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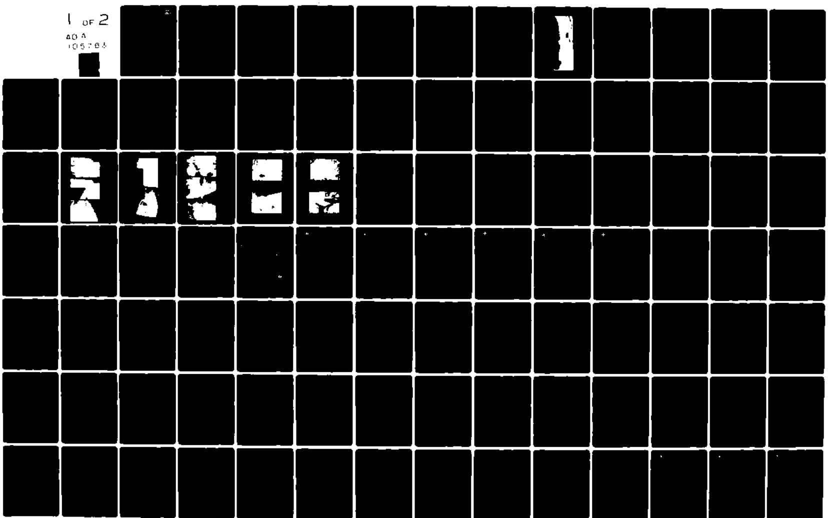

MOHAWK RIVER BASIN

AD A105763

LEVEL

# CLINTON RESERVOIR DAM
# NEW YORK
# INVENTORY No. NY 212

# PHASE I INSPECTION REPORT
# NATIONAL DAM SAFETY PROGRAM

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NEW YORK DISTRICT CORPS OF ENGINEERS

JULY 1981

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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| | |
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| National Dam Safety Program | Clinton Reservoir Dam |
| Visual Inspection | Oneida County |
| Hydrology, Structural Stability | Mohawk River Basin |

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 Phase I inspection of the Cinton Reservoir Dam did not indicate conditions which would constitute an immediate hazard to human life or property. However, the dam has some deficiencies which require further investigations and remedial work.

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The structural analysis indicates unsatisfactory stability against overturning for the conditions of the reservoir at spillway crest plus ice loading and the 1/2 PMF and PMF conditions. A stability investigation of the spillway section should be undertaken to determine the factors of safety during extreme loading conditions. A structural stability investigation should be commenced within 3 to 6 months to determine the characteristics of the uplift forces acting on the dam, the properties of the existing dam and foundation, and the effect of these conditions on the stability of the dam. Remedial work should be undertaken depending on the results of this investigation and completed within 18 to 24 months.

The hydrologic/hydraulic analysis establishes the spillway capacity as 35 percent of the Probable Maximum Flood (PMF). The dam will be overtopped by 0.7 feet by the PMF and 0.25 feet under the 1/2 PMF. However, a dam break analysis indicates that a dam failure would not significantly increase the downstream hazard to loss of life from that which would occur just prior to the failure. Therefore, the spillway is assessed as inadequate according to the Corps of Engineers' screening criteria.

## 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 aid 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.

## TABLE OF CONTENTS



## APPENDIX

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

| | |
|---|---|
| Name of Dam: | Clinton Reservoir Dam ID. No. NY 212 |
| State Located: | New York |
| County: | Oneida |
| Watershed: | Mohawk River Basin |
| Stream: | Unnamed |
| Date of Inspection: | March 13, 1981 |

ASSESSMENT OF GENERAL CONDITIONS

The Phase I inspection of the Cinton Reservoir Dam did not indicate conditions which would constitute an immediate hazard to human life or property. However, the dam has some deficiencies which require further investigations and remedial work.

The structural analysis indicates unsatisfactory stability against overturning for the conditions of the reservoir at spillway crest plus ice loading and the 1/2 PMF and PMF conditions. A stability investigation of the spillway section should be undertaken to determine the factors of safety during extreme loading conditions. A structural stability investigation should be commenced within 3 to 6 months to determine the characteristics of the uplift forces acting on the dam, the properties of the existing dam and foundation, and the effect of these conditions on the stability of the dam. Remedial work should be undertaken depending on the results of this investigation and completed within 18 to 24 months.

The hydrologic/hydraulic analysis establishes the spillway capacity as 35 percent of the Probable Maximum Flood (PMF). The dam will be overtopped by 0.7 feet by the PMF and 0.25 feet under the 1/2 PMF. However, a dam break analysis indicates that a dam failure would not significantly increase the downstream hazard to loss of life from that which would occur just prior to the failure. Therefore, the spillway is assessed as inadequate according to the Corps of Engineers' screening criteria.

The following remedial work should be undertaken by the Owner within 12 months:

1. The channel at the downstream end of the spillway should be repaired to provide a stable channel for the discharge flows.

2. Trees and brush should be removed from the embankment and a suitable sod cover established to allow for inspection of the embankment.

3. Woodchucks should be eliminated from the embankment and the burrows filled.

4. 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.

5. 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

Approved By: Col. W. M. Smith, Jr.
Date: New York District Engineer

31 Aug 81

1. Overview of Clinton Reservoir Dam as viewed from downstream. Spillway is located in left portion of photo. Note extensive tree and brush growth on embankment.

PHASE I INSPECTION REPORT
CLINTON RESERVOIR DAM I.D. NO. NY 212
MOHAWK RIVER BASIN
ONEIDA COUNTY, NEW YORK

## 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 U.S. Army Corps of Engineers.

#### b. Purpose of Inspection

The purpose of this inspection is to evaluate the existing condition of the Clinton Reservoir Dam and appurtenant structures, owned by the Village of Clinton, New York, and to determine if the dam constitutes a hazard to human life or property and to transmit findings to the U.S. Army Corps of Engineers.

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

### 1.2 DESCRIPTION OF PROJECT

#### a. Description of Dam and Appurtenances

The Clinton Reservoir Dam is located in the Town of Kirkland and formerly served as the source of water for the Village of Clinton. At present, the system operates as a standby source of water. The dam consists of an earthen embankment approximately 440 feet long with a maximum height of approximately 34 feet. The upstream slope of the dam is 2-1/2 horizontal to 1 vertical. The surface is protected by riprap for its entire length. The downstream slope is 2 horizontal on 1 vertical. The dam, as it presently exists, was constructed over an existing dam which was situated at the site. A concrete corewall extends from just above the crest of the earth embankment down to the clay puddle core of the old dam embankment. A 30 foot long ogee shaped spillway is situated near the south abutment of the dam. This spillway discharges through a natural channel. The main inlet into the impoundment flows immediately adjacent to Bloosfield Road. A small sedimentation chamber is located along the roadway. This chamber collects sediment and prevents its deposition in the impoundment.

b. Location

The Clinton Reservoir Dam is located in the Town of Kirkland, Oneida County, New York, at the intersection of Reservoir Road and Bloosfield Road approximately 1/2 mile from Route 12B.

c. Size Classification

The maximum height of the dam is approximately 34 feet. The volume of the impoundment is approximately 71 acre feet to the top of dam. Therefore, the dam is in the small size classficiation as defined by the Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification

The impoundment is located immediately above a residential property. An additional residence is located approximately 1/2 mile downstream on the receiving stream. Therefore, the dam is in the high hazard category as defined in the Recommended Guidelines for Safety Inspection of Dams.

e. Ownership

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

Contact: Harlan Lewis, Mayor
Village of Clinton
Village Hall
Box 242
Clinton, New York 13323
Telephone: (315) 853-5231

f. Purpose of the Dam

The dam was originally developed as a source of water supply for the Village of Clinton. At present, the dam is used only as an emergency supply and is not directly connected into the water system of the Village of Clinton.

g. Design and Construction History

The original reservoir was constructed at the site in approximately 1884. The plans included in this report indicate that the dam was reconstructed to a height of 10 feet above the original dam in approximately 1936. The 1936 plans substantially conform to the present configuration.

h. Normal Operational Procedures

At the present time, water level is uncontrolled in the impoundment. The reservoir has not been used as a part of the public water supply and the water level is allowed to fluctuate with runoff.

## 1.3 PERTINENT DATA

### a. Drainage Area

The drainage area of Clinton Reservoir Dam is 0.6 square miles.

### b. Discharge at Dam Site

No discharge records are available for this site.

Computed discharges:

| | |
|---|---|
| Ungated spillway, top of dam | 465 cfs |
| Reservoir Drain Capacity* | 29 cfs |

### c. Elevation (feet above MSL; estimated from USGS mapping)

| | |
|---|---|
| Top of dam | 830+ |
| Emergency spillway crest | 827.5± |
| Stream bed at centerline of dam | 796± |

### d. Reservoir

| | |
|---|---|
| Length of normal pool | 520 feet |

### e. Storage

| | |
|---|---|
| Top of dam | 71 acre feet |
| Normal pool (@ spillway crest) | 58 acre feet |

### f. Reservoir Area

| | |
|---|---|
| Top of dam | 5.5 acres |
| Normal pool (@ spillway crest) | 4.8 acres |

### g. Dam

Type - earth fill
Length - 440+ feet
Height - 34 feet
Freeboard between normal reservoir and top of dam - 2.5 feet
Top width - 8 feet
Side slopes- Upstream: 2-1/2 horizontal:1 vertical
Downstream: 2 horizontal:1 vertical
Zoning - None
Impervious core - concrete corewall
Grout Curtain - center puddle

* 16 inch diameter drain with water level at spillway crest. Additional drain capacity can be provided through water distribution system.

h. Spillway

Type - Ogee shaped
Length - 30 feet
Crest elevation - 827.5
Gates - None
U/S Channel - Impoundment
D/S Channel - stream channel

i. Regulating Outlets

Reservoir levels can be regulated by flow through the 16 inch diameter cast iron pipe which extends from the reservoir to the gatehouse where it branches to a 16 inch diameter mud pipe and a 16 inch diameter water supply main. Both the mud pipe and water supply pipe are controlled by valves (presumably gate valves) at the gatehouse.

## SECTION 2: ENGINEERING DATA

### 2.1 GEOTECHNICAL DATA

#### a. Geology

Geologically, Clinton Reservoir is located in the southern New York section of the Appalachian Plateaus Province, which is part of the Appalachian Highlands, the major physiographic division. The Mohawk section is located to the north of this section. The reservoir is on the western valley wall of the Oriskany glacial valley. The stream feeding the reservoir is considered to be flowing in a hanging valley. Bedrock in the site area is the Vernon Shale, a formation of the Salina Group of Late Silurian age. The formation consists of a red, crumbly, shaly claystone with some greenish layers or zones of green spots. The rock, upon exposure, weathers easily and crumbles. The Vernon is exposed along the valley downstream of the spillway apron. About fifty feet down valley of the spillway toe there is an exposure of tufa overlying the Vernon. This calcareous material extends for about thirty feet along the west bank of the stream and has a maximum exposed thickness of approximately six feet. The tufa had most likely formed by precipitation from the spray of the highly calcareous waters flowing through the valley. The carbonate precipitate coated all debris encountered, including twigs, branches, and logs. In time decomposition of the encrusted vegetable matter left a honeycombed tufa deposit with numerous tubes and channels. It is most likely that the "horse bone" referred to in the 1935 report is the tufa described above. Present stream flow from the spillway channel is removing the weak Vernon Shale and undercutting the tufa downstream. In several places, along the spillway stream channel, this sapping has led to collapse of blocks of tufa resulting in a partial blockage of the channel. Other blocks are on the verge of dropping into the valley which would add to the presently existing obstructions.

#### b. Subsurface Investigations

The early reports and plans of 1924, 1926 and 1935 indicate that the dam site was keyed into bedrock whereas the walls were sited on shale and clay. The clay referred to would be a glacial till-clay and is relatively impermeable. According to the plans of 1935, the puddle core, near the east end of the site, penetrated the "horse-bone" (tufa) bed. (Although not stated in the 1935 report, it is believed that the excavated "horse-bone" waste was used as part of the downstream dam face fill. A large woodchuck hole about 1/2 way down the face and about 1/4 of the way north of the spillway was ringed with spoil of the tufa. This material, subjected to rainwater, is highly soluble.

### 2.2 DESIGN RECORDS

No reports are available from the original design of the dam. Drawings for the original dam and its reconstruction are included in Appendix G of this report.

## 2.3 CONSTRUCTION RECORDS

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

## 2.4 OPERATIONAL RECORDS

There are no operational records available for this dam.

## 2.5 EVALUATION OF DATA

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

## SECTION 3: VISUAL INSPECTION

### 3.1 FINDINGS

#### a. General

The Clinton Reservoir Dam was inspected on March 13, 1981. The Dale Engineering Company Inspection Team was accompanied on the inspection by Robert Galinski of the Village of Clinton, Department of Public Works and John Lane, Trustee of the Village of Clinton.

#### b. Dam

At the time of the inspection, the water level in the impoundment was approximately at the spillway level. A small flow was cresting the spillway. The slopes of the earthen dike were uniform and no evidence of displacement was detected. The downstream face of the dam was heavily overgrown with trees and brush. Woodchuck burrows were found on the downstream face of the earthen dike. The crest of the dam was uniform and no evidence of settlement or subsidence was detected. The corewall of the facility extends above the surface of the ground and forms a portion of the upstream face of the impoundment. This wall was generally in good, condition, although there was a slight angle change in its alignment with a small crack at the apex of this angle. The abutments of the embankment showed no signs of erosion or seepage. The downstream slope at the toe of the embankment was also uniform in slope and showed no signs of sloughing or seepage. The heavy growth of brush and trees extends to the toe of the slope. This growth has resulted in the loss of sod cover on the embankment slope due to the shading of the foliage. A developed spring is situated at the toe of slope near the center of the embankment. This spring consists of a concrete springbox with cover. The spring supplies water to the residence downstream from the dam. Plans dated 1884 indicate the presence of a spring in the general area of this facility. Observations in the springbox show no signs of piping of material or boils. The flow is clear and moderate in quantity.

#### c. Appurtenant Structures

A sedimentation chamber is located on the inlet stream approximately 200 feet above the impoundment. This structure is used to intercept sediment and prevent deposition in the impoundment. At the time of the inspection, there was a small quantity of sediment in the upstream end of the chamber. Personnel from the Village of Clinton indicate that this facility was cleaned during 1980.

#### d. Spillway

The outlet of the impoundment consists of a 30 foot long ogee shaped weir discharging through a concrete channel. The concrete of this spillway section is generally in good condition with some minor deterioration. Significant erosion has occurred at the end of the concrete spillway channel. The left wall of the spillway is undermined and erosion has occurred at the end of the wall.

e. Reservoir Drain and Water Supply Pipe

A 16 inch diameter cast iron pipe extends from the reservoir to the gatehouse where it branches into a 16 inch diameter mud pipe and a 16 inch diameter water supply main. Valves at the gatehouse control flow through these two pipes. It is not known whether the valve for the mud pipe is operable, as it has not been used in several years. The valve for the water supply line is believed to be in operating condition, as this system is used as a supplement to the Hamilton College water supply system and as an emergency supply of water to the Village of Clinton.

f. Reservoir Area

The reservoir area covers approximately 4.8 acres. Significant growth of cattails is evident near the inlet to the impoundment indicating that some sedimentation has occurred in the impoundment. The shoreline of the impoundment is planted in coniferous trees and no indication of slope instability was detected along the banks of the impoundment.

g. Downstream Channel

The downstream channel of the spillway shows signs of erosion at the end of the concrete spillway.

## 3.2 EVALUATION

The visual inspection revealed that the embankment is generally in good condition. The following remedial work should be addressed by the Owner:

1) The channel at the downstream end of the spillway is seriously eroded. Continued erosion could result in damage to the embankment. This area should be repaired to provide a stable channel for the discharge flows.

2) The growth of trees and brush on the embankment should be removed to allow inspection of the embankment and to allow the establishment of a durable sod cover on the embankment.

3) Woodchucks should be eliminated from the embankment and the burrows filled.

## SECTION 4: OPERATION AND MAINTENANCE PROCEDURES

### 4.1 PROCEDURES

This reservoir is used as an emergency source of water for the Village of Clinton Water Supply system. At present, the valve controlling flow from the reservoir is fully closed. The reservoir level is allowed to fluctuate with runoff through the spillway channel.

### 4.2 MAINTENANCE OF THE DAM

Maintenance and operation of the dam is controlled by the Village of Clinton. Periodic visits are made to the site to check on conditions of the facilities. No formal operating system is in effect at the site.

### 4.3 MAINTENANCE OF OPERATION FACILITIES

The valves controlling flow from the impoundment have not been operated recently but are believed are to be in operating condition.

### 4.4 DESCRIPTION OF WARNING SYSTEM

No warning system is in effect at the present.

### 4.5 EVALUATION

The dam and appurtenances are inspected by representatives of the Village of Clinton. The facility at present shows signs of lack of maintenance. The following operation and maintenance procedures should be implemented by the Owner:

1) Since the dam is in the high hazard classification, a warning system should be implemented to alert the public should conditions occur which could result in failure of the dam.

2) A formalized inspection system should be initiated to develop data on conditions and maintenance operations of the facility.

## SECTION 5: HYDROLOGIC/HYDRAULIC

### 5.1 DRAINAGE AREA CHARACTERISTICS

The Clinton Reservoir Dam is located in the Town of Kirkland, southwest of the Village of Clinton. The dam has a drainage area of 0.60 square miles, which is characterized by moderately steep to steeply sloping hills. The watershed is essentially undeveloped. The reservoir has a surface area of approximately 4.7 acres and outlets into an unnamed tributary to Oriskany Creek.

### 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. In the event that the dam could not pass 1/2 the Probable Maximum Flood without overtopping, additional analyses are to be performed on potential dam failures if the dam is designated as a High Hazard Classification. This process was done with the concept that if the dam was unable to satisfy this criteria, further refined hydrologic investigations would be required.

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

Unit hydrographs were defined by Snyder coefficients, $C_t$ and $C_p$. Snyder's $C_t$ was estimated to be 2.0 for the drainage area and $C_p$ was estimated to be 0.625. In this analysis, the reservoir pool was assumed to be at the spillway crest elevation at the start of the storm and flow through the reservoir drain and water distribution pipe was assumed to be zero.

The Probable Maximum Precipitation (PMP) was 19.8 inches according to Hydrometeorological Report (HMR #33) for a 24-hour duration storm, 200 square mile basin. Loss rates were set at 1.0 inch initial loss and 0.1 inch/hour constant loss. These assumptions yielded 84 percent run-off from the PMF. The peak for the PMF inflow hydrograph was 1,330 cfs and the 1/2 PMF inflow peak was 665 cfs. The small storage capacity of the reservoir above the spillway reduced these peak flows a negligible amount.

## 5.3 SPILLWAY CAPACITY

The spillway is an ogee shaped weir with a length of 30 feet. Weir coefficients ranging from 2.98 to 4.12 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 465 cfs.

SPILLWAY CAPACITY

| Flood | Peak Discharge | Capacity as % of Flood Discharge |
|---|---|---|
| PMF | 1,332 cfs | 35% |
| 1/2 PMF | 666 cfs | 70% |

## 5.4 RESERVOIR CAPACITY

The reservoir storage capacity was obtained from the plans included in Appendix G and USGS mapping. The resulting estimates of the reservoir storage capacity are shown below:

| | |
|---|---|
| Top of Dam | 71 Acre Feet |
| Spillway Crest | 58 Acre Feet |

## 5.5 FLOODS OF RECORD

There is no information on water levels at the dam site.

## 5.6 OVERTOPPING POTENTIAL

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

| Flood | Peak Inflow | Peak Outflow | Maximum Depth Over Dam |
|---|---|---|---|
| PMF | 1,330 cfs | 1,332 cfs | 0.69 feet |
| 1/2 PMF | 665 cfs | 666 cfs | 0.23 feet |

The stability analysis indicates unsatisfactory stability against overturning for the spillway section under the 1/2 PMF loading. Therefore, a dam break analysis was performed to determine the significance of various failures of the spillway section only on the downstream hazard. This analysis was performed with the 1/2 PMF assuming the spillway section of the dam to fail at the maximum elevation resulting from the 1/2 PMF. The flood elevations, due to various dam failures and the flood elevations that would exist just before the corresponding dam break induced flood wave are shown on the next page. These flood elevations are compared in the area of the closest downstream hazard, which is some 500 feet downstream of the dam.

Flood Elevations @ Downstream Hazard

| | Just Prior to Dam Break | Due to Dam Break |
|---|---|---|
| Failure Time = 0.1 hrs. | 777.2 | 779.4 |
| Failure Time = 0.3 hrs. | 777.2 | 779.2 |
| Failure Time = 0.5 hrs. | 777.2 | 779.0 |

The above elevations were estimated from USGS quad sheets. These elevations are not exact and their significance is in the difference between the elevations for the flood levels with and without the dam failure. The worst of these three cases indicates that the flood depth would increase from 3.2 feet to 5.4 feet due to a dam failure.

The first floor of the house which constitutes the downstream hazard is located about 5 feet above the stream bed. Therefore, it appears from this analysis that this flood depth increase of 2 feet will not significantly increase the downstream hazard.

## 5.7 EVALUATION

The hydrologic/hydraulic analysis establishes the spillway capacity as 35% of the Probable Maximum Flood (PMF). The dam will be overtopped by 0.7 feet by the PMF and 0.25 feet under the 1/2 PMF. However, failure of the spillway section of the dam during the 1/2 PMF event will not significantly increase the downstream hazard from that which would occur just prior to the dam failure. Therefore, the spillway is assessed as inadequate according to the Corps of Engineers screening criteria.

## SECTION 6: STRUCTURAL STABILITY

### 6.1 EVALUATION OF STRUCTURAL STABILITY

#### a. Visual Observations

The Clinton Reservoir has been created by the construction of an earthen embankment dam which establishes a necessary easterly limit for an otherwise natural impounding area. This embankment, having a generally north-south alignment, is provided with a concrete core wall which extends slightly higher than the earthen section. The concrete core in fact serves alone as the upper two feet, approximately, of the dam's upstream side. Soil fill to the top of the core wall backs up the downstream side of the wall. A concrete ogee spillway section 30 feet in length near to the dams southerly limit, is incorporated into the overall dam structure and generally aligned with the core wall of the embankment near to the dam's southerly limit. The concrete abutments for the spillway extend to become training walls for the spillway apron which directs spillway flow to the site's apparently natural discharge channel which begins near the dam's downstream toe.

The downstream face of the embankment is generally covered with a relatively heavy growth of trees and brush. Brush and trees were bare at the time of the field inspection (early spring season, vegetation not yet leafed), and the alignment of the cross-section could be evaluated with some confidence. No indication of misalignment or sloughing was noted, and no indication of through-dam seepage was detected. The exposed upper zone of the concrete core wall was similarly noted as retaining structural alignment (a slight change in the alignment near to the dam's midlength, discussed in Section 3.1(b), appears to be the result of planned construction and not a condition of post-construction movement).

The upstream side of the embankment has been provided with a cobble-size riprap which, to the limited depth visible through the water surface, appeared to be properly retained in position as a protective facing.

Observation indicates the concrete spillway to be in relatively good condition and retaining stability. A crack of significant size has developed where the northside abutment meets the adjoining concrete core wall. The stability of the endmost section of the concrete abutment training wall near the downstream discharge channel and which forms the southerly side of the spillway apron, suffers from a significant degree of cracking and spalling plus some undermining of its foundation.

A town road borders the southerly limit of the reservoir at elevations higher than the impounded water with a result that some sections of steep slope exist between the road edge/shoulder and the edge of the reservoir. In the area adjacent to the spillway training wall, severe erosion/sloughing has required that dumped cobble-size crushed rock be provided to protect the roadway shoulder and the fence bordering the reservoir site. This condition does not endanger the spillway section, but does present some danger to the outermost length of spillway training wall.

b. Design and Construction Data

Drawings are available which indicate that an embankment dam constructed to create the Clinton Village reservoir at the present site was completed in 1884. This dam included a core wall which penetrated original ground. The dam was raised ten feet to achieve a maximum height of about 34 feet, and the embankment cross-section was correspondingly enlarged to the present dimensions by the construction of 1936. The new construction included a core wall. The present spillway was built as part of the new construction.

No calculations regarding the stability of the spillway or embankment sections have been located. However, correspondence on record between the New York State Department of Engineering and the Design Engineer for the dam allude to stability analysis for the concrete spillway section while embankment slopes (2.5 to 1 upstream, 2 to 1 downstream) were apparently selected on the basis of experience and/or empirical data. Similarly, no specific information referring to properties of the dam and foundation materials, nor field construction records, have been located.

Observations indicate that the dimensions of the existing embankment and spillway substantially conform to the information shown on the Drawings prepared in 1935 and reproduced for Appendix G of this report.

c. Operating Records

There are no available operating records for the facility.

d. Post Construction Changes

There is no information available to indicate post construction changes to the facility since the aforementioned 1936 enlargement of the structure.

e. Seismic Stability

No known faults exist in the immediate vicinity of this dam. The closest known fault is found on Lairdville gorge just north of Route 5, about three miles north-northwest of the dam. Displacement along this fault is minor, less than one foot. Several lineaments in the general area, which suggest possible fault lines, are noted on the Brittle Structures Map applicable to this area (Ref. 17). The closest lineament is about one-fifth mile west-southwest of the dam. Zones of high angle faults also noted on that map are approximately three miles west and southwest of the dam.

Numerous slickensided joint planes are found in the Vernon Formation. Such surfaces are indicative of movement. The Vernon Formation is structurally incompetent and is considered to be the weakest member of the entire rock series in the Oriskany Valley. Any movement in the area would be concentrated upon the Vernon because it is highly susceptible and incompetent when stress is applied as compared to other rocks in the area. None of the other rock units in the area exhibit slickensided surfaces similar to those of the Vernon.

Rock bedding dips less than 1° to the southwest. Joints are close to vertical and strikes and spacing are as follows:

| Strike | Spacing |
|---|---|
| N50W | 6-8 in. |
| N20E | 6-8 in. |
| N80E | 2-3 feet |
| N75W | 6 in. -3 ft. |

The area is located within Zone 2 of the Seismic Probability Map. Only minor earthquake activity has occurred in this region. The most severe, indicated as intensity V-VII on the Modified Mercalli scale, occurred in 1849 in the Utica area, about 22 miles east of the dam site. Another of intensity II occurred in 1930 about 8 miles northeast of the dam. The most recent earthquake (1979) was less than II and about 8 miles to the east.

## 6.2 STRUCTURAL STABILITY ANALYSIS

Drawings available for review show a generalized plan alignment and cross-sections for the dam embankment and spillway, but do not include information on the properties of the dam and foundation materials, nor stability analysis. As part of the present study, stability evaluations have been performed for the spillway section. Actual properties of the dam's construction materials and foundation were not determined as part of this study; where information on properties was necessary for computations but lacking, assumptions felt to be practical were made. The stability computations assumed a structural cross-section based on dimensions indicated by the plans included in this report. The results of the stability computations are summarized in the table following this page. The stability analyses are presented in Appendix E.

The loading conditions studied are:

1. normal summer-type operation, with the reservoir at the spillway crest;

2. winter conditions with the reservoir at the spillway crest plus ice effects;

3. reservoir level at the 1/2 PMF elevation;

4. reservoir level at the PMF elevation;

5. reservoir pool at the spillway crest plus seismic effects.

The results of the stability computations indicate satisfactory stability against overturning and sliding for the normal summer operations case, and the normal operation case with seismic effects. Unsatisfactory stability against overturning is indicated for the condition of winter pool plus ice loading, and the 1/2 PMF and the PMF conditions, according to the

Recommended Guidelines for Safety Inspection of Dams (i.e., factors of safety less than unity, and/or the resultant of forces acting on the dam is located outside the middle third of the base since tensile stresses would develop in the dam section, a condition which is structurally undesirable).

Lateral water pressures were computed from the water surface elevations calculated in the hydraulic analysis.

Critical to the analysis and resulting indication of stability are the items of uplift water pressure acting on the base of the dam and the relative permeability of the site's foundation material. For the "normal operating conditions" case, the analysis uplift force was based on a full headwater hydrostatic pressure acting on the dam's upstream corner and a zero tailwater hydrostastic 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 the indications of instability.

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

The drawings available for review indicate that the spillway has a foundation section which penetrates to rock. However, design records provide no information on the extent of such foundation dimensions, and field records to substantiate the foundation extension have not been found. For the analysis performed as part of this report, the possibility of a foundation extending to rock was disregarded as a conservative measure. It should be noted that a foundation extension of appreciable magnitude would improve the resistance to overturning and sliding.

The following items should be addressed by the Owner to insure the structural integrity of the spillway:

1. Some concrete repair to the spillway abutments is indicated as an undertaking considered important to the spillway retaining stability. Additional slope protection should be provided for the severely eroded road shoulder area immediately adjacent to the spillway abutment/apron.

2. Further investigation of the as-built section of the spillway is recommended to be followed by stability computations for the PMF, 1/2 PMF and ice loading conditions. This information would serve as the basis for planning modifications which may be necessary to assure the spillway is stable when exposed to these severe loading cases. It is understood that the reservoir may be drained in the near future for purposes of removing silt accumulations which appear to be reducing the reservoirs holding capacity. A dewatered reservoir would offer a good opportunity to investigate the foundation for the spillway.

RESULTS OF STABILITY COMPUTATIONS

| | Loading Condition | Factor of Safety* Overturning | Sliding** | Location of Resultant Passing through Base*** |
|---|---|---|---|---|
| (1) | Water level at elevations of spillway crest uplift acts on base, no ice. | 1.61 | 31± | 0.34b |
| (2) | Water level at crest elevation, uplift on base, 7.5 kips per lineal foot ice load. | 0.45 | 10± | (FS<1) |
| (3) | Water levels against upstream face and downstream face based on 1/2 PMF elevations, uplift acting on base as computed for the normal operating condition. | 1.15 | 20± | 0.12b |
| (4) | Water level against upstream face and downstream face based on PMF elevations, uplift acting on base as computed for the normal operating condition. | 1.10 | 19± | 0.08b |
| (5) | Water level at crest elevation, uplift on base, seismic effect for Zone 2 | 1.41 | 27± | 0.27b |

* 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.

## SECTION 7: ASSESSMENT/REMEDIAL MEASURES

### 7.1 DAM ASSESSMENT

#### a. Safety

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

The hydrologic/hydraulic analysis establishes the spillway capacity as 35 percent of the Probable Maximum Flood (PMF). The dam will be overtopped by 0.7 feet by the PMF and 0.25 feet under the 1/2 PMF. A dam break analysis of a failure of the spillway section of the dam during the 1/2 PMF indicates that the downstream hazard would not be significantly increased from that which would occur just prior to the failure. Therefore, the spillway is assessed as inadequate according to the Corp of Engineers screening criteria.

The structural stability analysis indicates unsatisfactory stability against overturning for the conditions of the reservoir at the spillway crest plus ice loading and the 1/2 PMF and PMF conditions.

The following specific safety assessments are based on the Phase I visual examination and analysis of hydrology and hydraulics and structural stability:

1. The channel at the downstream end of the spillway is seriously eroded. Continued erosion could result in damage to the embankment.

2. A growth of trees and brush has been established on the downstream face of the embankment. This growth has resulted in loss of sod cover due to shading.

3. Woodchuck burrows were found to exist on the exterior slopes of the embankment.

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

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

#### b. Adequacy of Information

The information available is adequate for a Phase I investigation.

#### c. Urgency

The items listed in the Safety Assessment should be addressed by the Owner and appropriate actions taken within 12 months of this notification. The recommended investigations should begin within 3 to 6 months.

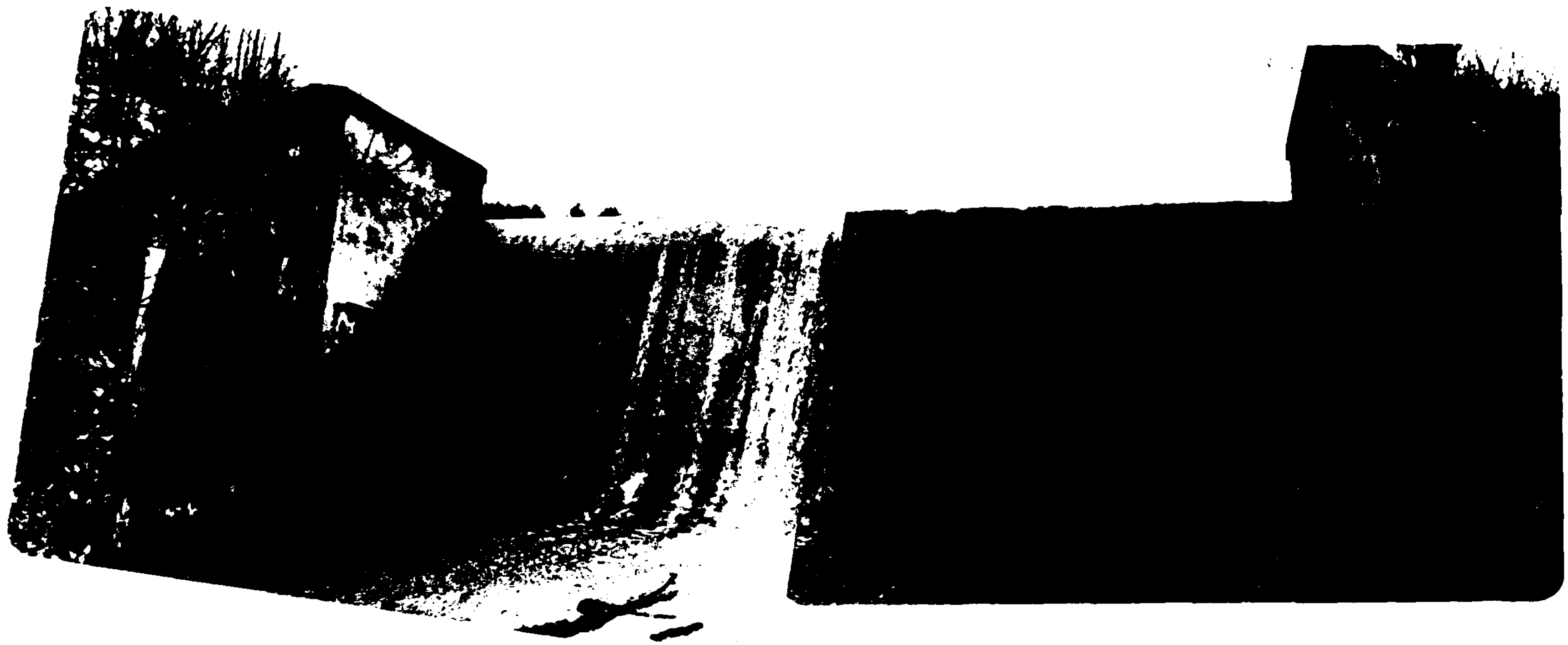
# APPENDIX A

## PHOTOGRAPHS

2. View along down-stream slope of embankment

3. View along crest of embankment. Reservoir on left

4. Close-up of deflection in concrete core wall



5. Spillway as viewed from downstream.

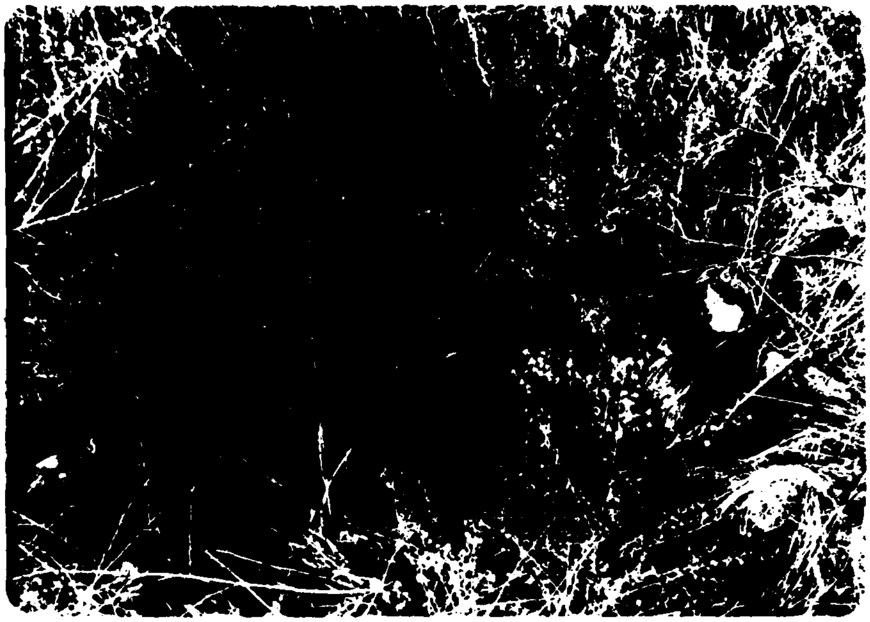
6. Spillway [illegible] downstream [illegible] viewed from dam.

7. Close-up of deteriorated portions of right spillway channel wall.

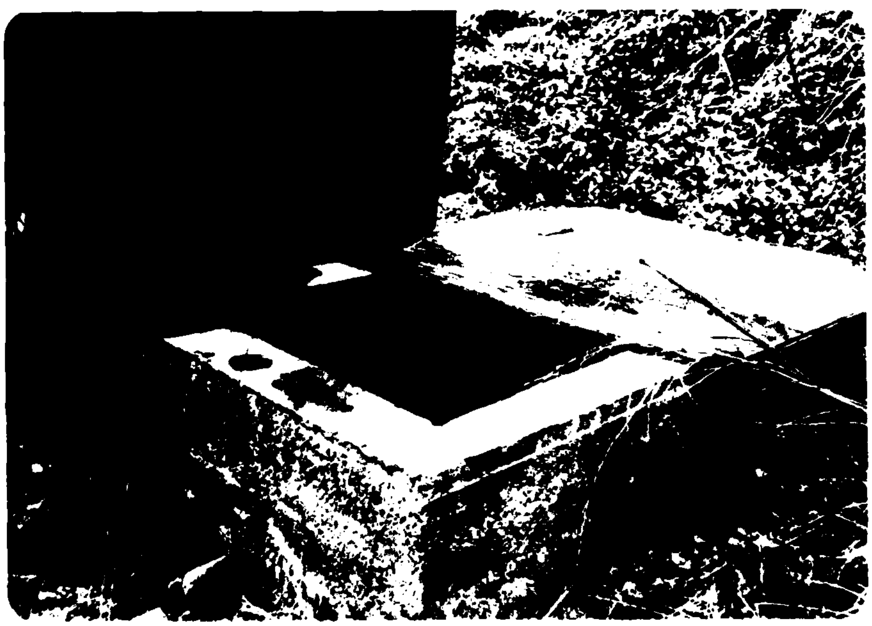
8. Spillway channel just downstream of training wall. Note pink shale forming channel.

9. Animal burrow on downstream slope of embankment.

10. Large diameter tree trunk near downstream toe of embankment.



11. Outlet to reservoir drain located at toe of slope.



12. Spring box located just beyond the toe of slope.

# APPENDIX B

## VISUAL INSPECTION CHECKLIST

d. Need for Additional Investigations

Further investigation of the as-built section of the spillway is recommended to be followed by stability computations for the PMF, 1/2 PMF, and the ice loading conditions. This information should serve as the basis for planning modifications which may be necessary to assure the spillway is stable when exposed to these severe cases of loading.

## 7.2 RECOMMENDED MEASURES

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

1. A stability investigation of the spillway section should be undertaken to determine the factors of safety during extreme loading conditions. Remedial work should be undertaken depending on the results of this investigation.

2. The channel at the downstream end of the spillway should be repaired to provide a stable channel for the discharge flows.

3. Trees and brush should be removed from the embankment and a suitable sod cover established to allow for inspection of the embankment.

4. Woodchucks should be eliminated from the embankment and the burrows filled.

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.

3-15-3(9/80)

VISUAL INSPECTION CHECKLIST

1) Basic Data

a. General

Name of Dam CLINTON RESERVOIR DAM

Fed. I.D. # N.Y 212 DEC Dam No. ______

River Basin MOHAWK RIVER

Location: Town KIRKLAND County ONEIDA

Stream Name UNNAMED

Tributary of ORISKANY CREEK

Latitude (N) 43-02.2 Longitude (W) 75-25.0

Type of Dam EARTH

Hazard Category HIGH

Date(s) of Inspection MARCH 13, 1981

Weather Conditions OVERCAST 40°

Reservoir Level at Time of Inspection @ SPILLWAY LEVEL

b. Inspection Personnel F.W. BUSZEWSKI, J.A. GOMEZ, D.F. McCARTHY, H. MUSKATT - DALE ENGINEERING COMPANY; ROBERT GALINSKI, JOHN LANE - VILLAGE OF CLINTON

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

HARLAN LEWIS - MAYOR
VILLAGE OF CLINTON TELEPHONE: 315-853-5231
VILLAGE HALL
BOX 242
CLINTON, N.Y. 13323

d. History:

Date Constructed 1884 Date(s) Reconstructed 1936

Designer JAMES P. WELLS

Constructed By UNKNOWN

Owner VILLAGE OF CLINTON

2) Embankment

a. Characteristics

(1) Embankment Material REPUTEDLY CLAY FILL.

(2) Cutoff Type CENTER PUDDLE EXTENDS INTO RED SHALE

(3) Impervious Core CENTER PUDDLE – ORIGINAL CONSTRUCTION CONCRETE CORE WALL – 1936 RECONSTRUCTION.

(4) Internal Drainage System NONE

(5) Miscellaneous NONE

b. Crest

(1) Vertical Alignment NO MISALIGNMENT DETECTED

(2) Horizontal Alignment NO SUBSIDENCE NOTED

(3) Surface Cracks NONE OBSERVED.

(4) Miscellaneous NONE

c. Upstream Slope

(1) Slope (Estimate) (V:H) 1 : 2 1/2

(2) Undesirable Growth or Debris, Animal Burrows NONE

(3) Sloughing, Subsidence or Depressions NONE OBSERVED

(4) Slope Protection NONE OBSERVED DUE TO ICE COVER AND HIGH WATER ELEVATION

(5) Surface Cracks or Movement at Toe NOT OBSERVED.

d. Downstream Slope

(1) Slope (Estimate - V:H) 1 : 2

(2) Undesirable Growth or Debris, Animal Burrows HEAVILY OVERGROWN WITH BRUSH & TREES NUMEROUS WOODCHUCK BURROWS.

(3) Sloughing, Subsidence or Depressions NONE OBSERVED SLOPE IS UNIFORM - VOID OF SOD PROBABLY DUE TO SHADING BY HEAVY BRUSH.

(4) Surface Cracks or Movement at Toe NONE OBSERVED

(5) Seepage NONE OBSERVED. (A DEVELOPED SPRING WITH CONCRETE SPRING BOX LOCATED AT TOE OF CENTER OF DAM SUPPLIES WATER TO NEARBY RESIDENCE FLOW WAS MODERATE, CLEAR, NO PIPING OBSERVED)

(6) External Drainage System (Ditches, Trenches; Blanket) NONE

(7) Condition Around Outlet Structure EROSION AT SPILLWAY OUTLET COULD CAUSE DAMAGE TO EMBANKMENT

(8) Seepage Beyond Toe (SEE REFERENCE TO SPRING ABOVE) NO OTHER SEEPAGE DETECTED

e. Abutments - Embankment Contact

GOOD CONDITION NO EROSION DUE TO SURFACE FLOW OF DRAINAGE

(1) Erosion at Contact NONE

(2) Seepage Along Contact NONE

3) Drainage System

a. Description of System NONE

b. Condition of System —

c. Discharge from Drainage System —

4) Instrumentation (Momumentation/Surveys, Observation Wells, Weirs, Piezometers, Etc.)

NONE

5) Reservoir

a. Slopes MODERATE SLOPES NO SIGNS OF INSTABILITY

b. Sedimentation CAT TAIL GROWTH AT INLET INDICATES SOME EROSION. HOWEVER A SEDIMENT

c. Unusual Conditions Which Affect Dam CHAMBER ON THE INLET STREAM EXISTS JUST UPSTREAM FROM RESERVOIR. SEDIMENT WOULD BE THE RESULT OF POOR MAINTENANCE OF THIS STRUCTURE

6) Area Downstream of Dam

a. Downstream Hazard (No. of Homes, Highways, etc.) ONE HOME IMMEDIATELY BELOW DAM ADDITONAL HOME APPROX 1/2 MILE DOWN STREAM

b. Seepage, Unusual Growth NONE OBSERVED

c. Evidence of Movement Beyond Toe of Dam NONE OBSERVED

d. Condition of Downstream Channel GOOD, NO EXTENSIVE RECENT EROSION EXCEPT AT END OF SPILLWAY.

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

a. General GOOD CONDITION, MINOR SPALLING OF CONCRETE, SOME UNDERMINING OF BASE OF SPILLWAY WALL. SUBSTANTIAL EROSION AT END OF SPILLWAY TRAINING WALL.

b. Condition of Service Spillway GOOD CONDITION, FREE OF DEBRIS MINOR SURFACE EROSION

c. Condition of Auxiliary Spillway NONE

d. Condition of Discharge Conveyance Channel OPEN FREE FLOWING

8) Reservoir Drain/Outlet

Type: Pipe CAST IRON Conduit ____ Other ____

Material: Concrete ____ Metal ✓ Other ____

Size: 12" Length ____

Invert Elevations: Entrance UNKNOWN Exit UNKNOWN

Physical Condition (Describe): Unobservable ✓

Material: ____

Joints: ____ Alignment ____

Structural Integrity: ____

Hydraulic Capability: ____

Means of Control: Gate ____ Valve ✓ Uncontrolled ____

Operation: Operable ✓ Inoperable ____ Other ____

Present Condition (Describe): ____

9) Structural

a. Concrete Surfaces N/A

b. Structural Cracking N/A

c. Movement - Horizontal & Vertical Alignment (Settlement) N/A

d. Junctions with Abutments or Embankments N/A

e. Drains - Foundation, Joint, Face N/A

f. Water Passages, Conduits, Sluices N/A

g. Seepage or Leakage N/A

h. Joints - Construction, etc. N/A

i. Foundation N/A

j. Abutments N/A

k. Control Gates N/A

l. Approach & Outlet Channels N/A

m. Energy Dissipators (Plunge Pool, etc.) N/A

n. Intake Structures N/A

o. Stability N/A

p. Miscellaneous N/A

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

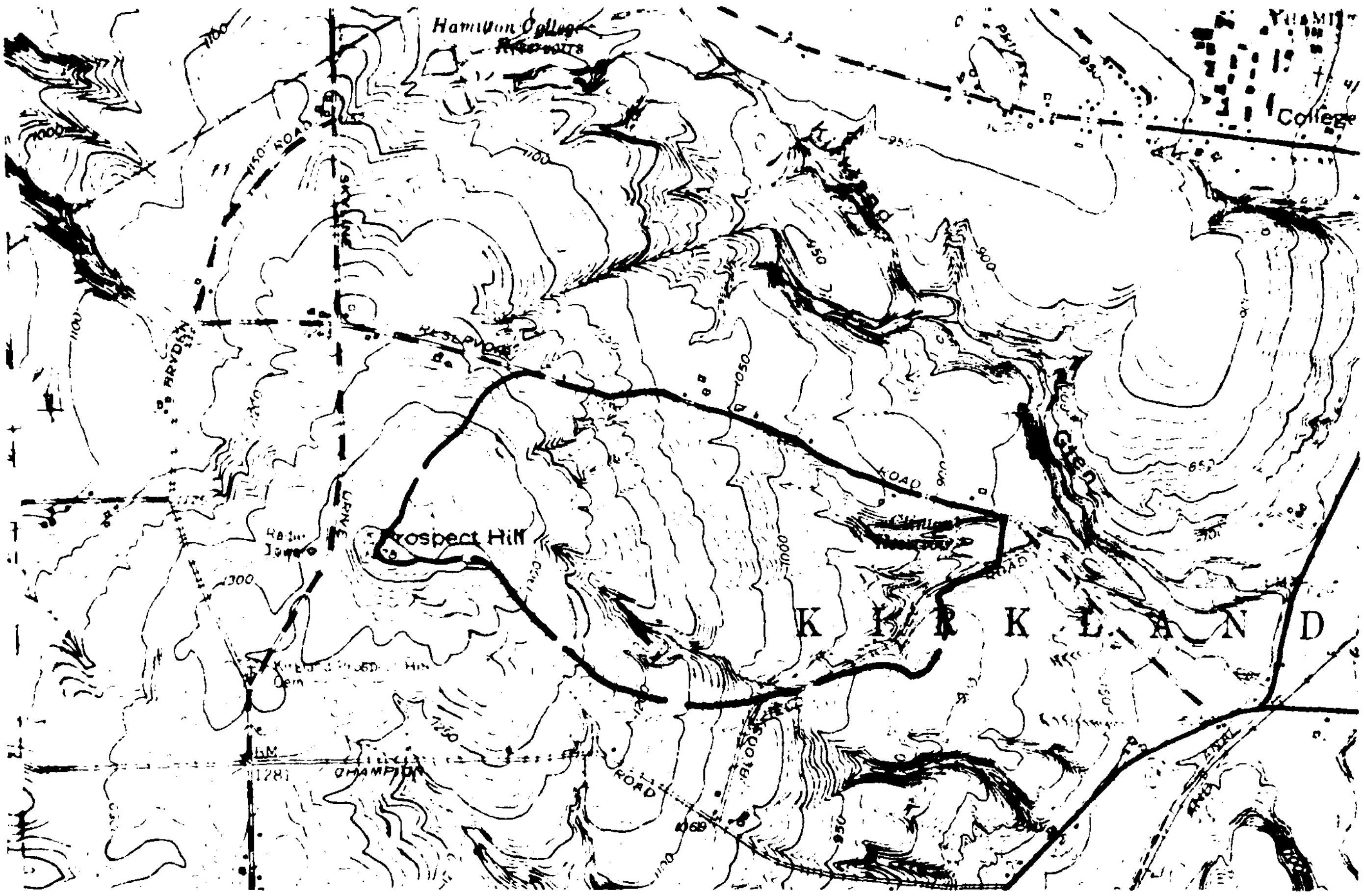
a. Description and Condition NONE

11) Operation Procedures (Lake Level Regulation):

RESERVOIR IS NOT USED AS WATER SUPPLY. THE FACILITY IS SELDOM VISITED. THERE IS LITTLE EVIDENCE OF MAINTENANCE AT THE SITE. SEDIMENT CHAMBER WAS CLEANED RECENTLY.

# APPENDIX C

## HYDROLOGIC/HYDRAULIC, ENGINEERING DATA AND COMPUTATIONS




SCALE: 1" = 2000'

## LEGEND

— — — WATERSHED AREA

# DRAINAGE BASIN

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

TEL 315•797•5800

PROJECT NAME N.Y.S. Dam Inspections -1981 DATE

SUBJECT Clinton Reservoir PROJECT NO

Hydrologic Parameters DRAWN BY JAG

Drainage Area = 0.603 mi²

$L = 1.515$ mi

$L_{CA} = 0.701$

$C_t = 2.0$ (assumed)

$t_1 = C_t (L \times L_{CA})^{0.3} = 2.04$ hr.

$C_p = 0.625$ (assumed)

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

PROJECT NAME N.Y.S. Dam Inspections 1981 DATE 12-19-80
SUBJECT Clinton Reservoir Dam ID# 212 PROJECT NO. 2520
Depth-Area-Duration DRAWN BY JAG

PMP from HMR #33
for Lat. ~ 43°02' Long. ~ 75°25'
Index Rainfall = 19.8" for 200 mi², 24 hr
Zone 1

| Duration | % Index* | Depth |
|---|---|---|
| 6 hrs. | 111 | 22.0" |
| 12 hrs. | 123 | 24.4 |
| 24 hrs | 133 | 26.3 |
| 48 hrs | 142 | 28.1 |

* Adjusted for site area, Drainage Area = [illegible] mi² (which is less than the lower limit of the area adjustment graph, 10 mi², therefore [illegible] were adjusted for this lower limit)

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DESIGN BRIEF

PROJECT NAME N.Y.S. Dam Inspections - 1981 DATE 5-30-81
SUBJECT Clinton Reservoir PROJECT NO. 2520
Spillway Rating DRAWN BY JAG

Ogee Shaped Section
Shape of Spillway indicates a design head of approximately 3'

L = 30'

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

C - based on discharge head: Fig. 14-4 "Open Channel Hydraulics - Chow" for $h/H_d \geq 1.33$, h = spillway height

$C_d = 4.03$

Note: Elevations estimated from USGS (based on top of dam elev. = 830)

| Elev. | H | $H/H_d$ | $C/C_d$ | C | Q |
|---|---|---|---|---|---|
| 827.8 | 0.3' | 0.1 | 0.74 | 2.98 | 14.7 cfs |
| | 0.6 | 0.2 | 0.785 | 3.16 | 44 |
| | 0.9 | 0.3 | 0.83 | 3.34 | 86 |
| | 1.2 | 0.4 | 0.87 | 3.51 | 138 |
| 829 | 1.5 | 0.5 | 0.90 | 3.63 | 200 |
| | 1.8 | 0.6 | 0.925 | 3.73 | 270 |
| | 2.1 | 0.7 | 0.95 | 3.83 | 350 |
| | 2.4 | 0.8 | 0.97 | 3.91 | 436 |
| | 2.7 | 0.9 | 0.985 | 3.97 | 528 |
| 830.5 | 3.0 | 1.0 | 1.0 | 4.03 | 628 |
| 831 | 3.5 | 1.17 | 1.02 | 4.11 | 807 |
| | 4.0 | 1.33 | 1.025 | 4.13 | 991 |
| 832 | 4.5 | 1.5 | 1.03 | 4.15 | 1188 |
| | 5.0 | 1.67 | 1.03 | 4.15 | 1392 |
| 833 | 5.5 | 1.83 | 1.03 | 4.15 | 1606 |
| | 6.0 | 2.0 | 1.03 | 4.15 | 1830 |
| | 6.5 | 2.17 | 1.03 | 4.15 | 2063 |
| | 7.0 | 2.33 | 1.03 | 4.15 | 2306 |

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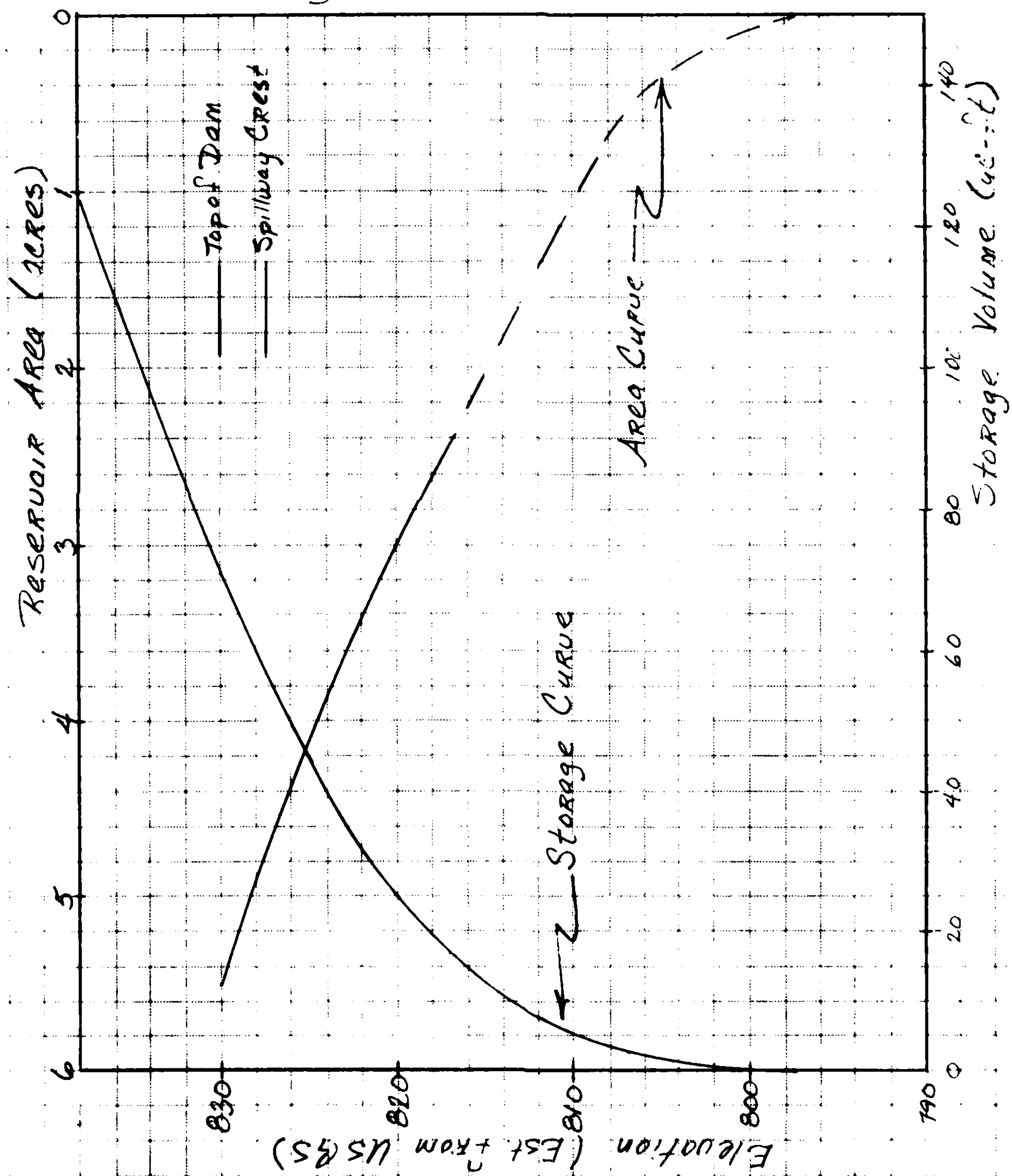
PROJECT NAME N.Y.S. Dam Inspections - 1981 DATE

SUBJECT Clinton Reservoir PROJECT NO

Area - Capacity Curve DRAWN BY JA



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# DESIGN BRIEF

PROJECT NAME: N.Y.S. Dam Inspections 1981 DATE: ____

SUBJECT: Clinton Reservoir PROJECT NO. ____

Area-Capacity Tabulations DRAWN BY: ____

| Elev. | Area (ac.) | ΔS (ac-ft) | ΣS (ac-ft) |
|---|---|---|---|
| 797.6 | 0 | | |
| | | 2.35 | |
| 807 | 0.5 | | 2.35 |
| | | 14.75 | |
| 817 | 2.45 | | 17.1 |
| | | 36 | |
| 827 | 4.75 | | 53.1 |
| | | 30.9 | |
| 832 | 7.6 | | 84 |

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

PROJECT NAME N.Y.S. Dam Inspections - 1981 DATE

SUBJECT Clinton Reservoir PROJECT NO.

Reservoir Drain Capacity DRAWN BY

16"φ Pipe
Inlet invert ~ Elev. 792
length ~ 155'

Discharge Capacity with Reservoir @ Spillway Crest · Elev. 8275

Headwater = 35.5' (conservatively assuming min. slope, use H = 35.5')

Full Flow

$$Q = A\sqrt{\frac{2gH}{1+K_e+K_b+K_pL}}$$

$K_e$ = entrance loss ~ 0.5

$K_b$ = bend loss = $\frac{n\beta}{3} = \frac{0.013(40)}{3} = 0.173$

$K_p$ = friction loss $= \frac{5100\,n^2}{D^{4/3}} = \frac{5100\,(.013)^2}{(16)^{4/3}} = 0.021318$

effective length:
valve opening effective loss ~ 4/D = 0.7 ; L = ½(?) = 9'
eff. length = 155+9 = 164'
$K_pL$ = 3.506

$A = \pi D^2/4 = \frac{\pi\,(16/12)^2}{4} = 1.3963\,ft^2$

$Q = 1.3963\,ft^2\sqrt{\frac{64.4\,(35.5')}{5.179}} = 29.34\ cfs$

Checking inlet control by Fig B-8 "Design of Small Dams"
$Q_{inlet\ control}$ = 35 cfs
∴ full flow controls
**Q = 29 cfs** with reservoir @ spillway crest

Clinton Reservoir
NY 212



CHECK LIST FOR DAMS
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

AREA-CAPACITY DATA:

| | Elevation (ft.) | Surface Area (acres) | Storage Capacity (acre-ft.) |
|---|---|---|---|
| 1) Top of Dam | 830 | 5.5 | 71 |
| 2) Design High Water (Max. Design Pool) | N.A. | | |
| 3) Auxiliary Spillway Crest | N.A. | | |
| 4) Pool Level with Flashboards | N.A. | | |
| 5) Service Spillway Crest | 827.5 | 4.8 | 58 |

DISCHARGES

| | Volume (cfs) |
|---|---|
| 1) Average Daily | Unknown |
| 2) Spillway @ Maximum High Water (Top of Dam) | 465 cfs |
| 3) Spillway @ Design High Water | N.A. |
| 4) Spillway @ Auxiliary Spillway Crest Elevation | N.A. |
| 5) Low Level Outlet (w/ Reservoir @ Top of Dam) | 30 cfs * |
| 6) Total (of all facilities) @ Maximum High Water | 495 cfs |
| 7) Maximum Known Flood | Unknown |
| 8) At Time of Inspection | Unknown |

* Low level outlet would not normally be utilized under flood events.

CREST: ELEVATION: 830

Type: Earthfill with concrete corewall

Width: 8' Length: 440'

Spillover Location: None (except spillway at Right abutment)

SPILLWAY:

| PRINCIPAL | | EMERGENCY |
|---|---|---|
| | Elevation | 827.5 |
| | Type | Ogee |
| | Width | 30' |
| | Type of Control | |
| | Uncontrolled | ✓ |
| | Controlled: | |
| | Type (Flashboards; gate) | |
| | Number | |
| | Size/Length | |
| | Invert Material | |
| | Anticipated Length of operating service | |
| | Chute Length | |
| | Height Between Spillway Crest & Approach Channel Invert (Weir Flow) | 10' |

HYDROMETEROLOGICAL GAGES:

Type : None

Location:

Records:

Date -

Max. Reading -

FLOOD WATER CONTROL SYSTEM:

Warning System: None

Method of Controlled Releases (mechanisms):

Through water distribution system and reservoir drain

**DRAINAGE AREA:** 0.6 $mi^2$

**DRAINAGE BASIN RUNOFF CHARACTERISTICS:**

Land Use - Type: Forest & agricultural

Terrain - Relief: Moderately steep to steep

Surface - Soil:

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

No known planned alterations to drainage basin

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

Sedimentation chamber is located on inlet stream just above impoundment

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

None at present

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

Location: N.A.

Elevation:

Reservoir:

Length @ Maximum Pool 0.1 ± (Miles)

Length of Shoreline (@ Spillway Crest) 0.4 ± (Miles)

```
(0001)  A1       CLINTON RESERVOIR DAM      FILE IS ABSZ-1
(0002)  A2       HEC-1DB (SNYDER PARAMETERS)
(0003)  A3       PMF - DAM OVERTOPPING ANALYSIS
(0004)  B     300        0       15        0        0        0        0        0        4        0
(0005)  B1      5        0        0        0        0        0        0        0        0        0
(0006)  J       1        7        1        0        0        0        0        0        0        0
(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        0        0        0
(0009)  K1       RUNOFF SUBAREA 1
(0010)  M       1        1    0.603        0    0.603        0        0        0        1        0
(0011)  P       0     19.8      111      123      133      142        0        0        0        0
(0012)  T       0        0        0        0        0        0      1.0      0.1        0     .015
(0013)  W    2.04    0.625        0        0        0        0        0        0        0        0
(0014)  X    -2.0    -0.10      1.6        0        0        0        0        0        0        0
(0015)  K       1      100        0        0        0        0        1        0        0        0
(0016)  K1       ROUTE THRU RESERVOIR AND OVER SPILLWAY
(0017)  Y       0        0        0        1        1        0        0        0        0        0
(0018)  Y1      1        0        0        0        0        0   -827.5       -1        0        0
(0019)  Y4  827.5    827.8    828.1    828.4    828.7    829.0    829.3    829.6    829.9    830.2
(0020)  Y4  830.5    831.0    831.5    832.0    832.5    833.0    833.5    834.0    834.5
(0021)  Y5      0       15       44       86      136      200      270      350      436      528
(0022)  Y5    626      807      991     1168     1392     1606     1830     2063     2306
(0023)  $S      0      0.6      2.4      7.5       17       32       55       60       66       71
(0024)  $S     77       84       90       96      103      110      117      125
(0025)  $E  797.6      802      807      812      817      822      827      828      829      830
(0026)  $E    831      832      833      834      835      836      837      838
(0027)  $$  827.5
(0028)  $D  83[illegible]     2.65      1.5      420        0        0        0        0        0        0
(0029)  K       1       03        0        0        0        0        1        0        0        0
(0030)  K1       SPILLWAY CHANNEL ROUTE
(0031)  Y       0        0        0        1        1        0        0        0        0        0
(0032)  Y1      1        0        0        0        0        0       -1        0        0        0
(0033)  Y6   .060     .015     .060      100      115        3   0.1500        0        0        0
(0034)  Y7    100      115      125      114      150      113    150.1      100      180      100
(0035)  Y7  18[illegible].1      113      235      114      230      115
(0036)  K       1       25        0        0        0        0        1        0        0        0
(0037)  K1       SPILLWAY CHANNEL ROUTE
(0038)  Y                0        0        1        1        0        0        0        0        0
```

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| (0039) | Y1 | 1 | 0 | 0 | 0 | 0 | 0 | -1 | 0 | 0 | 0 |
| (0040) | Y6 | .06[illegible] | .015 | .0[illegible] | 96 | 1[illegible]6 | 22 | 0.15 | | | |
| (0041) | Y7 | 1[illegible] | 156 | 125 | 105 | 150 | 104 | 150.1 | 96 | 175 | 96 |
| (0042) | Y7 | 175.1 | 194 | 200 | 165 | 225 | 106 | | | | |
| (0043) | K | 99 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| (0044) | A | | | | | | | | | | |
| (0045) | A | | | | | | | | | | |
| (0046) | A | | | | | | | | | | |
| (0047) | A | | | | | | | | | | |
| (0048) | A | | | | | | | | | | |

```
PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS
          RUNOFF HYDROGRAPH AT          100
          ROUTE HYDROGRAPH TO           100
          ROUTE HYDROGRAPH TO            63
          ROUTE HYDROGRAPH TO            25
          END OF NETWORK
```

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

RUN  DATE?MON, APR 2  1981
     TIME?14:40:46

                    CLINTON RESERVOIR DAM      FILE IS ABSZ-1
                    HEC-1DB (SNYDER PARAMETERS)
                    PMF - DAM OVERTOPPING ANALYSIS

                                JOB SPECIFICATION
     NQ      NHR     NMIN    IDAY     IHR    IMIN   METRC    IPLT    IPRT   NSTAN
    300        0       15       0       0       0       0       0       4       0
                            JOPER     NWT   LROPT   TRACE
                                5       0       0       0

                       MULTI-PLAN ANALYSES TO BE PERFORMED
                         NPLAN= 1 NRTIO= 7 LRTIO= 1
          RTIOS=   0.20    0.30    0.40    0.50    0.60    0.80    1.00


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

                          SUB-AREA RUNOFF COMPUTATION

  RUNOFF SUBAREA 1
            ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
              1.0       0       0       0       1       0       1       0       0

                              HYDROGRAPH DATA
     IHYDG   IUHG   TAREA    SNAP   TRSDA   TRSPC   RATIO   ISNOW   ISAME   LOCAL
         1      1    2.60    0.00    2.60    0.00   0.000       0       1

                                 PRECIP DATA
               SPFE     PMS      R6     R12     R24     R48     R72     R96
               0.00   140.0   111.0   123.0   133.0   142.0    0.00    0.00
TRSPC COMPUTED BY THE PROGRAM IS  .8

                                  LOSS DATA
   LROPT  STRKR  DLTKR  RTIOL  ERAIN  STRKS  RTIOK  STRTL  CNSTL  ALSMX  RTIMP
      0    0.0   0.0   1.00   0.00   0.00   1.00   1.00   0.10   0.00   0.01

                              UNIT HYDROGRAPH DATA
```

```
TP= 2.04   CP=0.63   NTA= 0

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

      UNIT HYDROGRAPH 44 END-OF-PERIOD ORDINATES, LAG=   2.03 HOURS, CP= 0.63  VOL= 1.00
     5.      19.      38.      59.      82.     102.     116.     123.     123.     113.
    99.      86.      75.      66.      57.      50.      44.      38.      33.      29.
    25.      22.      19.      17.      15.      13.      11.      10.       9.       7.
     7.       6.       5.       4.       4.       3.       3.       3.       2.       2.
     2.       1.       1.       1.

                                   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  22.49  18.86   3.63   31011.
                                                                          ( 571.)( 479.)(  92.)(  878.13)


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

                                   HYDROGRAPH ROUTING

              ROUTE THRU RESERVOIR AND OVER SPILLWAY
                     ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                       100       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   0.000   0.000   0.000   -828.      -1

 STAGE      827.5    827.80    828.10    828.40    828.70    829.00    829.30    829.60    829.90
            830.50   831.00    831.50    832.00    832.50    833.00    833.50    834.00    834.50

 FLOW         .0      15.00     44.00     86.00    138.00    200.00    270.00    350.00    436.00
            528.00   637.00    991.00   1188.00   1392.00   1606.00   1830.00   2063.00   2306.00

 CAPACITY=       0.        1.        2.        6.       17.       32.       55.       60.       66.       71.
                77.       84.       90.       96.      103.      110.      117.      125.

 ELEVATION=    798.      802.      807.      812.      817.      822.      827.      829.      829.      830.
               831.      832.      833.      834.      835.      836.      837.      838.

                  CREL    SPWID    COQW    EXPW   ELEVL    COOL   CAREA    EXPL
                 827.5      .0      0.0     0.0     0.0     0.0     0.0     0.0

                                       DAM DATA
                                 TOPEL    COQD    EXPD   DAMWID
```

```
                                                              [illegible]     [illegible]     [illegible]     [illegible]

PEAK OUTFLOW IS      262. AT TIME  42.[illegible] HOURS

PEAK OUTFLOW IS      395. AT TIME  41.75 HOURS

PEAK OUTFLOW IS      532. AT TIME  41.75 HOURS

PEAK OUTFLOW IS      666. AT TIME  41.75 HOURS

PEAK OUTFLOW IS      799. AT TIME  41.75 HOURS

PEAK OUTFLOW IS     1066. AT TIME  41.75 HOURS

PEAK OUTFLOW IS     1332. AT TIME  41.75 HOURS


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

                                                HYDROGRAPH ROUTING

                       SPILLWAY CHANNEL ROUTE
                                ISTAQ   ICOMP   IECON   ITAPE   JPLT    JPRT    INAME   ISTAGE  IAUTO
                                    3       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   0.000   0.000   0.000     -1.       0


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

         QN(1)   QN(2)   QN(3)   ELNVT   ELMAX   RLNTH    SEL
         [illegible]   [illegible]   [illegible]   [illegible]   115.[illegible]      3. [illegible]

         CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
          1[illegible]0.[illegible]  115.[illegible]  125.00  114.00  150.00  113.0[illegible]  15[illegible].10  100.00  180.00  100.00
          1[illegible].1   115.    [illegible]5.[illegible]   114.[illegible]   23[illegible].[illegible]   115.[illegible]

  STORAGE        [illegible]       [illegible]      [illegible]      [illegible]      0.01      0.01     [illegible]      0.01      [illegible].01
                 [illegible]      0.02      0.02      0.02      0.02      0.02      0.03      0.03      [illegible].03

  OUTFLOW        [illegible]     749.7[illegible]   23[illegible]4.[illegible]1   4392.9[illegible]   68[illegible]0.1[illegible]   9717.14  12817.52  1614[illegible].96  19678.48
            [illegible]  [illegible]1214.9[illegible]  [illegible]5316.45  [illegible]9522.96  43[illegible]2[illegible].[illegible]5  4[illegible]9.87  52673.[illegible]9  57794.[illegible]3  63824.27
```

```
STAGE        [illegible]     [illegible]     [illegible]     102.5[illegible]  103.[illegible]  103.9[illegible]  104.74     105.5[illegible]  106.32
             107.69          108.68          109.47          110.26     111.05     111.84     112.63     113.42     114.21

FLOW         [illegible]     749.79          2304.81         4392.98    6890.18    9717.14    12817.52   16148.96   19678.48
             27231.59        31214.97        35316.45        39522.96   43823.85   48209.87   52673.09   57794.03   63824.27

MAXIMUM STAGE IS     100.3

MAXIMUM STAGE IS     103.4

MAXIMUM STAGE IS     10[illegible]

MAXIMUM STAGE IS     100.7

MAXIMUM STAGE IS     10[illegible]

MAXIMUM STAGE IS     1[illegible].9

MAXIMUM STAGE IS     101.1


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

                                        HYDROGRAPH ROUTING

                    SPILLWAY CHANNEL ROUTE
                            ISTAQ    ICOMP    IECON    ITAPE    JPLT    JPRT    INAME    ISTAGE    IAUTO
                              25        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    0.000    0.000    0.000     -1.        0


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

        QN(1)    QN(2)    QN(3)    ELNVT    ELMAX    RLNTH      SEL
        .06[illegible]   [illegible].15    [illegible]6.     96.[illegible]    106.[illegible]      22. 0.150[illegible]

        CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
          1[illegible]    1[illegible]    125.[illegible]   105.00   150.00   104.0[illegible]   15[illegible].10   96.00   175.00   96.00
          175.1[illegible]    1[illegible]    2[illegible]   1[illegible]5.00   225.00   1[illegible]6.0[illegible]

  STORAGE      [illegible]      [illegible]      [illegible]1      [illegible]2      [illegible]3      0.03      0.04      0.05      0.05
               [illegible]      [illegible]      [illegible]       [illegible]       [illegible]9      0.1[illegible]      0.11      0.12      0.15
```

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| OUTFLOW | [illegible] | 319.85 | 969.32 | 1896.45 | 2990.19 | 4237.61 | 5614.99 | 7104.20 | 8690.90 |
| | 12112.22 | 13929.15 | 15807.37 | 17740.99 | 19724.97 | 21754.87 | 24167.29 | 26860.86 | 29836.26 |
| STAGE | [illegible] | 96.53 | 97.05 | 97.58 | 98.11 | 98.63 | 99.16 | 99.68 | 100.21 |
| | 101.26 | 101.79 | 102.32 | 102.84 | 103.37 | 103.89 | 104.42 | 104.95 | 105.47 |
| FLOW | [illegible] | 319.85 | 969.32 | 1896.45 | 2990.19 | 4237.61 | 5614.99 | 7104.20 | 8690.90 |
| | 12112.22 | 13929.15 | 15807.37 | 17740.99 | 19724.97 | 21754.87 | 24167.29 | 26860.86 | 29836.26 |

MAXIMUM STAGE IS 96.4

MAXIMUM STAGE IS 96.6

MAXIMUM STAGE IS 96.7

MAXIMUM STAGE IS 96.8

MAXIMUM STAGE IS 96.9

MAXIMUM STAGE IS 97.1

MAXIMUM STAGE IS 97.3

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

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

| OPERATION | STATION | AREA | PLAN | RATIO 1 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 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | RATIOS APPLIED TO FLOWS | | | | | | |
| HYDROGRAPH AT | 100 | 0.60 | 1 | 266. | 399. | 532. | 665. | 798. | 1064. | 1330. |
| | ( | 1.56) | ( | 7.53)( | 11.30)( | 15.06)( | 18.83)( | 22.60)( | 30.13)( | 37.66)( |
| ROUTED TO | [illegible] | [illegible] | 1 | 262. | 395. | 532. | 666. | 799. | 1066. | 1332. |
| | ( | 1.56) | ( | 7.42)( | 11.20)( | 15.06)( | 18.86)( | 22.63)( | 30.18)( | 37.72)( |
| ROUTED TO | [illegible] | 0.60 | 1 | 262. | 395. | 532. | 666. | 799. | 1066. | 1332. |
| | ( | 1.56) | ( | 7.42)( | 11.20)( | 15.06)( | 18.86)( | 22.63)( | 30.18)( | 37.72)( |
| ROUTED TO | [illegible] | [illegible] | 1 | 262. | 395. | 532. | 666. | 799. | 1066. | 1332. |
| | ( | 1.56) | ( | 7.42)( | 11.20)( | 15.06)( | 18.86)( | 22.63)( | 30.18)( | 37.72)( |

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ...............

| | INITIAL VALUE | SPILLWAY CREST | TOP OF DAM |
|---|---|---|---|
| ELEVATION | 827.50 | 827.50 | 830.00 |
| STORAGE | 58. | 58. | 71. |
| OUTFLOW | 0. | 0. | 467. |

| 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 | 829.27 | 0.00 | 67. | 262. | 0.00 | 42.00 | 0.00 |
| 0.30 | 829.76 | 0.00 | 70. | 395. | 0.00 | 41.75 | 0.00 |
| 0.40 | 830.10 | 0.10 | 72. | 532. | 1.50 | 41.75 | 0.00 |
| 0.50 | 830.23 | 0.23 | 72. | 666. | 2.75 | 41.75 | 0.00 |
| 0.60 | 830.34 | 0.34 | 73. | 799. | 3.75 | 41.75 | 0.00 |
| 0.80 | 830.53 | 0.53 | 74. | 1066. | 4.75 | 41.75 | 0.00 |
| 1.00 | 830.69 | 0.69 | 75. | 1332. | 5.75 | 41.75 | 0.00 |

PLAN 1 STATION 03

| RATIO | MAXIMUM FLOW,CFS | MAXIMUM STAGE,FT | TIME HOURS |
|---|---|---|---|
| 0.20 | 262. | 100.3 | 42.00 |
| 0.30 | 395. | 100.4 | 41.75 |
| 0.40 | 532. | 100.6 | 41.75 |
| 0.50 | 666. | 100.7 | 41.75 |
| 0.60 | 799. | 100.8 | 41.75 |
| 0.80 | 1066. | 100.9 | 41.75 |
| 1.00 | 1332. | 101.1 | 41.75 |

PLAN 1 STATION 25

| RATIO | MAXIMUM FLOW,CFS | MAXIMUM STAGE,FT | TIME HOURS |
|---|---|---|---|
| 0.20 | 262. | 96.4 | 42.00 |
| 0.30 | 395. | 96.6 | 41.75 |
| 0.40 | 532. | 96.7 | 41.75 |
| 0.50 | 666. | 96.8 | 41.75 |
| 0.60 | 799. | 96.9 | 41.75 |
| 0.80 | 1066. | 97.1 | 41.75 |
| 1.00 | 1332. | 97.3 | 41.75 |

```
(0001)  A1      CLINTON RESERVOIR DAM       FILE IS ABSZ
(0002)  A2      HEC-1DB (SNYDER PARAMETERS)
(0003)  A3      PMF - DAM BREAK ANALYSIS
(0004)  B     300          10              0        0                 0        0        4        0
(0005)  B1      5                                                              0        0        0
(0006)  J       0      1         1
(0007)  J1     .5                                                              0        0
(0008)  K             100        0         0        0        0        1         0        0        0
(0009)  K1      RUNOFF SUBAREA 1
(0010)  M       1      1       .6 3              .6 3                                   1
(0011)  P             10.       111        125      133      142
(0012)  T                                                             1.0      0.1       0     .015
(0013)  W     2. 4     .065                                                    0
(0014)  X    -2.     -.1       1.6
(0015)  K       1      1                                              1
(0016)  K1      ROUTE THRU RESERVOIR AND OVER SPILLWAY
(0017)  Y                                   1        1                         0
(0018)  Y1      1                                                  -827.5       -1
(0019)  Y4   827.5    827.     827.1    827.4    828.7    829.0    829.3    829.6    829.9   831.2
(0020)  Y4   830.5    831.     -31.5    832.     832.5    -33.     833.5    834.0    834.5
(0021)  Y5             15        44       [illegible]      136      2[illegible]0      27       350      436     526
(0022)  Y5     6[illegible]      [illegible]7      9[illegible]       11      1372     16[illegible]0      163     2363    23 6
(0023)  $S              .5       2.4      7.5       17       37       55       61       66      71
(0024)  $S      7        4        [illegible]        [illegible]      1 3      11      117      125
(0025)  $E   827.0     8[illegible]2     8[illegible]7     812     817     822     827     828     829     830
(0026)  $E    [illegible]     [illegible]2     [illegible]     834     835     836     837     838
(0027)  $$   27.5
(0028)  $D      5     2.65     1.5      42
(0029)  [illegible]                   [illegible]     0.1     27.5   830.[illegible]
(0030)  [illegible]                   817      .5    -27.5   83[illegible]
(0031)  $B      5                 817      0.5     27.5   83[illegible]
(0032)  K       1       5                                             1        0
(0033)  K1      SPILLWAY CHANNEL ROUTE
(0034)  Y                                   1        1                         0        0       0
(0035)  Y1      1                                                   -1
(0036)  Y6      [illegible]     .15      .06       1[illegible]      115        5   .15[illegible]       0        0       0
(0037)  Y7      [illegible]     11[illegible]      1[illegible]      114       15      115    15[illegible].1      10[illegible]     1[illegible]    1 0
(0038)  Y7   1  .1     11[illegible]      2 5      114       25      115
```

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| (0039) | K | 1 | 23 | | 0 | 0 | | 1 | 0 | 0 | 0 |
| (0040) | K1 | SPILLWAY CHANNEL ROUTE | | | | | | | | | |
| (0041) | Y | | | | 1 | 1 | | | | | |
| (0042) | Y1 | 1 | | | 0 | 0 | | -1 | 0 | 0 | 0 |
| (0043) | Y6 | .0 | .15 | .0 | 96 | 1 6 | 82 | 0.15 | | | |
| (0044) | Y7 | 1 | 1 | 125 | 1.5 | 150 | 1 4 | 15".1 | 96 | 175 | 96 |
| (0045) | Y7 | 175.1 | 1 4 | 2 | 1.5 | 225 | 1 6 | | | | |
| (0046) | K | 1 | 70 | 0 | 0 | | | 1 | | | |
| (0047) | K1 | CHANNEL ROUTE | | | | | | | | | |
| (0048) | Y | | | | 1 | 1 | | | | | |
| (0049) | Y1 | 1 | | | | | | -1 | | | |
| (0050) | Y6 | 0.0 | 0.3 | .0 | 93 | 113 | 45 | 0.15 | | | |
| (0051) | Y7 | 1 | 113 | 1.3 | 1.5 | 145 | 99 | 142 | 93 | 152 | 93 |
| (0052) | Y7 | 104 | 99 | 1 | 1.6 | 195 | 112 | | | | |
| (0053) | K | 1 | 75 | | | | | 1 | | | |
| (0054) | K1 | CHANNEL ROUTE | | | | | | | | | |
| (0055) | Y | | | | 1 | 1 | | | | | |
| (0056) | Y1 | 1 | | | | | | -1 | | | |
| (0057) | Y6 | .0 | .35 | .0 | 5 | 113 | 5 | .2 | | | |
| (0058) | Y7 | 1 | 11 | 14 | 96 | 172 | 91.5 | 17 | 5 | 1 | 85 |
| (0059) | Y7 | 1 | 91.5 | 2 | 9 | 222 | 1 | | | | |
| (0060) | K | 1 | 275 | | | | | 1 | | | |
| (0061) | K1 | CHANNEL ROUTE | | | | | | | | | |
| (0062) | Y | | | 0 | 1 | 1 | | | | | |
| (0063) | Y1 | 1 | | | 0 | | | -1 | | | |
| (0064) | Y6 | .0 | .35 | . | 76 | 97 | 2 | .9 | | | |
| (0065) | Y7 | 1 | 7 | 14 | 5.5 | 23 | 1 | 235 | 76 | 243 | 76 |
| (0066) | Y7 | 251 | 4 | 2 5 | 55 | | | | | | |
| (0067) | K | 1 | 32 | 0 | | 0 | 1 | 1 | | | |
| (0068) | K1 | CHANNEL ROUTE TO HOUSE DOWNSTREAM | | | | | | | | | |
| (0069) | Y | | | | 1 | 1 | | | | | |
| (0070) | Y1 | 1 | | 0 | 0 | 0 | | -1 | | | |
| (0071) | Y6 | .7 | .35 | .070 | 774 | 07 | 245 | .042 | | | |
| (0072) | Y7 | 0 | 7 | 15 | 787 | 215 | 777 | 22 | 774 | 226 | 774 |
| (0073) | Y7 | 253 | 777 | 2 | 779 | 3 | 799 | | | | |
| (0074) | K | 99 | 0 | | 0 | 0 | | 0 | 0 | | 0 |
| (0075) | A | | | | | | | | | | |
| (0076) | A | | | | | | | | | | |

```
PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS
          RUNOFF HYDROGRAPH AT          100
          ROUTE HYDROGRAPH TO           100
          ROUTE HYDROGRAPH TO            03
          ROUTE HYDROGRAPH TO            25
          ROUTE HYDROGRAPH TO            70
          ROUTE HYDROGRAPH TO            75
          ROUTE HYDROGRAPH TO           275
          ROUTE HYDROGRAPH TO           520
          END OF NETWORK
```

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

RUN  DATE?MON, APR 2  19c1
     TIME?15:44:45

                    CLINTON RESERVOIR DAM      FILE IS ABSZ
                    HEC-1DB (SNYDER PARAMETERS)
                    PMF - DAM BREAK ANALYSIS

                              JOB SPECIFICATION
        NQ     NHR    NMIN    IDAY    IHR    IMIN   METRC    IPLT    IPRT   NSTAN
       300       0      10       0      0       0       0       0       4       0
                             JOPER    NWT   LROPT   TRACE
                                 5      0       0       0

                    MULTI-PLAN ANALYSES TO BE PERFORMED
                        NPLAN= 3 NRTIO= 1 LRTIO= 1
       RTIOS=    0.5

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

                          SUB-AREA RUNOFF COMPUTATION

       RUNOFF SUBAREA 1
              ISTAG   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                100       0       0       0       0       0       1       0       0

                              HYDROGRAPH DATA
       IHYDG    IUHG   TAREA    SNAP   TRSDA   TRSPC   RATIO   ISNOW   ISAME   LOCAL
           1       1    [illegible]    0.00    [illegible]    0.00   0.000       0       1       0

                              PRECIP DATA
              SPFE     PMS      R6     R12     R24     R48     R72     R96
              [illegible]    19.8  111.00  123.00  133.00  142.00    0.00    0.00
TRSPC COMPUTED BY THE PROGRAM IS  [illegible]

                              LOSS DATA
        LROPT  STRKR  DLTKR  RTIOL  ERAIN  STRKS  RTIOK  STRTL  CNSTL  ALSMX  RTIMP
               [illegible]   [illegible]   1.00   0.00   [illegible]   1.00   1.00   0.10   0.00   0.01

                              UNIT HYDROGRAPH DATA
                         TP=  2.04    CP=[illegible]    NTA=  0
```

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

        UNIT HYDROGRAPH 67 END-OF-PERIOD ORDINATES, LAG=   2.04 HOURS, CP= 0.63  VOL= 1.00
          3.       11.       22.       35.       49.       64.       79.       94.      106.      115.
        121.      124.      123.      117.      108.       99.       91.       83.       76.       69.
         63.       58.       53.       49.       44.       41.       37.       34.       31.       29.
         26.       24.       22.       20.       18.       17.       15.       14.       13.       12.
         11.       10.        9.        8.        8.        7.        6.        6.        5.        5.
          4.        4.        4.        3.        3.        3.        3.        2.        2.        2.
          2.        2.        2.        1.        1.        1.        1.

    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  22.49  18.86   3.63    43779.
                                                                              ( 571.)( 479.)(  92.)( 1239.68)


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

                                            HYDROGRAPH ROUTING

                         ROUTE THRU RESERVOIR AND OVER SPILLWAY
                                ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                                  1.0       1       0       0       0       0       1       0       0

                                           ALL PLANS HAVE SAME
                                               ROUTING DATA
                         QLOSS   CLOSS     AVG    IRES   ISAME    IOPT    IPMP            LSTR
                           0.0   0.000    0.00       1       1       0       0               0

                                 NSTPS   NSTDL     LAG   AMSKK       X     TSK   STORA  ISPRAT
                                     1       0       0   0.000   0.000   0.000   -828.      -1

STAGE        827.50      827.80      828.10      828.40      828.70      829.00      829.30      829.60      829.90
             830.50      831.00      831.50      832.00      832.50      833.00      833.50      834.00      834.50

FLOW           0.0        15.0        44.00       66.00      138.00      200.00      270.00      350.00      436.00
             62[illegible].00      807.00      991.00     1188.00     1392.00     1606.00     1830.00     2063.00     2306.00

 CAPACITY=        0.        1.        2.        8.       17.       32.       55.       60.       66.       71.
                 77.       84.       90.       96.      103.      110.      117.      125.

ELEVATION=      796.      802.      807.      812.      817.      822.      827.      828.      829.      830.
                831.      832.      833.      834.      835.      836.      837.      838.

                          CREL     SPWID     COQW      EXPW     ELEVL      COQL     CAREA      EXPL
                     [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]
```

DAM DATA

| TOPEL | COQD | EXPD | DAMWID |
|---|---|---|---|
| 830.0 | 2.6 | 1.5 | 420. |

DAM BREACH DATA

| BRWID | Z | ELBM | TFAIL | WSEL | FAILEL |
|---|---|---|---|---|---|
| 30. | 0.00 | 817.00 | 0.10 | 827.50 | 830.22 |

BEGIN DAM FAILURE AT 41.50 HOURS

PEAK OUTFLOW IS 3564. AT TIME 41.60 HOURS

DAM BREACH DATA

| BRWID | Z | ELBM | TFAIL | WSEL | FAILEL |
|---|---|---|---|---|---|
| 30. | 0.00 | 817.00 | 0.30 | 827.50 | 830.22 |

BEGIN DAM FAILURE AT 41.50 HOURS

PEAK OUTFLOW IS 2472. AT TIME 41.80 HOURS

DAM BREACH DATA

| BRWID | Z | ELBM | TFAIL | WSEL | FAILEL |
|---|---|---|---|---|---|
| 30. | 0.00 | 817.00 | 0.50 | 827.50 | 830.22 |

BEGIN DAM FAILURE AT 41.5[illegible] HOURS

PEAK OUTFLOW IS 1934. AT TIME 42.00 HOURS

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

HYDROGRAPH ROUTING

SPILLWAY CHANNEL ROUTE

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

ALL PLANS HAVE SAME
ROUTING DATA

| QLOSS | CLOSS | AVG | IRES | ISAME | IOPT | IPMP | | LSTR |
|---|---|---|---|---|---|---|---|---|
| 0.0 | 0.000 | 0.00 | 1 | 1 | 0 | 0 | | [illegible] |

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

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

```
   QN(1)    QN(2)    QN(3)    ELNVT    ELMAX    RLNTH      SEL
  0.0600   0.0150   0.0600    100.0    115.0       3.  0.15000

   CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
    100.00  115.00  125.00  114.00  150.00  113.00  155.10  100.00  180.00  100.00
    183.10  115.00  235.00  114.00  236.00  115.00

 STORAGE       0.00       0.00       0.00       0.00       0.01       0.01       0.01       0.01       0.01
               0.02       0.02       0.02       0.02       0.02       0.02       0.03       0.03       0.03

 OUTFLOW       0.00     749.79    2304.81    4392.98    6890.18    9717.14   12817.52   16148.96   19678.48
           27231.09   31214.97   35316.45   39522.96   43823.85   48209.87   52673.09   57794.03   63824.27

   STAGE     100.00     100.79     101.58     102.37     103.16     103.95     104.74     105.53     106.32
             107.89     108.68     109.47     110.26     111.05     111.84     112.63     113.42     114.21

    FLOW       0.00     749.79    2304.81    4392.98    6890.18    9717.14   12817.52   16148.96   19678.48
           27231.09   31214.97   35316.45   39522.96   43823.85   48209.87   52673.09   57794.03   63824.27

MAXIMUM STAGE IS     101.6

MAXIMUM STAGE IS     101.5

MAXIMUM STAGE IS     101.4


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

                                          HYDROGRAPH ROUTING

                         SPILLWAY CHANNEL ROUTE
                                  ISTAQ   ICOMP    IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                                     25       1        0       0       0       0       1       0       0

                                          ALL PLANS HAVE SAME
                                              ROUTING DATA
                         QLOSS    CLOSS     AVG     IRES   ISAME    IOPT    IPMP            LSTR
                           0.0    0.000    0.00        1       1       0       0               0

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


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

   QN(1)    QN(2)    QN(3)    ELNVT    ELMAX    RLNTH      SEL
```

```
0.0400  0.0150  0.0500    90.0   106.0     22. 0.15000

   CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
     100.00  106.00  125.00  105.00  150.00  104.00  150.10   96.00  175.00   96.00
     175.10  104.00  200.00  105.00  225.00  106.00

 STORAGE       0.00       0.01       0.01       0.02       0.03       0.03       0.04       0.05       0.05
               0.07       0.07       0.08       0.09       0.09       0.10       0.11       0.12       0.13

 OUTFLOW       0.00     319.85     989.32    1896.45    2990.19    4237.61    5614.99    7104.20    8690.90
           12112.22   13929.15   15807.37   17740.99   19724.97   21754.87   24167.29   26860.86   29836.26

   STAGE      96.00      96.53      97.05      97.58      98.11      98.63      99.16      99.68     100.21
             101.26     101.79     102.32     102.84     103.37     103.89     104.42     104.95     105.47

    FLOW       0.0      319.85     989.32    1896.45    2990.19    4237.61    5614.99    7104.20    8690.90
           12112.22   13929.15   15807.37   17740.99   19724.97   21754.87   24167.29   26860.86   29836.26

MAXIMUM STAGE IS      97.6

MAXIMUM STAGE IS      97.7

MAXIMUM STAGE IS      97.6


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

                                                   HYDROGRAPH ROUTING

                           CHANNEL ROUTE
                                 ISTAQ     ICOMP     IECON     ITAPE      JPLT      JPRT     INAME    ISTAGE     IAUTO
                                    70         1         0         0         0         0         1         0         0

                                                   ALL PLANS HAVE SAME
                                                      ROUTING DATA
                            QLOSS     CLOSS       AVG      IRES     ISAME      IOPT      IPMP                LSTR
                              0.0     0.000      0.00         1         1         0         0                   0

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


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

      QN(1)     QN(2)     QN(3)     ELNVT     ELMAX     RLNTH       SEL
      .0400     .0300     .0800      95.0     113.0       45. 0.15000
```

```
CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
   100.00  113.00  135.00  100.50  145.00   99.00  148.00   93.00  158.00   93.00
   164.00   99.00  180.00  106.00  195.00  112.00

STORAGE        0.00       0.01       0.03       0.04       0.06       0.08       0.10       0.13       0.16
               0.26       0.31       0.37       0.44       0.51       0.59       0.67       0.76       0.86

OUTFLOW        0.00     223.15     638.78    1259.41    2056.82    3032.20    4274.02    5969.27    8022.99
           13228.01   16407.48   19994.03   24000.80   28449.58   33360.77   38751.90   44640.20   51042.65

  STAGE       93.00      94.05      95.11      96.16      97.21      98.26      99.32     100.37     101.42
             103.53     104.58     105.63     106.66     107.74     108.79     109.84     110.89     111.95

   FLOW        0.0      223.15     638.78    1259.41    2056.82    3032.20    4274.02    5969.27    8022.99
           13228.01   16407.48   19994.03   24000.80   28449.58   33360.77   38751.90   44640.20   51042.65

MAXIMUM STAGE IS      97.6

MAXIMUM STAGE IS      97.2

MAXIMUM STAGE IS      97.

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

                                          HYDROGRAPH ROUTING

                    CHANNEL ROUTE
                              ISTAQ     ICOMP     IECON     ITAPE      JPLT      JPRT     INAME    ISTAGE     IAUTO
                                 75         1         0         0         0         0         1         0         0

                                          ALL PLANS HAVE SAME
                                             ROUTING DATA
                    QLOSS     CLOSS       AVG      IRES     ISAME      IOPT      IPMP                LSTR
                      0.0     0.000      0.00         1         1         0         0                   0

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

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

          QN(1)     QN(2)     QN(3)     ELNVT     ELMAX     RLNTH       SEL
            .0       .03       .08       85.      113.         5.     0.

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

```
   [illegible]  [illegible]  140.00   90.00  172.00   91.50  172.00   85.00  186.00   85.00
   192.00   91.50  237.00   98.00  222.00  106.00

STORAGE       0.00       0.01       0.00       0.01       0.01       0.01       0.02       0.03       0.04
              0.06       0.07       0.09       0.10       0.12       0.14       0.15       0.17       0.19

OUTFLOW       0.00     576.01    1892.07    3910.25    6680.77   10807.43   16583.25   24046.88   33599.96
          59122.05   75054.91   93179.20  113569.78  136304.00  162104.59  190582.91  221542.13  255005.69

STAGE        85.00      86.47      87.95      89.42      90.89      92.37      93.84      95.32      96.79
             99.74     101.21     102.68     104.16     105.63     107.11     108.58     110.05     111.53

FLOW          0.00     576.01    1892.07    3910.25    6680.77   10807.43   16583.25   24046.88   33599.96
          59122.05   75054.91   93179.20  113569.78  136304.00  162104.59  190582.91  221542.13  255005.69

MAXIMUM STAGE IS      88.3

MAXIMUM STAGE IS      88.1

MAXIMUM STAGE IS      88.0


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

                                        HYDROGRAPH ROUTING

                         CHANNEL ROUTE
                              ISTAQ    ICOMP    IECON    ITAPE     JPLT     JPRT    INAME   ISTAGE    IAUTO
                                275        1        0        0        0        0        1        0        0

                                              ALL PLANS HAVE SAME
                                                 ROUTING DATA
                     QLOSS    CLOSS      AVG     IRES    ISAME     IOPT     IPMP              LSTR
                       0.0    0.000     0.00        1        1        0        0                 0

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


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

     QN(1)    QN(2)    QN(3)    ELNVT    ELMAX    RLNTH     SEL
     .06      .0350    .0600    76.      97.0     2000.   0.09000


     CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
       1  [illegible]  97.00  141.00  85.50  230.00  81.00  235.00  76.00  243.00  76.00
       [illegible]  [illegible]  [illegible]  95.00  [illegible]  0.00
```

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| STORAGE | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| OUTFLOW | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| STAGE | 76.00 | 77.11 | 78.21 | 79.32 | 80.42 | 81.53 | 82.63 | 83.74 | 84.84 |
| | 87.05 | 88.16 | 89.26 | 90.37 | 91.47 | 92.58 | 93.68 | 94.79 | 95.89 |
| FLOW | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

MAXIMUM STAGE IS 76.0

MAXIMUM STAGE IS 76.0

MAXIMUM STAGE IS 76.0

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

HYDROGRAPH ROUTING

CHANNEL ROUTE TO HOUSE DOWNSTREAM

| ISTAQ | ICOMP | IECON | ITAPE | JPLT | JPRT | INAME | ISTAGE | IAUTO |
|---|---|---|---|---|---|---|---|---|
| 520 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |

ALL PLANS HAVE SAME
ROUTING DATA

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

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

NORMAL DEPTH CHANNEL ROUTING

| QN(1) | QN(2) | QN(3) | ELNVT | ELMAX | RLNTH | SEL |
|---|---|---|---|---|---|---|
| [illegible] | [illegible] | [illegible] | 774.[illegible] | 807.0 | 245. | 0.0420 |

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
0. 807. 15[illegible].00 787.00 215.00 777.00 22[illegible]. 774.00 228.00 774.00
233.00 777.00 260.00 779.00 380.00 799.00

| ST FAC | [illegible] | [illegible].11 | 0.29 | [illegible] | 1.74 | 2.61 | 4.[illegible] | 5.56 | 7.22 |
|---|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| OUTFLOW | 0.00 | 194.89 | 752.40 | 2086.05 | 4591.70 | 8230.81 | 13065.30 | 19176.15 | 26717.74 |
| | 46200.26 | 58163.93 | 71742.27 | 86935.83 | 103825.11 | 123640.97 | 146008.75 | 170163.78 | 196104.34 |
| STAGE | 774.00 | 775.74 | 777.47 | 779.21 | 780.95 | 782.68 | 784.42 | 786.16 | 787.89 |
| | 791.37 | 793.10 | 794.84 | 796.58 | 798.32 | 800.05 | 801.79 | 803.53 | 805.26 |
| FLOW | 0.00 | 194.89 | 752.40 | 2086.05 | 4591.70 | 8230.81 | 13065.30 | 19176.15 | 26717.74 |
| | 46200.26 | 58163.93 | 71742.27 | 86935.83 | 103825.11 | 123640.97 | 146008.75 | 170163.78 | 196104.34 |

STATION 520, PLAN 1, RTIO 1

OUTFLOW

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 1. |
| 1. | 1. | 1. | 2. | 2. | 3. | 3. | 4. | 4. | 4. |
| 5. | 5. | 5. | 6. | 6. | 6. | 6. | 6. | 6. | 6. |
| 5. | 5. | 5. | 5. | 5. | 5. | 4. | 4. | 4. | 4. |
| 3. | 3. | 3. | 3. | 3. | 2. | 2. | 2. | 2. | 2. |
| 2. | 2. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 2. | 2. | 2. | 3. | 4. | 4. |
| 5. | 7. | 8. | 9. | 11. | 12. | 14. | 16. | 18. | 21. |
| 23. | 25. | 26. | 28. | 29. | 30. | 31. | 32. | 33. | 34. |
| 35. | 35. | 36. | 36. | 37. | 37. | 38. | 38. | 39. | 41. |
| 43. | 46. | 52. | 59. | 68. | 78. | 90. | 105. | 121. | 138. |
| 157. | 175. | 193. | 214. | 233. | 252. | 269. | 290. | 313. | 342. |
| 377. | 415. | 455. | 506. | 563. | 600. | 628. | 647. | 659. | 2290. |
| 1329. | 652. | 760. | 514. | 693. | 485. | 631. | 454. | 569. | 416. |
| 574. | 372. | 439. | 325. | 377. | 279. | 319. | 238. | 270. | 203. |
| 229. | 174. | 193. | 151. | 162. | 131. | 137. | 113. | 116. | 98. |
| 99. | 85. | 84. | 74. | 73. | 66. | 65. | 60. | 58. | 55. |
| 53. | 50. | 45. | 46. | 44. | 42. | 40. | 39. | 36. | 35. |

STOR

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| [illegible] | 0. | [illegible] | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | [illegible] | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | 0. | 0. | 0. | [illegible] | 0. |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | 0. | [illegible] | [illegible] | 0. |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 1. |
| 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |

STAGE

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774.0 | 774.0 | 774.0 | 774.0 | 774.1 | 774.1 | 774.1 | 774.1 | 774.1 | 774.1 |
| 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| [illegible] | 774.1 | 774.1 | 774.1 | 774.1 | 774.1 | 774.1 | 774.1 | 774.2 | 774.2 |
| 774.2 | 774.2 | 774.2 | 774.2 | 774.3 | 774.3 | 774.3 | 774.3 | 774.3 | 774.3 |
| 774.3 | 774.3 | 774.3 | 774.3 | 774.3 | 774.3 | 774.3 | 774.3 | 774.3 | 774.4 |
| 774.4 | 774.4 | 774.5 | 774.5 | 774.6 | 774.7 | 774.8 | 774.9 | 775.1 | 775.2 |
| 775.4 | [illegible] | 775.7 | [illegible] | 775.9 | 775.9 | 776.0 | 776.0 | 776.1 | 776.2 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 776.3 | 776.4 | 776.5 | 776.7 | 776.9 | 777.0 | 777.1 | 777.1 | 777.2 | 779.4 |
| 778.2 | 777.2 | 777.5 | 776.7 | 777.3 | 776.6 | 777.1 | 776.5 | 776.9 | 776.4 |
| 776.7 | 776.3 | 776.5 | 776.1 | 776.3 | 776.0 | 776.1 | 775.9 | 776.0 | 775.8 |
| 775.8 | 775.6 | 775.7 | 775.5 | 775.4 | 775.2 | 775.2 | 775.0 | 775.0 | 774.9 |
| 774.9 | 774.8 | 774.8 | 774.7 | 774.6 | 774.6 | 774.6 | 774.5 | 774.5 | 774.5 |
| 774.5 | 774.4 | 774.4 | 774.4 | 774.4 | 774.4 | 774.4 | 774.3 | 774.3 | 774.3 |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 2290. | 519. | 165. | 80. | 23880. |
| CMS | 65. | 15. | 5. | 2. | 676. |
| INCHES | | 8.01 | 10.15 | 10.23 | 10.23 |
| MM | | 203.49 | 257.90 | 259.92 | 259.92 |
| AC-FT | | 256. | 326. | 329. | 329. |
| THOUS CU M | | 316. | 403. | 406. | 406. |

MAXIMUM STORAGE = 1.

MAXIMUM STAGE IS 779.4

STATION 520, PLAN 2, RTIO 1

OUTFLOW

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 1. |
| 1. | 1. | 1. | 2. | 2. | 3. | 3. | 4. | 4. | 4. |
| 5. | 5. | 5. | 6. | 6. | 6. | 6. | 6. | 6. | 6. |
| 5. | 5. | 5. | 5. | 5. | 5. | 4. | 4. | 4. | 4. |
| 3. | 3. | 3. | 3. | 3. | 2. | 2. | 2. | 2. | 2. |
| 2. | 2. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 2. | 2. | 2. | 3. | 4. | 4. |
| 5. | 7. | 6. | 9. | 11. | 12. | 14. | 16. | 18. | 21. |
| 25. | 25. | 26. | 28. | 29. | 30. | 31. | 32. | 33. | 34. |
| 35. | 35. | 34. | 36. | 37. | 37. | 38. | 38. | 39. | 41. |
| 43. | 46. | 52. | 59. | 68. | 78. | 90. | 105. | 121. | 138. |
| 157. | 175. | 193. | 214. | 233. | 252. | 269. | 290. | 313. | 342. |
| 377. | 415. | 455. | 508. | 563. | 600. | 628. | 647. | 659. | 1580. |
| 2116. | 1127. | 717. | 653. | 575. | 587. | 539. | 538. | 492. | 485. |
| 441. | 429. | 377. | 373. | 334. | 316. | 284. | 270. | 241. | 229. |
| [illegible] | 195. | 175. | 156. | [illegible] | 141. | 128. | 121. | 110. | 103. |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| 53. | 50. | 48. | 46. | 44. | 42. | 40. | 38. | 37. | 35. |
| | | | | STOR | | | | | |
| . | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| . | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| . | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| . | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| . | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| . | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| . | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| . | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| . | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| . | 0. | . | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| . | 0. | . | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| . | 0. | . | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| . | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| . | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| . | 0. | . | 0. | 0. | 0. | 0. | 0. | 0. | 1. |
| 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| . | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| . | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| . | 0. | . | 0. | . | 0. | 0. | 0. | 0. | 0. |
| | | | | STAGE | | | | | |
| 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774. | 774. | 774. | 774. | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774. | 774.0 | 774. | 774. | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774. | 774. | 774. | 774. | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774. | 774. | 774. | 774. | 774.0 | 774. | 774.0 | 774.0 | 774.0 | 774.0 |
| 774. | 774. | 774. | 774. | 774. | 774. | 774.0 | 774.0 | 774.0 | 774. |
| 774.0 | 774.0 | 774.0 | 774.0 | 774.1 | 774.1 | 774.1 | 774.1 | 774.1 | 774.1 |
| 774. | 774.0 | 774.0 | 774. | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774. |
| 774. | 774. | 774. | 774. | 774. | 774. | 774.0 | 774. | 774.0 | 774. |
| 774. | 774. | 774. | 774. | 774.0 | 774. | 774. | 774. | 774. | 774. |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774.0 | 774. | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774.0 | 774.1 | 774.1 | 774.1 | 774.1 | 774.1 | 774.1 | 774.1 | 774.2 | 774.2 |
| 774.2 | 774.2 | 774.2 | 774.2 | 774.3 | 774.3 | 774.3 | 774.3 | 774.3 | 774.3 |
| 774.3 | 774.3 | 774.3 | 774.3 | 774.3 | 774.3 | 774.3 | 774.3 | 774.3 | 774.4 |
| 774.4 | 774.4 | 774.5 | 774.5 | 774.6 | 774.7 | 774.8 | 774.9 | 775.1 | 775.2 |
| 775.4 | 775.6 | 775.7 | 775.8 | 775.9 | 775.9 | 776.0 | 776.0 | 776.1 | 776.2 |
| 776.3 | 776.4 | 776.5 | 776.7 | 776.9 | 777.0 | 777.1 | 777.1 | 777.2 | 778.6 |
| 779.2 | 778.0 | 777.4 | 777.2 | 777.0 | 777.0 | 776.8 | 776.8 | 776.7 | 776.6 |
| 776.5 | 776.5 | 776.3 | 776.3 | 776.2 | 776.1 | 776.0 | 776.0 | 775.9 | 775.8 |
| 775.8 | 775.7 | 775.6 | 775.5 | 775.3 | 775.3 | 775.1 | 775.1 | 775.0 | 774.9 |
| 774.6 | 774.6 | 774.7 | 774.7 | 774.6 | 774.6 | 774.6 | 774.5 | 774.5 | 774.5 |
| 774.5 | 774.4 | 774.4 | 774.4 | 774.4 | 774.4 | 774.4 | 774.3 | 774.3 | 774.3 |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 2116. | 535. | 169. | 82. | 24455. |
| CMS | 60. | 15. | 5. | 2. | 693. |
| INCHES | | 8.26 | 10.40 | 10.48 | 10.48 |
| MM | | 209.75 | 264.16 | 266.18 | 266.18 |
| AC-FT | | 265. | 334. | 337. | 337. |
| THOUS CU M | | 327. | 412. | 415. | 416. |

MAXIMUM STORAGE = 1.

MAXIMUM STAGE IS 779.2

STATION 520, PLAN 3, RTIO 1

OUTFLOW

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 1. |
| 1. | 1. | 1. | 2. | 2. | 3. | 3. | 4. | 4. | 4. |
| 5. | 5. | 5. | 6. | 6. | 6. | 6. | 6. | 6. | 6. |
| 6. | 5. | 5. | 5. | 5. | 5. | 4. | 4. | 4. | 4. |
| 5. | 3. | 3. | 3. | 3. | 2. | 2. | 2. | 2. | 2. |
| 2. | 2. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 2. | 2. | 2. | 3. | 4. | 4. |

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

| OPERATION | STATION | AREA | PLAN | RATIOS APPLIED TO FLOWS<br>RATIO 1<br>0.50 |
|---|---|---|---|---|
| HYDROGRAPH AT | [illegible] | 0.60 | 1 | 664. |
| | ( | 1.56) | ( | 18.79)( |
| | | | 2 | 664. |
| | | | ( | 18.79)( |
| | | | 3 | 664. |
| | | | ( | 18.79)( |
| ROUTED TO | 100 | 0.60 | 1 | 2395. |
| | ( | 1.56) | ( | 67.82)( |
| | | | 2 | 2090. |
| | | | ( | 59.20)( |
| | | | 3 | 1934. |
| | | | ( | 54.76)( |
| ROUTED TO | [illegible] | 0.60 | 1 | 2395. |
| | ( | 1.56) | ( | 67.81)( |
| | | | 2 | 2091. |
| | | | ( | 59.20)( |
| | | | 3 | 1934. |
| | | | ( | 54.75)( |
| ROUTED TO | 25 | 0.60 | 1 | 2393. |
| | ( | 1.56) | ( | 67.76)( |
| | | | 2 | 2091. |
| | | | ( | 59.22)( |
| | | | 3 | 1933. |
| | | | ( | 54.74)( |
| ROUTED TO | [illegible] | 0.60 | 1 | 2387. |
| | ( | 1.56) | ( | 67.61)( |
| | | | 2 | 2093. |
| | | | ( | 59.27)( |
| | | | 3 | 1932. |
| | | | ( | 54.71)( |
| ROUTED TO | 75 | 0.60 | 1 | 2387. |
| | ( | 1.56) | ( | 67.60)( |
| | | | 2 | 2093. |
| | | | [illegible] | [illegible] |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | [illegible] | 7. | 11. | 12. | 14. | 16. | 16. | 21. |
| | [illegible] | 25. | 28. | 29. | 30. | 31. | 32. | 33. | 34. |
| | [illegible] | [illegible] | 36. | 37. | 37. | 38. | 38. | 39. | 41. |
| | [illegible] | [illegible] | 59. | 68. | 78. | 90. | 105. | 121. | 138. |
| | [illegible] | [illegible] | 214. | 233. | 252. | 269. | 290. | 313. | 342. |
| | [illegible] | 455. | 538. | 563. | 60[illegible]. | 628. | 647. | 659. | 1094. |
| | 1419. | 1157. | 642. | 655. | 547. | 582. | 501. | 527. | 454. |
| [illegible] | 403. | 411. | 351. | 353. | 301. | 300. | 256. | 254. | 217. |
| [illegible] | 165. | 163. | 159. | 155. | 136. | 132. | 117. | 113. | 101. |
| [illegible] | 87. | [illegible]3. | 76. | 72. | 67. | 64. | 60. | 58. | 55. |
| [illegible] | [illegible] | 46. | 46. | 44. | 42. | 40. | 38. | 36. | 35. |

STOP

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 1. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |

START

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774. | 774. | 774. | 774. | 774.0 | 774.0 | 774.0 | 774.0 | 774. | 774. |
| 774. | 774. | 774. | 774. | 774. | 774. | 774.0 | 774.0 | 774. | 774. |
| 774. | 774. | 774. | 774. | 774. | 774. | 774.0 | 774. | 774.0 | 774.0 |
| 774.0 | 774. | 774. | 774. | 774.0 | 774. | 774.0 | 774.0 | 774. | 774. |
| 774. | 774. | 774. | 774. | 774. | 774. | 774. | 774.0 | 774. | 774. |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 774. | 774. | 774. | 774. | 774.0 | 774. | 774.0 | 774. | 774.0 | 774. |
| 774. | 774. | 774. | 774. | 774.0 | 774. | 774.0 | 774.0 | 774.0 | 774.0 |
| 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774.0 | 774.0 | 774.0 | 774. | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774.0 | 774. | 774. | 774. | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774.0 | 774. | 774.0 | 774. | 774.1 | 774.1 | 774.1 | 774.1 | 774.1 | 774.1 |
| 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774. | 774. | 774. | 774. | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774. | 774. | 774. | 774. | 774.0 | 774. | 774.0 | 774.0 | 774.0 | 774.0 |
| 774.0 | 774. | 774. | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774. | 774. | 774. | 774. | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 | 774.0 |
| 774. | 774.1 | 774.1 | 774.1 | 774.1 | 774.1 | 774.1 | 774.1 | 774.2 | 774.2 |
| 774.2 | 774.2 | 774.2 | 774.2 | 774.3 | 774.3 | 774.3 | 774.3 | 774.3 | 774.3 |
| 774.3 | 774.3 | 774.3 | 774.3 | 774.3 | 774.3 | 774.3 | 774.3 | 774.3 | 774.4 |
| 774.4 | 774.4 | 774.5 | 774.5 | 774.6 | 774.7 | 774.8 | 774.9 | 775.1 | 775.2 |
| 775.4 | 775.6 | 775.7 | 775.8 | 775.9 | 775.9 | 776.0 | 776.0 | 776.1 | 776.2 |
| 776.3 | 776.4 | 776.5 | 776.7 | 776.9 | 777.0 | 777.1 | 777.1 | 777.2 | 777.9 |
| 776.6 | 779. | 778. | 777.3 | 777.2 | 776.8 | 776.9 | 776.7 | 776.6 | 776.5 |
| 776.6 | 776.4 | 776.4 | 776.2 | 776.2 | 776.1 | 776.1 | 775.9 | 775.9 | 775.8 |
| 775.8 | 775.7 | 775.6 | 775.4 | 775.4 | 775.2 | 775.2 | 775.0 | 775. | 774.9 |
| 774.9 | 774. | 774.7 | 774.7 | 774.6 | 774.6 | 774.6 | 774.5 | 774.5 | 774.5 |
| 774.5 | 774.4 | 774.4 | 774.4 | 774.4 | 774.4 | 774.4 | 774.3 | 774.3 | 774.3 |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 1919. | 544. | 141. | 83. | 24771. |
| CMS | 54. | 15. | 5. | 2. | 701. |
| INCHES | | 8.39 | 10.53 | 10.61 | 10.61 |
| MM | | 213.18 | 267.59 | 269.61 | 269.61 |
| AC-FT | | 270. | 339. | 341. | 341. |
| THOUS CU M | | 333. | 418. | 421. | 421. |

MAXIMUM STORAGE = 1.

MAXIMUM STAGE IS 779.

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

```
                                            (     59.27)(
                                            3      1932.
                                             (    54.71)(

ROUTED TO           275      0.00           1      2387.
                       (     1.56)           (    67.60)(
                                            2      2093.
                                             (    59.27)(
                                            3      1932.
                                             (    54.71)(

ROUTED TO           52       0.00           1      2290.
                       (     1.56)           (    64.86)(
                                            2      2116.
                                             (    59.91)(
                                            3      1919.
                                             (    54.34)(
```

## SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ................

| | INITIAL VALUE | SPILLWAY CREST | TOP OF DAM |
|---|---|---|---|
| ELEVATION | 827.50 | 827.50 | 830.00 |
| STORAGE | 58. | 58. | 71. |
| OUTFLOW | 0. | 0. | 467. |

| RATIO OF PMF | MAXIMUM RESERVOIR W.S.ELEV | MAXIMUM DEPTH OVER DAM | MAXIMUM STORAGE AC-FT | MAXIMUM OUTFLOW CFS | DURATION OVER TOP HOURS | TIME OF MAX OUTFLOW HOURS | TIME OF FAILURE HOURS |
|---|---|---|---|---|---|---|---|
| 0.50 | 830.23 | 0.23 | 72. | 3564. | 1.04 | 41.60 | 41.50 |

PLAN 2 ................

| | INITIAL VALUE | SPILLWAY CREST | TOP OF DAM |
|---|---|---|---|
| ELEVATION | 827.50 | 827.50 | 830.00 |
| STORAGE | 58. | 58. | 71. |
| OUTFLOW | 0. | 0. | 467. |

| 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 |
|---|---|---|---|---|---|---|---|
| .5 | 830.23 | 0.23 | 72. | 2472. | 1.03 | 41.80 | 41.50 |

PLAN 3 ................

| | INITIAL VALUE | SPILLWAY CREST | TOP OF DAM |
|---|---|---|---|
| ELEVATION | 827.50 | 827.50 | 830.00 |
| STORAGE | 58. | 58. | 71. |
| OUTFLOW | 0. | 0. | 467. |

| 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 |
|---|---|---|---|---|---|---|---|
| .5 | 830.23 | 0.23 | 72. | 1934. | 1.11 | 42.00 | 41.50 |

PLAN 1 STATION 03

| RATIO | MAXIMUM FLOW,CFS | MAXIMUM STAGE,FT | TIME HOURS |
|---|---|---|---|
| 0.50 | 2395. | [illegible] | 41.67 |

PLAN 2 STATION 03

| RATIO | MAXIMUM FLOW,CFS | MAXIMUM STAGE,FT | TIME HOURS |
|---|---|---|---|
| [illegible] | [illegible] | [illegible] | [illegible] |

| | | | |
|---|---|---|---|
| [illegible] | [illegible] | [illegible] | 41.[illegible] |

PLAN 3 STATION 03

| RATIO | MAXIMUM FLOW,CFS | MAXIMUM STAGE,FT | TIME HOURS |
|---|---|---|---|
| [illegible].50 | 1934. | 101.4 | 42.00 |

PLAN 1 STATION 25

| RATIO | MAXIMUM FLOW,CFS | MAXIMUM STAGE,FT | TIME HOURS |
|---|---|---|---|
| .50 | 23[illegible]3. | 97.8 | 41.67 |

PLAN 2 STATION 25

| RATIO | MAXIMUM FLOW,CFS | MAXIMUM STAGE,FT | TIME HOURS |
|---|---|---|---|
| 0.50 | 2[illegible]91. | 97.7 | 41.83 |

PLAN 3 STATION 25

| RATIO | MAXIMUM FLOW,CFS | MAXIMUM STAGE,FT | TIME HOURS |
|---|---|---|---|
| 0.50 | 1933. | 97.6 | 42.00 |

PLAN 1 STATION 7[illegible]

| RATIO | MAXIMUM FLOW,CFS | MAXIMUM STAGE,FT | TIME HOURS |
|---|---|---|---|
| [illegible].50 | 2387. | 97.6 | 41.67 |

PLAN 2 STATION 7[illegible]

| RATIO | MAXIMUM FLOW,CFS | MAXIMUM STAGE,FT | TIME HOURS |
|---|---|---|---|
| [illegible].5[illegible] | 2[illegible]93. | 97.2 | 41.83 |

PLAN 3 STATION 7[illegible]

| RATIO | MAXIMUM FLOW,CFS | MAXIMUM STAGE,FT | TIME HOURS |
|---|---|---|---|
| .5 | 1[illegible]. | 97. | 42.[illegible] |

| RATIO | MAXIMUM FLOW,CFS | MAXIMUM STAGE,FT | TIME HOURS |
|---|---|---|---|
| .50 | 2116. | 779.2 | 41.83 |

PLAN 3 STATION 520

| RATIO | MAXIMUM FLOW,CFS | MAXIMUM STAGE,FT | TIME HOURS |
|---|---|---|---|
| .50 | 1919. | 779.[illegible] | 42.00 |

PLAN 1 STATION 75

| RATIO | MAXIMUM FLOW,CFS | MAXIMUM STAGE,FT | TIME HOURS |
|---|---|---|---|
| .5 | 2387. | 8[illegible].3 | 41.67 |

PLAN 2 STATION 75

| RATIO | MAXIMUM FLOW,CFS | MAXIMUM STAGE,FT | TIME HOURS |
|---|---|---|---|
| .5[illegible] | 2[illegible]3. | 8[illegible].1 | 41.83 |

PLAN 3 STATION 75

| RATIO | MAXIMUM FLOW,CFS | MAXIMUM STAGE,FT | TIME HOURS |
|---|---|---|---|
| .5[illegible] | 1[illegible]52. | [illegible] | 42.[illegible] |

PLAN 1 STATION [illegible]75

| RATIO | MAXIMUM FLOW,CFS | MAXIMUM STAGE,FT | TIME HOURS |
|---|---|---|---|
| .5 | 2387. | 76.[illegible] | 41.67 |

PLAN [illegible] STATION [illegible]75

| RATIO | MAXIMUM FLOW,CFS | MAXIMUM STAGE,FT | TIME HOURS |
|---|---|---|---|
| .5 | 2[illegible]3. | 76.[illegible] | 41.[illegible] |

PLAN 3 STATION 275

| RATIO | MAXIMUM FLOW,CFS | MAXIMUM STAGE,FT | TIME HOURS |
|---|---|---|---|
| .5 | 1[illegible]2. | 76.[illegible] | 42.[illegible] |

PLAN 1 STATION 52[illegible]

| RATIO | MAXIMUM FLOW,CFS | MAXIMUM STAGE,FT | TIME HOURS |
|---|---|---|---|
| .5 | [illegible] | 7[illegible].4 | 41.67 |

PLAN [illegible] STATION [illegible]

APPENDIX D

REFERENCES

APPENDIX D

REFERENCES


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# APPENDIX E

## STABILITY ANALYSIS

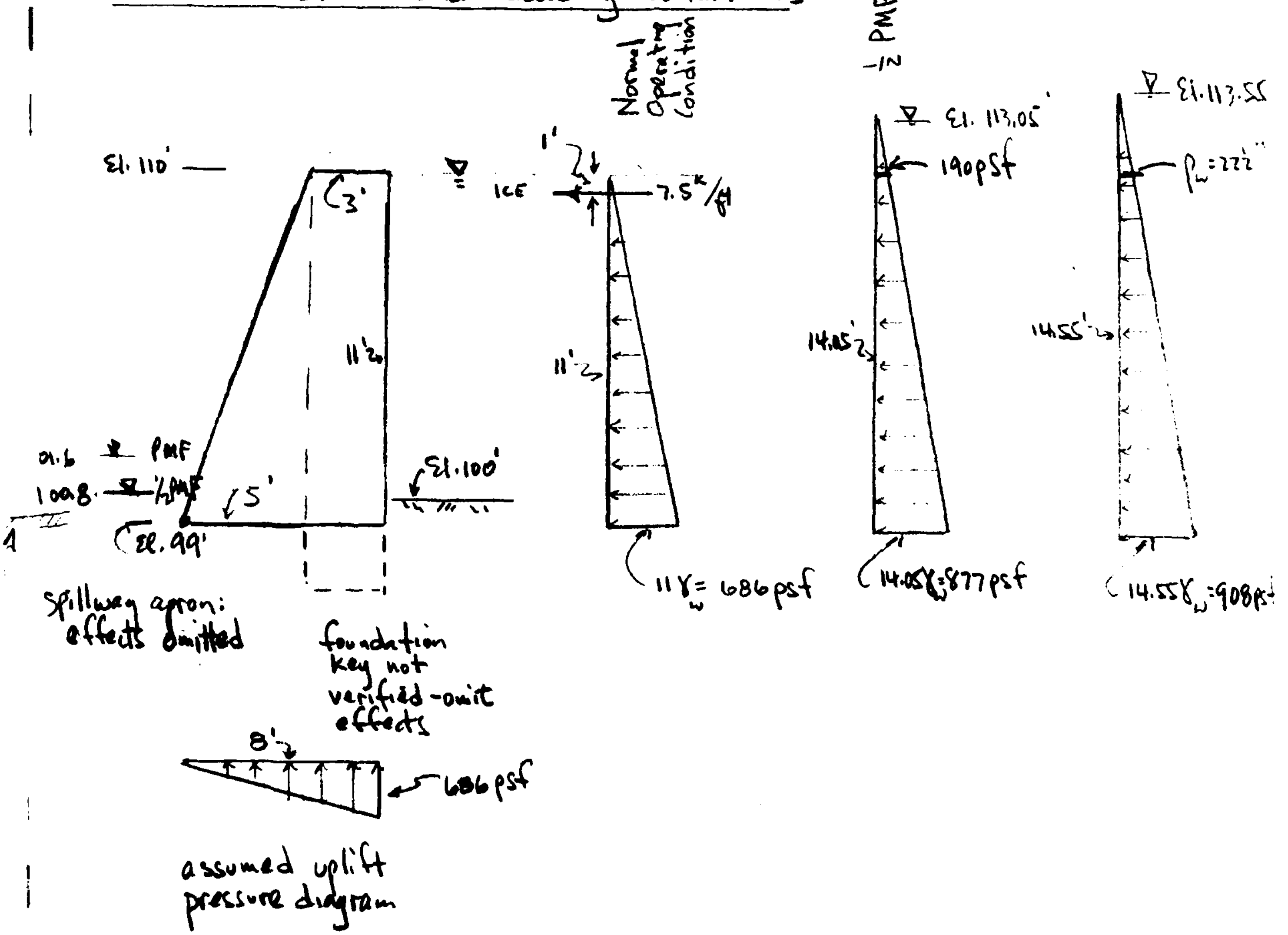
STETSON • DALE BANKERS TRUST BUILDING UTICA • NEW YORK • 13501 TEL 315•797•5800 **DESIGN BRIEF**

PROJECT NAME CLINTON RESERVOIR DAM DATE 4/11/81

SUBJECT STABILITY ANALYSIS – SPILLWAY SECTION PROJECT NO.

DRAWN BY DFM

## Assumed Section and Loading Conditions




Weight of dam $= .150^{kcf}\left(\frac{3+8}{2}\right)(11) = 9.07^{k}/ft$ of length

$M_{toe}$ due to weight of dam $= .150\left[\left(\frac{1}{2}\times 11\times 5\times \frac{2}{3}\times 5\right)+(3\times 11)\left(\frac{3}{2}+5\right)\right] = 45.9^{k\text{-}ft}$

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PROJECT NAME CLINTON DATE

SUBJECT PROJECT NO

DRAWN BY

CASE I, II: WL @ Spillway Elevation (No Ice Load, Ice Load)

OVERTURNING

$M_{toe}$ causing overturning due to horiz water pressure, ice, uplift

$$= \left(\tfrac{1}{2} \times 11 \times .686 \times \tfrac{11}{3}\right) + \left(7.5^{k}/ft \times 10'\right) + \left(\tfrac{1}{2} \times 8 \times .686\right)\left(\tfrac{2}{3} \times 8\right) =$$

$$= 13.83^{k'} + 75^{k'} + 14.63 = 103.5^{kft}$$

$M_{toe}$ resisting overturning due to mass of dam = $45.9^{kft}$

(I) FS against overturning (no ice) = $\dfrac{45.9^{kft}}{(103.5-75)^{kft}}$ = 1.61 (no ice)

(II) FS against overturning (ice load acting) = $\dfrac{45.9^{kft}}{103.5^{kft}}$ = 0.45 (ice load acting) (unsafe)

(I) Position of Resultant, R: $d = \dfrac{\Sigma M_{toe}}{\Sigma V}$

where $\Sigma V$ = wt. of dam − uplift = $9.07^{k} - \left(\tfrac{1}{2} \times 8 \times .686\right) = 6.33^{k}$

$d = \dfrac{(45.9-28.5)^{k\text{-}ft}}{6.33^{k}}$ = 2.75' from toe = 0.34 b (within mid third) (ok)

(II) Position of Resultant Outside of Base Since FS < 1

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PROJECT NAME CLINTON DATE

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DRAWN BY

SLIDING

(I) FS against sliding (friction - shear/bond method, assume τ = 100 psi bond between dam and shale fdtn)

$$FS_{(no\ ice)} = \frac{\mu(W - uplift) + \tau b}{\Sigma \text{lateral water pressure}} = \frac{(0.65)(9.07 - 2.74) + (0.100 \times 144 \times 8')}{(\frac{1}{2} \times 11 \times .686)} = \frac{119.3}{3.77} = 31$$

(II) $$FS_{(ice\ load\ cts)} = \frac{119.3^k}{\Sigma \text{lat. } H_2O + ice} = \frac{119.3}{(3.77 + 7.5)} = 10.6 \quad (ok)$$

AD-A105 763 STETSON-DALE UTICA NY F/G 13/13
NATIONAL DAM SAFETY PROGRAM. CLINTON RESERVOIR DAM (INVENTORY N--ETC(U)
AUG 81 J B STETSON DACW51-81-C-0009

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PROJECT NAME CLINTON DATE

SUBJECT PROJECT NO

DRAWN BY

CASE III : WL @ $\frac{1}{2}$ PMF, uplift as for case I

OVERTURNING

$M_{toe}$ causing ovt due to horiz. water pressures, uplift

$= (.190 \times 11 \times \frac{11}{2}) + (28.5^{k\,ft}) = 40^{k\,ft}$

FS against overturning $= \frac{45.9^{k\,ft}}{40^{k\,ft}} = 1.15$

Position of Resultant, R: $d = \frac{\Sigma M_{toe}}{\Sigma V}$ where $\Sigma V = 6.33^k$

$d = \frac{(45.9 - 40)^{k\,ft}}{6.33} = 0.93^{ft} = 0.12\,b$ (outside mid third)

SLIDING

FS against sliding $= \frac{119.3^k}{\Sigma \text{ Ht. } H_2O \text{ pressure}} = \frac{119.3^k}{(\frac{.190 + .877}{2})(11')} = \frac{119.3}{5.87} = 20\pm$

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PROJECT NAME CLINTON DATE

SUBJECT PROJECT NO

DRAWN BY

CASE IV: WL @ PMF, uplift as for case I

OVERTURNING

$M_{toe}$ causing ot due to horiz. water pressures, uplift

$$= \left(.22 \times 11 \times \frac{11}{2}\right) + (28.5) = 41.8^{kFt}$$

FS against overturning: $\frac{45.9^{kFt}}{41.8^{kFt}} = 1.10$

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

$$d = \frac{(45.9 - 41.8)^{kFt}}{6.33^{k}} = 0.65' = 0.08\,b \text{ (outside middle third)}$$

SLIDING

FS against sliding $= \frac{119.3^{k}}{\Sigma \text{ lat. } H_2O \text{ pressure}} = \frac{119.3^{k}}{\left(\frac{.222 + .908}{2}\right)(11')} = 19^{\pm} \text{ (ok)}$

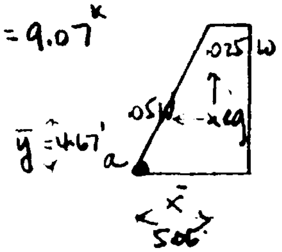
STETSON • DALE BANKERS TRUST BUILDING UTICA • NEW YORK • 13501 TEL 315-797-5800 **DESIGN BRIEF**

PROJECT NAME CLINTON DATE
SUBJECT PROJECT NO
DRAWN BY

CASE V: WL @ Spillway Elevation plus Zone 2 Seismic Effects

Seismic coefficients: Horiz = 0.05
Vert = 0.025

$W = 9.07^k$




Location of c.g. with respect to ⓐ

$$\bar{x} = \frac{M_{tot}}{\Sigma V} = \frac{45.9^{k\text{-}ft}}{9.07^k} = 5.06 \text{ ft}$$

$$\bar{y} = \frac{.15\left[\left(\tfrac{1}{2}\times 5'\times 11'\times \tfrac{11}{3}\right) + \left(3\times 11\times \tfrac{11}{2}\right)\right]}{9.07^k} = \frac{42.35}{9.07} = 4.67 \text{ ft}$$

OVERTURNING

$M_a$ causing overturning due to:
upstream $H_2O$ pressure = $13.83^{k\text{-}ft}$
uplift $H_2O$ pressure = $14.63^{k\text{-}ft}$
seismic effect on mass of dam = $(.05W)(4.67 \text{ ft}) + (.025W)(5.06 \text{ ft}) = 2.12 + 1.15 = 3.27$
seismic effect-water/dam = $(0.30)(.73)(.05)(.0624\times 11\times 11\times 11) = 0.91^{k\text{-}ft}$

$$\text{FS against overturning} = \frac{45.9^{k\text{-}ft}}{(13.83+14.63+3.27+0.91)} = \frac{45.9}{32.64} = 1.41$$

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

$$= \frac{45.9 - 32.64}{6.33 - .025(9.07)} = 2.18 \text{ ft. from a} = 0.27\ b$$

(outside middle third)
[illegible]

SLIDING

$$\text{FS against sliding} = \frac{0.65(W - \text{uplift}) + \tau b}{\text{lateral } H_2O \text{ pressure} + \text{horiz. seismic} + \text{water/dam effect}}$$

$$= \frac{119.3}{3.77 + (.05\times 9.07) + (.73)(.05\times .0624\times 11\times 11\times .73)} = \frac{119.3}{4.43} = 27 \pm$$

.45 .79

# APPENDIX F

## PREVIOUS INSPECTION REPORTS/AVAILABLE DOCUMENTS

DEC DAM INSPECTION REPORT

Superseded by 115-1061

| RB | CTY | YR. AP. | DAM NO. | INS. DATE | USE | TYPE |
|---|---|---|---|---|---|---|
| 03 | 33 | 24 | 00862A | 051873 | 003 | 4 |

**AS BUILT INSPECTION**

- [1] Location of Spillway and outlet
- [1] Elevations
- [1] Size of Spillway and outlet
- [1] Geometry of Non-overflow section

[1] **GENERAL CONDITION OF NON-OVERFLOW SECTION**

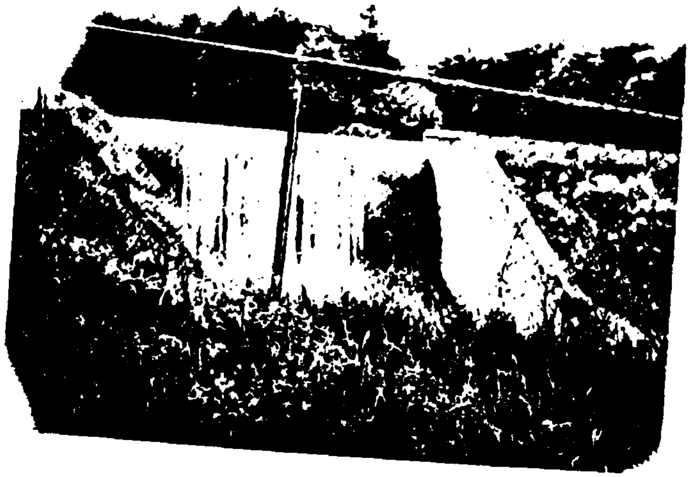
- [1] Settlement
- [1] Cracks
- [1] Deflections
- [2] Joints
- [2] Surface of Concrete
- [1] Leakage
- [1] Undermining
- [1] Settlement of Embankment
- [2] Crest of Dam
- [1] Downstream Slope
- [1] Upstream Slope
- [2] Toe of Slope

[1] **GENERAL CONDITION OF SPILLWAY AND OUTLET WORKS**

- [1/4] Auxiliary Spillway
- [2] Service or Concrete Spillway
- [2] Stilling Basin
- [2] Joints
- [2] Surface of Concrete
- [2] Spillway Toe
- [2] Mechanical Equipment
- [2] Plunge Pool
- [2] Drain

- [1] Maintenance
- [A] Hazard Class
- [3] Evaluation
- [5] Inspector

COMMENTS:



ECTION REPORT
/ 115-1061

| | INS. DATE | USE | TYPE |
|---|---|---|---|
| 2 17 | 5 9 1 2 7 5 | 3 | 7 |

[1] Elevations

[1] Geometry of Non-overflow section

ECTION

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

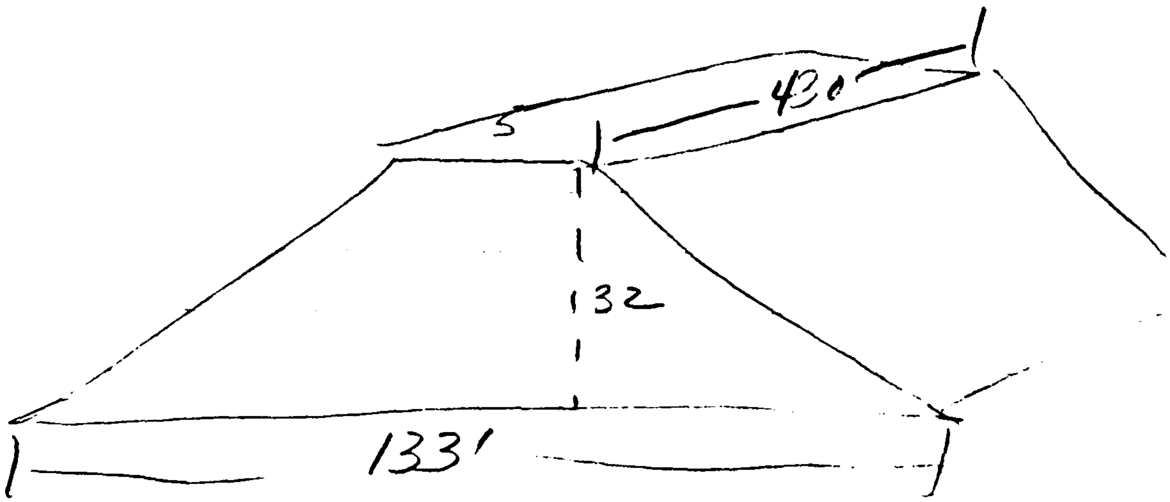
[1] GENERAL CONDITION OF SPILLWAY AND OUTLET WORKS

| | | |
|---|---|---|
| [1/4] Auxiliary Spillway | [2] Service or Concrete Spillway | [2] Stilling Basin |
| [2] Joints | [2] Surface of Concrete | [2] Spillway Toe |
| [2] Mechanical Equipment | [4] Plunge Pool | [4] Drain |

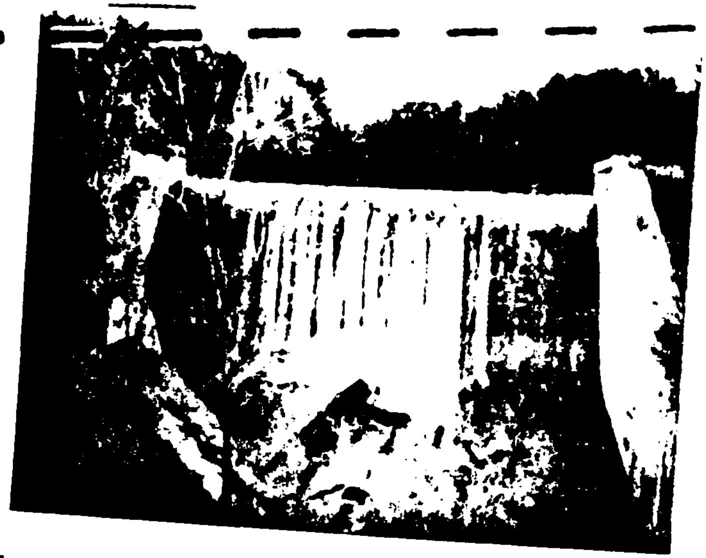
[1] Maintenance — [A] Hazard Class

[3] Evaluation — [ 5] Inspector

75°25.0
43 02.2




$$V = \frac{1/2\,(138)(430)(32)}{27} = 35164$$



CTION REPORT *Clinton N...*

| | INS. DATE | USE | TYPE |
|---|---|---|---|
| | 1/2/1/6/7/1 | 003 | 2 |

[1] Elevations

[1] Geometry of Non-overflow section

CTION

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

[1] GENERAL CONDITION OF SPILLWAY AND OUTLET WORKS

| | | |
|---|---|---|
| [2] Auxiliary Spillway | [2] Service or Concrete Spillway | [1] Stilling Basin |
| [2] Joints | [2] Surface of Concrete | [1] Spillway Toe |
| [2] Mechanical Equipment | [1] Plunge Pool | [1] Drain |

[1] Maintenance — [B] Hazard Class

[3] Evaluation — [-4] Inspector

## DEC DAM INSPECTION REPORT

CLINTON RES.

| RB | CTY | YR. AP. | DAM NO. | INS. DATE | USE | TYPE |
|---|---|---|---|---|---|---|
| 03 | 33 | ~~34~~ 35 | 000[redacted] (1061) | 121671 | 003 | 2 |

### AS BUILT INSPECTION

| | | | |
|---|---|---|---|
| 1 | Location of Spillway and outlet | 1 | Elevations |
| 1 | Size of Spillway and outlet | 1 | Geometry of Non-overflow section |

### 1 GENERAL CONDITION OF NON-OVERFLOW SECTION

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

### 1 GENERAL CONDITION OF SPILLWAY AND OUTLET WORKS

| | | | | | |
|---|---|---|---|---|---|
| 2 | Auxiliary Spillway | 2 | Service or Concrete Spillway | 1 | Stilling Basin |
| 2 | Joints | 2 | Surface of Concrete | 1 | Spillway Toe |
| 2 | Mechanical Equipment | 1 | Plunge Pool | 1 | Drain |

| | | | |
|---|---|---|---|
| 1 | Maintenance | Ø | Hazard Class |
| 3 | Evaluation | -4 | Inspector |

COMMENTS:

BUILT ~~[illegible]~~ IN ACCORDANCE WITH PLANS AND SPECS FOR DAM ~~[illegible]~~, ~~[illegible]~~ CHANGED

August 3, 1936.

M E M O R A N D U M

On July 29, 1936, in company with Mr. William Robinson, I inspected the water supply dam being reconstructed for the Village of Clinton.

The corewall was nearing completion and appeared to be of good quality. The embankment was well placed but was composed principally of clay and would have been better to have had sand and gravel mixed with it. The conditions at the spillway end of the dam were somewhat different than the plans show in the following regard: The plans show abutment wall extending to the toe of the embankment and the apron below the dam also extending to the toe of the embankment. The way the dam is being constructed, both the abutment wall and apron will fall short of extending to the toe of the embankment. The attention of the foreman in charge was drawn to this matter and it was agreed to by him that both the wall and apron would be carried to the toe of the earth embankment wherever the latter might finally be located.

JOHN P. NEWTON
Senior Civil Engineer.

JPN:R

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

STATE OF NEW YORK

DEPARTMENT OF PUBLIC WORKS

DIVISION OF ENGINEERING

ALBANY

Received Dec. 4, 1935 Dam No. 115—1061

Disposition Dec. 4, 1935 Watershed Mohawk

Foundation inspected

Structure inspected

# Application for the Construction or Reconstruction of a Dam

Application is hereby made to the Superintendent of Public Works, Albany, N. Y., in compliance with the provisions of Section 948 of the Conservation Law (see last page of this application) for the approval of specifications and detailed drawings, marked WATER SUPPLY CLINTON, N.Y. herewith submitted for the ~~construction~~ reconstruction of a dam herein described. All provisions of law will be complied with in the erection of the proposed dam. It is intended to complete the work covered by the application about APRIL 1, 36 (Date)

1. The dam will be on SMALL TRIBUTARY flowing into ORISKANY CR. in the town of KIRKLAND, County of ONEIDA and 1 MILE S.W. OF HAMILTON COLLEGE (give exact distance and direction from a well-known bridge, dam, village main cross-roads or mouth of a stream)
2. Location of dam is shown on the ORISKANY quadrangle of the United States Geological Survey.
3. The name of the owner is VILLAGE OF CLINTON
4. The address of the owner is CLINTON, N.Y.
5. The dam will be used for WATER SUPPLY PURPOSES
6. Will any part of the dam be built upon or its pond flood any State lands? No
7. The watershed above the proposed dam is FLOOD FLOW FROM ABOUT 1/3 □ MILE square miles
8. The proposed dam will create a pond area at the spillcrest elevation of 3½ acres and will impound ABT 2,500,000 cubic feet of water.

9. The maximum height of the proposed dam above the bed of the stream is ABOUT 32 feet ........ inches.

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

11. State if any damage to life or to any buildings, roads or other property could be caused by any possible failure of the proposed dam DAMAGE TO PROPERTY AND POSSIBLE LOSS OF LIFE

12. The natural material of the bed on which the proposed dam will rest is (clay, sand, gravel, boulders, granite, shale, slate, limestone, etc.) ........

13. Facing down stream, what is the nature of material composing the right bank? ~~RS~~ CLAY

14. Facing down stream, what is the nature of the material composing the left bank? CLAY

15. State the character of the bed and the banks in respect to the hardness, perviousness, water bearing, effect of exposure to air and to water, uniformity, etc. ........

16. Are there any porous seams or fissures beneath the foundation of the proposed dam? HORSE BONE ON ONE END PENETRATED BY PUDDLE CORE

17. Wastes. The spillway of the above proposed dam will be 20 feet long in the clear; the waters will be held at the right end by aN ABUTMENT the top of which will be ........ feet above the spillcrest, and have a top width of ........ feet; and at the left end by aN ABUTMENT the top of which will be ........ feet above the spillcrest, and have a top width of ........ feet.

18. The spillway is designed to safely discharge 250 cubic feet per second.

19. Pipes, sluice gates, etc., for flood discharge will be provided through the dam as follows:

20. What is the maximum height of flash boards which will be used on this dam? ——

21. Apron. Below the proposed dam there will be an apron built of CONCRETE ........ feet long across the stream, ........ feet wide and ........ feet thick.

22. Does this dam constitute any part of a public water supply? YES

# INSTRUCTIONS

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

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

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

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

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

## SECTION 948 OF THE CONSERVATION LAW

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

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

.................................................................... Owner

By *James P. Wells* authorized agent of owner.

Address of signer *42 EAST AVE* Date *DEC 3, '35*
*ROCHESTER, N.Y.*

WATER SUPPLY APPLICATION NO. 553

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

Received Feb 25th 1924 — Dam No. 862 Mohawk — Watershed

Disposition Withdrawn April 8-1924 — Serial No. 552

Site inspected

Foundation inspected

Structure inspected

NOTE: This dam not built at original location. Final location west of Franklin Springs. Dam No. 862 A 12-4-71

## Application for the Construction [redacted] of a Dam

Application is hereby made to the State Engineer, Albany, N. Y., in compliance with the provisions of Chapter LXV of the Consolidated Laws and Chapter 647, Laws of 1911, Section 22 as amended, for the approval of specifications and detailed plans, marked Proposed White Creek Water Supply for Clinton, N.Y.

herewith submitted for the {construction ~~reconstruction~~} of a dam located as stated below. All provisions of law will be complied with in the erection of the proposed dam.

1. The dam will be on White Creek branch of ........ in the town of Kirkland, County of Oneida, N.Y. and about 2 miles southerly of the village of Clinton, N.Y. (Give exact distance and direction from a well-known bridge, dam, village, main cross-roads or mouth of a stream)

2. The name and address of the owner is Village of Clinton, N.Y. W E. Brockway, Clerk,

3. The dam will be used for impounding water for said village

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

5. The watershed at the proposed dam draining into the pond to be formed thereby is about 3,1/2 Sq miles square miles.

6. The proposed dam will have a pond area at the spillcrest elevation of about 5,3/4 acres and will impound 20,000,000 Gals ~~cubic feet~~ of water.

7. The lowest part of the natural shore of the pond is 15 to 20 feet vertically above the spillcrest, and everywhere else the shore will be at least 20 feet above the spillcrest.

8. The maximum known flow of the stream at the dam site was 2 cubic feet per second on Oct 5-1920 (Date)

9. State if any damage to life or to any buildings, roads or other property could be caused by any possible failure of the proposed dam No

10. The natural material of the bed on which the proposed dam will rest is ~~clay~~, sand, gravel, ~~boulders, granite,~~ shale, ~~slate, limestone, etc.~~ The shale formation, as developed by test pits, lays at an average of about 4 to 5 feet below the top soil of sand, gravel, etc.,

Copy will be filed soon as possible

11. The material of the right bank, in the direction with the current, is earth and shale at the spillcrest elevation this material has a top slope of 6 inches vertical to a foot horizontal on the center line of the dam, a vertical thickness at this elevation of ........ feet, and the top surface extends for a vertical height of ........ feet above the spillcrest.

12. The material of the left bank is as above ; has a top slope of ........ inches to a foot horizontal, a thickness of ........ feet, and a height of ........ feet.

13. 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. good

14. If the bed is in layers, are the layers horizontal or inclined? horizontal If inclined what is the direction of the slope relative to the center line of the dam and the inches vertical to a foot horizontal?

15. What is the thickness of the layers? Earth, about 4 to 5 feet, Shale, unknown

16. Are there any porous seams or fissures? none yet discovered

17. Wastes. The spillway of the above proposed dam will be 55 feet long in the clear; the waters will be held at the right end by a ........ the top of which will be ........ feet above the spillcrest, and have a top width of ........ feet; and at the left end by a ........ the top of which will be ........ feet above the spillcrest, and have a top width of ........ feet.

18. There will be also for flood discharge a pipe 16 inches in diameter and the bottom will be 20 feet below the spillcrest, a sluice or gate ........ feet wide in the clear by ........ feet high, and the bottom will be ........ feet below the spillcrest.

19. Apron. Below the proposed dam there will be an apron built of concrete, See plans ........ feet long, ........ feet wide and ........ feet thick. The downstream side of the apron will have a thickness of ........ feet for a width of ........ feet.

20. Plans. Each application for a permit of a dam over 12 feet in height must be accompanied by a location map and complete working drawings of the proposed structure. Each drawing should have a title giving the parts shown, the name of the town and county in which the dam site is located, and the name of the owner and of the engineer.

The location map (U. S. Geological Quadrangle or other map) should show the exact location of the proposed dam; of buildings below the dam which might be damaged by any failure of the dam; of roads adjacent to or crossing the stream below the dam, 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.

The complete working drawings should give all the dimensions necessary for the calculations of the stability of the structure, and all the information asked for below under "Sketches." There may be attached to the plans any written reports, calculations, investigations or opinions that may aid in showing the data and method used by the designer.

21. SKETCHES. For small and unimportant structures, if plans have not been made, on the back sheet of this application make a sketch to scale for each different cross-section at the highest point; showing the height and the depth from the surface of the foundation, the bottom width, the top width (for a concrete or masonry spill at 18 inches below the crest), the elevation of the top in reference to the spillcrest, the length of the section, and the material of which the section is to be constructed. 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; and the abutments by their top width and top lengths from the upstream face of the spillcrest and give the elevation of the top in reference to the spillcrest.

22. ELEVATIONS. Also give the elevations, if possible from the Mean Sea Level, of at least two permanent Bench Marks; of the spillcrest for any existing dam on the proposed dam site, at the middle and at both ends of the spill; and of the spillcrest for the above proposed dam.

23. SAMPLES. When so instructed, send samples of the materials to be used in the construction of the proposed dam, using shipping tags which will be furnished. For sand one-half a cubic foot is desired; for cement, three pints; and for the natural bed, twenty cubic inches.

24. INSPECTION. State how inspection is to be provided for during construction by the Engineer in charge or by an experienced Inspector in his employ.

W G, Stone, C, E,
Mann Building,
Utica, N, Y.

N.Y. STATE
No. 2098
LICENSE

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

Mann Bldg. Utica, N.Y.
(Address of Signer)

W. G. Stone C.E.

Feb 27 1924
(Date)

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

LICENSE

862 Mch

# Board of Village Trustees

CLINTON, N.Y.



April 14, 1924.

REC'D OFFICE ST... APR 15 1924 ... McKim

Mr. Arnold G. Chapman,
Deputy State Engineer,
Albany, N. Y.

Dear Sir -

Your letter of April 5th addressed to W. H. Brockway, Clerk of the Village of Clinton, N. Y. was not turned over to the New Board until Saturday, April 12th. The Present Clerk is John M. O'Rourke, and Mr. Brockway has no connection with the present Village Board; he has been out of office since the 18th of March, 1924.

You are correct in your understanding that the Village of Clinton has withdrawn its application for the proposed new dam on White Creek, and the writer is at a loss to understand how any additional matters could be filed with the Conservation Commission or your office after the 17th of March, inasmuch as the firm of W. ?. Stone & Company were no longer in the employ of the village after that date.

Very truly yours,

Douglas Ross

Chairman,
Board of Water Commissioners.

DMR/JD

AGC/K.

Dam No. 862, Mohawk.

April 5, 1924.

Mr. W. H. Brockway,
Village Clerk,
Clinton, New York.

Dear Sir:

We have under recent date received from W. G. Stone & Company a blueprint marked "Details of Spillway of Dam of Proposed White Creek Water Supply for Clinton, N. Y., Amended Sheet No. 4."

It is our understanding that the village has withdrawn its application for the creation of this district and therefore no action will be taken on these plans until such time as the Water Control Commission shall have considered and passed upon the application authorizing such construction.

Very truly yours,

Deputy State Engineer.

DWIGHT B. LA DU,
STATE ENGINEER

ARNOLD G. CHAPMAN
DEPUTY

STATE OF NEW YORK
STATE ENGINEER AND SURVEYOR
ALBANY

ADDRESS ALL COMMUNICATIONS TO
DWIGHT B. LA DU, STATE ENGINEER

April.4, 1924.

Dam No. 862,Mohawk.

Not sent as withdrawn.

Mr. W. H. Brockway,
Village Clerk,
Clinton, N. Y.

Dear Sir:

We have received from your engineer, W. G. Stone & Son, a print marked "Details of Spillway of Dam of Proposed White Creek Water Supply for Clinton, N. Y., Amended Sheet No. 4." We have designated this dam on our records as No. 862, Mohawk watershed.

If the excavations made in the bed are entirely refilled with the concrete core we will require that the core be carried perpendicular to the surface into a solid rock foundation bed and banks for a distance from any point of the natural bed equal to at least one foot plus 1/10 the depth of that point below the proposed upstream highest water surface, and into an impervious compact earth foundation bed and banks equal to at least 1/4 of the depth below the proposed upstream highest water surface; that the core wall have a batter on each face of 1/2 horizontal to 12 vertical or a thickness equal to that which would be obtained from the batter; that the slope of the earth embankment be at least 2 horizontal to 1 vertical on the downstream side, and that your engineer submit a report to this department on the bed and banks as soon as excavations are made for any section, stating the character of the material, the compactness and the permeability, and if any pervious strata are found a report from your engineer should be sent to this office at once.

The construction of the above dam in accordance with the plan submitted is approved, subject to the above requirements, in so far as the matter involves the jurisdiction conferred upon this office by Chapter LXV of the Consolidated Laws and Chapter 647, Laws of 1911, Section 22, as amended, and permission is given for the construction of this work up to November 1, 1925, and subject before commencement to the approval of the Water Control Commission, Albany, N. Y., in accordance with the provisions of Article IX of the Conservation Law.

This approval shall not be deemed to authorize any invasion of property rights, either public or private, in carrying out the above work; nor to create any claim against the State of New York; nor to be considered as authorizing the flooding or the use of State lands, nor as acquiescing in the flooding of such lands.

We will require two additional prints of the above drawing for this department.

We enclose shipping tag No. 54 in order that you may ship to our laboratory for testing 1/2 cubic foot, exclusive of any stones over 1/4 inch in size mixed therewith, of the sand to be used for the concrete in the above dam.

Please acknowledge the receipt of this letter and advise us when the work is started.

Very truly yours,

Deputy State Engineer.

Copy to-

W. G. Stone & Son,
Mann Building,
Utica, N.Y.

ARMcK/F.

ENGINEERING OFFICE
OF
# W. G. STONE & SON
MANN BUILDING
UTICA, N Y

WILLIAM G. STONE } AM. SOC. C. E. / AM. SOC. M. E.
WILLIAM D. STONE, C. E.

CIVIL, HYDRAULIC AND
MECHANICAL ENGINEERS

April 3rd, 1924.

In re Dam No 862
Mohawk-Clinton, N.Y.



State Engineer and Surveyor,
Albany, N.Y.

Sir,

Herewith find amanded plan of spillway as requested, which, we trust will meet your approval.

Very truly yours,

W G Stone & Son

WGS/DAC.

March 24, 1924.

Dam No. 862, Mohawk,
Clinton.

W. G. Stone & Son,
Mann Building,
Utica, N. Y.

Gentlemen:

We have received your two letters of March 21, 1924.

For a shale rock such as you describe, very little uplift pressure on the dam section would be necessary. We believe this should be taken at the base as one-third the maximum head at the upstream face and diminished uniformly to zero at the downstream face extended.

A 2 ft. thick core wall, if not reinforced, is difficult to construct for the height shown without being cracked. The core should be let into the bed sufficiently to break the line of creep in order that there will be as little underseepage as possible.

The abutment walls where not supported by the dam section should be thick enough to resist the pressure of the earth.

The slopes of the embankment are not marked on the print submitted. Canal banks and dam embankments are not quite analogous, but our minimum requirement for the downstream slope of 1 vertical to 2 horizontal is the same as quoted by you from the "History of New York State Canals"; and for the upstream slope of 1 vertical to 2-1/2 horizontal is the same as you gave for the proposed dam.

W.G.S. & Son 3/24/24.

As you have found the baffle flanges satisfactory in preventing the creeping of water along pipes, we will approve of their use.

We await your reply to the second and third paragraphs of our letter of March 15th.

Very truly yours,

________________________

Deputy State Engineer.

AHMcK/F

ENGINEERING OFFICE
OF
W. G. STONE & SON
MANN BUILDING
UTICA, N. Y.

WILLIAM G. STONE } AM. SOC. C. E. / AM. SOC. M. E.
WILLIAM D. STONE, C. E.

CIVIL, HYDRAULIC AND
MECHANICAL ENGINEERS

N.Y. STATE
No. 2090
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In re Dam No 862, Mohawk. March 21st, 1924.

State Engineer and Surveyor,
Albany, N.Y.

Sir,

I find that in another communication of this date I failed to answer the query as to baffle flanges.

The enclosed sketch illustrates the method I have used in many similar situations and that has proven entirely satisfactory.

The bell of the flange is made sufficiently large to slip over the bead of the pipe. The pipe joint is made in the usual manner with lead and jute. The flange is then slipped back to meet the pipe bell, centered and then leaded and caulked in the usual manner. This makes an absolutely water tight joint, which is not always the case with sectional flanges or concrete collars and has the further qualification of compelling any water percolating along the pipe to make four abrupt bends before it again strikes the pipe.

I personally consider this a better arrangement than the usual concrete collars.

Very truly yours,

W. G. Stone.

WGS/DAC.

ENGINEERING OFFICE
OF
# W. G. STONE & SON
MANN BUILDING
UTICA N Y

WILLIAM G. STONE { AM SOC C E / AM SOC M E
WILLIAM D. STONE, C. E.

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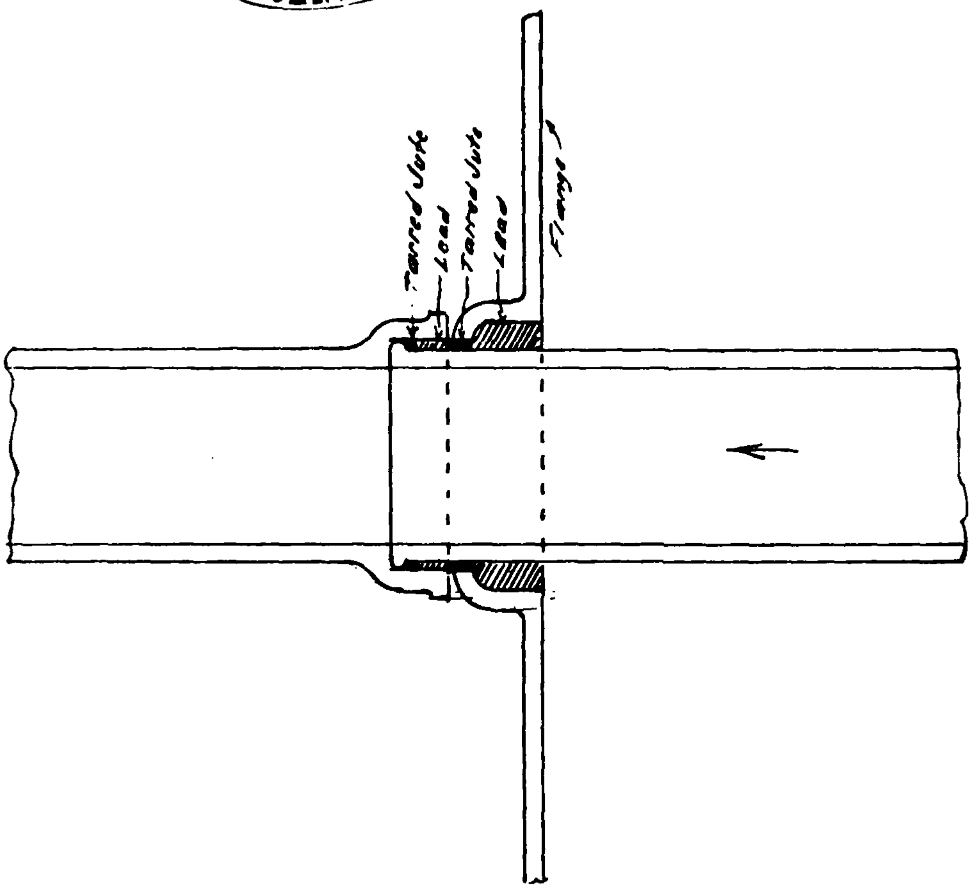

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WILLIAM D. STONE
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UTICA, N. Y.
CIVIL HYDRAULIC AND
MECHANICAL ENGINEERS

N.Y. STATE No. 2090 LICENSE

2

March 21st, 1924.

In re Dam 863, Mohawk.

State Engineer and Surveyor,
Albany, N.Y.

Sir,

Replying to yours of March 15th. Assuming that this will be referred to Mr A R, McKim, I feel that I can discuss the matters therein referred to with less formality than with a stranger.

The thickness of spillway base is 8 feet. I do not know the permeability of the underlaying rock. Tests pits disclose a firm, hard, solid red shale. This when unexposed to the air, remains solid. When exposed to air it disintegrates, as is the case with all the shales in this vicinity.

I am unable to conceive of any appreciable lifting effect of the water on the structures founded on this shale. When the solid shale is reached and the cavity filled with concrete and thus sealed against air or water, it seems to me that the structure, below the shale, becomes a part of the permanent geology. I can see no reason why it should lift, any more than the entire bottom of the reservoir, which is not possible.

The core wall rock bond is fully met by the dimensions shown on the plans though I can see no reason why a core wall should go lower than impervious foundation.

A 6" pipe drains the water cushion basin, though it is not shown on plans.

Your criticism as to the section of top of spillway is well founded and should be as you suggest.

In the matter of the spillway abutments or retaining walls, it seems to me, in consideration of the fact that they are tied to the core wall on one si side and supported by the spillway on the other, that the rigid requirement, as to retaining walls could be modified. Personally I consider them perfectly safe.

As to the batter of the core wall. It was made straight for structural reasons. It is practically impossible to make a Contractor follow a batter of 1/2" to 12". The wall is almost universally distorted in construction. It is much easier to construct and maintain straight forms than battered ones. While a core wall of the dimensions shown may add somewhat to the impermeability of a dam, its prime function, in my opinion, is to act as a bar to burrowing animals, crabs, etc. For this reason I prefer it to a puddle core.

In the matter of bank slopes I think I have abundant authority for those shown. The "History of N, Y State Canals, Vol 11, gives earth slopes as follows

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water slopes,1 on 1,25. Earth slopes,1 on 2. These slopes were used from 1825-1834 down to the construction of the Barge Canal. The"Barge Canal Report"of 1901 gives slopes as follows;Water slopes 1on 2; earth slopes 1 on 1,50.The Clinton dam shows water slope of 1 on 2,50 and earth slope of 1 on 1,1,50 a more generous proportion than used by the State.In no case were core walls demanded.

Your request for larger scale drawing of spillway and appurtenances will be complied with as soon as possible.

Very truly yours,

W. G. Stone.

WGS/DAC.

ARMcK/BW

March 15, 1924.

Dam #862-Mohawk
Clinton

W. G. Stone & Son,
Mann Building,
Utica, New York.

Gentlemen:

We received your letter of March 11th and prints in triplicate for the proposed dam for the village of Clinton.

What is the spillway section thickness at the base, or at the pool bottom level? There is no provision for ice pressure. For low dams the ice pressure can be provided by a batter at the top of the upstream face; for a spillway section make the batter at least one foot horizontal to two feet vertical, rounded at the crest. The thickness at 18 inches below the crest should be at least four feet. What is the assumed uplift pressure and the permeability and quality of the shale under the spillway section? The resultant pressure must fall within the middle third of the section, assuming the concrete to weigh not more than 141 pounds per cubic foot and at high flow that due to the velocity of the current over the spillway crest there would be no weight of water on the crest, on the downstream face or no back pressure.

We will require a larger scale sketch of the proposed crest of the spillway.

Is there a drain to empty the water cushion pool when water is not flowing over the spillway?

An abutment wall of concrete acting as an earth retaining wall must not be less than 18 inches thick; the thickness at any depth must be at least one-half the vertical depth of the embankment.

The concrete core wall must be carried perpendicular to the surface into a solid rock foundation bed and banks for a distance from any point of the natural bed equal to at least one foot plus one-tenth the depth of that point below the proposed upstream highest water surface; and into an impervious compact earth foundation bed and banks equal to at least one-fourth of the depth below the proposed upstream highest water surface. The top of the core wall should be at least as high as the proposed upstream highest water surface with a top width of not less than two feet and the batter of one-half horizontal to twelve vertical on each side down to the surface of the natural bed.

We note you have baffle flanges instead of concrete collars to stop the flow of the water along the outlet pipes. Are these baffle flanges part of the pipe and cast with it?

The slopes of the embankment should be at least two and one-half horizontal to one vertical on the upstream side and two to one on the downstream side. For fine materials the slopes must be less.

Very truly yours,

..............................
State Engineer.

ARMcK/BW

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OF
# W. G. STONE & SON
MANN BUILDING
UTICA, N. Y.

WILLIAM G. STONE, AM. SOC. C. E., AM. SOC. M. E.
WILLIAM D. STONE, C. E.

CIVIL, HYDRAULIC AND MECHANICAL ENGINEERS

In re Dam No 862, Clinton, N.Y. March 11th, 1924.

State Engineer and Surveyor,
Albany, N.Y.



Sir.

Enclosed find plans, in triplicate, of the proposed dam bearing your number, 862.

The specifications therefor are now in the hands of the printer and copy will be forwarded as soon as possible.

We were not advised that triplicate plans were required.

Very truly yours,

W G Stone Son

WGS/DAC.

N.Y. STATE
No. 2090
LICENSE

March 7, 1924.

Dam 862, Mohawk,
Clinton.

Mr. W. G. Stone,
Mann Building,
Utica, N. Y.

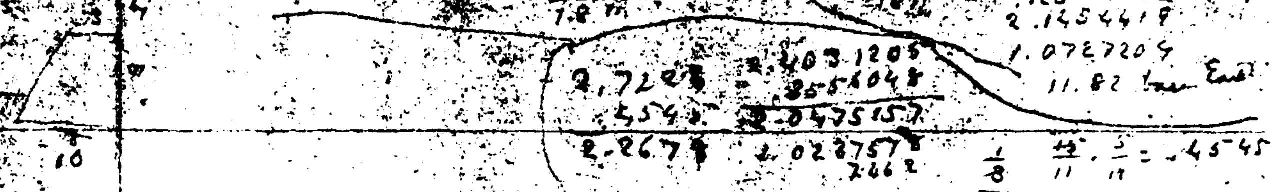
Dear Sir:

We have received an application for the reconstruction of dam 862, Mohawk Watershed at Clinton, and U. S. G. S. Sheet locating a dam owned by the Village of Clinton, N. Y. However, we have not received a copy of the specifications nor plans in triplicate for the reconstruction of the above dam, which will be required before we can approve of the reconstruction.

Very truly yours,

Deputy State Engineer.

ARMcK/F.



2.4031205
.2571770
2.1454419
1.0727204
11.82 [illegible] East

2.7228 2.4031205
.4545 .3551048
2.2678 2.0475157
2.0287578
7662

1/8 11/15

45/11 . 5/11 = .4545

base = 10.562
shale

Mar 24-24

Uplift less, as sunk [illegible] ledge [illegible]
2010' base [illegible]
ac. 1266 [illegible]

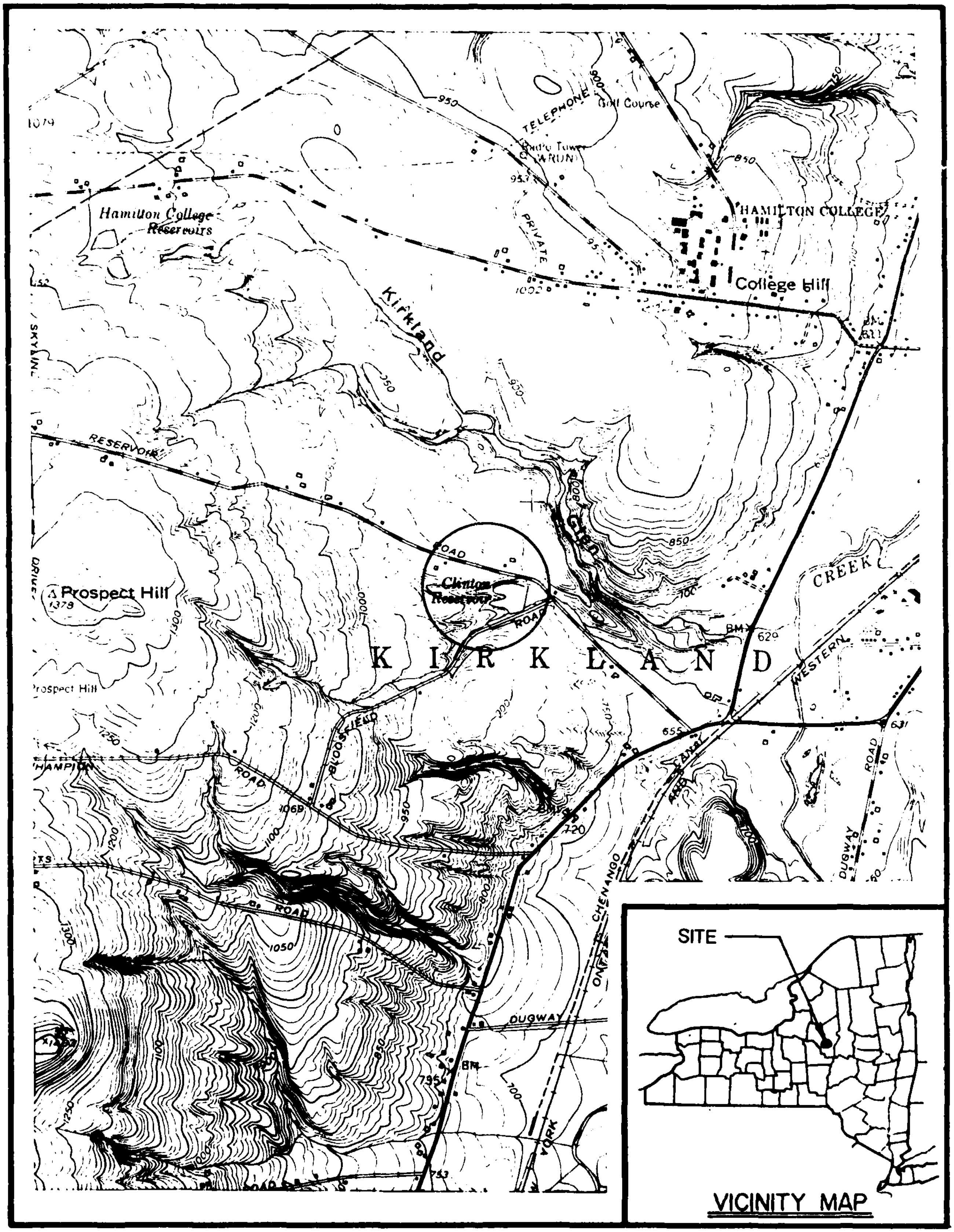
Dam 1361, Mohawk near Clinton

Owner - Village of Clinton

Plans on file in map filing cabinet.

# APPENDIX G

## DRAWINGS




# LOCATION PLAN

SCALE 1:24,000

FIGURE 1

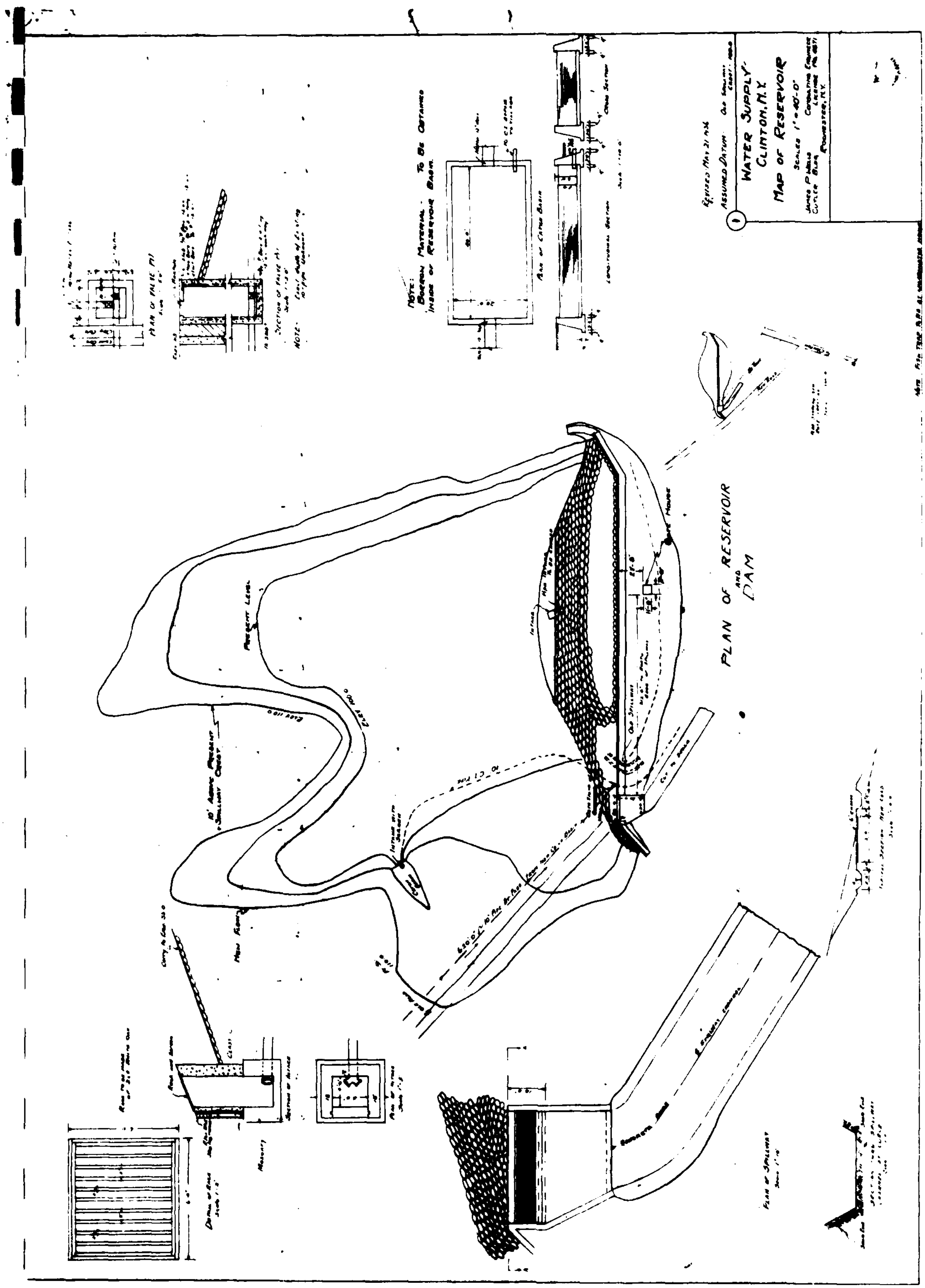
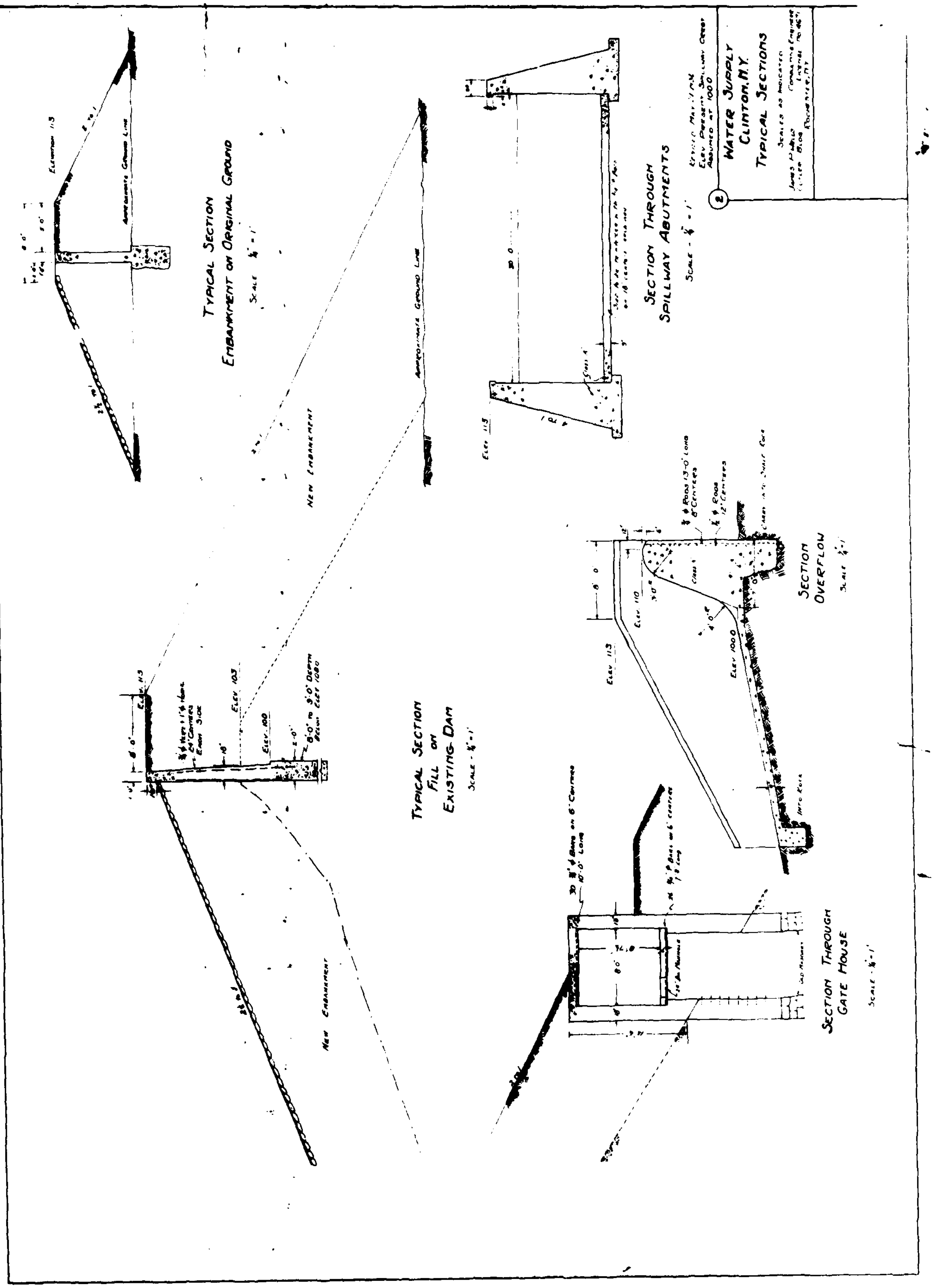

PLAN OF RESERVOIR AND DAM
WATER SUPPLY
CLINTON, N.Y.
MAP OF RESERVOIR
NOTE: BORROW MATERIAL: TO BE OBTAINED INSIDE OF RESERVOIR BASIN.

FIGURE 2



Typical Section
Embankment on Original Ground
Approximate Ground Line
New Embankment
Section Through
Spillway Abutments
Water Supply
Clinton, N.Y.
Typical Sections
Typical Section
Fill on
Existing Dam
New Embankment
Section
Overflow
Section Through
Gate House


FIGURE 3

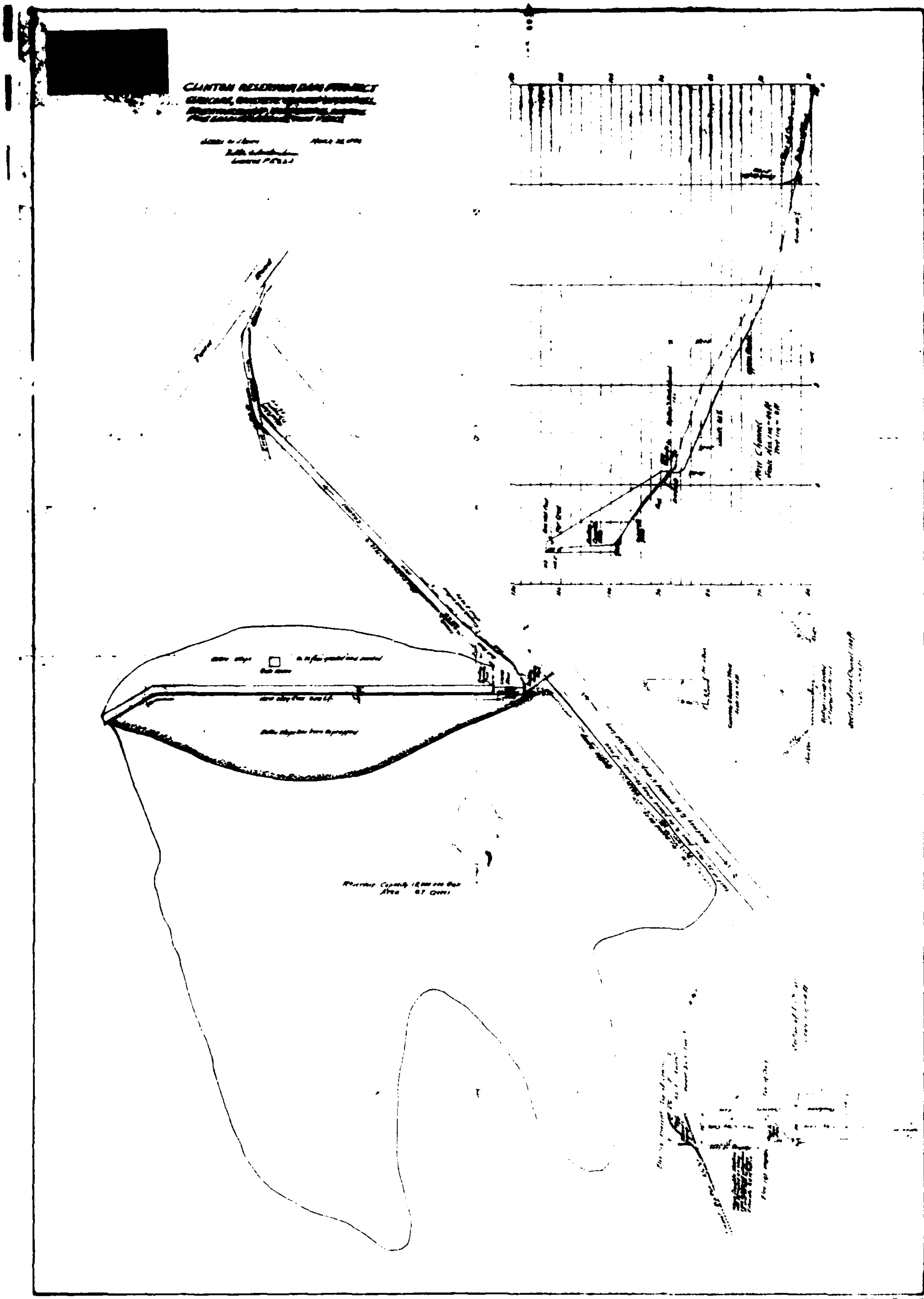



FIGURE 4

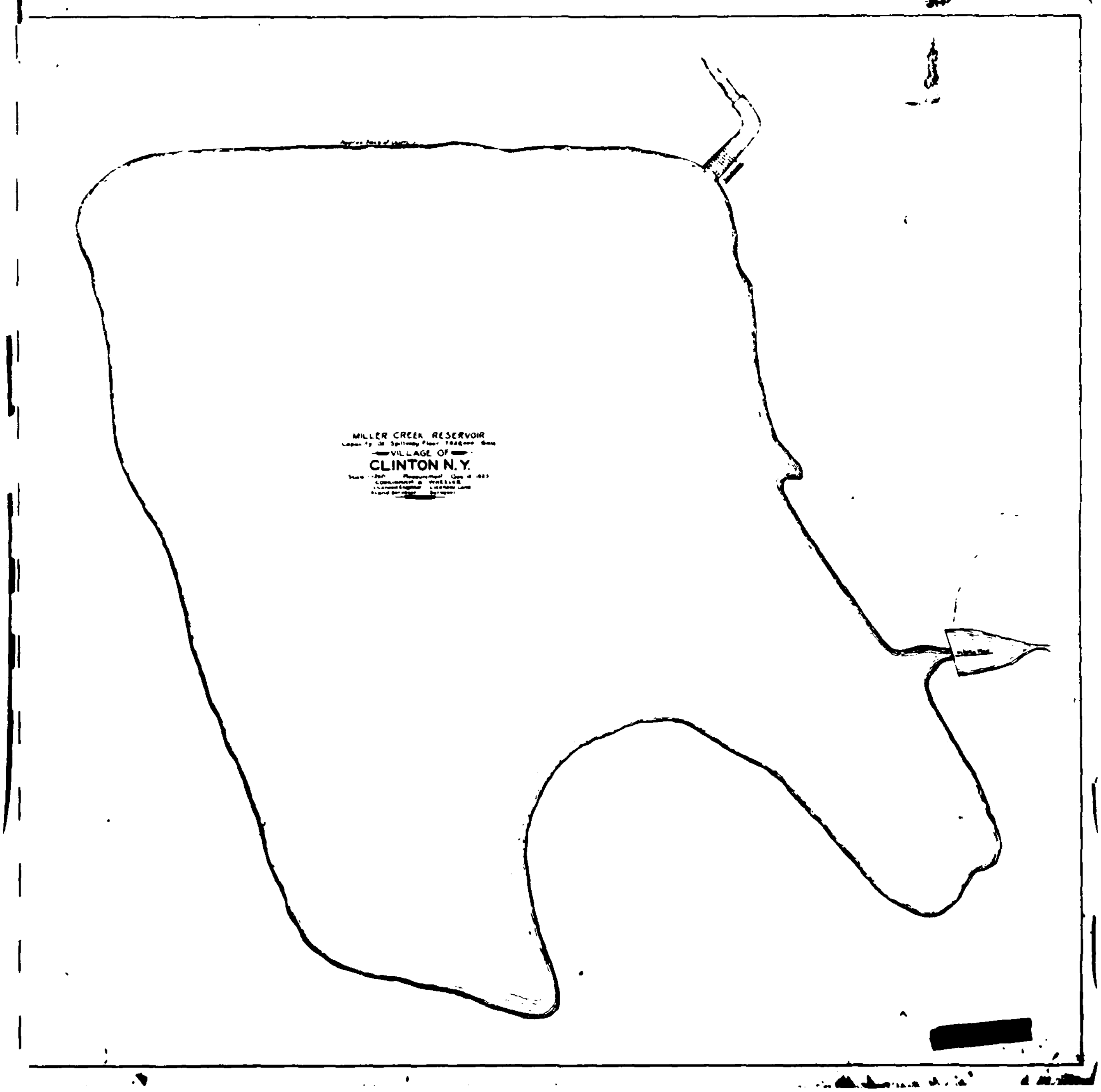



FIGURE 5

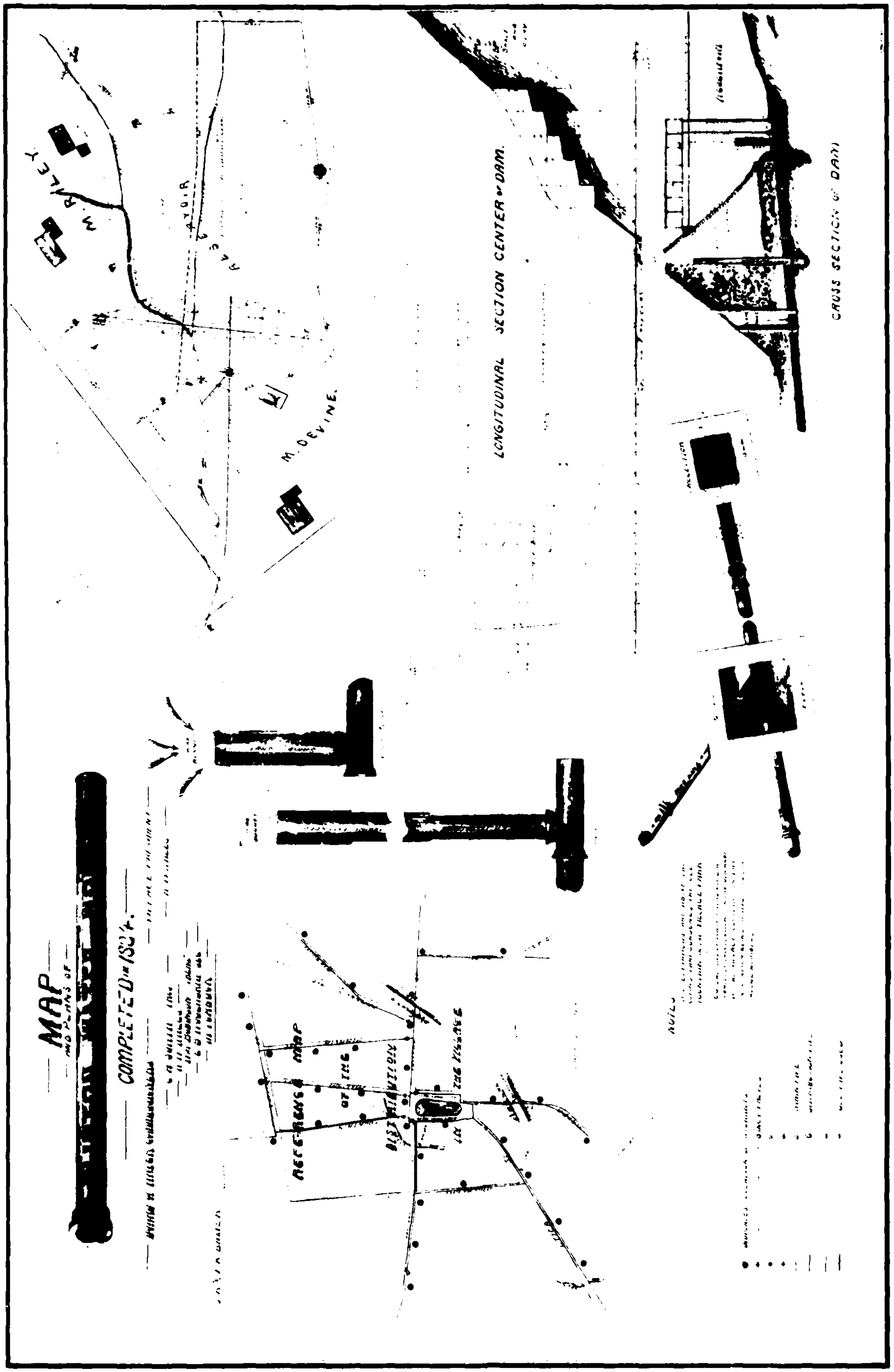

MAP
LONGITUDINAL SECTION CENTER of DAM.
CROSS SECTION of DAM
M. DEVINE.

FIGURE 6

DAT
ILM