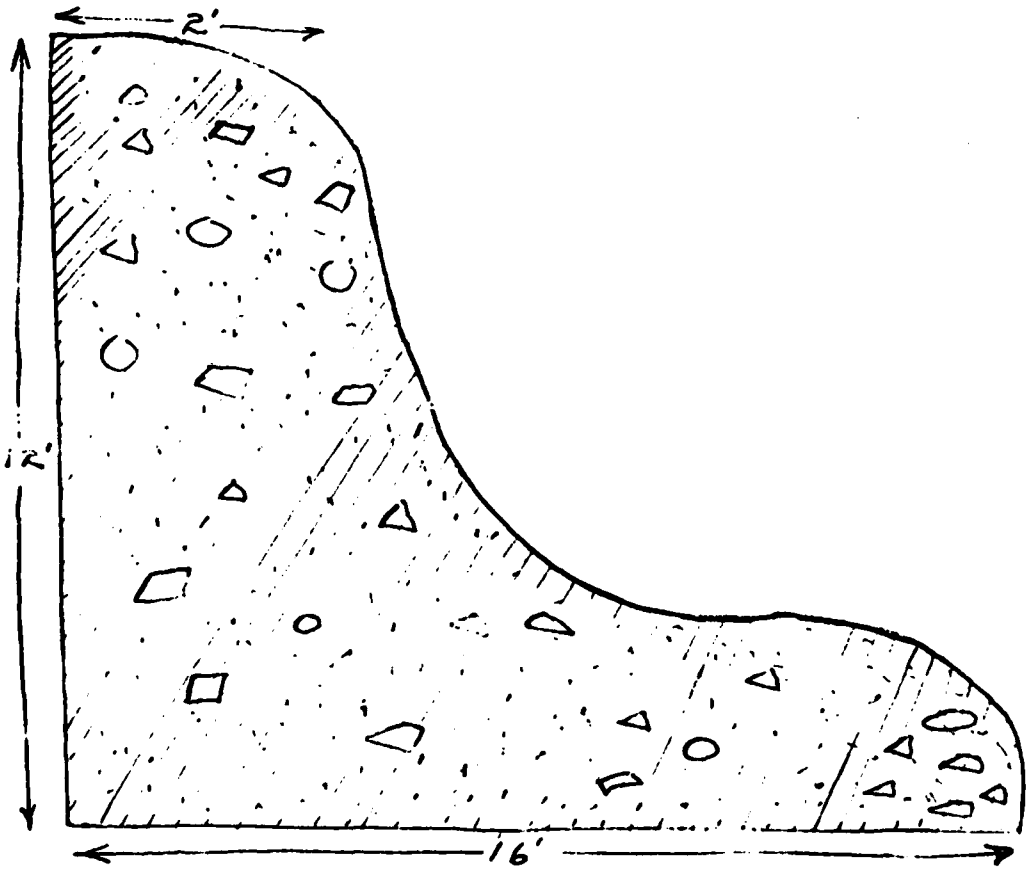
and the other portions are built of Concrete (State whether of masonry, concrete, earth or timber with or without rock fill)

As nearly as I can learn, the character of the foundation bed under the spillway portion of the dam is ——— and under the remaining portions such foundation bed is [illegible]

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



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



The total length of this dam is 350 feet. The ~~spillway or~~ flood gates or waste-weir portion, is about Thirty feet long, and the crest of the spillway is about ~~feet~~ below the top of the dam.

The number, size and location of discharge pipes, waste pipes or gates which may be used for drawing off the water from behind the dam, are as follows: 58 Openings Size 4'x5' Located at diff. ent mills.

At the time of this inspection the water level above the dam was 1 ft. ~~in.~~ ~~below~~ above the crest of the spillway.

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

The dam appeared to be in very good condition and did not seem to have any leaks in or around it. It is practically a new dam and was put in on the down stream side of an old timber dam which helped to relieve the pressure upon it.

Reported by M H Montross
(Signature)

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

Glenwood, New Mex.

S 22-21 3000 (6-1266)

RECEIVED
OFFICE OF STATE ENGINEER
MAR 19 1925
REF'D TO
ANS'D

STATE OF NEW YORK

DEPARTMENT OF

State Engineer and Surveyor

ALBANY

Report of a Structure Impounding Water

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

1. The structure is on Oswegatchie River flowing into St. Lawrence in the Town of Oswegatchie County of St. Lawrence and City of Ogdensburg, North of LaFayette Bridge and South-East of Lake Street Bridge,

(Give exact distance and direction from a well-known bridge, dam, village main cross-roads or mouth of a stream)

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

3. The name and address of the owner is Ogdensburg Water Power Property Ogdensburg, N. Y. - managed by three Referees appointed by Supreme Cou

4. The structure is used for Impounding water for Power purposes

5. The material of the right bank, in the direction with the current, is Concrete retaining wall; at the spillway crest elevation this material ~~has a top slope of~~ Flat on top-concrete, ~~inches vertical to a foot horizontal on the center line of the structure, a vertical thickness at this elevation of~~ from bed rock, ~~feet~~, and the top surface extends for a vertical height of 7 feet above the spillway crest.

6. The material of the left bank is clay loam, : has a top slope of flat on top, inches to a foot horizontal, a thickness of ✓ feet and a height of Gradual rise back from river, feet.

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

8. State the character of the bed and the banks in respect to the hardness, perviousness, water bearing, effect of exposure to air and to water, uniformity, etc. Bed is bed rock and is hard and impervious non water bearing, no effect of exposure to air and water and is uniform. Banks are fairly hard, impervious non water bearing, exposure to air and water having little effect and are uniform.

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

10. What is the thickness of the layers? 2" to 5"

11. Are there any porous seams or fissures? No

12. The watershed at the above structure and draining into the pond formed thereby is 1580 square miles.

13. The pond area at the spillway crest elevation is Approximately 160 acres and the pond impounds 69,000,000 cubic feet of water.

14. The maximum known flow of the stream at the structure was 15,200 cubic feet per second on April 10, 1912, (Date)

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

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

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

Several boathouses on right bank might be damaged. Buildings of Proctor Manufacturing Company and buildings belonging to James McCasland on left bank might be flooded temporarily. Proctor Manufacturing Company are Manufacturers of lumber and mill work and James McCasland has hub factory.

17. WASTES. The spillway of the above structure is 300 feet long in the clear; the waters are held at the right end by a retaining wall of City Water Works, 6'9 3/4" the top of which is feet above the spillway crest, and has a top width of 4 feet; and at the left end by a Power Canal, the top of which is 7 feet above the spillway crest, and has a top width of ------ feet.

18. There is also for flood discharge a pipe ---------- inches inside diameter and the bottom is ------ feet below the spillway crest; and a (sluice, gate outlet) ---- feet wide in the clear by ------- feet high, and the bottom is. ------ feet below the spillway crest.

19. Apron. Below the spillway there is an apron built of concrete, (Material) feet wide and feet thick. The downstream side of the apron has a thickness of 1 1/2 to 2 feet for a width of tapers up into dam, feet.

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

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

22. Water Supply. The waters impounded by the above structure have (not) been used for a public water supply since July 1912 by City of Ogdensburg,

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

C. O. R. Bell, J. E. Fell, John Dorsey,
(Name of owner) (Signature)

March 18, 1925.
(Date)

Referees, Ogdensburg Water Power Propert.
Ogdensburg, N. Y.
(A person signing for owner should indicate his title or authority)

DNR DAM INSPECTION REPORT

23	45	08	000006	090971	037	4
RS	CTY	YR AP.	DAM NO.	INS. DATE	USE	TYPE

AS BUILT INSPECTION

1	Location of Sp'way and outlet	Hydraulic Canal Blocked off	1	Elevations	
3	Size of Sp'way and Outlet		3	Geometry of Non-overflow section	

1 GENERAL CONDITION OF NON-OVERFLOW SECTION

1	Settlement		2	Cracks	1 Deflections
1	Joints		2	Surface of Concrete	2 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

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

1	Maintenance	C	Hazard Class
3	Evaluation	3	Inspector

COMMENTS:

The Hydraulic Canal That originally went to a power house has been filled in

Dam is in good condition

... below and buildings on the shore make this ... hazard

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

ITEMS 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

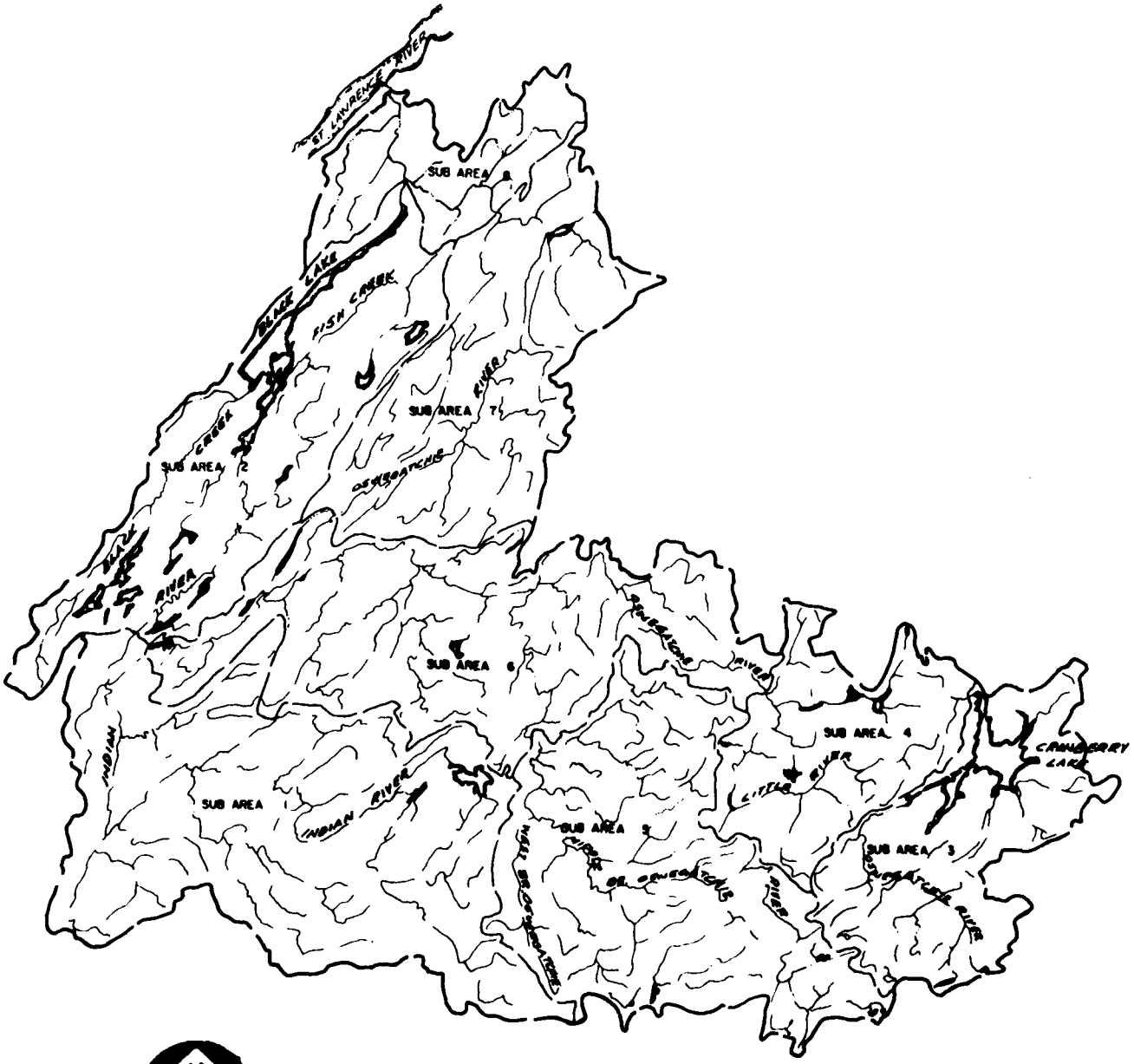
STATE ABBREVIATION: NY

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	RICHLYOND
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

APPENDIX C

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

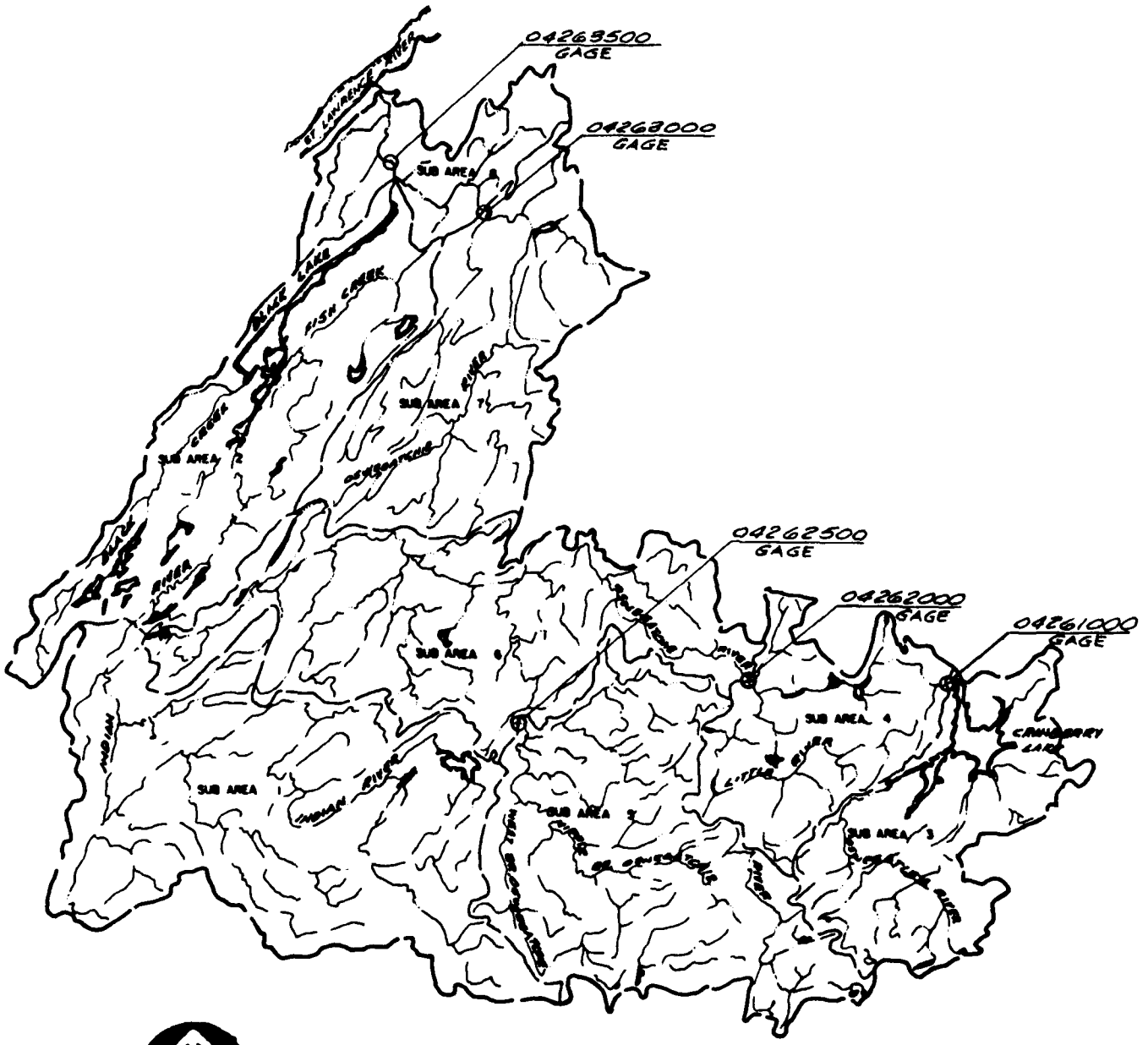


SCALE: 1" = 8 MI. ±

DRAINAGE BASIN

LEGEND

— — — — WATERSHED AREA
— ——— — SUB AREA



SCALE: 1" = 8 MI.±

LEGEND

— — — — WATERSHED AREA
— — — — SUB AREA

DRAINAGE BASIN

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TEL 315-797-5800

DESIGN BRIEF

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

SUBJECT Ogdensburg Water Power Co. PROJECT NO.

Sub-Basin Areas DRAWN BY

Sub-Area	Area	Area of Major Lakes
1	341 mi²	1.68 mi²
2	218	19.35
3	144	10.76
4	19	3.13
5	8	2.30
6	258	1.85
7	194	
8	48	
9	27	

Total = 1607 mi²

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DESIGN BRIEF

PROJECT NAME N.Y.S. Dam Inspections DATE

OBJECT Ogdensburg W.P. Co. Dam PROJECT NO.

Snyder Parameters DRAWN BY

$t_p = C_t (L \times L_{CA})^{0.3}$ $(C_t = 3)$

Sub-Area	L	L_{CA}	
1	59.6 mi	34.7 mi	27.7
2	21.3	7.5	13.8
3	15.8	6.7	12.1 +.6* = 12.7
4	21.3	14.6	16.8
5	34.5	13.4	18.9
6	39.85	22.1	23.0
7	29.6	11.05	17.1
8	13.8	6.7	11.7
9	11.84	5.13	10.2

* Adjusted for travel time thru lakes

Travel Time Thru Lakes

	Length	Avg. Depth	$V = \sqrt{gD_m}$	Lag
Cranberry Lake	48,000'	16'	22.7 fps	0.6 hr.
Black Lake				
Sub-area 1 Hydrograph	46,000'	12'	19.7	1.35 hr.
Sub-area 2 Hydrograph	77,000'			1.1 hr.

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DESIGN BRIEF

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

SUBJECT Ogdensburg W.T. Co. Dam PROJECT NO.
Precipitation Values DRAWN BY

Longitude ~ 75°30' Latitude ~ 44°15'

PMP = 18" for 200 mi², 24 hr. duration
Adjusting for the drainage area of ~1600 mi² - from HMR #33 (HMR #33 curves only extend to areas = 1000 mi² therefore values for area = 160 mi² were extrapolated)

Duration	% of Index
6 hr	45
12	59
24	70
48	77

24 hr. Storm, Point Precipitations

Storm	Point Precipitation	Adjusted Precip. Areal Adjustment factor ~.91
1 yr.	2.1	1.9
2	2.4	2.2
5	3.1	2.8
10	3.5	3.2
25	4.	3.6
50	4.5	4.1
100	4.8	4.37
500	5.8	5.3

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DESIGN BRIEF

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

SUBJECT Ogdensburg Dam NY #400 PROJECT NO.

Spillway Rating Curve DRAWN BY

Length = 350'

Design Head, Assumed $H_d = 5.5'$ based on spillway geometry

$Q = C L H^{3/2}$ C from Fig. 14-4 - Open Channel Hydraulics by Chow

$h/H_d = 12/5.5 > 1.33$ $C_d = 4.03$

Elev.	He.	He./Hd	C/Cd	C	Q (cfs)
258	0	—			0
259	1	.18	.78	3.14	1100
260	2	.36	.855	3.45	3415
261	3	.55	.915	3.69	6710
262	4	.73	.96	3.87	10,835
263	5	.91	.98	3.95	15,455
264	6	1.1	1.01	4.07	20,935
265	7	1.3	1.02	4.11	26,640
266	8	1.5	1.03	4.15	32,865
268	10		1.03	4.15	45,930
270	12		1.03	4.15	60,380
272	14		1.03	4.15	76,085
274	16		1.03	4.15	92,960
276	18			4.15	110,925
278	20			4.15	129,915

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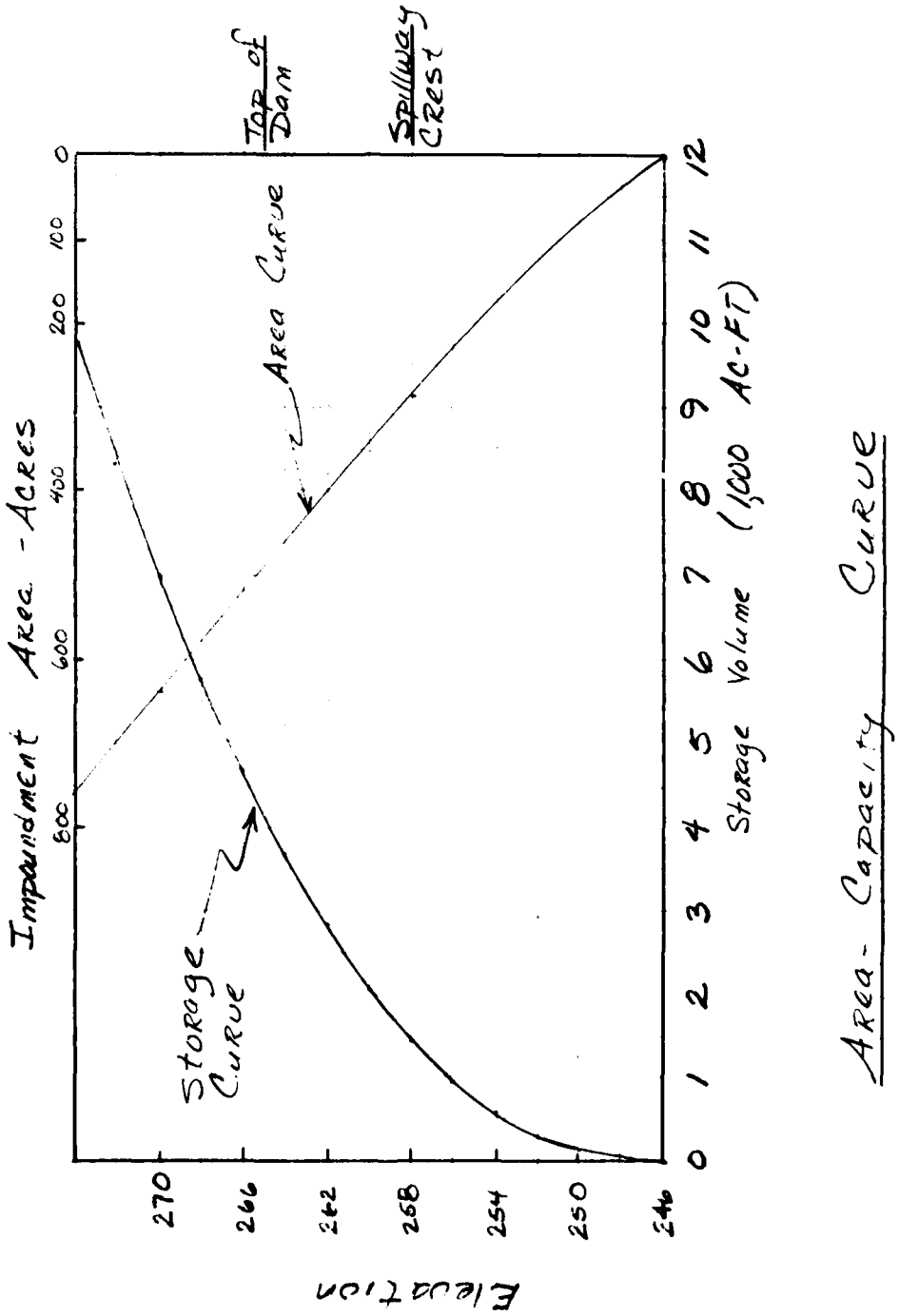
DESIGN BRIEF

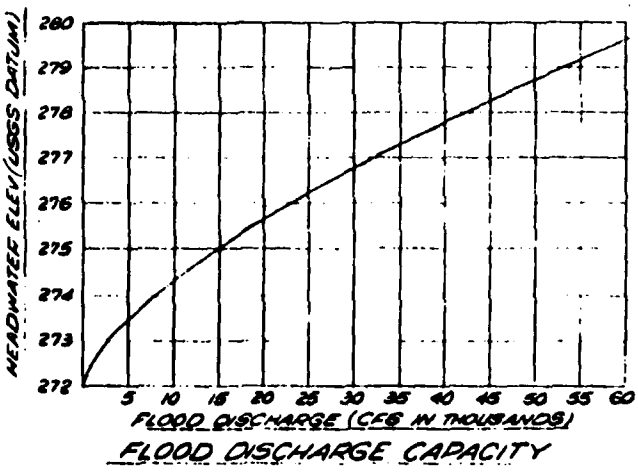
PROJECT NAME N.Y.S. Dam Inspections - 1980 DATE

BJECT Ogdensburg W.F. Co. Dam PROJECT NO

DRAWN BY



Area - Capacity Curve



FLOOD DISCHARGE CAPACITY

THIS DRAWING IS A PART OF THE APPLICATION FOR LICENSE MADE BY THE UNDERSIGNED THIS 30TH DAY OF NOVEMBER 1970

NIAGARA MOHAWK POWER CORPORATION

BY

TITLE VICE PRESIDENT & CHIEF ENGINEER

NIAGARA MOHAWK POWER CORPORATION

SYRACUSE N. Y.

CONSTRUCTED OSWEGATCHIE RIVER PROJECT

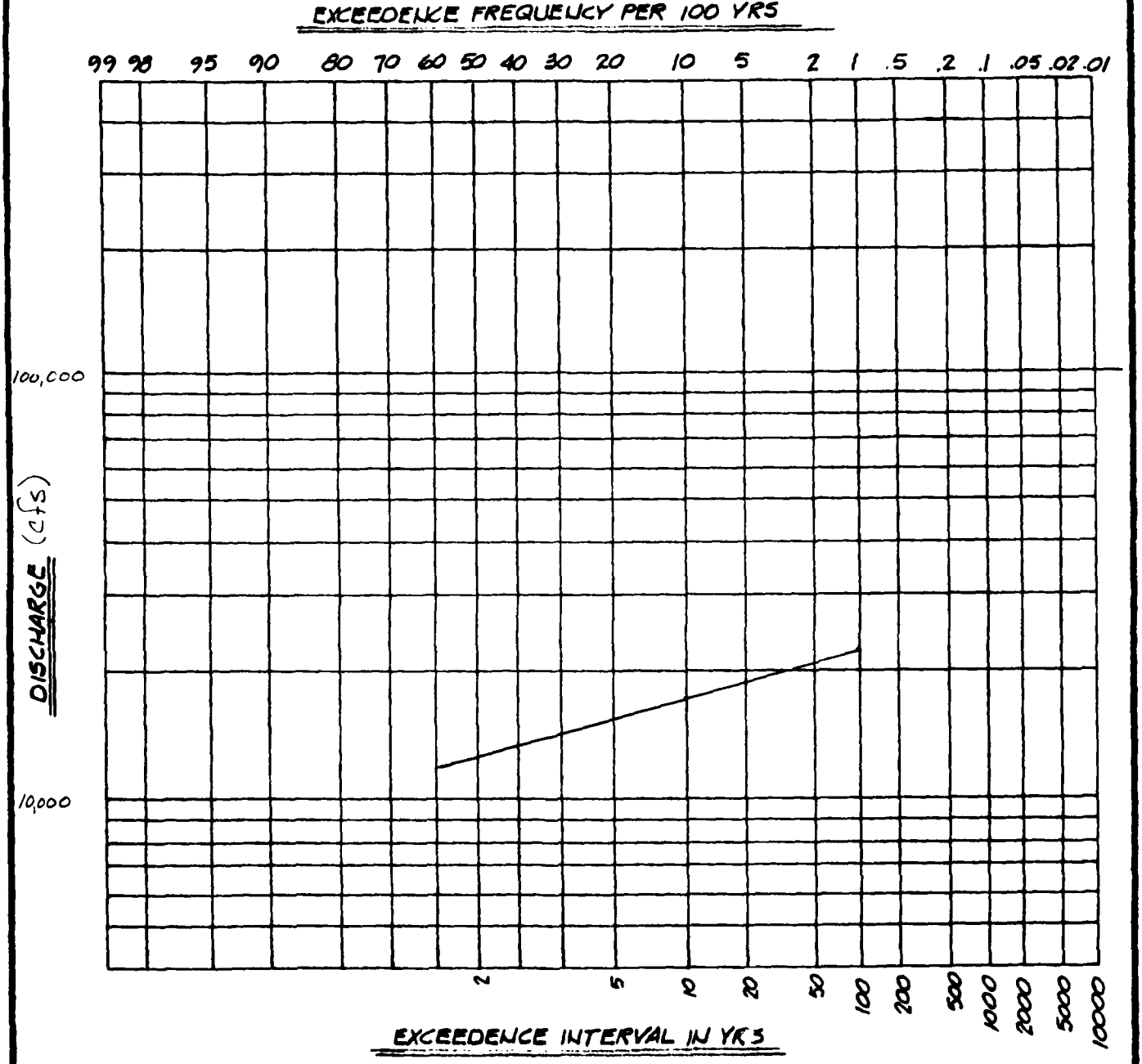
EEL WEIR DEVELOPMENT

GENERAL PLAN - DAM, INTAKE AND SPILLWAY

EXHIBIT L PLAN, ELEVATIONS AND SECTIONS SHEET NO 7

SCALE 1" = 50'

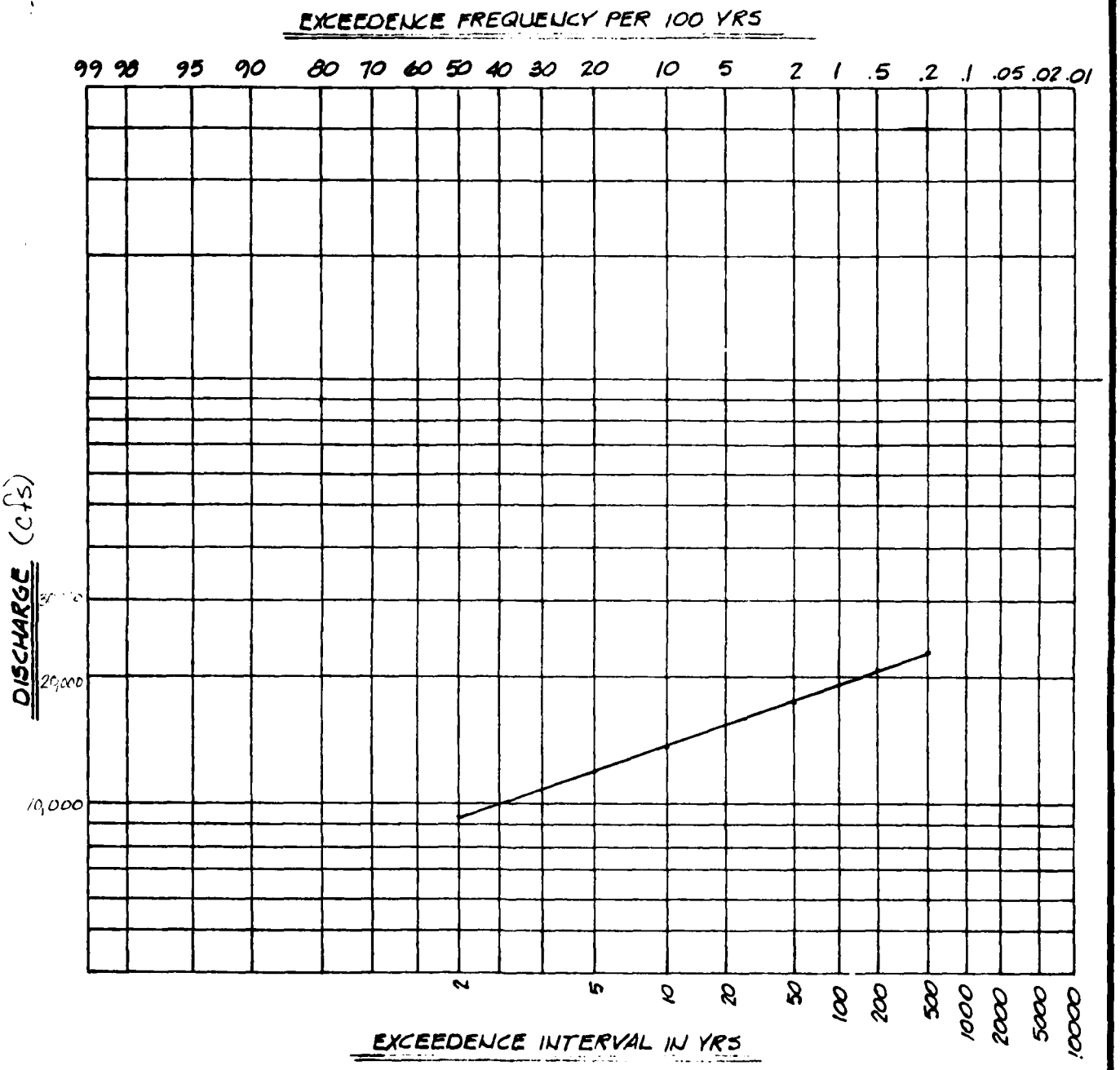
0 50 100 200 300 400



DISCHARGE - FREQUENCY CURVE

STETSON • DALE

DATE		DRAWN JPG	U.S.G.S. Gage No. 04263500 Near Ogdensburg STA. 800
JOB		APP'D	



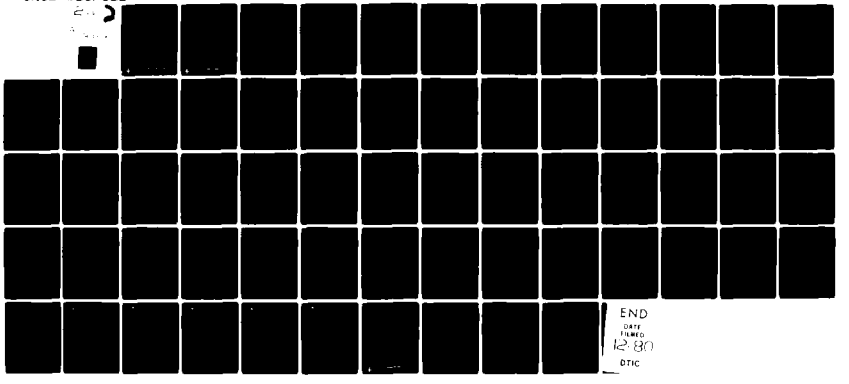
DISCHARGE - FREQUENCY CURVE

STETSON • DALE

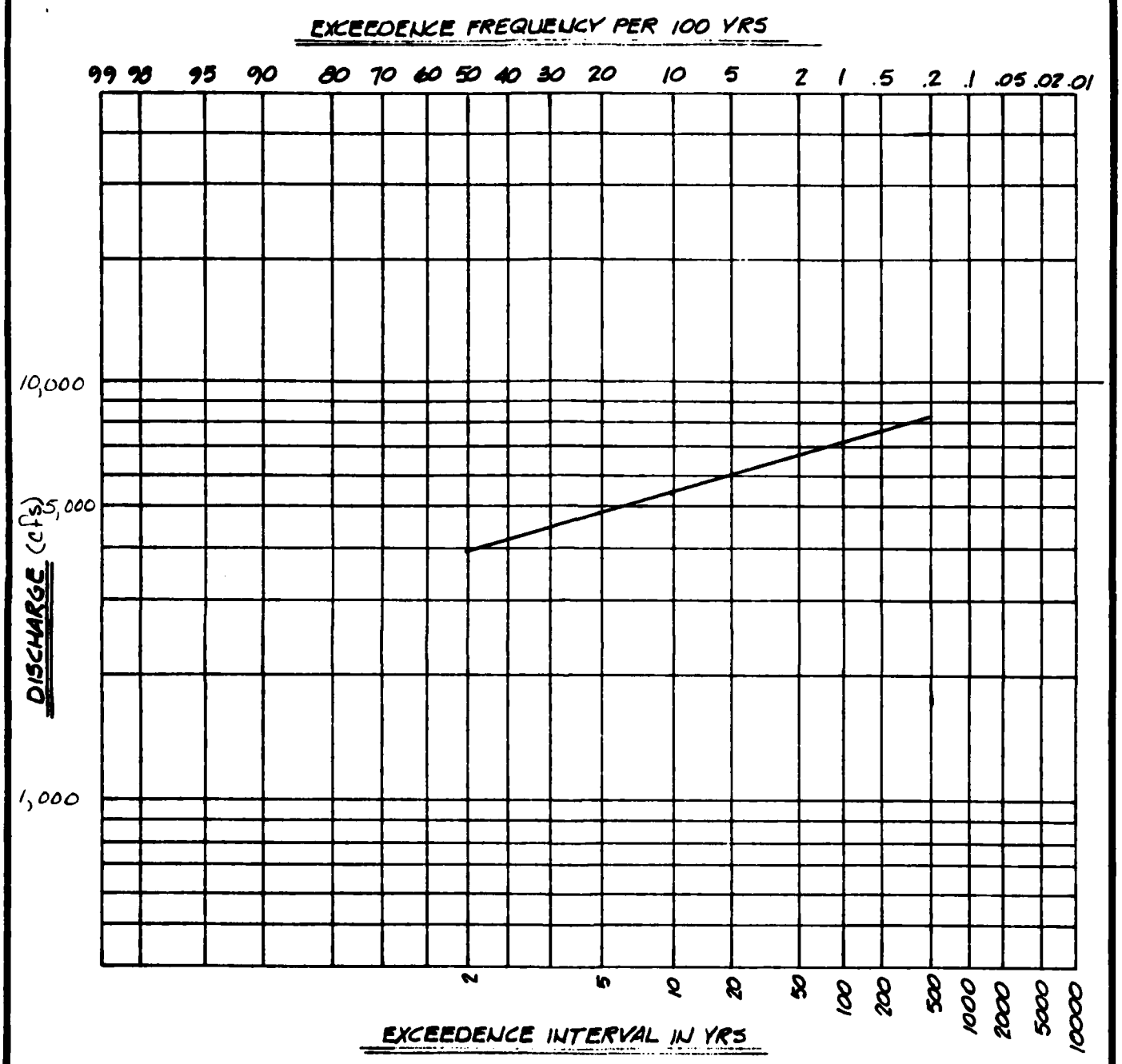
DATE	DRAWN JPG	Heuvelton Gage No. 04263000
JOB	APP'D	STA. 700

AD-A091 076 NEW YORK STATE DEPT OF ENVIRONMENTAL CONSERVATION ALBANY F/G 13/13
NATIONAL DAM SAFETY PROGRAM. OGDENSBURG WATER POWER COMPANY DAM--ETC(U)
SEP 80 J B STETSON DACW51-79-C-0001

UNCLASSIFIED NI

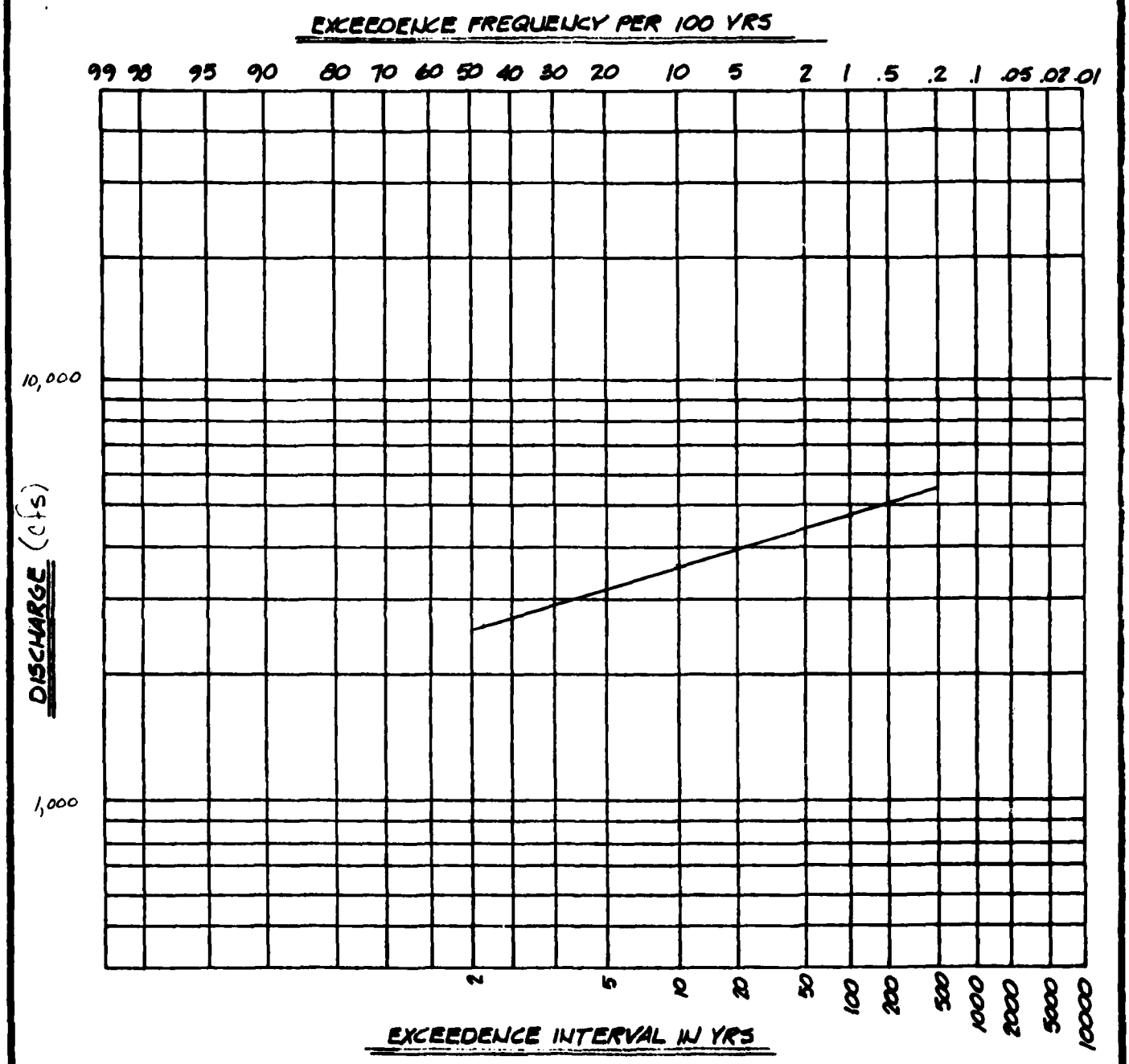


END
DATE FILMED
12-80
DTIC



DISCHARGE - FREQUENCY CURVE

STETSON • DALE	DATE	DRAWN JPG	U.S.G.S. Gage No. 04262500 Harrisville, NY STA 500
	JOB	APP'D	



DISCHARGE - FREQUENCY CURVE

STETSON • DALE

DATE	DRAWN JPG	U.S.G.S. Gage No. 04262000 Oswegatchie, NY
JOB	APP'D	STA. 400

```
(0001)   A1       OGDENSBURG WATER POWER CO. DAM NY 400
(0002)   A2       HEC-1DB (SNYDER PARAMETERS)
(0003)   A3       PMF - DAM OVERTOPING ANALYSIS
(0004)   B     288         1         0         0         0         0         0         0         4
(0005)   B1      5
(0006)   J       1         2         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        1 RUNOFF SUBAREA 1
(0010)   M       1         1       341         0      1607         0         0         0         1
(0011)   P       0      18.        45        59        70        77
(0012)   T       0         0         0         0         0         0       1.0       0.1         0   0.005
(0013)   W    29.7     0.550
(0014)   X    -2.0     -0.20       1.3
(0015)   K       1       201         0         0         0         0         1
(0016)   K1        2 ROUTE TO BLACK LAKE
(0017)   Y       0         0         0         0         1
(0018)   Y1      1         0         0      4.00       0.2
(0019)   K       1       201         0         0         0         0         1
(0020)   K1        3 ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THRU BLACK LAKE
(0021)   Y       0         0         0         0         1
(0022)   Y1      3         3         1
(0023)   K       0       200         0         0         0         0         1
(0024)   K1        4 RUNOFF SUBAREA 2
(0025)   M       1         1       216         0      1607         0         0         0         1
(0026)   P       0      18.        45        59        70        77
(0027)   T       0         0         0         0         0         0       1.0       0.1         0   0.089
(0028)   W    13.8     0.550
(0029)   X    -2.0     -0.20       1.3
(0030)   K       1       201         0         0         0         0         1
(0031)   K1        5 ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THRU BLACK LAKE
(0032)   Y       0         0         0         0         1
(0033)   Y1      0         3         1
(0034)   K       2       200         0         0         0         0         1
(0035)   K1        6 COMBINE 2 HYDROGRAPHS AT BLACK LAKE  1+2=2
(0036)   K       0       300         0         0         0         0         1
(0037)   K1        8 RUNOFF SUBAREA 3
(0038)   M       1         1       144         0      1607         0         0         0         1
```

```
(0039)   P        1      18.       45       59       70       77
(0040)   T        0       0         0        0        0        0      1.0      0.1        0    0.075
(0041)   W     12.7    0.550
(0042)   X     -2.0    -0.20      1.3
(0043)   K        1      300       0        0        0        0        1
(0044)   K1        10 ROUTE THRU AND OVER CRANBERRY LAKE
(0045)   Y        0       0         0        1
(0046)   Y1       1       0         0        0        0        0    -1490       -1
(0047)   Y4    1490    1492      1494     1496     1498     1500     1502
(0048)   Y5       0    1855      3800     7870    13340    19880    27315
(0049)   $S       0   15040     31745    50110    70145    91840   115200
(0050)   $E    1490    1492      1494     1496     1498     1500     1502
(0051)   $$    1490
(0052)   $D    1493     2.6       1.5        1
(0053)   K        1      400       0        0        0        0        1
(0054)   K1        11 ROUTE THRU AREA 4
(0055)   Y        0       0         0        0        1
(0056)   Y1       1       0         0      2.6     0.35
(0057)   K        0      400       0        0        0        0        1
(0058)   K1        12 RUNOFF SUBAREA 4
(0059)   M        1       1       119        0     1607        0        0        0        1
(0060)   P        0      18.       45       59       70       77
(0061)   T        0       0         0        0        0        0      1.0      0.1        0    0.026
(0062)   W    16.8    0.550
(0063)   X     -2.0    -0.20      1.3
(0064)   K        2      400       0        0        0        0        1
(0065)   K1        13 COMBINE 2 HYDROGRAPHS AT 400,  3+4=4
(0066)   K        1      601       0        0        0        0        1
(0067)   K1        15 ROUTE TO CONFLUENCE WITH AREA 5
(0068)   Y        0       0         0        0        1
(0069)   Y1       1       0         0      3.7     0.35
(0070)   K        0      500       0        0        0        0        1
(0071)   K1        15 RUNOFF SUBAREA 5
(0072)   M        1       1       256        0     1607        0        0        0        1
(0073)   P        0      18.       45       59       70       77
(0074)   T        0       0         0        0        0        0      1.0      0.1        0    0.009
(0075)   W    18.9    0.550
(0076)   X     -2.0    -0.20      1.3
```

```
(0077)   K       1     601       0        0        0        0        1
(0078)   K1       16 ROUTE TO CONFLUENCE WITH AREA 4
(0079)   Y       1       0        0        0        1
(0080)   Y1      1       0        0      1.9     0.35
(0081)   K       2     601       0        0        0        0        1
(0082)   K1       17 COMBINE 2 HYDROGRAPHS AT 601.  5+4=4
(0083)   K       1     600       0        0        0        0        1
(0084)   K1       18 ROUTE THRU AREA 6
(0085)   Y       0       0        0        0        1
(0086)   Y1      1       0        0      4.5     0.35
(0087)   K       0     600       0        0        0        0        1
(0088)   K1       19 RUNOFF SUBAREA 6
(0089)   M       1       1      258        0     1607        0        0        0        1
(0090)   P       0     18.       45       59       70       77
(0091)   T       0       0        0        0        0        0      1.0      0.1        0    0.007
(0092)   W   23.0    0.550
(0093)   X   -2.0   -0.20      1.3
(0094)   K       2     600       0        0        0        0        1
(0095)   K1       20 COMBINE 2 HYDROGRAPHS AT 600  4+6=6
(0096)   K       1     700       0        0        0        0        1
(0097)   K1       21 ROUTE THRU AREA 7
(0098)   Y       0       0        0        0        1
(0099)   Y1      1       0        0     10.7     0.25
(0100)   K       0     700       0        0        0        0        1
(0101)   K1       22 RUNOFF SUBAREA 7
(0102)   M       1       1      194        0     1607        0        0        0        1
(0103)   P       0     18.       45       59       70       77
(0104)   T       0       0        0        0        0        0      1.0      0.1        0    0.003
(0105)   W   17.1    0.550
(0106)   X   -2.0   -0.20      1.3
(0107)   K       2     700       0        0        0        0        1
(0108)   K1       23 COMBINE 2 HYDROGRAPHS AT 700  7+6=7
(0109)   K       1     801       0        0        0        0        1
(0110)   K1       24 ROUTE TO CONFLUENCE WITH AREA 2
(0111)   Y       0       0        0        0        1
(0112)   Y1      1       0        0      1.9      0.2
(0113)   K       0     800       0        0        0        0        1
(0114)   K1       25 RUNOFF SUBAREA 8
```

```
(0115)   M      1       1       48       0     1607       0       C       C       1
(0116)   P      .     18.       45      59       70      77
(0117)   T      0       0        0       0        0       0     1.0     0.1       0   0.003
(0118)   W   11.7   0.550
(0119)   X   -2.0   -0.20     1.3
(0120)   K      3     800        3       0        0       0       1
(0121)   K1        26 COMBINE 3 HYDROGRAPHS  2+7+8=8
(0122)   K      1     901        0       0        0       0       1
(0123)   K1        27 ROUTE THRU RESERVOIR AND OVER DAM AT EEL WEIR
(0124)   Y      3       0        0       1
(0125)   Y1     1       0        0       0        0       0    -272      -1
(0126)   Y4   272     273      274     275      276     277     278     279     280
(0127)   Y5     0    2500     8000   15000    23000   32000   42300   53000   64000
(0128)   $S     3   18125    40475   67375    99225
(0129)   $E   272     274      276     278      280
(0130)   $$   272
(0131)   $D   280    2.65      1.5     185
(0132)   K      0     900        0       0        0       0       1
(0133)   K1        28 RUNOFF SUBAREA 9
(0134)   M      1       1       27       0     1607       0       C       C       1
(0135)   P      3      18.       45      59       70      77
(0136)   T      3       0        0       0        0       0     1.0     0.1       0   0.003
(0137)   W   10.2   0.550
(0138)   X   -2.0   -0.20     1.3
(0139)   K      2     900        0       0        0       0       1
(0140)   K1        29 COMBINE 2 HYDROGRAPHS AT OGDENSBURG DAM  8+9=9
(0141)   K      1     900        0       0        0       0       1
(0142)   K1        30 ROUTE THRU RESERVOIR AND OVER OGDENSBURG DAM
(0143)   Y      3       0        0       1
(0144)   Y1     1       0        0       0        0       0    -258      -1
(0145)   Y4   258     259      260     261      262     263     264     265     266     268
(0146)   Y4   270     272      274     276      278
(0147)   Y5     0    1100     3415    6710    10835   15455   20935   26640   32865   45930
(0148)   Y5 60380   76085    92960  110925   129915
(0149)   $S     0     560     1450    2080     2820    3685    4665    6980    9780   12750
(0150)   $E   246     254      258     260      262     264     266     270     274     278
(0151)   $$   258
(0152)   $D   265    2.65      1.5     150
```

```
(0153)   K       1      901          0          0          0          1
(0154)   K1        CHANNEL ROUTE DOWNSTREAM OF DAM
(0155)   Y       0          0          0          1          1
(0156)   Y1      1          0          0          0          0          0         -1
(0157)   Y6   0.067     0.035      0.070        245        290       1000     0.0015
(0158)   Y7      15        260        650        250        990        240       1000        245       1300        245
(0159)   Y7    1302        253       1400        280       1650        290
(0160)   K       99
(0161)   A
(0162)   A
(0163)   A
(0164)   A
(0165)   A
```

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT	100
ROUTE HYDROGRAPH TO	201
ROUTE HYDROGRAPH TO	201
RUNOFF HYDROGRAPH AT	200
ROUTE HYDROGRAPH TO	201
COMBINE 2 HYDROGRAPHS AT	200
RUNOFF HYDROGRAPH AT	300
ROUTE HYDROGRAPH TO	300
ROUTE HYDROGRAPH TO	401
RUNOFF HYDROGRAPH AT	400
COMBINE 2 HYDROGRAPHS AT	400
ROUTE HYDROGRAPH TO	601
RUNOFF HYDROGRAPH AT	500
ROUTE HYDROGRAPH TO	601
COMBINE 2 HYDROGRAPHS AT	601
ROUTE HYDROGRAPH TO	600
RUNOFF HYDROGRAPH AT	600
COMBINE 2 HYDROGRAPHS AT	600
ROUTE HYDROGRAPH TO	700
RUNOFF HYDROGRAPH AT	700
COMBINE 2 HYDROGRAPHS AT	700
ROUTE HYDROGRAPH TO	801
RUNOFF HYDROGRAPH AT	800
COMBINE 2 HYDROGRAPHS AT	800
ROUTE HYDROGRAPH TO	901
RUNOFF HYDROGRAPH AT	900
COMBINE 2 HYDROGRAPHS AT	900
ROUTE HYDROGRAPH TO	900
ROUTE HYDROGRAPH TO	901

END OF NETWORK

```
**********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  28 FEB 79
**********************************

RUN  DATE?HED. AUG 16 19.0
     TIME?15:07:14
```

CODENSBURG WATER POWER CO. DAM NY 400
HEC-1DB (SNYDER PARAMETERS)
FAF - DAM OVERTOPING ANALYSIS

JOB SPECIFICATION

NS	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
COE	1	0	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

1 RUNOFF SUBAREA 1

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

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	341.00	0.00	107.00	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	16.00	45.00	59.00	70.00	77.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS 0.91?

LOSS DATA

LROPT	STRKS	DLTKR	RTIOL	ERAIN	STRKS	RTIOR	STRTL	CNSTL	ALSMX	RTIMP
1	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.10	0.00	0.00

UNIT HYDROGRAPH DATA
TP= 29.70 CP= 0.55 NTA= 0

RECESSION DATA

STPTN = -2.00 QRCSN= -0.20 RTIOR= 1.30

UNIT HYDROGRAPH 199 END-OF-PERIOD ORDINATES, LAG= 29.7y HOURS, CP= 0.55 VOL= 0.71

96.	199.	325.	467.	623.	791.	969.	1156.	1351.	
1755.	1973.	2191.	2415.	2637.	2856.	3061.	3249.	3421.	
3571.	3642.	3693.	4040.	4114.	4179.	4205.	4220.	4210.	
4161.	4061.	3967.	3855.	3746.	3640.	3537.	3436.	3340.	3246.
3155.	3066.	2979.	2895.	2813.	2734.	2657.	2582.	2509.	2438.
2369.	2302.	2237.	2174.	2113.	2053.	1995.	1939.	1884.	1831.
1779.	1729.	1680.	1633.	1587.	1542.	1498.	1456.	1415.	1375.
1336.	1299.	1262.	1226.	1192.	1158.	1125.	1094.	1063.	1033.
1004.	975.	948.	921.	895.	870.	845.	821.	798.	776.
754.	732.	712.	692.	672.	653.	635.	617.	599.	583.

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	12.73	9.19	3.54	2306524.
										(323.)(234.)(90.)(58517.39)			

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HYDROGRAPH ROUTING

2 ROUTE TO BLACK LAKE

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	ICUTO
201	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
1	0	0	4.00	0.200	0.000	0.	0

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HYDROGRAPH ROUTING

3 ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THRU BLACK LAKE

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	ICUTO
201	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

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SUB-AREA RUNOFF COMPUTATION

4 RUNOFF SUBAREA 2

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
2.0	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDW	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	216.00	0.00	1607.00	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	14.00	45.00	59.00	71.00	77.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS 0.917

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.00	0.00	0.00	1.00	0.00	0.0	1.00	1.00	0.10	0.00	0.00

UNIT HYDROGRAPH DATA

TP= 13.80 CP=0.55 NTA= 0

RECESSION DATA

STRTQ= -2.00 QRCSN= -0.20 RTIOR= 1.30

UNIT HYDROGRAPH 93 END-OF-PERIOD ORDINATES, LAG= 13.73 HOURS, CP= 0.55 VOL= 1.00

196.	398.	818.	1315.	1869.	2464.	3091.	3732.	4327.	4826.
5226.	5524.	5716.	5786.	5685.	5413.	5087.	4780.	4491.	4220.
3966.	3726.	3502.	3290.	3092.	2905.	2730.	2565.	2411.	2265.
2129.	2000.	1879.	1766.	1660.	1559.	1465.	1377.	1294.	1216.
1142.	1074.	1009.	948.	891.	837.	787.	739.	694.	653.
615.	578.	541.	509.	478.	449.	422.	397.	373.	350.
329.	309.	291.	273.	257.	241.	227.	213.	200.	188.
177.	166.	156.	147.	136.	129.	122.	114.	107.	101.
95.	89.	84.	79.	74.	69.	65.	61.	58.	54.
51.	48.	45.							

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	12.73	9.49	3.24	1564408.
										(323.)(241.)(82.)(44313.22)			

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HYDROGRAPH ROUTING

5 ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THRU BLACK LAKE

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

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	3	1	0	3	0

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

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COMBINE HYDROGRAPHS

6 COMBINE 2 HYDROGRAPHS AT BLACK LAKE 142=2

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

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SUB-AREA RUNOFF COMPUTATION

6 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	144.00	0.00	1607.00	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	18.00	45.00	59.00	70.00	77.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS 0.919

LOSS DATA

LROPT	STRKP	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
1	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.10	0.00	0.7

UNIT HYDROGRAPH DATA

TP= 12.00 CP=0.70. NTA= 0

RECESSION DATA

STRTQ= -2.00 QRCSN= -0.20 RTIOR= 1.30

UNIT HYDROGRAPH 23 END-OF-PERIOD ORDINATES, LAG= 12.08 HOURS, CP= 0.77 VOL= 1.00

0c0.	1754.	2602.	3207.	3711.	4152.	4551.	4917.	5258.	5578.
5880.	6077.	5907.	5696.	5384.	5052.	4696.	4311.	3887.	3410.
2892.	2137.	1012.							

0 END-OF-PERIOD FLOW

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MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS    COMP Q        MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS    COMP Q
                                                                                SUM  12.73   9.44   3.29  1247651.
                                                                                   ( 323.)( 240.)(  84.)(35329.51)

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                                         HYDROGRAPH ROUTING

                      1? ROUT: THRU AND OVER CRANBERRY LAKE
                              ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                                3.0       1       0       0       0       0       1       0       0
                                                   ROUTING DATA
                       QLOSS   CLOSS     AVG    IRES   ISAME    IOPT    IPMP            LSTR
                         0.0   0.000    0.00       1       0       0       0               0

                              NSTPS   NSTDL     LAG   AMSKK       X     TSK   STORA  ISPRAT
                                  1       0       0   0.000   0.000   0.000  -1490.      -1

STAGE     1490.00    1492.00    1494.00    1496.00    1498.00    1500.00    1502.00

  FLOW       0.00    1855.00    3600.00    7870.00   13340.00   19860.00   27315.00

   CAPACITY=     0.     15040.     31745.     50110.     70145.     91840.    115200.

  ELEVATION=     1490.     1492.     1494.     1496.     1498.     1500.     1502.

                            CREL   SPWID    COQW    EXPW   ELEVL    COQL   CAREA    EXPL
                          1490.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0

                                                DAM DATA
                                        TOPEL    COQD    EXPD  DAMWID
                                       1493.0     2.6     1.5      1.

PEAK OUTFLOW IS      1568. AT TIME  71.00 HOURS

PEAK OUTFLOW IS      2332. AT TIME  71.00 HOURS

PEAK OUTFLOW IS      3082. AT TIME  72.00 HOURS

PEAK OUTFLOW IS      3869. AT TIME  72.00 HOURS

PEAK OUTFLOW IS      5160. AT TIME  67.00 HOURS

PEAK OUTFLOW IS      7755. AT TIME  63.00 HOURS

PEAK OUTFLOW IS     10860. AT TIME  62.00 HOURS

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HYDROGRAPH ROUTING

11 ROUTE THRL AREA 4

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	0.0	0	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	2.600	0.350	0.100	0.	0

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SUB-AREA RUNOFF COMPUTATION

12 RUNOFF SUBAREA 4

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

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	119.50	0.00	1607.00	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	16.00	45.00	59.00	70.00	77.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS 0.919

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
1	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.10	0.00	0.0

UNIT HYDROGRAPH DATA

TP= 16.80 CP=0.55 NTA= 0

RECESSION DATA

STRTG= -2.00 QRCSN= -0.20 RTIOR= 1.30

UNIT HYDROGRAPH 10 END-OF-PERIOD ORDINATES, LAG= 16.74 HOURS, CP= 0.55 VOL= 0.9

35.	134.	276.	446.	636.	843.	1061.	1290.	1527.	1761.
1972.	2153.	2305.	2425.	2514.	2569.	2586.	2549.	2451.	2330.
2215.	2106.	2002.	1903.	1809.	1720.	1635.	1555.	1478.	1405.
1336.	1270.	1207.	1147.	1091.	1037.	986.	937.	891.	847.
805.	765.	726.	692.	658.	625.	594.	565.	537.	511.
485.	461.	439.	417.	396.	377.	358.	341.	324.	308.
293.	278.	264.	251.	239.	227.	216.	205.	195.	186.
176.	168.	159.	152.	144.	137.	130.	124.	118.	112.
106.	101.	96.	91.	87.	83.	78.	75.	71.	67.

64. 61. 58. 55. 52. 50. 47. 45. 43. 41.

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	12.73	9.27	3.47	800451.
										(323.)(235.)(88.)(22666.23)			

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COMBINE HYDROGRAPHS

15 COMBINE 2 HYDROGRAPHS AT 400, 3+4=4

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
400	2	0	0	0	0	1	0	0

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HYDROGRAPH ROUTING

15 ROUTE TO CONFLUENCE WITH AREA 5

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
5.1	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
1	0	0	3.700	0.350	0.000	0.	0

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SUB-AREA RUNOFF COMPUTATION

15 RUNOFF SUBAREA 5

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
5.0	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	258.00	0.00	1607.00	0.00	0.010	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	16.00	45.00	59.00	70.00	77.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .919

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	0.1

UNIT HYDROGRAPH DATA
TP= 1.90 CP= .55 NTA= 0

RECESSION DATA
STRTQ= -2.00 QRCSN= -0.20 RTIOR= 1.30

UNIT HYDROGRAPH 100 END-OF-PERIOD ORDINATES, LAG= 18.66 HOURS, CP= 0.55 VOL= 0.98

58.	219.	452.	731.	1045.	1386.	1749.	2131.	2527.	2936.
3342.	3716.	4044.	4325.	4561.	4749.	4887.	4973.	4999.	4946.
4791.	4579.	4377.	4184.	4000.	3823.	3655.	3494.	3339.	3192.
3051.	2917.	2789.	2665.	2548.	2435.	2328.	2225.	2127.	2033.
1944.	1858.	1776.	1698.	1623.	1551.	1483.	1418.	1355.	1295.
1238.	1184.	1131.	1082.	1034.	988.	945.	903.	863.	825.
789.	754.	721.	689.	659.	630.	602.	575.	550.	526.
502.	480.	459.	439.	420.	401.	383.	366.	350.	335.
320.	306.	292.	280.	267.	255.	244.	233.	223.	213.
204.	195.	186.	178.	170.	163.	156.	149.	142.	136.

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	12.73	9.21	3.53	1686605.
										(323.)	(234.)	(90.)	(47759.29)

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HYDROGRAPH ROUTING

16 ROUTE TO CONFLUENCE WITH AREA 4

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

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	1.900	0.350	0.000	0.	0

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COMBINE HYDROGRAPHS

17 COMBINE 2 HYDROGRAPHS AT 601, 5+4=4

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO

6.1	2	0	0	0	0	1	0	0

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HYDROGRAPH ROUTING

To ROUTE THRU AREA 6

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	I-AUTO
6 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
1	0	0	4.500	0.357	0.000	0.	0

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SUB-AREA RUNOFF COMPUTATION

19 RUNOFF SUBAREA 6

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	I-AUTO
600	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUNG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	258.00	0.00	1607.00	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	16.20	45.00	59.00	70.00	77.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS 0.919

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	PTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.57	0.17	0.00	0.1

UNIT HYDROGRAPH DATA

TP= 23.00 CP=0.55 NTA= 0

RECESSION DATA

STRTQ= -2.00 QRCSN= -0.20 RTIOR= 1.50

UNIT HYDROGRAPH 100 END-OF-PERIOD ORDINATES, LAG= 23.1 HOURS, CP= 0.55 VOL= 0.96

36.	136.	281.	455.	652.	868.	1098.	1341.	1595.	1858.
2129.	2396.	2685.	2948.	3186.	3398.	3585.	3746.	3880.	3987.
4066.	4115.	4136.	4134.	4015.	3878.	3736.	3599.	3467.	3340.
3217.	3099.	2985.	2876.	2770.	2669.	2571.	2476.	2386.	2298.

2214.	2133.	2054.	1979.	1906.	1836.	1769.	1704.	1642.	1581.
1523.	1468.	1414.	1362.	1312.	1264.	1217.	1173.	1130.	1088.
1048.	1010.	973.	937.	903.	870.	838.	807.	777.	749.
721.	695.	669.	645.	621.	598.	576.	555.	535.	515.
496.	478.	461.	444.	427.	412.	397.	382.	368.	355.
342.	329.	317.	305.	294.	283.	273.	263.	253.	244.

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	12.73	9.20	3.53	1630148.
										(323.)	(234.)	(90.)	(46160.61)

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COMBINE HYDROGRAPHS

20 COMBINE 2 HYDROGRAPHS AT 600 4+6=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

21 ROUTE THRU AREA 7

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
700	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
1	0	0	10.700	0.250	0.000	0.	0

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SUB-AREA RUNOFF COMPUTATION

22 RUNOFF SUBAREA 7

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
700	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	194.00	0.00	1607.00	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
[illegible]	18.00	45.00	59.00	71.00	77.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .919

LOSS DATA

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

UNIT HYDROGRAPH DATA

TP= 17.10 CP=0.55 NTA= 0

RECESSION DATA

STRTQ= -2.00 QRCSN= -1.21 RTIOR= 1.30

UNIT HYDROGRAPH 1 END-OF-PERIOD ORDINATES, LAG= 17.13 HOURS, CP= 0.55 VOL= 1.00

56.	212.	436.	705.	1036.	1332.	1678.	2040.	2415.	2789.
3131.	3426.	3674.	3875.	4026.	4125.	4166.	4133.	3997.	3805.
3619.	3442.	3274.	3114.	2962.	2817.	2680.	2549.	2424.	2306.
2193.	2086.	1984.	1888.	1795.	1708.	1624.	1545.	1470.	1398.
1330.	1265.	1203.	1144.	1088.	1035.	985.	936.	891.	847.
806.	767.	729.	693.	660.	627.	597.	568.	540.	514.
488.	465.	442.	420.	400.	380.	362.	344.	327.	311.
296.	282.	268.	255.	242.	231.	219.	209.	198.	189.
179.	171.	162.	154.	147.	140.	133.	126.	120.	114.
109.	103.	98.	94.	89.	85.	81.	77.	73.	69.

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	12.73	9.19	3.55	1290918.
										(323.)	(233.)	(90.)	(36554.69)

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COMBINE HYDROGRAPHS

23 COMBINE 2 HYDROGRAPHS AT 700 7+6=7

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
700	2	0	0	0	0	1	0	0

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HYDROGRAPH ROUTING

24 ROUTE TO CONFLUENCE WITH AREA 2

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

ROUTING DATA

QLOSS	CLOSS	AVG	IPES	ISAME	ICFT	IEMP	LSTR
0.0	0.100	0.00	0	1	3	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	3	0	1.90	0.200	0.000	0.	0

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SUB-AREA RUNOFF COMPUTATION

25 RUNOFF SUBAREA 8

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

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	48.00	0.00	1607.00	0.91	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	18.00	45.00	59.00	72.00	77.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS 0.919

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOR	STRTL	CNSTL	ALSMX	RTIMP
1	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.10	0.00	0.0

UNIT HYDROGRAPH DATA

TP= 11.70 CP=0.55 NTA= 0

RECESSION DATA

STRTQ= -2.00 QRCSN= -0.20 RTIOR= 1.30

UNIT HYDROGRAPH 80 END-OF-PERIOD ORDINATES, LAG= 11.65 HOURS, CP= 0.55 VOL= 1.00

34.	129.	264.	423.	599.	787.	979.	1153.	1293.	1397.
1464.	1490.	1455.	1369.	1273.	1184.	1100.	1023.	951.	884.
822.	765.	711.	661.	614.	571.	531.	494.	459.	427.
397.	369.	343.	319.	297.	276.	256.	238.	222.	206.
192.	178.	166.	154.	143.	133.	124.	115.	107.	99.
92.	86.	80.	74.	69.	64.	60.	56.	52.	48.
45.	41.	38.	36.	33.	31.	29.	27.	25.	23.
22.	20.	19.	17.	16.	15.	14.	13.	12.	11.

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	12.73	9.19	3.55	346324.
										(323.)	(233.)	(90.)	(9806.79)

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COMBINE HYDROGRAPHS

c6 COMBINE 3 HYDROGRAPHS 2+7+8=6

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
6	3	0	0	0	0	1	0	0

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HYDROGRAPH ROUTING

c7 ROUTE THRU RESERVOIR AND OVER DAM AT EEL WEIR

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
951	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	0	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-272.	-1

STAGE	272.00	273.00	274.00	275.00	276.00	277.00	278.00	279.00	280.00
FLOW	0.00	2500.00	8000.00	15000.00	23000.00	32000.00	42300.00	53000.00	64000.00

CAPACITY= 0. 18125. 40475. 67375. 99225.

ELEVATION= 272. 274. 276. 278. 280.

CREL	SPWID	COGW	EXPW	ELEVL	COQL	CAREA	EXPL
272.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COGD	EXPD	DAMWID
280.0	2.6	1.5	185.

PEAK OUTFLOW IS 25356. AT TIME 84.00 HOURS

PEAK OUTFLOW IS 38754. AT TIME 84.00 HOURS

PEAK OUTFLOW IS 51659. AT TIME 84.00 HOURS

PEAK OUTFLOW IS 64658. AT TIME 83.00 HOURS

PEAK OUTFLOW IS 78221. AT TIME 83.00 HOURS

PEAK OUTFLOW IS 105881. AT TIME 83.00 HOURS

PEAK OUTFLOW IS 133944. AT TIME 83.00 HOURS

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SUB-AREA RUNOFF COMPUTATION

20 RUNOFF SUBAREA 9

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	I-UTO
900	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	27.00	0.00	1607.00	0.00	0.000	0	1	1

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	18.00	45.00	59.00	70.00	77.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS 0.919

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	0.00

UNIT HYDROGRAPH DATA

TP= 10.20 CP= 0.55 NTA= 0

RECESSION DATA

STRTQ= -2.00 QRCSN= -0.20 RTIOR= 1.30

UNIT HYDROGRAPH 69 END-OF-PERIOD ORDINATES, LAG= 10.26 HOURS, CP= 0.55 VOL= 1.00

27.	101.	205.	328.	462.	603.	733.	837.	911.	953.
957.	910.	838.	770.	708.	651.	598.	550.	506.	465.
428.	393.	361.	332.	305.	281.	258.	237.	218.	201.
184.	170.	156.	143.	132.	121.	111.	102.	94.	87.
80.	73.	67.	62.	57.	52.	48.	44.	41.	37.
34.	32.	29.	27.	25.	23.	21.	19.	18.	16.
15.	14.	13.	12.	11.	10.	9.	8.	8.	

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	12.73	9.19	3.55	201681.
										(323.)	(233.)	(90.)	(5710.96)

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COMBINE HYDROGRAPHS

29 COMBINE 2 HYDROGRAPHS AT OGDENSBURG DAM 8+9=5

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	I-UTO
900	2	0	0	0	0	1	0	0

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HYDROGRAPH ROUTING

3 ROUTE THRU RESERVOIR AND OVER OGDENSBURG DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
9	1	1	0		0	1	0	0

ROUTING DATA

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

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.00	0.000	-258.	-1

STAGE	258.00	259.00	260.00	261.00	262.00	263.00	264.00	265.00	266.00
	270.00	272.00	274.00	276.00	278.00				
FLOW	0.00	1130.00	3415.00	6710.00	10835.00	15455.00	20935.00	26740.00	32865.00
	63851.00	76085.00	92960.00	110925.00	129915.00				
CAPACITY=	0.	560.	1450.	2060.	2820.	3685.	4665.	6980.	9780.	12750.
ELEVATION=	246.	254.	256.	260.	262.	264.	266.	270.	274.	278.

CREL	SPWID	COGW	EXPW	ELEVL	COGL	CAREA	EXPL
258.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COGD	EXPD	DAMWID
265.0	2.6	1.5	150.

PEAK OUTFLOW IS 25548. AT TIME 85.00 HOURS

PEAK OUTFLOW IS 39850. AT TIME 84.00 HOURS

PEAK OUTFLOW IS 52370. AT TIME 84.00 HOURS

PEAK OUTFLOW IS 65167. AT TIME 84.00 HOURS

PEAK OUTFLOW IS 78829. AT TIME 84.00 HOURS

PEAK OUTFLOW IS 106694. AT TIME 84.00 HOURS

PEAK OUTFLOW IS 134957. AT TIME 84.00 HOURS

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HYDROGRAPH ROUTING

CHANNEL ROUTE DOWNSTREAM OF DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
9.1	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	0	0	0.00	0.000	0.000	-1.	0

NORMAL DEPTH CHANNEL ROUTING

GN(1)	GN(2)	GN(3)	ELNVT	ELMAX	RLNTH	SEL
0.0600	0.0350	0.0700	245.	290.	1000.	0.0150

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

10.00 200.00 650.00 250.00 990.00 290.00 1000.00 245.00 1300.00 245.00
1302.33 255.00 1400.00 280.00 1650.00 290.00

STORAGE	0.00	16.54	39.32	77.86	124.84	180.51	244.88	316.13	388.30
	534.05	607.63	681.67	756.18	831.16	906.67	984.58	1065.70	1150.03
OUTFLOW	0.00	2061.63	6882.87	15250.33	27293.61	43171.22	63091.28	88974.83	119904.64
	193430.13	235611.75	281286.44	330316.56	382611.00	437691.94	495242.44	556034.00	621660.00
STAGE	245.00	247.37	249.74	252.11	254.47	256.84	259.21	261.58	263.95
	266.66	271.05	273.42	275.79	278.16	280.53	282.89	285.26	287.63
FLOW	0.00	2061.63	6882.87	15250.33	27293.61	43171.22	63091.28	88974.83	119904.64
	193430.13	235611.75	281286.44	330316.56	382611.00	437691.94	495242.44	556034.00	621660.00

MAXIMUM STAGE IS 254.1

MAXIMUM STAGE IS 256.2

MAXIMUM STAGE IS 257.9

MAXIMUM STAGE IS 259.4

MAXIMUM STAGE IS 260.7

MAXIMUM STAGE IS 262.9

MAXIMUM STAGE IS 265.2

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PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPLTATIONS
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 0.20	RATIO 2 0.30	RATIO 3 0.40	RATIO 4 0.50	RATIO 5 0.60	RATIO 6 0.80	RATIO 7 1.00
HYDROGRAPH AT	1[illegible]	341.00	1	7524.	11286.	15047.	18809.	22571.	30094.	37618.
		(883.18)		(213.04)(	319.57)(	426.09)(	532.61)(	639.13)(	852.18)(	1065.22)(
ROUTED TO	201	341.00	1	7363.	11044.	14725.	18406.	22088.	29450.	36813.
		(883.18)		(208.48)(	312.72)(	416.97)(	521.21)(	625.45)(	833.93)(	1042.42)(
ROUTED TO	2[illegible]1	341.00	1	7350.	11025.	14700.	18375.	22050.	29400.	36750.
		(883.18)		(208.13)(	312.19)(	416.26)(	520.32)(	624.39)(	832.52)(	1040.64)(
HYDROGRAPH AT	200	218.00	1	9821.	14731.	19642.	24552.	29462.	39283.	49104.
		(564.61)		(278.09)(	417.14)(	556.19)(	695.23)(	834.28)(	1112.37)(	1390.47)(
ROUTED TO	2[illegible]1	218.00	1	9765.	14648.	19530.	24413.	29295.	39060.	48825.
		(564.61)		(276.52)(	414.77)(	553.03)(	691.29)(	829.55)(	1106.06)(	1382.58)(
2 COMBINED	200	559.00	1	13048.	19572.	26096.	32620.	39144.	52192.	65240.
		(1447.79)		(369.48)(	554.22)(	738.95)(	923.69)(	1108.43)(	1477.91)(	1847.39)(
HYDROGRAPH AT	300	144.00	1	10017.	15025.	20033.	25042.	30050.	40066.	50083.
		(372.96)		(283.64)(	425.46)(	567.28)(	709.10)(	850.91)(	1134.55)(	1418.19)(
ROUTED TO	30[illegible]	144.00	1	1568.	2332.	3082.	3860.	5160.	7755.	10860.
		(372.96)		(44.40)(	66.02)(	87.26)(	109.30)(	146.13)(	219.61)(	307.51)(
ROUTED TO	400	144.00	1	1568.	2331.	3081.	3858.	5157.	7735.	10781.
		(372.96)		(44.39)(	66.00)(	87.24)(	109.24)(	146.02)(	219.02)(	305.29)(
HYDROGRAPH AT	40[illegible]	119.00	1	4436.	6654.	8872.	11090.	13308.	17744.	22180.
		(308.21)		(125.62)(	188.42)(	251.23)(	314.04)(	376.85)(	502.46)(	628.08)(
2 COMBINED	400	263.00	1	5574.	8363.	11125.	13683.	16625.	23010.	29576.
		(681.16)		(157.84)(	236.80)(	315.03)(	393.13)(	470.76)(	651.57)(	837.49)(
ROUTED TO	601	263.00	1	5448.	8171.	10870.	13566.	16300.	22512.	28987.
		(681.16)		(154.28)(	231.37)(	307.81)(	384.15)(	461.58)(	637.47)(	820.83)(
HYDROGRAPH AT	59[illegible]	258.00	1	8640.	12960.	17280.	21599.	25919.	34559.	43199.
		(668.21)		(244.65)(	366.98)(	489.30)(	611.63)(	733.95)(	978.60)(	1223.26)(

ROUTED TO	601	258.00	1	8592.	12888.	17184.	21480.	25776.	34368.	42960.
		(668.21)		(243.30)(	364.95)(	486.60)(	608.25)(	729.90)(	973.20)(	1216.50)(
2 COMBINED	601	521.00	1	14018.	21028.	28017.	35000.	41972.	56568.	71472.
		(1349.37)		(396.96)(	595.45)(	793.36)(	991.10)(	1188.52)(	1601.83)(	2023.87)(
ROUTED TO	600	521.00	1	13575.	20361.	27129.	33892.	40719.	54924.	69379.
		(1349.37)		(384.41)(	576.55)(	768.20)(	959.72)(	1153.04)(	1555.26)(	1964.59)(
HYDROGRAPH AT	600	258.00	1	7253.	10879.	14505.	18132.	21758.	29010.	36263.
		(668.21)		(205.37)(	308.06)(	410.74)(	513.43)(	616.11)(	821.48)(	1026.85)(
2 COMBINED	600	779.00	1	20693.	31039.	41367.	51690.	62031.	83237.	104684.
		(2017.59)		(585.97)(	878.94)(	1171.39)(	1463.71)(	1756.51)(	2357.02)(	2964.31)(
ROUTED TO	700	779.00	1	17704.	26550.	35382.	44211.	53209.	71485.	90018.
		(2017.59)		(501.31)(	751.81)(	1001.91)(	1251.92)(	1506.72)(	2024.22)(	2549.02)(
HYDROGRAPH AT	700	194.00	1	7112.	10667.	14223.	17779.	21335.	28447.	35558.
		(502.45)		(201.38)(	302.07)(	402.76)(	503.45)(	604.14)(	805.52)(	1006.90)(
2 COMBINED	700	973.00	1	21271.	31916.	42528.	53148.	63822.	85529.	107455.
		(2520.04)		(602.34)(	903.47)(	1204.27)(	1504.97)(	1807.25)(	2421.90)(	3042.77)(
ROUTED TO	801	973.00	1	21174.	31760.	42333.	52904.	63539.	85145.	106979.
		(2520.04)		(599.59)(	899.33)(	1198.74)(	1498.07)(	1799.21)(	2411.03)(	3029.30)(
HYDROGRAPH AT	800	48.00	1	2418.	3627.	4836.	6045.	7254.	9672.	12090.
		(124.32)		(68.47)(	102.70)(	136.94)(	171.17)(	205.41)(	273.88)(	342.34)(
3 COMBINED	800	1580.00	1	32953.	49430.	65898.	82362.	98834.	132036.	165400.
		(4092.15)		(933.13)(	1399.70)(	1866.02)(	2332.23)(	2798.68)(	3738.85)(	4683.60)(
ROUTED TO	901	1580.00	1	25356.	38754.	51659.	64658.	78221.	105881.	133944.
		(4092.15)		(718.00)(	1097.40)(	1462.63)(	1830.90)(	2214.97)(	2998.21)(	3792.87)(
HYDROGRAPH AT	900	27.00	1	1528.	2292.	3056.	3820.	4584.	6112.	7640.
		(69.93)		(43.27)(	64.90)(	86.54)(	108.17)(	129.81)(	173.08)(	216.35)(
2 COMBINED	900	1607.00	1	25570.	39060.	52095.	65207.	78881.	106760.	135044.
		(4162.08)		(724.07)(	1106.63)(	1475.17)(	1846.47)(	2233.65)(	3023.12)(	3824.01)(
ROUTED TO	900	1607.00	1	25548.	39050.	52070.	65167.	78829.	106694.	134957.
		(4162.08)		(723.44)(	1105.76)(	1474.47)(	1845.33)(	2232.19)(	3021.24)(	3821.56)(
ROUTED TO	901	1607.00	1	25548.	39048.	52069.	65164.	78828.	106697.	134961.
		(4162.08)		(723.43)(	1105.73)(	1474.43)(	1845.24)(	2232.15)(	3021.32)(	3821.67)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1490.00	1490.00	1493.00
STORAGE	0.	0.	23393.
OUTFLOW	0.	0.	2826.

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	1491.69	0.00	12714.	1568.	0.00	71.00	0.00
0.30	1492.49	0.00	19133.	2332.	0.00	71.00	0.00
0.40	1493.26	0.26	25572.	3082.	45.00	72.00	0.00
0.50	1494.03	1.03	32003.	3860.	84.00	72.00	0.00
0.60	1494.67	1.67	37858.	5160.	105.00	67.00	0.00
0.80	1495.94	2.94	49534.	7755.	131.00	63.00	0.00
1.00	1497.09	4.09	60981.	10860.	148.00	62.00	0.00

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	272.00	272.00	280.00
STORAGE	0.	0.	99225.
OUTFLOW	0.	0.	64000.

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	276.26	0.00	43996.	25356.	0.00	84.00	0.00
0.30	277.66	0.00	62745.	36754.	0.00	84.00	0.00
0.40	278.87	0.00	81305.	51659.	0.00	84.00	0.00
0.50	280.06	0.06	100167.	64658.	8.00	83.00	0.00
0.60	281.23	1.23	118843.	78221.	33.00	83.00	0.00
0.80	283.51	3.51	155182.	105881.	54.00	83.00	0.00
1.00	285.74	5.74	190712.	133944.	67.00	83.00	0.00

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	258.00	258.00	265.00
STORAGE	1450.	1450.	4175.
OUTFLOW	0.	0.	26640.

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	264.61	6.61	4081.	25548.	0.00	85.00	0.00
0.30	266.80	1.80	5126.	39050.	46.00	84.00	0.00
0.40	268.49	3.49	6107.	52070.	65.00	84.00	0.00
0.50	270.04	5.04	7006.	65167.	78.00	84.00	0.00
0.60	271.51	6.51	8036.	78829.	88.00	84.00	0.00
0.80	274.26	9.26	9987.	106694.	104.00	84.00	0.00
1.00	276.83	11.83	11880.	134957.	116.00	84.00	0.00

PLAN 1 STATION SC1

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.20	25546.	254.1	85.00
0.30	39048.	256.2	84.00
0.40	52069.	257.9	84.00
0.50	65164.	259.4	84.00
0.60	78828.	260.7	84.00
0.80	106697.	262.9	84.00
1.00	134961.	265.0	84.00

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(0001)   A1       OGDENSBURG WATER POWER CO. DAM NY 400
(0002)   A2       HEC-1DB (SNYDER PARAMETERS) 100 YR. STORM
(0003)   A3        HYPOTHETICAL STORM - CALIBRATION OF MODEL - SCS TYPE II DISTRIBUTION
(0004)   B     289         1         0         0         0         0         0         4
(0005)   B1      3
(0006)   K       0       100         0         0         0         0         1
(0007)   K1        1 RUNOFF SUBAREA 1
(0008)   M       0         1       341         0      1607         0         0         0         1
(0009)   O      24       4.4
(0010)   O1 0.010    0.012    0.013    0.013    0.014    0.018    0.020    0.020    0.027    0.034
(0011)   O1 0.054    0.428    0.109    0.048    0.035    0.025    0.020    0.021    0.017    0.014
(0012)   O1 0.017    0.011    0.010    0.010
(0013)   T       0         0         0         0         0         0        -1       -69         0    0.005
(0014)   N    29.7    0.550
(0015)   X   -0.75     -0.20      1.3
(0016)   K       1       201         0         0         0         0         1
(0017)   K1        2 ROUTE TO BLACK LAKE
(0018)   Y       0         0         0         0         1
(0019)   Y1      1         0         0      4.00       0.2
(0020)   K       1       201         0         0         0         0         1
(0021)   K1        3 ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THRU BLACK LAKE
(0022)   Y       0         0         0         0         1
(0023)   Y1      0         3         1
(0024)   K       0       200         0         0         0         0         1
(0025)   K1        4 RUNOFF SUBAREA 2
(0026)   M       0         1       218         0      1607         0         0         0         1
(0027)   O     -24       4.4
(0028)   T       0         0         0         0         0         0        -1       -69         0    0.089
(0029)   N    13.6     0.550
(0030)   X   -0.75     -0.20      1.3
(0031)   K       1       201         0         0         0         0         1
(0032)   K1        5 ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THRU BLACK LAKE
(0033)   Y       0         0         0         0         1
(0034)   Y1      0         3         1
(0035)   K       2       200         0         0         0         0         1
(0036)   K1        6 COMBINE 2 HYDROGRAPHS AT BLACK LAKE  1+2=2
(0037)   K       0       300         0         0         0         0         1
(0038)   K1        8 RUNOFF SUBAREA 3
```

```
(0039)   M       0        1      144        0     1607        0        0        0        1
(0040)   O     -24      4.4
(0041)   T       0        0        0        0        0        0       -1      -69        0    0.075
(0042)   W    12.7    0.550
(0043)   X   -0.75    -0.20      1.3
(0044)   K       1      300        0        0        0        0        1
(0045)   K1        10 ROUTE THRU AND OVER CRANBERRY LAKE
(0046)   Y       0        0        0        1
(0047)   Y1      1        0        0        0        0        0    -1490       -1
(0048)   Y4   1490     1492     1494     1496     1498     1500     1502
(0049)   Y5      0     1655     3800     7870    13340    19880    27315
(0050)   $S      0    15040    31745    50110    70145    91840   115200
(0051)   $E   1490     1492     1494     1496     1498     1500     1502
(0052)   $$   1490
(0053)   $D   1493      2.6      1.5        1
(0054)   K       1      400        0        0        0        0        1
(0055)   K1        11 ROUTE THRU AREA 4
(0056)   Y       0        0        0        0        1
(0057)   Y1      1        0        0      2.6     0.35
(0058)   K       0      400        0        0        0        0        1
(0059)   K1        12 RUNOFF SUBAREA 4
(0060)   M       0        1      119        0     1607        0        0        0        1
(0061)   O     -24      4.4
(0062)   T       0        0        0        0        0        0       -1      -69        0    0.026
(0063)   W    10.6    0.550
(0064)   X   -0.75    -0.20      1.3
(0065)   K       2      400        0        0        0        0        1
(0066)   K1        13 COMBINE 2 HYDROGRAPHS AT 400,  3+4=4
(0067)   K       1      601        0        0        0        0        1
(0068)   K1        15 ROUTE TO CONFLUENCE WITH AREA 5
(0069)   Y       0        0        0        0        1
(0070)   Y1      1        0        0      3.7     0.35
(0071)   K       0      500        0        0        0        0        1
(0072)   K1        15 RUNOFF SUBAREA 5
(0073)   M       0        1      258        0     1607        0        0        0        1
(0074)   O     -24      4.4
(0075)   T       0        0        0        0        0        0       -1      -69        0    0.009
(0076)   W    18.9    0.550
```

```
(0077)   X  -0.75    -0.20      1.3
(0078)   K       1      601        0        0        0        0        1
(0079)   K1       16 ROUTE TO CONFLUENCE WITH AREA 4
(0080)   Y        0        0        0        0        1
(0081)   Y1       1        0        0      1.9     0.35
(0082)   K        2      601        0        0        0        0        1
(0083)   K1       17 COMBINE 2 HYDROGRAPHS AT 601,  5+4=4
(0084)   K        1      600        0        0        0        0        1
(0085)   K1       18 ROUTE THRU AREA 6
(0086)   Y        0        0        0        0        1
(0087)   Y1       1        0        0      4.5     0.35
(0088)   K        3      600        0        0        0        0        1
(0089)   K1       19 RUNOFF SUBAREA 6
(0090)   M        3        1      258        0     1607        3        0        0        0        1
(0091)   0     -24      4.4
(0092)   T        0        0        0        0        0        0       -1      -69        0    0.007
(0093)   W    23.0    0.550
(0094)   X  -0.75    -0.20      1.3
(0095)   K        2      600        0        0        0        0        1
(0096)   K1       20 COMBINE 2 HYDROGRAPHS AT 600   4+6=6
(0097)   K        1      700        0        0        0        0        1
(0098)   K1       21 ROUTE THRU AREA 7
(0099)   Y        0        0        0        0        1
(0100)   Y1       1        0        0     10.7     0.25
(0101)   K        0      700        0        0        0        0        1
(0102)   K1       22 RUNOFF SUBAREA 7
(0103)   M        3        1      194        0     1607        0        0        0        0        1
(0104)   0     -24      4.4
(0105)   T        0        0        0        0        0        0       -1      -69        0    0.003
(0106)   W    17.1    0.550
(0107)   X  -0.75    -0.20      1.3
(0108)   K        2      700        0        0        0        0        1
(0109)   K1       23 COMBINE 2 HYDROGRAPHS AT 700   7+6=7
(0110)   K        1      801        0        0        0        0        1
(0111)   K1       24 ROUTE TO CONFLUENCE WITH AREA 2
(0112)   Y        0        0        0        0        1
(0113)   Y1       1        0        0      1.9      0.2
(0114)   K        3      800        0        0        0        0        1
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```
(0115)   K1       25 RUNOFF SUBAREA 8
(0116)   M        .        1       48        0     1607        0        0        0        1
(0117)   G      -24      4.4
(0118)   T        0        0        0        0        0        0       -1      -69        0    0.003
(0119)   W     11.7    0.550
(0120)   X    -0.75    -0.20      1.3
(0121)   K        3      800        0        0        0        0        1
(0122)   K1       26 COMBINE 3 HYDROGRAPHS  2+7+8=8
(0123)   K        1      901        0        0        0        0        1
(0124)   K1       27 ROUTE THRU RESERVOIR AND OVER DAM AT EEL WEIR
(0125)   Y        0        0        0        1
(0126)   Y1       1        0        0        0        0        0     -272       -1
(0127)   Y4     272      273      274      275      276      277      278      279      280
(0128)   Y5       0     2500     8000    15000    23000    32000    42300    53000    64000
(0129)   $S       0    18125    40475    67375    99225
(0130)   $E     272      274      276      278      280
(0131)   $$     272
(0132)   $D     280     2.65      1.5      185
(0133)   K        0      900        0        0        0        0        1
(0134)   K1       28 RUNOFF SUBAREA 9
(0135)   M        .        1       27        0     1607        0        0        0        1
(0136)   G      -24      4.4
(0137)   T        0        0        0        0        0        0       -1      -69        0    0.003
(0138)   W     10.2    0.550
(0139)   X    -0.75    -0.20      1.3
(0140)   K        2      900        0        0        0        0        1
(0141)   K1       29 COMBINE 2 HYDROGRAPHS AT OGDENSBURG DAM  8+9=9
(0142)   K        1      900        0        0        0        0        1
(0143)   K1       30 ROUTE THRU RESERVOIR AND OVER OGDENSBURG DAM
(0144)   Y        0        0        0        1
(0145)   Y1       1        0        0        0        0        0     -258       -1
(0146)   Y4     258      259      260      261      262      263      264      265      266      268
(0147)   Y4     270      272      274
(0148)   Y5       0     1100     3415     6710    10835    15455    20935    26640    32865    45930
(0149)   Y5  60380    76085    92960
(0150)   $S       0      560     1450     2080     2820     3685     4665     5760     6980     9780
(0151)   $E     246      254      258      260      262      264      266      268      270      274
(0152)   $$     258
```

1 OGDENSBURG WATER POWER CO. DAM NY 400 PAGE 0005

(0153)	$D	265	2.65	1.5	50
(0154)	K	99			
(0155)	A				
(0156)	A				
(0157)	A				
(0158)	A				
(0159)	A				

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT	100
ROUTE HYDROGRAPH TO	201
ROUTE HYDROGRAPH TO	201
RUNOFF HYDROGRAPH AT	200
ROUTE HYDROGRAPH TO	201
COMBINE 2 HYDROGRAPHS AT	200
RUNOFF HYDROGRAPH AT	300
ROUTE HYDROGRAPH TO	300
ROUTE HYDROGRAPH TO	400
RUNOFF HYDROGRAPH AT	400
COMBINE 2 HYDROGRAPHS AT	400
ROUTE HYDROGRAPH TO	601
RUNOFF HYDROGRAPH AT	500
ROUTE HYDROGRAPH TO	601
COMBINE 2 HYDROGRAPHS AT	601
ROUTE HYDROGRAPH TO	600
RUNOFF HYDROGRAPH AT	600
COMBINE 2 HYDROGRAPHS AT	600
ROUTE HYDROGRAPH TO	700
RUNOFF HYDROGRAPH AT	700
COMBINE 2 HYDROGRAPHS AT	700
ROUTE HYDROGRAPH TO	801
RUNOFF HYDROGRAPH AT	800
COMBINE 3 HYDROGRAPHS AT	800
ROUTE HYDROGRAPH TO	901
RUNOFF HYDROGRAPH AT	900
COMBINE 2 HYDROGRAPHS AT	900
ROUTE HYDROGRAPH TO	900

END OF NETWORK

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

RUN  DATE?TUE, AUG 05 1980
     TIME?17:52:56
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OGDENSBURG WATER POWER CO. DAM NY 400
HEC-1DB (SNYDER PARAMETERS) 100 YR. STORM
HYPOTHETICAL STORM - CALIBRATION OF MODEL - SCS TYPE II DISTRIBUTION

JOB SPECIFICATION

NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
288	1	0	0	0	0	0	0	4	0

JOPER	NWT	LROPT	TRACE
3	0	0	0

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SUB-AREA RUNOFF COMPUTATION

1 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
0	1	341.00	0.00	1607.00	0.00	0.000	0	1	0

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	-69.00	0.00	0.00

CURVE NO = -69.00 WETNESS = -1.00 EFFECT CN = 69.00

UNIT HYDROGRAPH DATA
TP= 29.70 CP=0.55 NTA= 0

RECESSION DATA
STRTQ= -0.75 QRCSN= -0.20 RTIOR= 1.30

UNIT HYDROGRAPH 100 END-OF-PERIOD ORDINATES, LAG= 29.79 HOURS, CP= 0.55 VOL= 0.91

25.	96.	199.	325.	467.	623.	791.	969.	1156.	1351.
1553.	1760.	1973.	2191.	2413.	2637.	2856.	3061.	3249.	3421.
3578.	3718.	3842.	3950.	4040.	4114.	4169.	4205.	4220.	4210.
4168.	4081.	3987.	3855.	3746.	3640.	3537.	3438.	3340.	3246.

3155.	3066.	2979.	2895.	2813.	2734.	2657.	2582.	2509.	2438.
2369.	2302.	2237.	2174.	2113.	2053.	1995.	1939.	1884.	1831.
1779.	1729.	1680.	1633.	1587.	1542.	1498.	1456.	1415.	1375.
1336.	1299.	1262.	1226.	1192.	1158.	1125.	1094.	1063.	1033.
1004.	975.	946.	921.	895.	870.	845.	821.	798.	776.
754.	732.	712.	692.	672.	653.	635.	617.	599.	583.

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	4.40	1.55	2.85	353760.
										(112.)	(39.)	(72.)	(10017.36)

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HYDROGRAPH ROUTING

2 ROUTE TO BLACK LAKE

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
201	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
1	0	0	4.000	0.200	0.000	0.	0

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HYDROGRAPH ROUTING

3 ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THRU BLACK LAKE

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
201	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

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SUB-AREA RUNOFF COMPUTATION

4 RUNOFF SUBAREA 2

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

HYDROGRAPH DATA

IHYDG	IUNG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	1	218.00	0.00	1607.00	0.00	0.000	0	1	0

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	-69.00	0.00	0.09

CURVE NO = -69.00 WETNESS = -1.00 EFFECT CN = 69.00

UNIT HYDROGRAPH DATA
TP= 13.80 CP=0.55 NTA= 0

RECESSION DATA
STRTQ= -0.75 QRCSN= -0.20 RTIOR= 1.30

UNIT HYDROGRAPH 93 END-OF-PERIOD ORDINATES, LAG= 13.73 HOURS, CP= 0.55 VOL= 1.00

136.	398.	816.	1315.	1869.	2464.	3091.	3732.	4327.	4826.
5226.	5524.	5716.	5786.	5685.	5413.	5087.	4780.	4491.	4220.
3966.	3726.	3502.	3290.	3092.	2905.	2730.	2565.	2411.	2265.
2129.	2000.	1879.	1766.	1660.	1559.	1465.	1377.	1294.	1216.
1142.	1074.	1009.	948.	891.	837.	787.	739.	694.	653.
613.	576.	541.	509.	478.	449.	422.	397.	373.	350.
329.	309.	291.	273.	257.	241.	227.	213.	200.	188.
177.	166.	156.	147.	138.	129.	122.	114.	107.	101.
95.	89.	84.	79.	74.	69.	65.	61.	58.	54.
51.	48.	45.							

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	4.40	1.79	2.61	297213.
										(112.)(	45.)(	66.)(	8416.13)

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HYDROGRAPH ROUTING

5 ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THRU BLACK LAKE

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
201	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

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COMBINE HYDROGRAPHS

6 COMBINE 2 HYDROGRAPHS AT BLACK 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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SUB-AREA RUNOFF COMPUTATION

8 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
0	1	144.00	0.00	1607.00	0.00	0.000	0	1	0

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	-69.00	0.00	0.07

CURVE NO = -69.00 WETNESS = -1.00 EFFECT CN = 69.00

UNIT HYDROGRAPH DATA

TP= 12.00 CP=$70. NTA= 0

RECESSION DATA

STRTQ= -0.75 QRCSN= -0.20 RTIOR= 1.30

UNIT HYDROGRAPH 23 END-OF-PERIOD ORDINATES, LAG= 12.08 HOURS, CP= 0.77 VOL= 1.00

62..	1754.	2602.	3207.	3711.	4152.	4551.	4917.	5256.	5578.
5880.	6077.	5987.	5696.	5384.	5052.	4696.	4311.	3887.	3410.
2852.	2137.	1012.							

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	4.40	1.75	2.65	229945.
										(112.)	(44.)	(67.)	(6511.31)

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HYDROGRAPH ROUTING

10 ROUTE THRU AND OVER CRANBERRY LAKE

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

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-149C.	-1

STAGE	1490.00	1492.00	1494.00	1496.00	1498.00	1500.00	1502.00
FLOW	0.00	1e55.00	3800.00	7870.00	13340.00	19880.00	27315.00
CAPACITY=	0.	15040.	31745.	50110.	70145.	91840.	115200.
ELEVATION=	1490.	1492.	1494.	1496.	1498.	1500.	1502.

CREL	SPWID	COOW	EXPW	ELEVL	COGL	CAREA	EXPL
1490.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1493.0	2.6	1.5	1.

PEAK OUTFLOW IS 1444. AT TIME 46.00 HOURS

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HYDROGRAPH ROUTING

11 ROUTE THRU AREA 4

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
1	0	0	2.600	0.350	0.000	0.	0

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SUB-AREA RUNOFF COMPUTATION

12 RUNOFF SUBAREA 4

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

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	1	119.00	0.00	1607.00	0.00	0.000	0	1	0

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	-69.00	0.00	0.03

CURVE NO = -69.00 WETNESS = -1.00 EFFECT CN = 69.00

UNIT HYDROGRAPH DATA
TP= 16.80 CP=0.55 NTA= 0

RECESSION DATA
STRTQ= -0.75 QRCSN= -0.20 RTIOR= 1.30

UNIT HYDROGRAPH 100 END-OF-PERIOD ORDINATES, LAG= 16.74 HOURS, CP= 0.55 VOL= 0.99

35.	134.	276.	446.	636.	843.	1061.	1290.	1527.	1761.
1972.	2153.	2305.	2425.	2514.	2569.	2586.	2549.	2451.	2330.
2215.	2106.	2002.	1903.	1809.	1720.	1635.	1555.	1478.	1405.
1336.	1270.	1207.	1147.	1091.	1037.	986.	937.	891.	847.
805.	765.	728.	692.	658.	625.	594.	565.	537.	511.
485.	461.	439.	417.	396.	377.	358.	341.	324.	308.
293.	278.	264.	251.	239.	227.	216.	205.	195.	186.
176.	168.	159.	152.	144.	137.	130.	124.	118.	112.
106.	101.	96.	91.	87.	83.	78.	75.	71.	67.
64.	61.	58.	55.	52.	50.	47.	45.	43.	41.

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	4.40	1.61	2.79	140512.
										(112.)(	41.)(	71.)(	3978.85)

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COMBINE HYDROGRAPHS

13 COMBINE 2 HYDROGRAPHS AT 400, 3+4=4

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
400	2	0	0	0	0	1	0	0

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HYDROGRAPH ROUTING

15 ROUTE TO CONFLUENCE WITH AREA 5

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
601	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
1	0	0	3.700	0.350	0.000	0.	0

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SUB-AREA RUNOFF COMPUTATION

15 RUNOFF SUBAREA 5

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
530	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	1	258.00	0.00	1607.00	0.00	0.000	0	1	0

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	-69.00	0.00	0.01

CURVE NO = -69.00 WETNESS = -1.00 EFFECT CN = 69.00

UNIT HYDROGRAPH DATA
TP= 18.90 CP=0.55 NTA= 0

RECESSION DATA
STRTQ= -0.75 QRCSN= -0.20 RTIOR= 1.30

UNIT HYDROGRAPH 100 END-OF-PERIOD ORDINATES, LAG= 18.86 HOURS, CP= 0.55 VOL= 0.92

58.	219.	452.	731.	1045.	1386.	1749.	2131.	2527.	2936.
3342.	3716.	4044.	4325.	4561.	4749.	4887.	4973.	4999.	4946.
4790.	4579.	4377.	4184.	4000.	3823.	3655.	3494.	3339.	3192.
3051.	2917.	2788.	2665.	2548.	2435.	2328.	2225.	2127.	2033.
1944.	1858.	1776.	1698.	1623.	1551.	1483.	1418.	1355.	1295.
1236.	1184.	1131.	1082.	1034.	988.	945.	903.	863.	825.
789.	754.	721.	689.	659.	630.	602.	575.	550.	526.
502.	480.	459.	439.	420.	401.	383.	366.	350.	335.
320.	306.	292.	280.	267.	255.	244.	233.	223.	213.
204.	195.	186.	178.	170.	163.	156.	149.	142.	136.

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	4.40	1.56	2.84	289540.
										(112.)	(40.)	(72.)	(8196.85)

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HYDROGRAPH ROUTING

16 ROUTE TO CONFLUENCE WITH AREA 4

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
601	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
1	0	0	1.900	0.350	0.000	0.	0

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COMBINE HYDROGRAPHS

17 COMBINE 2 HYDROGRAPHS AT 601, 5+4=4

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
601	2	0	0	0	0	1	0	0

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HYDROGRAPH ROUTING

18 ROUTE THRU AREA 6

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
600	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
1	0	0	4.500	0.350	0.000	0.	0

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SUB-AREA RUNOFF COMPUTATION

19 RUNOFF SUBAREA 6

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

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	1	256.00	0.00	1607.00	0.00	0.000	0	1	0

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	-69.00	0.00	0.1

CURVE NO = -69.00 WETNESS = -1.00 EFFECT CN = 69.00

UNIT HYDROGRAPH DATA
TP= 23.00 CP=0.55 NTA= 0

RECESSION DATA
STRTQ= -0.75 QRCSN= -0.20 RTIOR= 1.30

UNIT HYDROGRAPH 100 END-OF-PERIOD ORDINATES, LAG= 23.10 HOURS, CP= 0.55 VOL= 0.96

36.	136.	261.	455.	652.	868.	1098.	1341.	1595.	1858.
2129.	2406.	2685.	2948.	3166.	3398.	3585.	3746.	3880.	3987.
4066.	4115.	4130.	4104.	4015.	3878.	3736.	3599.	3467.	3340.
3217.	3099.	2985.	2876.	2770.	2669.	2571.	2476.	2386.	2298.
2214.	2133.	2054.	1979.	1906.	1836.	1769.	1704.	1642.	1581.
1523.	1468.	1414.	1362.	1312.	1264.	1217.	1173.	1130.	1088.
1048.	1010.	973.	937.	903.	870.	838.	807.	777.	749.
721.	695.	669.	645.	621.	598.	576.	555.	535.	515.
496.	478.	461.	444.	427.	412.	397.	382.	368.	355.
342.	329.	317.	305.	294.	283.	273.	263.	253.	244.

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	4.40	1.55	2.85	279427.
										(112.)(	39.)(	72.)(	7912.48)

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COMBINE HYDROGRAPHS

20 COMBINE 2 HYDROGRAPHS AT 600 4+6=6

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

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HYDROGRAPH ROUTING

21 ROUTE THRU AREA 7

ISTAQ	ICOPP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
700	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
1	0	0	10.700	0.250	0.000	0.	0

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SUB-AREA RUNOFF COMPUTATION

22 RUNOFF SUBAREA 7

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
7	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
	1	194.00	0.00	1607.00	0.00	0.000	0	1	0

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	-69.00	0.00	0.00

CURVE NO = -69.00 WETNESS = -1.00 EFFECT CN = 69.00

UNIT HYDROGRAPH DATA

TP= 17.10 CP=0.55 NTA= 0

RECESSION DATA

STRTQ= -0.75 QRCSN= -0.20 RTIOR= 1.30

UNIT HYDROGRAPH 100 END-OF-PERIOD ORDINATES, LAG= 17.13 HOURS, CP= 0.55 VOL= 0.99

56.	212.	436.	705.	1006.	1332.	1678.	2040.	2415.	2789.
3151.	3426.	3674.	3875.	4026.	4125.	4166.	4133.	3997.	3805.
3619.	3442.	3274.	3114.	2962.	2817.	2680.	2549.	2424.	2306.
2193.	2086.	1984.	1888.	1795.	1708.	1624.	1545.	1470.	1398.
1330.	1265.	1203.	1144.	1088.	1035.	985.	936.	891.	847.
806.	767.	729.	693.	660.	627.	597.	568.	540.	514.
488.	465.	442.	420.	400.	380.	362.	344.	327.	311.
296.	282.	268.	255.	242.	231.	219.	209.	198.	189.
179.	171.	162.	154.	147.	140.	133.	126.	120.	114.
109.	103.	98.	94.	89.	85.	81.	77.	73.	69.

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	4.40	1.54	2.86	219506.
										(112.)(39.)(73.)(6215.71)			

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COMBINE HYDROGRAPHS

23 COMBINE 2 HYDROGRAPHS AT 700 7+6=7

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
700	2	0	0	0	0	1	0	0

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HYDROGRAPH ROUTING

24 ROUTE TO CONFLUENCE WITH AREA 2

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
601	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
1	0	0	1.900	0.200	0.000	0.	0

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SUB-AREA RUNOFF COMPUTATION

25 RUNOFF SUBAREA 6

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

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	1	48.00	0.00	1607.00	0.00	0.000	0	1	0

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	-69.00	0.00	0.00

CURVE NO = -69.00 WETNESS = -1.00 EFFECT CN = 69.00

UNIT HYDROGRAPH DATA

TP= 11.70 CP=0.55 NTA= 0

RECESSION DATA

STRTQ= -0.75 QRCSN= -0.20 RTIOR= 1.30

UNIT HYDROGRAPH 60 END-OF-PERIOD ORDINATES, LAG= 11.65 HOURS, CP= 0.55 VOL= 1.00

34.	129.	264.	423.	599.	787.	979.	1153.	1293.	1397.
1464.	1490.	1455.	1369.	1273.	1184.	1100.	1023.	951.	884.
822.	765.	711.	661.	614.	571.	531.	494.	459.	427.
397.	369.	343.	319.	297.	276.	256.	238.	222.	206.
192.	178.	166.	154.	143.	133.	124.	115.	107.	99.
92.	86.	80.	74.	69.	64.	60.	56.	52.	48.
45.	41.	39.	36.	33.	31.	29.	27.	25.	23.
22.	20.	19.	17.	16.	15.	14.	13.	12.	11.

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	4.40	1.54	2.86	58496.
	(112.)	(39.)	(73.)	(1656.42)

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COMBINE HYDROGRAPHS

26 COMBINE 3 HYDROGRAPHS 2+7+8=8

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
800	3	0	0	0	0	1	0	0

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HYDROGRAPH ROUTING

27 ROUTE THRU RESERVOIR AND OVER DAM AT EEL WEIR

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
901	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	0	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-272.	-1

STAGE	272.00	273.00	274.00	275.00	276.00	277.00	278.00	279.00	280.00
FLOW	0.00	2500.00	8000.00	15000.00	23000.00	32000.00	42300.00	53000.00	64000.00

CAPACITY=	0.	18125.	40475.	67375.	99225.
ELEVATION=	272.	274.	276.	278.	280.

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
272.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
280.0	2.6	1.5	155.

PEAK OUTFLOW IS 22091. AT TIME 60.00 HOURS

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SUB-AREA RUNOFF COMPUTATION

28 RUNOFF SUBAREA 9

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
900	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	1	27.00	0.00	1607.00	0.00	0.000	0	1	0

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	-69.00	0.00	0.00

CURVE NO = -69.00 WETNESS = -1.00 EFFECT CN = 69.00

UNIT HYDROGRAPH DATA
TP= 10.20 CP=0.55 NTA= 0

RECESSION DATA
STRTQ= -0.75 QRCSN= -0.20 RTIOR= 1.30

UNIT HYDROGRAPH 69 END-OF-PERIOD ORDINATES, LAG= 10.26 HOURS, CP= 0.55 VOL= 1.00

27.	101.	205.	328.	462.	603.	733.	837.	911.	953.
957.	910.	836.	770.	708.	651.	598.	550.	506.	465.
428.	393.	361.	332.	305.	281.	258.	237.	218.	201.
184.	170.	156.	143.	132.	121.	111.	102.	94.	87.
80.	73.	67.	62.	57.	52.	48.	44.	41.	37.
34.	32.	29.	27.	25.	23.	21.	19.	18.	16.
15.	14.	13.	12.	11.	10.	9.	8.	8.	

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	4.40	1.54	2.86	33934.
										(112.)	(39.)	(73.)	(960.90)

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COMBINE HYDROGRAPHS

29 COMBINE 2 HYDROGRAPHS AT OGDENSBURG DAM 8+9=9

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
900	2	0	0	0	0	1	0	0

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HYDROGRAPH ROUTING

30 ROUTE THRU RESERVOIR AND OVER OGDENSBURG DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
900	1	0	0	0	0	1	0	0

ROUTING DATA

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

	NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
	1	0	0	0.000	0.000	0.000	-258.	-1

STAGE	258.00	259.00	260.00	261.00	262.00	263.00	264.00	265.00	266.00	
	270.00	272.00	274.00							
FLOW	0.00	1100.00	3415.00	6710.00	10835.00	15455.00	20935.00	26040.00	32865.00	
	60300.00	76065.00	92960.00							
CAPACITY=	0.	560.	1450.	2080.	2820.	3685.	4665.	5760.	6980.	9780.
ELEVATION=	246.	254.	258.	260.	262.	264.	266.	268.	270.	274.

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
258.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COGD	EXPD	DAMWID
265.0	2.6	1.5	50.

PEAK OUTFLOW IS 22248. AT TIME 61.00 HOURS

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RUNOFF SUMMARY, AVERAGE FLOW IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES(SQUARE KILOMETERS)

		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
HYDROGRAPH AT	100	6429.	6360.	5777.	3931.	341.00
		(182.04)(	180.09)(	163.56)(	111.31)(	883.16)
ROUTED TO	201	6257.	6210.	5693.	3914.	341.00
		(177.17)(	175.84)(	161.21)(	110.82)(	883.18)
ROUTED TO	201	6247.	6200.	5668.	3912.	341.00
		(176.89)(	175.57)(	161.06)(	110.76)(	883.16)
HYDROGRAPH AT	200	9186.	8955.	7110.	3630.	218.00
		(260.12)(	253.59)(	201.32)(	102.79)(	564.61)
ROUTED TO	201	9131.	8914.	7094.	3628.	218.00
		(258.55)(	252.41)(	200.87)(	102.74)(	564.61)
2-COMBINED	200	11665.	11618.	10918.	7384.	559.00
		(330.30)(	328.99)(	309.16)(	209.09)(	1447.79)
HYDROGRAPH AT	300	9409.	9146.	6454.	2873.	144.00
		(266.45)(	258.98)(	182.76)(	81.36)(	372.96)
ROUTED TO	300	1444.	1444.	1435.	1338.	144.00
		(40.90)(	40.88)(	40.63)(	37.90)(	372.96)
ROUTED TO	400	1444.	1443.	1434.	1337.	144.00
		(40.89)(	40.87)(	40.60)(	37.87)(	372.96)
HYDROGRAPH AT	400	3841.	3764.	3119.	1698.	119.00
		(108.77)(	106.58)(	88.33)(	48.07)(	308.21)
2-COMBINED	400	4855.	4810.	4240.	2904.	263.00
		(137.47)(	136.21)(	120.06)(	82.22)(	681.16)
ROUTED TO	601	4768.	4725.	4201.	2895.	263.00
		(135.00)(	133.81)(	118.96)(	81.98)(	681.16)
HYDROGRAPH AT	500	7342.	7207.	6105.	3465.	258.00
		(207.91)(	204.08)(	172.87)(	98.11)(	668.21)
ROUTED TO	601	7282.	7166.	6087.	3463.	258.00
		(206.20)(	202.91)(	172.38)(	98.05)(	668.21)
2-COMBINED	601	12008.	11839.	10251.	6326.	521.00
		(340.03)(	335.23)(	290.29)(	179.14)(	1349.37)
ROUTED TO	600	11645.	11519.	10106.	6308.	521.00
		(329.74)(	326.18)(	286.18)(	178.62)(	1349.37)
HYDROGRAPH AT	600	6189.	6097.	5341.	3271.	258.00
		(175.27)(	172.66)(	151.23)(	92.61)(	668.21)
2-COMBINED	600	17643.	17456.	15334.	9518.	779.00
		(499.60)(	494.29)(	434.22)(	269.53)(	2017.59)
ROUTED TO	700	15246.	15145.	13954.	9344.	779.00
		(431.71)(	428.86)(	395.13)(	264.59)(	2017.59)
HYDROGRAPH AT	700	5969.	5838.	4849.	2650.	194.00
		(169.02)(	165.32)(	137.32)(	75.04)(	502.45)
2-COMBINED	700	18290.	18183.	16853.	11612.	973.00
		(517.91)(	514.88)(	477.23)(	328.80)(	2520.04)
ROUTED TO	801	18214.	18109.	16801.	11601.	973.00
		(515.75)(	512.78)(	475.75)(	328.49)(	2520.04)
HYDROGRAPH AT	800	1974	1920	1673	720	49.00

		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		(56.01)	(54.37)	(41.69)	(20.39)	(124.32)
3-COMBINED	200	28691.	28546.	26869.	19469.	1580.00
		(812.44)	(808.33)	(760.86)	(551.31)	(4092.15)
ROUTED TO	901	22091.	22037.	21291.	16962.	1580.00
		(625.54)	(624.03)	(602.89)	(480.30)	(4092.15)
HYDROGRAPH AT	900	1236.	1194.	883.	419.	27.00
		(35.01)	(33.82)	(24.99)	(11.88)	(69.93)
2-COMBINED	900	22267.	22213.	21465.	17136.	1607.00
		(630.52)	(629.01)	(607.82)	(485.24)	(4162.08)
ROUTED TO	900	22248.	22194.	21450.	17129.	1607.00
		(629.99)	(628.48)	(607.40)	(485.03)	(4162.08)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1490.00	1490.00	1493.00
STORAGE	0.	0.	23393.
OUTFLOW	0.	0.	2828.

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
0.00	1491.56	0.00	11710.	1444.	0.00	46.00	0.00

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	272.00	272.00	280.00
STORAGE	0.	0.	99225.
OUTFLOW	0.	0.	64000.

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
0.00	275.89	0.00	39205.	22091.	0.00	60.00	0.00

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	258.00	258.00	265.00
STORAGE	1450.	1450.	4175.
OUTFLOW	0.	0.	26640.

RATIO OF	MAXIMUM RESERVOIR	MAXIMUM DEPTH	MAXIMUM STORAGE	MAXIMUM OUTFLOW	DURATION OVER TOP	TIME OF MAX OUTFLOW	TIME OF FAILURE

APPENDIX D

STABILITY ANALYSIS

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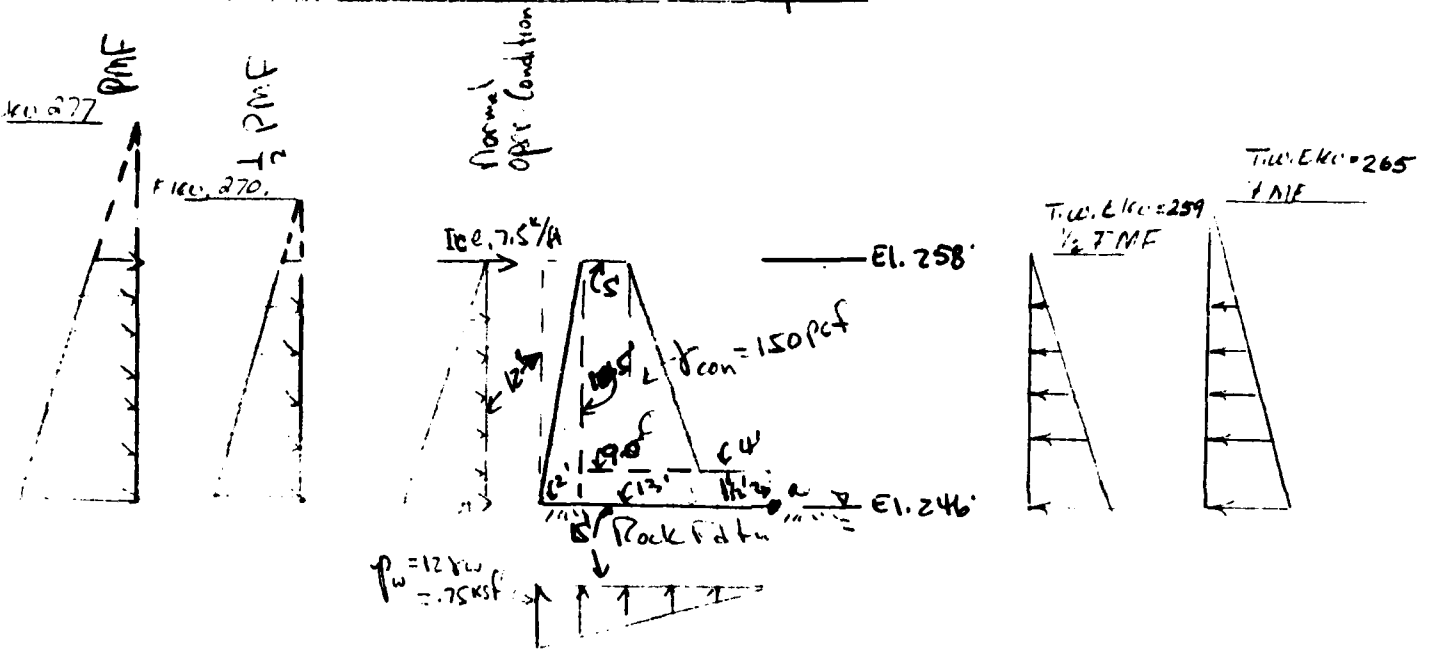
DESIGN BRIEF

PROJECT NAME Ogdensburg Dam DATE 7/22/80

SUBJECT Stability Analysis PROJECT NO.

DRAWN BY JFM

Assumed Cross Section for Analysis



Weight Dam = $(.150)\left[(1.5\times13)+\left(\frac{9+5}{2}\right)(10.5)+\left(\frac{1}{2}\times2\times12\right)\right]$ = 15.75 k/ft. of length

M_{O} due to weight of dam = $(.150)\left[(19.5\times\frac{13}{2})+(5\times10.5)(8+\frac{5}{2})+\right.$

$\left.+(\frac{1}{2}\times4\times10.5)(4+\frac{2\times4}{3})+(12)(13+\frac{2}{3})\right]$ = 147.3 k

Location of c.g. from toe = $\frac{147.3\ k}{15.75\ k}$ = 9.35' = $\bar{x}$

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DESIGN BRIEF

PROJECT NAME Ogdensburg DATE

SUBJECT PROJECT NO.

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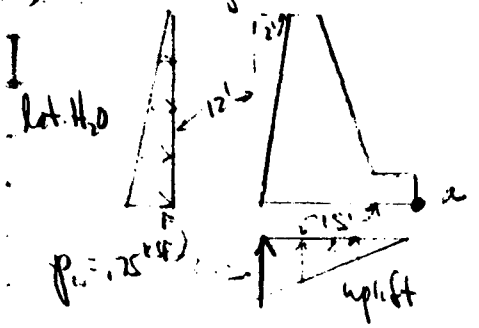
Case I · Normal Operations (No Ice)

(i) Overturning



M_a resisting overturning due to mass of dam, H_2O above upstream face =

$= 147.3^{k} + \left(\frac{1}{2} \times 2 \times 12 \times .0624^{kcf}\right)\left(13 + \frac{2\times 2}{3}\right) = 158^{k}$

M_a causing ovt due to lat. H_2O upstream, uplift =

$= \left(\frac{1}{2} \times .75 \times 12\right)\left(\frac{12}{3}\right) + \left(.75 \times \frac{15}{2}\right)\left(\frac{2}{3} \times 15\right) = 74.13^{k}$

U_f = uplift force = $\frac{1}{2} \times .75 \times 15 = 5.63^{k}$

FS against overturning = $\frac{158^{k}}{74.1^{k}} = \underline{2.13}$

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

$d = \frac{(158 - 74.1)^{k}}{W_{dam} - U_f + H_2O \text{ above upst. face}} = \frac{83.9^{k}}{15.75 - 5.63 + 0.75} = \frac{83.9^{k}}{10.88^{k}} = 7.7' = .51b$

- ok -

(ii) Sliding (using friction - shear method, $T_{conc\text{-}rock} = 100$ psi, $\mu = 0.65$)

FS against Sliding = $\frac{(\mu)(\Sigma V) + Tbl}{\text{lat. } H_2O \text{ upstream}} = \frac{(0.65)(10.88^{k}) + (.100^{ksi} \times 15' \times 1' \times 144^{\frac{in^2}{ft^2}})}{\left(\frac{1}{2} \times .75 \times 12'\right)}$

$= \frac{(7.1 + 216)^{k}}{4.5^{k}} = \underline{50\pm}$ - ok -

Case II · Normal Operations, with Ice

(i) FS against overturning = $\frac{158^{k}}{74.1 + (7.5 \times 11)} = \frac{158}{156.6} = \underline{1.01}$

$d = .01\,b$

[computation will be same if 10k/ft ice load acts]

(ii) FS against sliding = $\frac{223}{4.5 + 7.5} = \underline{18.6}$

PROJECT NAME _____ DATE _____

SUBJECT _____ PROJECT NO. _____

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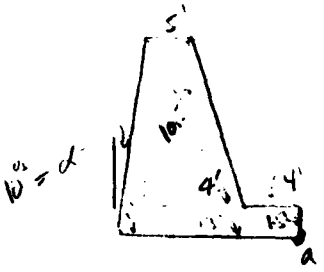
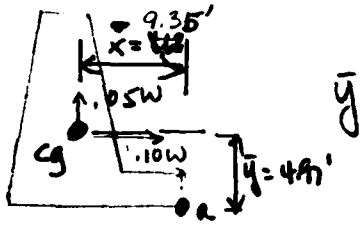
Case III · Normal Operations (No Ice) plus Seismic effects applicable to Zone 3

Zone 3 Seismic coef = 0.10 (horiz)
= 0.05 (vert)



locating c.g. from toe, $\bar{y}$

$$\Sigma W\bar{y} = (1.15)\left[\left(13\times1.5\times\tfrac{11.5}{2}\right)+\left(\tfrac{1}{2}\times4\times10.5\right)\left(1.5+\tfrac{10.5}{3}\right)+\right.$$
$$\left.+\left(5\times10.5\right)\left(\tfrac{10.5}{2}+1.5\right)+\left(\tfrac{1}{2}\times2\times12\right)\left(\tfrac{12}{3}\right)\right] = 78.3^{k}$$



$$\bar{y} = 78.3^{k}/15.75 = 4.97'$$

(i) Overturning

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

$$= (.10\times15.75^{k})(4.97') + (.05\times15.75^{k})(9.35) = 15.2^{'k}$$

Additional overturning M_a due to dam-reservoir water interaction =

$$= (0.30)(.67\times.10\times.0624\times12\times12\times12) = 7.2^{'k}$$

$$\therefore \text{FS against overturning} = \frac{158^{'k}}{(74.1+15.2+7.2)} = \frac{158}{91.5} = \underline{1.73}$$

$$\text{Position of Resultant measured from toe, } d = \frac{158-91.5}{10.88-(.05\times15.75)} = \frac{66.5}{10.09} = 6.6' = .44b$$

(ii) Sliding

Additional lateral force due to dam-reservoir interaction =

$$= (0.7)(0.67\times.10\times.0624\times12\times12) = 0.44^{k}$$

$$\text{FS against sliding} = \frac{223}{4.5^{k}+0.44^{k}+.10(15.75)} = \frac{223}{6.5} = \underline{34}\ \pm$$

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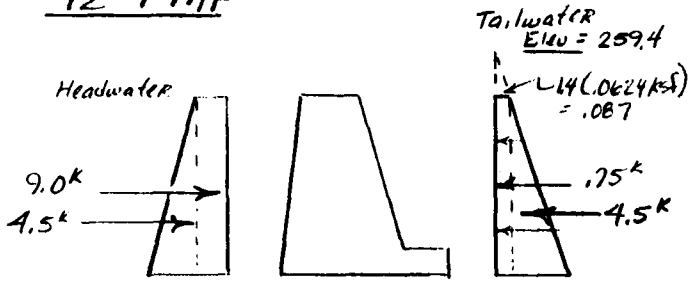
½ PMF



Add'l u/s H_2O force
$= (.0624)ksf\,(270'-258')(12') = 9.0^k$
Add'l Moment $= 9^k(\frac{12'}{2}) = 53.9'^k$

Add'l resistance - D/S H_2O
Force $= 4.5^k + .087^{kf}(12') = 4.5 + 1.05 = 5.55^k$
Moment $= 4.5^k(12'/3) + 1.05^k(\frac{12'}{2}) = 24.3'^k$

Overturning

$$F.S. = \frac{158'^k + 24.3'^k}{74.1'^k + 53.9'^k} = \frac{182.3}{128} = 1.42$$

$$d = \frac{\Sigma M}{\Sigma V} = \frac{182.3 - 128}{10.88} = 5.0' = 0.33\,b$$ at edge of middle third

Sliding

$$F.S. = \frac{2.43 + 5.55^k}{4.5^k + 9^k} = 1?$$

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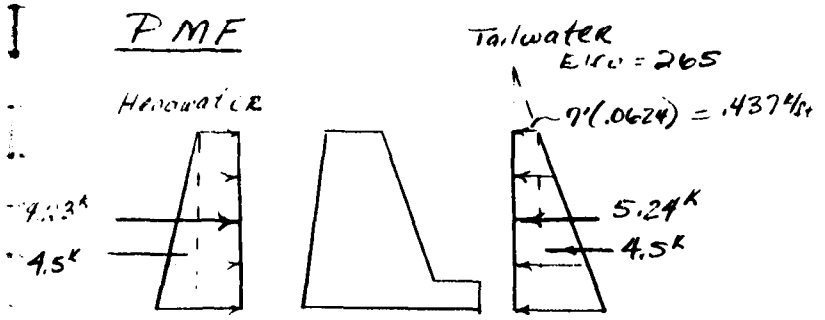
PMF



Add'l 4/5 H_2O force
$= (.0624\ k/sf)(7' - 2.5')(12')$
$= 14.23^k$
Add'l moment
$= 14.23^k\ (12'/2) = 85.4^{f\text{-}k}$

Add'l resistance due to 2/5 H_2O
force $= 4.5^k + 12'(.0624 \times 7') = 4.5 + 5.24$
$= 9.74^k$
moment $= 17.97 + 5.24^k(6') = 49.41^{f\text{-}k}$

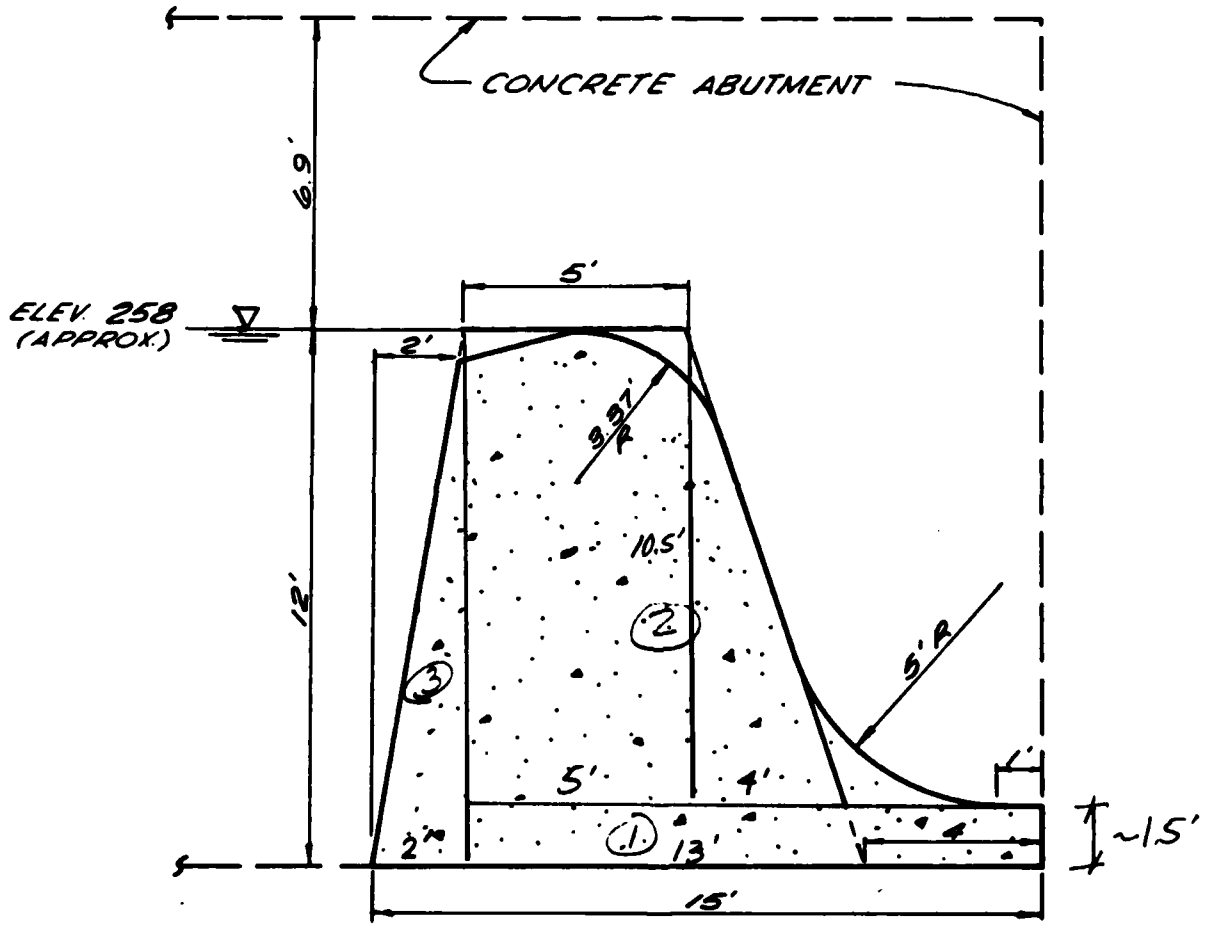
Overturning

$$F.S. = \frac{158^{f\text{-}k} + 49.4^{f\text{-}k}}{74.1 + 85.4^{f\text{-}k}} = \frac{207.4}{159.5} = 1.3$$

$$d = \frac{\Sigma M}{\Sigma V} = \frac{207.4 - 159.5}{10.88} = \frac{47.9}{10.88} = 4.4' = 0.36$$

Sliding

$$F.S. = \frac{223 + 9.74}{4.5^k + 14.23^k} = \frac{232.7}{18.73} = 12 \pm$$



SCALE: 1"=40'

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	JOB 2899	APP'D	

APPENDIX E

REFERENCES

APPENDIX E

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