This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization. The examination of documents and the visual inspection of Mt. Beacon Reservoir Dam did not reveal conditions which constitute an immediate hazard to human life or property. However, the dam has some deficiencies which require further investigation and remedial action.
Using the Corps of Engineers screening criteria for review of spillway adequacy, it has been determined that the dam would be overtopped for all storms exceeding approximately 16 percent of the PMF. The overtopping of the dam could cause dam failure, thus significantly increasing the hazard to the loss of life downstream. The spillway is therefore adjudged as "seriously inadequate" and the dam is assessed as unsafe, non-emergency.

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

Structural stability analysis based on available information and the visual inspection indicates that the stability of the non-overflow section against overturning and sliding is inadequate for all loading conditions.

It is therefore recommended that within 3 months of notification to the owner, detailed hydrologic/hydraulic investigations of the structure should be undertaken to more accurately determine the site specific characteristics of the watershed and their affect upon the overtopping potential of the dam. The results of these investigations will determine the appropriate remedial measures which will be required to achieve a spillway capacity adequate to discharge the outlet flow from at least the one-half PMF. Within twelve months of the date of notification to the owner, modifications to the structure, deemed necessary, as a result of the studies, should have been completed. At the same time, a detailed investigation of the structural stability of the non-overflow section should be performed. In the interim, a detailed emergency action plan must be developed. Also, around-the-clock surveillance of the structure must be provided during these periods.

In addition, the dam has a number of problem areas which, if left uncorrected, have the potential for the development of hazardous conditions and must be corrected within twelve (12) months.

1. Establish a systematic program to observe and monitor changes in seepage occurring at the outlets of the seepage drains located on the downstream face of the gravity sections.

2. Backfill low area at the left abutment with concrete to the level of the crest of the dam.

3. Determine the sources of seepage occurring at the spillway right abutment contact, and in the vicinity of downstream from the toe of the dam near the left abutment. Monitor the seepage biweekly with the aid of weirs.

4. Remove the vegetation in the spillway channel and the area downstream from the toe of the dam. Provide a program of periodic cutting and mowing of these areas.

5. Repair the side walls of the spillway and the reservoir drain channels.

6. Provide a program of periodic inspection and maintenance of the dam and appurtenances including yearly operation and lubrication of the reservoir drain system. Document this information for future reference. The aforementioned emergency action plan should be maintained and updated periodically during the life of the structure.
DISCLAIMER NOTICE

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HUDSON RIVER BASIN

MT. BEACON RESERVOIR

DUTCHESS COUNTY, NEW YORK

INVENTORY NO. N.Y. 26

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

NEW YORK DISTRICT CORPS OF ENGINEERS

AUGUST 1980
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 investigations, 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.
PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
MOUNT BEACON RESERVOIR DAM
I.D. NO. N.Y. 26
D.E.C. NO. 537
HUDSON RIVER BASIN
DUTCHESS COUNTY, NEW YORK

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MOUNT BEACON RESERVOIR DAM
I.D. NO. N.Y. 26
D.E.C. NO. 537
HUDSON RIVER BASIN
DUTCHESS COUNTY, NEW YORK

Name of Dam: Mt. Beacon Reservoir Dam (I.D. No. N.Y. 26)
State Located: New York
County Located: Dutchess
Stream: Dry Brook
Basin: Hudson River
Date of Inspection: July 24, 1980

ASSESSMENT

The examination of documents and the visual inspection of Mt. Beacon Reservoir Dam did not reveal conditions which constitute an immediate hazard to human life or property. However, the dam has some deficiencies which require further investigation and remedial action.

Using the Corps of Engineers screening criteria for review of spillway adequacy, it has been determined that the dam would be overtopped for all storms exceeding approximately 16 percent of the PMF. The overtopping of the dam could cause dam failure, thus significantly increasing the hazard to the loss of life downstream. The spillway is therefore adjudged as "seriously inadequate" and the dam is assessed as unsafe, non-emergency.

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

Structural stability analysis based on available information and the visual inspection indicates that the stability of the non-overflow section against overturning and sliding is inadequate for all loading conditions.

It is therefore recommended that within 3 months of notification to the owner, detailed hydrologic/hydraulic investigations of the structure should be undertaken to more accurately determine the site specific characteristics of the watershed and their affect upon the overtopping potential of the dam. The results of these investigations will determine the appropriate remedial measures which will be required to achieve a spillway capacity adequate to discharge the outflow from at least the one-half PMF. Within twelve months of the date of notification to the owner, modifications to the structure, deemed necessary as a result of the studies, should have been completed. At the same time, a detailed investigation of the structural stability of the non-overflow section should be performed. In the interim, a detailed emergency action plan must be developed. Also, around-the-clock surveillance of the structure must be provided during these periods.

In addition, the dam has a number of problem areas which, if left uncorrected, have the potential for the development of hazardous conditions and must be corrected within twelve (12) months.

1. Establish a systematic program to observe and monitor changes in seepage occurring at the outlets of the seepage drains located on the downstream face of the gravity sections.

2. Backfill low area at the left abutment with concrete to the level of the crest of the dam.

3. Determine the sources of seepage occurring at the spillway right abutment contact, and in the vicinity of downstream from the toe of the dam near the left abutment. Monitor the seepage biweekly with the aid of weirs.

4. Remove the vegetation in the spillway channel and the area downstream from the toe of the dam. Provide a program of periodic cutting and mowing of these areas.

5. Repair the side walls of the spillway and the reservoir drain channels.
6. Provide a program of periodic inspection and maintenance of the dam and appurtenances including yearly operation and lubrication of the reservoir drain system. Document this information for future reference. The aforementioned emergency action plan should be maintained and updated periodically during the life of the structure.

Eugene O'Brien, P.E.
New York No. 29823

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

Date: 30 Sep 80
PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROJECT
MOUNT BEACON RESERVOIR DAM
I.D. NO. N.Y. 26
D.E.C. NO. 537
HUDSON RIVER BASIN
DUTCHESS COUNTY, NEW YORK

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority
The Phase I inspection reported herein was authorized
by the State of New York, Department of Environmental Conserva-
tion by a letter dated 7 January 1980, in fulfillment of the
requirements of the National Dam Inspection Act, Public Law
92-367, 8 August 1972.

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

1.2 DESCRIPTION OF THE PROJECT

a. Description of the Dam and Appurtenant Structures
The Mount (Mt.) Beacon Reservoir Dam consists of
about a 350 foot long, 35 foot high gunite surfaced concrete
masonry gravity, and concrete buttress dam with a spillway
at the right side of the dam. According to available drawings
dated July 1922 (See Appendix A), the gravity section under
the gunite surface is masonry with concrete at the downstream
face of the masonry; the upstream and downstream faces of the
section are 7V:1H and 0.37V:1H, respectively; and the crest
is about 8.5 feet wide. The dam is made up of 10 buttresses
forming eleven (11) bays. The width of each buttress is about
2.5 feet. The length of bays varies between 21 to 22 feet,
except for the two end bays. The bay at the left abutment is
about 32 feet wide and at the right abutment, about 73 feet,
of which 43 feet serves as the spillway. The spillway is broad
crested, ungated and has a sill about 8 feet wide and the crest
is 1.5 feet from the top of the dam. The downstream face of
the spillway is "ogee shaped" and is flanked on the left and
the right by a buttress and a wing wall, respectively. The
discharge over the spillway flows into a natural channel with
sides protected by 2 foot wide concrete walls except at the
right side a portion of which is rock.
The 22-inch diameter cast iron reservoir drain is located about 150 feet from the right abutment. Flows from the drain are controlled by two manually operated gate valves located upstream and downstream of the dam. The upstream gate valve is operated from a control located at the top of the dam, with access from a steel decked platform. The downstream gate valve is operated from a control located in a gate house at the toe of the dam. Discharges from the drain are into a natural channel whose sides are protected by concrete walls about 25 feet long. About 30 feet downstream from the drain outlet, the reservoir drain channel joins the spillway channel (See Photograph 7). The channel continues downstream (Dry Brook) to a water supply storage pond.

b. Location
The dam is located about 0.75 mile from the intersection of East Main Street and Mountain Avenue in the City of Beacon.

c. Size Classification
The dam is 35 feet high and has a reservoir capacity of 575 acre-feet. Therefore, the dam is classified as "small".

d. Hazard Classification
The dam is in the high hazard potential category because 3000 feet downstream from the dam is located the City of Beacon. There are several homes, a water supply filtration plant, and a water supply storage tank.

e. Ownership
Mt. Beacon Dam is owned by the City of Beacon, 427 Main Street, Beacon, New York, 12508, Tel. No. (914) 831-0932. The person to contact is Mr. Mark Giodano, Superintendent of Water Department.

f. Purpose of Dam
The impoundment provided by the dam is used for water supply. It is reported that the impoundment supplies about 20 percent of the city's water supply.

g. Design and Construction History
Original design and construction records are not available. It is reported that the dam was built in 1889. According to a dam section shown on the available drawing of 1913 (Plate No. 3 in Appendix A), it appears that the original dam was a rubble masonry concrete dam and later was raised and concrete buttresses added. The drawing and available information also proposed the strengthening of the downstream face of each buttress by providing a 3 foot thick concrete strut. The construction records of these repairs could not be located. The available drawings of 1922 (Plates 4 through
6 in Appendix A) proposed the following modifications to the dam. The construction records of these modifications could not be located.

a. The masonry gravity section between the buttresses to be strengthened by placing concrete struts and seepage drains installed between the masonry and concrete struts.

b. The geometry of the stepped downstream face of the spillway to be modified to "ogee shaped".

c. The new spillway channel walls to be relocated to accommodate the spillway modification.

d. The upstream face of the dam to be surfaced with "gunite".

It is reported that the upstream gate valve for the reservoir drain was added subsequent to the original construction; the date is unknown. Also, it is reported that the entire dam was surfaced with gunite in 1978.

h. Normal Operating Procedures

The flow from the reservoir is from the spillway and/or reservoir drain. It is reported that 300,000 gallons of water per day are released from the reservoir through either the reservoir drain or the reservoir drain and spillway.

1.3 PERTINENT DATA

a. Drainage Area, Square Miles 0.25

b. Discharge at Dam, cfs
   Maximum Known Flood at Site Unknown
   Ungated Spillway at Maximum Pool 210
   Reservoir Drain 67.5

c. Elevation, Feet Above MSL
   Top of Dam, Feet 1286.5
   Spillway, Feet 1285.0

d. Reservoir
   Length of Normal Pool, Feet 1300
   Surface Area of Maximum Pool, Acres 20.7
   Surface Area of Normal Pool, Acres 20

e. Storage, Acre-Feet
   Spillway Crest 575
   Top of Dam 606
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<th>f. Dam</th>
<th>Masonry Concrete Gravity Section and Concrete Buttress</th>
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<tr>
<td>Type</td>
<td>Length (Feet): 350</td>
</tr>
<tr>
<td></td>
<td>Height (Feet): 35</td>
</tr>
<tr>
<td></td>
<td>Crest Width (Feet): 8.5</td>
</tr>
<tr>
<td></td>
<td>Side Slopes: Upstream 7V:1H, Downstream 0.37V:1H</td>
</tr>
<tr>
<td>g. Spillway</td>
<td>Uncontrolled, Broad Crested</td>
</tr>
<tr>
<td>Type</td>
<td>Crest Width (Feet): 43+</td>
</tr>
<tr>
<td></td>
<td>Slopess Upstream 7V:1H, &quot;Ogee Shaped&quot;</td>
</tr>
<tr>
<td>h. Reservoir Drain</td>
<td>22-Inch</td>
</tr>
<tr>
<td>Type</td>
<td>Controls Upstream and Downstream Manually, Operated Gate Valves</td>
</tr>
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</table>
2.1 GEOLOGY

Mt. Beacon Reservoir is located in the western portion of the New England Uplands physiographic province of New York State. The durable Precambrian rocks of this area are reflected in the landforms of significant topographic relief. The rocks at the reservoir site include hornblende granite gneiss with subordinate lencogranite.

2.2 SUBSURFACE INVESTIGATION

No subsurface investigation could be located for the project. However, surface cover in the vicinity of Mt. Beacon Reservoir is described as "Rockland" (Refs. 9 and 10). Rock outcrops, stones and steep slopes are characteristics of this area of very thin glacial till over bedrock.

2.3 DESIGN RECORDS

The dam is reported to have been constructed in about 1889. There are no design data or specific design memoranda available for the project features. However, there are four drawings, one dated November, 1913 (Plate 3 in Appendix A) and three dated July, 1922 (Plates 4 through 6 in Appendix A) obtained from the New York State Department of Environmental Conservation. The 1913 drawing shows the original dam cross section, a modified section, and the suggested method of strengthening the buttresses. The 1922 drawing shows the strengthening of the gravity section between buttresses, new geometry of downstream face of the spillway, the relocation of the spillway channel walls and the gunite surfacing of the upstream face. There are no construction records of the modification.

It is reported that the upstream gate valve was added to the reservoir drain and the entire dam was resurfaced by applying gunite in 1978. There are no construction records available of the addition of the valve and resurfacing.

2.4 CONSTRUCTION RECORDS

There are no construction records for the original dam or subsequent modifications available for the project.

2.5 OPERATION RECORDS

There are no available operation records for the project and gates. However, there are weekly records of the reservoir level kept at the Department of Public Works and the City Engineers Office. There are no rainfall readings.
taken at the dam site. However, it is reported that rainfall readings are taken at Texaco Research Center, located 1.5 mile downstream from the dam.

2.6 EVALUATION OF DATA

Existing information was made available from the owner and the New York State Department of Environmental Conservation.

The information obtained from available data and the visual inspection is considered adequate for the Phase I inspection and evaluation.

There is one inconsistency in the available drawings: the July, 1922 drawing (Plate No. 6) indicates nine buttresses, whereas ten buttresses were observed during the visual investigation.
SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

The visual inspection of Mt. Beacon Reservoir was made on 24 July 1980. The weather was sunny with temperature at about 80°F. It was reported that rain occurred the previous night and the reservoir level was at about El 1281.5, 3.5 feet below the spillway crest.

b. Dam

The gunite surface on the bays (gravity sections) and buttresses appears to be in generally good condition. The horizontal and vertical alignment of the dam are uniform and there is no indications of movement. The crest and the upstream face above the waterline appears to be in good condition except at several locations, the gunite surface has hairline to 1/8 inch wide longitudinal, and transverse cracks. The downstream face of the dam appears to be in good condition. There are several hairline to 1/8 inch wide cracks in the gunite surface which are calcified and some of the cracks show evidence of seepage. There are seepage drain outlets located at different elevations on the downstream face of several bays. Some of the drains are active. The seepage was minor at all bays except at the third bay from the left abutment which was estimated at about 1.5 gpm.

At about 50 feet downstream from the toe of the dam and about 45 feet from the left abutment there is a saturated area caused by seepage. The source of the seepage could not be determined. The flow is estimated to be about 4 to 5 gallons per minute, with no signs of migration of fines.

The entire area downstream from the toe of the dam is covered with overgrown grass, bushes and saplings (See Photograph No. 3).

c. Spillway

The spillway appears to be in good condition except minor cracking of the gunite surface at the crest and the downstream face. The entire right abutment spillway contact which is bedrock was saturated as a result of seepage. The source of seepage could not be determined. The flow is estimated to be about 1 gallon per minute, but there are no signs of migration of fines.

d. Appurtenant Structures

The upstream and downstream gate valves of the reservoir drain were operated during the inspection. The reservoir drain and both regulating gate valves are in good operating condition.
At the outlet of the reservoir drain there are five (5) pipes of varying diameters (See Photograph No. 6). The purpose and upstream extent of these pipes could not be determined, nor could anyone explain their purpose.

e. **Abutments**
   There is a low area at the left abutment and it is about 2 inches lower than the level of the dam crest (See Photograph No. 12). Otherwise, there are no signs of seepage or other unusual conditions. At the right abutment except for the seepage mentioned in Section 3c, there are no signs of unusual conditions.

f. **Downstream Channel**
The spillway and reservoir drain channels join at about 10 feet from the dam to form a downstream channel which consists of boulders and bedrock. The spillway channel floor is bedrock and is overgrown with trees, bushes and saplings. The reservoir drain channel whose sides are protected by concrete walls, appears to be in good condition except the walls are spalled at several locations. The right wall of the reservoir drain channel, where the spillway and reservoir drain channel join, is undermined (See Photograph No. 7).

g. **Reservoir Area**
In the vicinity of the dam there is no evidence of sloughing, potentially unstable slopes or other unusual conditions which would adversely effect the dam. No evidence of excessive sedimentation was observed. The reservoir was relatively clean.

### 3.2 EVALUATION OF OBSERVATIONS

The visual observations made during the course of the investigation revealed several deficiencies which at present do not adversely affect the adequacy of the dam. However, these deficiencies do require attention and should be corrected. The following is a summary of the problem areas encountered, in order of importance, with appropriate recommended actions:

1. Establish a systematic program to observe and monitor changes in seepage occurring at the outlets of the seepage drains located on the downstream face of the gravity sections.

2. Low area at the left abutment should be backfilled with concrete to the level of the crest of the dam.

3. Determine the sources of seepage occurring at the spillway right abutment contact, and in the vicinity near the left abutment downstream from the toe of the dam. Monitor the seepage biweekly with the aid of weirs.
4. The vegetation in the spillway channel and the area downstream from the toe of the dam should be removed. Provide a program of periodic cutting and mowing of these areas.

5. Repair the side walls of the spillway and the reservoir drain channels.
SECTION 4 - OPERATION AND MAINTENANCE PROCEDURES

4.1 PROCEDURES

The flow from the reservoir is over the spillway and/or through the reservoir drain. It is reported that depending upon inflow, 300,000 gallons of water per day are released from the reservoir either through the reservoir drain or over the spillway.

4.2 MAINTENANCE OF THE DAM

The dam is maintained by the owner. It is reported that the dam is "looked at" once a week by the owner's maintenance crew. However, maintenance of the dam is considered inadequate as evidenced by the growth of vegetation in the spillway channel; downstream from the toe of the dam; seepage at the right abutment contact and the condition of the spillway and reservoir channel walls.

4.3 WARNING SYSTEM IN EFFECT

There is no warning system in effect or in preparation.

4.4 EVALUATION

The dam and appurtenances have not been maintained in satisfactory condition as noted in Section 3, "Visual Inspection".
5.1 DRAINAGE AREA CHARACTERISTICS

Mt. Beacon Reservoir is located about one mile east of Beacon, in Dutchess County, New York, Hydrologic Unit Code 02020008. The watershed, contributing to the reservoir, is 0.25 square mile and consists entirely of steep wooded slopes with peaks above El 1500. There are no defined stream channels in the basin as determined from the 1957 West Point Quadrangle (See Topographic Map in Appendix A) and there was no land development observed at the time of the inspection.

5.2 ANALYSIS CRITERIA

The analysis of the spillway capacity of this dam was performed using the U.S. Army Corps of Engineers HEC-1 DB computer program (Ref. 1).

Because of the small drainage area and steep slopes, (from 0.10 to 0.36 feet per foot) it was assumed that the runoff equals excess rainfall. Rainfall losses over the land area were assumed to be constant at 0.1 inch per hour after an initial loss of 0.2 inch. No losses were deducted for rain falling directly on the reservoir. A Probable Maximum Flood (PMF) peak of 1480 cfs was computed from the 24 hour, 200 square mile Probable Maximum Precipitation of 22 inches (Ref. 2).

5.3 SPILLWAY CAPACITY

The uncontrolled spillway is 43.32 feet long, with a crest width of 8.0 feet, at El 1285, 1.5 feet below the top of the dam. The maximum discharge capacity of the spillway with water level at El 1286.5 (top of dam) is 210 cfs. The discharge through the 22-inch diameter reservoir drain is 67.5 cfs with a head of 20.0 feet.

5.4 RESERVOIR CAPACITY

The normal capacity of Mt. Beacon Reservoir is reported to be 575 acre-feet at the spillway crest, El 1285. The computed surcharge storage, between El 1285 and El 1286.5 (top of dam) is 31 acre-feet, which is equivalent to about 2.3 inches of runoff over the entire basin. The maximum capacity of the reservoir is 606 acre-feet.

5.5 FLOODS OF RECORD

There are no records available of floods. However, there are weekly records of the reservoir levels available at the Department of Public Works and City Engineers Office.
5.6 OVERTOPPING POTENTIAL

The potential of the dam being overtopped was investigated on the basis of the spillway discharge capacity and the available surcharge storage to meet the selected design flood inflows. Analysis indicates the spillway does not have sufficient capacity to pass the outflow from one-half the PMF, and overtopping would occur for all storm events exceeding 16 percent of the PMF.

The PMF, routed through the reservoir, resulted in peak outflow of 1293 cfs, and a corresponding maximum water surface El 1287.35, 0.85 feet above the top of the dam. One-half the PMF routed through the reservoir resulted in peak outflow of 572 cfs, and a corresponding maximum water surface El 1286.96, 0.46 feet above the top of dam.

5.7 EVALUATION

The dam does not have sufficient spillway capacity to pass either the PMF or one-half the PMF without overtopping of the dam. The overtopping could cause the failure of the dam, thus significantly increasing the hazard to loss of life downstream. Therefore, the spillway is assessed as "seriously inadequate" and the dam is assessed as unsafe, non-emergency.
SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observation
   Visual observation did not indicate conditions which would affect the structural stability of the dam. The observed seepages at the downstream face of the gravity sections and at the spillway right abutment contact and downstream from the toe of the dam in the vicinity of the left abutment are not detrimental to the stability or safety of the dam at the present time.

b. Design and Construction Data
   The original preconstruction design computations regarding the structural stability of the dam are not available.

c. Operating Records
   It is reported there are available records of the reservoir levels from 1960 to date at the Water Department. There are no records of the gate operation available. No major operation problems which would affect the stability of the dam were reported.

d. Post-Construction Changes
   There are no recorded post-construction changes. However, there are four drawings, one dated November, 1913 (Plate 3 in Appendix A) and another three dated July, 1922 (Plates 4 through 6 in Appendix A) obtained from the New York State Department of Environmental Conservation. The 1913 drawing shows the original dam cross section, the modified section, and the suggested method for strengthening the buttresses. The 1922 drawing shows the strengthening of the gravity sections between buttresses, new geometry of downstream face of the spillway, the relocation of the spillway channel walls and the gunite surfacing of the upstream face. There are no construction records of the modifications.

   It is reported that the upstream gate valve was added to the reservoir drain and the entire dam was resurfaced with gunite in 1978. There are no construction records of the addition of the valve and the resurfacing.

e. Seismic Stability
   According to the recommended Corps guidelines, the dam is located in Seismic Zone No. 1. However, based on past earthquake history, the New York State Geological Survey considers the dam site to be in Zone 2. Based on this assessment, the dam is considered to be in Seismic Zone 2. The results of the seismic stability are described in Section 6.2.
6.2 **STRUCTURAL STABILITY ANALYSIS**

Structural stability analyses for a non-overflow section and spillway section were performed. The results of the analyses are as follows:

**NON-OVERFLOW SECTION**

<table>
<thead>
<tr>
<th>Case</th>
<th>Loading Condition</th>
<th>Resultant</th>
<th>Sliding F.S.</th>
<th>Location of Sliding F.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>Normal loading condition, reservoir level at spillway crest, no ice load</td>
<td>Outside middle third</td>
<td>1.21</td>
<td>(See Appendix E)</td>
</tr>
<tr>
<td>b</td>
<td>Normal loading condition, reservoir level at spillway crest, with ice load</td>
<td>Outside middle third</td>
<td>1.06</td>
<td></td>
</tr>
<tr>
<td>c</td>
<td>Unusual loading: flood level equal to 1/2 PMF</td>
<td>By comparison with Case a, the results are relatively the same</td>
<td>2.04</td>
<td></td>
</tr>
<tr>
<td>d</td>
<td>Extreme loading: flood level equal to PMF</td>
<td>By comparison with Case a, the results are relatively the same</td>
<td>2.04</td>
<td></td>
</tr>
<tr>
<td>e</td>
<td>Unusual loading: reservoir level at spillway crest, and earthquake forces</td>
<td>Outside Middle Half</td>
<td>1.04</td>
<td></td>
</tr>
</tbody>
</table>

**OVERFLOW SECTION (SPILLWAY)**

<table>
<thead>
<tr>
<th>Case</th>
<th>Loading Condition</th>
<th>Resultant</th>
<th>Sliding F.S.</th>
<th>Location of Sliding F.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>Normal loading condition, reservoir level at spillway crest, no ice load</td>
<td>Within Middle Third</td>
<td>2.64</td>
<td>(See Appendix E)</td>
</tr>
<tr>
<td>b</td>
<td>Normal loading condition, reservoir level at spillway crest, with ice load</td>
<td>Within Middle Third</td>
<td>1.83</td>
<td></td>
</tr>
<tr>
<td>c</td>
<td>Unusual loading: flood level equal to 1/2 PMF</td>
<td>Within Middle Half</td>
<td>2.04</td>
<td></td>
</tr>
<tr>
<td>d</td>
<td>Extreme loading: flood level equal to PMF</td>
<td>By comparison with Case c, the location of the resultant and the sliding F.S. almost the same</td>
<td>2.07</td>
<td></td>
</tr>
<tr>
<td>e</td>
<td>Unusual loading: reservoir level at spillway crest, and earthquake forces</td>
<td>Within Middle Third</td>
<td>2.07</td>
<td></td>
</tr>
</tbody>
</table>
The results of the stability analyses indicate that stability of the non-overflow section of the dam against overturning and sliding are inadequate for all loading conditions. However, the stability of the spillway section against overturning and sliding are adequate for all loading conditions.

It is therefore recommended that a more detailed structural stability analyses be performed. Field investigations should be carried out to obtain additional information regarding the uplift pressure within and under the base of the non-overflow section, the quality of the foundation, the geometry and extent of the non-overflow structure, and the condition of the non-exposed concrete. The information should then be incorporated into a more detailed structural stability evaluation.
SECTION 7 - ASSESSMENT/RECOMMENDATIONS

7.1 ASSESSMENT

a. Safety
Examination of the available documents and visual inspection of Mt. Beacon Reservoir Dam and appurtenant structures did not reveal any conditions which constitute an immediate hazard to human life or property. However, the dam has some deficiencies which require further investigation and remedial action.

Using the Corps of Engineers screening criteria for review of spillway adequacy, it has been determined that the dam would be overtopped for all storms which exceed approximately 16 percent of the Probable Maximum Flood (PMF). The overtopping of the dam could cause dam failure, thus significantly increasing the hazard to the loss of life downstream. The spillway is therefore adjudged as "seriously inadequate" and the dam is assessed as unsafe, non-emergency. The structural stability analyses based on available information and visual inspection indicates that the stability against overturning and sliding for the overflow section of the dam is adequate whereas for the non-overflow section is inadequate.

b. Adequacy of Information
The information and data available were adequate for performance of this investigation.

c. Need for Additional Investigations
Since the spillway is considered to be "seriously inadequate", additional hydrologic/hydraulic investigations are required to more accurately determine the site specific characteristics of the watershed. After the in-depth hydrologic/hydraulic investigations have been completed, remedial measures must be initiated to provide spillway capacity sufficient to discharge the outflow from the one-half PMF event. In addition, an investigation of the structural stability of the non-overflow section of the dam is required.

d. Urgency
The additional hydrologic/hydraulic and structural stability investigations which are required must be initiated within 3 months from the date of notification. Within 12 months of notification, remedial measures as a result of this investigation must be initiated, with completion of this measure during the following year. In the interim, develop an emergency action plan for the notification of downstream residents and proper around-the-clock surveillance of the dam during periods
of extreme runoff. The other problem areas listed below must be corrected within one year from notification.

7.2 RECOMMENDED MEASURES

1. Establish a systematic program to observe and monitor changes in seepage occurring at the outlets of the seepage drains located on the downstream face of the geometry section.

2. Backfill low area at the left abutment with concrete to the level of the crest of the dam.

3. Determine the sources of seepage occurring at the spillway right abutment contact, and in the vicinity of downstream from the toe of the dam near the left abutment. Monitor the seepage biweekly with the aid of weirs.

4. Remove the vegetation in the spillway, and the area downstream from the toe of the dam. Provide a program of periodic cutting and mowing of these areas.

5. Repair the side walls of the spillway and reservoir channels.

6. Provide a program of periodic inspection and maintenance of the dam and appurtenances including yearly operation and lubrication of the reservoir drain system. Document this information for future reference. The aforementioned emergency action plan should be maintained and updated periodically during the life of the structure.
APPENDIX A
MT. BEACON RESERVOIR DAM

TOPOGRAPHIC MAP
MT. BEACON RESERVOIR DAM

PLATE 2
SECTION ON T BEAM
BETWEEN BUTTRESES
SUGGESTED METHOD OF STRENGTHENING BEACH

To assist in the report
by Erna M. Clarke Emick

Messrs. Sabin & Company

Sherman-Carz Public Works

City of Buffalo

Dundas, In.

E. W. Emick
Be of Present Masonry

Be of New Masonry

Dowels in Main Dam Footing
½ in. Dowels set 3.0 in foundation rock

Coping
- 2½-p rods
- 1x4'0" Dowels spaced 5' o.c.

- Coral Wall

- Spill. Toe of New Spillway

- 1½" x 8'0" Dowels spaced 50' o.c.

- Dowels in Spillway Footing
Dowels in Face of Present Dam
1" Dowels, set 3'-0" in the old masonry
Toe of Present 5

1/2" x 5'0" Dowels 3pc

Toe of New Sp.

Dowels in Spillway

Dowels thru Bitress
1" x 12 3/4" rec
Spill. Toe of Present Spillway

Spill. "x 6'" Dovels spaced 5' o.c.

Spill. Toe of New Spillway

Dowels in Spillway footing

DAM AT STORAGE RESERVOIR
CITY OF BEACON
NEW YORK
Scale 1/4
George W. Krieger, Jr.

July 1922
Note. All corrections to be in red.

Typical Section
Scale 1" = 4'
at dowel spacing see Sheet No.2

Section at West End of Spillway
Scale 1:4

Note: Old walls to be removed.
New walls to be built as shown.
Plan
Scale 1" = 20'

Inlet Chamber

Existing 15 I-Beam

New Wall

Old Wall

New Wall

New Wall

New Wall

Top of 15 I-Beam

Shoe 15 I-Beam
Section at West End of Spillway
Scale 1:4

Note: Old walls to be removed.
New walls to be built as shown.

Wing Wall - Reinforcement 1/2 rods 2"c. with nails

DAM AT STORAGE RESERVOIR
CITY OF BEACON
NEW YORK

George W. Knickerbocker, Jr.
Concrete toe 1 ... 1 ft.

Drain 112.75
Drain 2134.39

Line of built 3.6 ft.

Concrete gun grade w 1 5 in. reinforcement.
Drain EL 34.25

Drain EL 212.5

Drain EL 121.25

Beam of buttress

Sewer fillway at EL 100

be placed in face

covered with 6" layer
of reinforcement.
Typical Section
Scale 1" = 1'
Note: Concrete to be 1...4 m
1. Donets, spaced 5' 0: to be used in face of dam and in cutlines.
Unstream face of dam to be covered with 2" layer of cement gun grout in mesh reinforcement.
PHOTOGRAPHS

APPENDIX B
2. UPSTREAM VIEW OF DAM

3. VIEW OF SPILLWAY AND DOWNSTREAM OF DAM.
NOTE: VEGETATION AT TOE OF DAM.
4. VIEW OF UPSTREAM REGULATING CONTROL FOR RESERVOIR DRAIN.

5. VIEW OF AREA DOWNSTREAM OF DAM. NOTE: THE GATE HOUSE IN WHICH DOWNSTREAM REGULATING CONTROL IS LOCATED.
6. VIEW OF RESERVOIR DRAIN OUTLET. NOTE: 6-INCH DIAMETER PIPE NEXT TO DRAIN.

7. VIEW OF DOWNSTREAM CHANNEL AT JUNCTION OF SPILLWAY AND RESERVOIR DRAIN CHANNELS EXIT.
8. VIEW OF DOWNSTREAM CHANNEL.

9. VIEW OF SEEPAGE DRAINS ON DOWNSTREAM FACE OF DAM.
10. VIEW AT RIGHT ABUTMENT AND SPILLWAY CONTACT. NOTE: SEEPAGE.

11. VIEW OF SEEPAGE AREA 50 FT DOWNSTREAM FROM DAM.
12. VIEW OF LEFT ABUTMENT. NOTE: THAT CONTACT IS LOWER THAN DAM CREST.
VISUAL INSPECTION CHECKLIST

APPENDIX C
VISUAL INSPECTION CHECKLIST

1) Basic Data
   a. General
      Name of Dam  MT. BEACON RESERVOIR
      Fed. I.D. #   N.Y. 26  DEC Dam No.  587
      River Basin  HUDSON
      Location: Town  BEACON  County  NACHES
      Stream Name  DRY BROOK
      Tributary of  HUDSON RIVER
      Latitude (N)  41° 29'  Longitude (E)  74° 56'
      Type of Dam  CONCRETE DAM  USE NACHES COUNTY LAND
      Hazard Category  HIGH
      Date(s) of Inspection  7-24-50
      Weather Conditions  SUNNY; 50° F
      Reservoir Level at Time of Inspection
   b. Inspection Personnel  HARVEY FELMAN & JUSTYSLAW
   c. Persons Contacted (Including Address & Phone No.)
      MR. MARK GIOVANNA, SUPT. OF DRY BROOK
      427 N. 11th St.
      BEACON, N.Y. 12510
      Tel. 914-264-2722
   d. History:
      Date Constructed 1890-1892  *  Date(s) Reconstructed 1904, 1922
      Designer  UNKNOWN
      Constructed By  UNKNOWN
      Owner  CITY OF BEACON

   * Based on copy of ed. study, on inspection dated 10/10/1913.
### Embankment:

#### a. Characteristics

1. **Embankment Material**
   
2. **Cutoff Type**
   
3. **Impervious Core**
   
4. **Internal Drainage System**
   
5. **Miscellaneous**

#### b. Crest

1. **Vertical Alignment**
   
2. **Horizontal Alignment**
   
3. **Surface Cracks**
   
4. **Miscellaneous**

#### c. Upstream Slope

1. **Slope (Estimate) (V:H)**
   
2. **Undesirable Growth or Debris, Animal Burrows**
   
3. **Sloughing, Subsidence or Depressions**
d. Downstream Slope

(1) Slope (Estimate - V:II)

(2) Undesirable Growth or Debris, Animal Burrows

(3) Sloughing, Subsidence or Depressions

(4) Surface Cracks or Movement at Toe

(5) Seepage

(6) External Drainage System (Ditches, Trenches; Blanket)

(7) Condition Around Outlet Structure

(8) Seepage Beyond Toe

e. Abutments - Embankment Contact
3) Drainage System

a. Description of System  

From available drawings, the drainage drain was installed at the downstream face of the original dam during the 1922 rehabilitation of the dam.

b. Condition of System  

The drains are within the dam, therefore could not be ascertained.

c. Discharge from Drainage System  

All the drains outlets at the downstream face were active.

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

NONE. Except a V-notch weir installed in the downstream channel about 25 feet from the reservoir drain outlet. Weir measures the flow from the drain and the spillway.
5) Reservoir
   a. Slopes  Within vicinity of the dam, reservoir slopes are stable and no incidence of adverse condition related.
   b. Sedimentation  No evidence of excessive sedimentation obtained; lake water relatively clean and no floating debris.
   c. Unusual Conditions Which Affect Dam  None observed.

6) Area Downstream of Dam
   a. Downstream Hazard (No. of Homes, Highways, etc.)  Several homes
   b. Seepage, Unusual Growth  Almost 50 feet. All seepage from the crest of the dam and in line with the first buttress from the left abutment. There is a strong area where seepage is observed. Vegetation along the channel.
   c. Evidence of Movement Beyond Toe of Dam  None observed.
   d. Condition of Downstream Channel  Good except evisceration near the banks and minor debris at the floor of the channel.

7) Spillway(s) (Including Discharge Conveyance Channel)
   a. General  Spillway is used extensively; uncontrolled and was rehabilitated several times. Downstream face is sloping. Entire spillway surface is "quartzite."
   b. Condition of Service Spillway  Good condition. There are several hairline to 1/8" wide transverse and longitudinal cracks at the crest and downstream face of the spillway. At several locations on the downstream face there is minor seepage. At crest near the left side of the spillway, a small cavity about 6" square is missing.
c. Condition of Auxiliary Spillway: NOE

d. Condition of Discharge Conveyance Channel: Clean and Free of Minor Vegetation and debris in the floor of the channel, and concrete trees at the sides of the channel.

3) Reservoir Drain/Outlet

<table>
<thead>
<tr>
<th>Type:</th>
<th>Pipe</th>
<th>Conduit</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material:</td>
<td>Concrete</td>
<td>Metal</td>
<td>Other</td>
</tr>
<tr>
<td>Size:</td>
<td>20 INCH (I.D.)</td>
<td>Length: 30 FT.</td>
<td></td>
</tr>
<tr>
<td>Invert Elevations: Entrance:</td>
<td>Exit: 1217 FT.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Condition (Describe):</td>
<td>Unobservable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Joints:</td>
<td>Alignment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structural Integrity:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydraulic Capability:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Means of Control: Gate</td>
<td>2</td>
<td>Valve</td>
<td>Uncontrolled</td>
</tr>
<tr>
<td>Operation: Operable</td>
<td>Inoperable</td>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

Present Condition (Describe): There are two gate valves located at upstream and downstream of the dam. Both gate valves were operated and function in good condition. The operating station of the downstream gate is limited; however, this does not affect the operation. 

* For available drawings, there are no other data or records of the owner.
The entire dam is rehabilitated by applying a grout surfaceing.

a. Concrete Surfaces: None visible. The grout at downstream face of the dam and butresses appeared in relatively good condition except at several locations, seen as hairline to 1/4" wide minor cracks, some of which are covered with debris deposits. At the crest, there are many cracks, except as noted above, minor cracks were not after additional crack grouting visible.

c. Horizontal & Vertical Alignment (Settlement): No. change was noted in either the horizontal or vertical alignment.

d. Junctions with Abutments or Embankments: The junction between the dam and the lift abutment is in good condition except for a depression which is about 2" wide formed in the contact of the dam. The contact between the right abutment and the dam (spillway portion) is in good condition. No seepage occurring at the contact. Seepage is about 1 GPM.

e. Drains - Foundation, Joint, Face: There are drain outlets at several locations along the downstream face of the dam. All drains were flowing.


g. Seepage or Leakage: At several locations at downstream face of the dam, there are seepages through the grout, particularly at the lift joint. Very often seepage through weep hole and at the right abutment contact as described above in e) and d) respectively.
h. Joints - Construction, etc. Entire surface is granite stone. No joints observed, except granite lift joints.

i. Foundation According to available information, etc. Dam is on rock.

j. Abutments Abutments are good conditions except minor seepage occurring at right abutment contact.

k. Control Gates No structural control gates.

l. Approach & Outlet Channels No approach channels. The outlet channels for reservoir drain and spillway are concrete in good condition. The walls of the reservoir drain channel are heavily chipped, the concrete walls of the spillway channel are repaired at several locations.

m. Energy Dissipators (Flume Pool, etc.) None.

n. Intake Structures None.

o. Stability Visual observations do not indicate any stability problems.

p. Miscellaneous
HYDROLOGIC DATA AND COMPUTATIONS

APPENDIX D
200 Sq Mile 24 Hour PMP = 22"  

% of INDEX Rainfall: 6 HR - 111% = 23.52; 24.42  
12 HR 121% = 26.62 - 2.20  
24 HR 133% = 28.26 - 2.64  

Redistributed rainfall:  

<table>
<thead>
<tr>
<th>Time</th>
<th>Losses</th>
<th>Land R/O</th>
<th>Lake R/O</th>
<th>Total R/O</th>
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<td>0-1</td>
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<td>2</td>
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<tr>
<td>6-7</td>
<td>2.42</td>
<td>325</td>
<td>48.4</td>
<td>383.</td>
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<td>2.94</td>
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<td>0.8</td>
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TAMS

Job No. 1551-05
Project Mt Beacon Reservoir
Subject Hydrologic / Hydraulic Computations
Spillway Rating

Date Aug 4, 80
By DLC
Ch’k. by

\[ Q = C \cdot L H^{3/2} \]

<table>
<thead>
<tr>
<th>El (ft)</th>
<th>H (ft)</th>
<th>( Q_s )</th>
<th>Q_D (L-30')</th>
<th>( Q_f )</th>
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<td>2</td>
<td>320</td>
<td>280</td>
<td>600</td>
</tr>
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<td>1290</td>
<td>5</td>
<td>1270</td>
<td>5290</td>
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<tr>
<td>1300</td>
<td>15</td>
<td>6620</td>
<td>40050</td>
<td>46670</td>
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</table>

\( Q_D \) = flow over dam.
\( Q_f \) = total discharge.

Diagram:
- Elevation: 1285, 1286, 1287, 1288, 1289
- Discharge x 1000 cfs: 0, 1, 2, 3, 4, 5, 6, 7
- Top of Dam

Use \( C = 2.63 \) and \( L = 43.82' \)
<table>
<thead>
<tr>
<th>El.</th>
<th>A.H</th>
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<th>Δ Vol</th>
<th>Storage (Ac ft)</th>
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<td>1.0</td>
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<td>20.25</td>
<td>20.25</td>
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<tr>
<td>128.6</td>
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<td>20.6</td>
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<td>20.8</td>
<td>10.4</td>
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![Graph showing storage, area, and elevation relationships.](image-url)
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<tr>
<td>1720</td>
<td>1280</td>
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<td>1238</td>
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<td>1240</td>
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<td>2100</td>
<td>1260</td>
</tr>
<tr>
<td>2150</td>
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**Maximum Storage**

| Test Run Stage 15 | 740.7 |

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<tr>
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<tr>
<th><strong>Closed</strong></th>
<th><strong>Closed</strong></th>
<th><strong>Avg</strong></th>
<th><strong>Closed</strong></th>
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<th><strong>LUS</strong></th>
<th><strong>TSK</strong></th>
<th><strong>STRT</strong></th>
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**Channel Routing Table**

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<th>STA-ELEV STA-ELEV ETC</th>
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<td><strong>Flt</strong></td>
<td><strong>Flight</strong></td>
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<td>2.70</td>
<td>12.14</td>
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<td>2.00</td>
<td>15.14</td>
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<td>1.50</td>
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<td>29.92</td>
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**Station 5 Plan 1**

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<th><strong>Coord</strong></th>
<th><strong>Coord</strong></th>
<th><strong>Coord</strong></th>
<th><strong>Coord</strong></th>
<th><strong>Coord</strong></th>
<th><strong>Coord</strong></th>
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<tbody>
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<td>19.00</td>
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**Cutline 1**

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<th><strong>Coord</strong></th>
<th><strong>Coord</strong></th>
<th><strong>Coord</strong></th>
<th><strong>Coord</strong></th>
<th><strong>Coord</strong></th>
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**Step**

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<td>OPERATION</td>
<td>STATION</td>
<td>AREA</td>
<td>PLAN PAT 1</td>
<td>RATIO 2</td>
<td>RATIO APPLIED TO FLOWS</td>
</tr>
<tr>
<td>-------------</td>
<td>---------</td>
<td>-----------</td>
<td>------------</td>
<td>---------</td>
<td>------------------------</td>
</tr>
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<td>20.721</td>
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<td>15.851</td>
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<td>1.626</td>
<td>13.471</td>
<td>1.626</td>
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</table>
STABILITY ANALYSIS

APPENDIX E
## I. ASSUMPTIONS, LOADING CONDITIONS & STABILITY CRITERIA

1. **TYPICAL CROSS SECTION - D.E. MARKS**
2. **PLAN - BETWEEN BUTTREGASSES**
3. **DEAD LOADS**
4. **HYDROSTATIC FORCES**
5. **CASE 1 - SUMMARY, NORMAL LOADING W/ICE RESULTANT WITHIN MIDDLE THIRD**
   - \( \text{Max} P = 152.1 \text{ kN/ft}^2 = 19.6 \text{ psf} \)
   - FFS = 2.64 > 1.5, OK
6. **CASE 2 - NORMAL LOADING, PLUS ICE LOAD RESULTANT WITHIN MIDDLE THIRD**
   - \( \text{Max} P = 196.1 \text{ kN/ft}^2 = 24.4 \text{ psf} \)
   - FFS = 1.83 > 1.5, OK
7. **CASE 3 - NORMAL LOADING, WITH ER = 0.05, LAKE LEVEL 1285**
8. **SUMMARY LOADS RESULTANT WITHIN MIDDLE THIRD**
   - \( \text{Max} P = 1361 \text{ kN/ft}^2 = 91.5 \text{ psf} \)
   - FFS = 2.07 > 1.25
9. **CASE 3 - 1/2 PMF**
    - **SUMMARY LOADS RESULTANT WITHIN MIDDLE THIRD**
    - FFS = 2.04 > 1.25
10. **CASE 4 - PMF NOT CRITICAL, BY INSPECTION**
ASSUMPTIONS

1) THE UNIT WT OF CONCRETE ASSUMED 150pcf
2) ICE LOAD OF 5000 psf ACTING 1 foot FROM TOP OF DAM (C.O.E. CRITERIA)
3) DAM SITE IS SEISMIC ZONE 2
4) ANGLE OF INTERNAL RESISTANCE OF ROCK $\phi = 45^\circ$

LOADING CONDITION

CASE 1) NLC, LAKE LEVEL @ SPILLWAY CREST, NO ICE LOAD

CASE 2) NLC, DITCH WITH ICE LOAD

STABILITY CRITERIA:

The stability criteria against overturning and sliding were evaluated as follows.

Overturning - Stability is considered adequate if the resultant of all forces falls within the middle third of the base under the normal loading condition and within middle half of the base under the unusual and extreme loading conditions.

Sliding - Stability along the base of the structure is evaluated using the friction factor of safety (FFS) which is equal to $\sqrt{\tan \phi}$, where $V$ is the sum of vertical forces acting on the base, $H$ is the sum of all horizontal forces and $\tan \phi$ is Friction Factor. The stability with respect to sliding is considered adequate if the FFS exceeds 1.50 under normal loading conditions, 1.25 under unusual loading conditions and 1.1 under extreme loading conditions.
OVERFLOW SECTION

SECTION A-A: WIDTH = 4.53 ft; 24 ft = 4.4 ft.
Job No. ____________

Project  DAM, CITY OF REASON

Subject  STABILITY ANALYSIS

OVERFLOW SECTION

TIPPETTS-ADDETT-McCARTHY-STRATTON
ENGINEERS AND ARCHITECTS  NEW YORK

Sheet 2 of ____________

Date  8-4-80

By  JBC

Chk. by ______

PLAN

\[ A = 46.67 \times 30 = 1400 \text{ ft}^2 \]
<table>
<thead>
<tr>
<th>DEAD LOADS</th>
<th>16,48</th>
<th>M @ TOE</th>
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<tr>
<td>I. 19 x 17 5 x 1 2 x 44 32 x 0 150 = 110 52 x 28 83 = 3 186</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II. 19 x 8 75 x 44 32 x 0 150 = 110 52 x 23 87 = 2 6382</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III. 1 3 x 3 5 x 1 2 x 3 35 x 0 150 = 114 x 27 7 = 31</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV. 1 3 x 5 25 x 3 35 x 0 150 = 3 43 x 23 87 = 82</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V. 11 75 x 8 25 x 1 2 x 44 32 x 0 150 = 322 22 x 16 75 = 5 397</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VI. 725 x 8 25 x 44 32 x 0 150 = 397 63 x 15 38 = 6 116</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VII. 5 25 x 5 25 x 1 2 x 44 32 x 0 150 = 91 62 x 9 5 = 870</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VIII. 2 0 x 5 25 x 44 32 x 0 150 = 60 80 x 8 63 = 602</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IX. 2 0 x 6 0 x 1 2 x 44 32 x 0 150 = 39 89 x 4 0 = 160</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X. 2 75 x 16 0 x 1 2 x 2 35 x 0 150 = 7 76 x 14 5 = 112</td>
<td></td>
<td></td>
</tr>
<tr>
<td>XI. 7 5 x 4 x 2 35 x 0 150 = 10 58 x 9 15 = 97</td>
<td></td>
<td></td>
</tr>
<tr>
<td>XII. 8 5 x 4 9 x 1 2 x 2 35 x 0 150 = 7 34 x 4 2 = 31</td>
<td></td>
<td></td>
</tr>
<tr>
<td>XIII. 1 5 x 6 0 x 1 2 x 2 35 x 0 150 = 4 23 x 2 0 = 8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[ \frac{4 4 4 6 3}{2 2 2 7 3 1} = 19.96 \] 1 2 1 7 1 3 9 kip \[ \sqrt{4 3 0 7 4} \]
HYDROSTATIC FORCES

CASE I: NORMAL LOADING, WL @ CREST, No ICE

CASE II: NORMAL LOADING, WL @ CREST, ICE 10" BELOW CREST

\[ 5 \times 46.67 = 233.35 \times 18 = 4200 \text{ kN} \]

\[ \tan 30^\circ = \frac{233.35}{P} \]

\[ P = 526.5 \times 6.33 = 3333 \text{ kN} \]

\[ U = 831 \times 20 = 16620 \text{ kN} \]

\[ V = 199.53 \text{ kN} \]
### Normal Loading w/o Ice

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<th>W2</th>
<th>Total</th>
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<td>3</td>
<td>217</td>
<td>48.5</td>
<td>221.9</td>
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<tr>
<td>4</td>
<td>221.9</td>
<td>48.5</td>
<td>270.4</td>
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\[ \Sigma V = 1388.9 \]

\[ EM = \frac{24548}{1388.9} = 17.67 \]

\[ V/S \text{ from Base} \]

\[ \theta = \tan^{-1} \left( \frac{1388.9}{526.5} \right) = 29.76 \]

\[ \theta = \left( 1 \pm \frac{6 \times 2.61}{30} \right) = 0.992 \left( 1 \pm 0.539 \right) = 1.52, 0.46 \]

\[ FF = \tan \theta \Sigma V = \frac{1388.9}{2.64} \]
Project: No.
Subject: STABILITY ANALYSIS OF CASE 2 WITH ICE

OVERFLOW SECTION

\[ \Sigma H = 526.5 \text{ ft} \]
\[ \Sigma V = 1388.9 \text{ kR} \]
\[ \Sigma M_s = 24,548 \text{ kR} \]
\[ \Sigma M_o = 29,348 \text{ kR} \]

\[ x = \frac{20348}{1388.9} = 14.65 \]
\[ \frac{\Sigma V}{2} = \frac{14.65}{2} = 0.35 \text{ R/s from base 4} \]

\[ \theta = \frac{29.76}{30} \left( 1 + 6 \times 0.35 \right) = 942 \left( 1 + 0.07 \right) \]

\[ FFS = \frac{\tan \theta \Sigma V}{\Sigma H} = \frac{1388.9}{760} = 1.83 > 1.50 \text{ kR} \]

\[ P_{\text{eq}} = \frac{1388.9}{1400} = 0.992 \text{ kSF} \]
**TIPPETTS-ABETT-McCARTHY-STRATTON**  
ENGINEERS AND ARCHITECTS  
NEW YORK  

**Job No.** 1551-04  
**Project** PAM CITY OF BEACON N.Y.  
**Subject** STABILITY ANALYSIS  
**OVERFLOW SECTION** CASES

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<th>Calculation</th>
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<tr>
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<td>110.23</td>
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<td>55.3 x 9.50 = 525.4</td>
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<td>III</td>
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<tr>
<td>V</td>
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<td>16.1</td>
<td>16.1 x 11.17 = 179.8</td>
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<td>VI</td>
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<td>19.9 x 3.63 = 72.2</td>
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<td>4.6</td>
<td>4.6 x 3.75 = 17.3</td>
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<td>3.5 x 1.0 = 3.5</td>
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<td>0.4 x 13.5 = 5.4</td>
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<td>4.23</td>
<td>0.2</td>
<td>0.2 x 10 = 2.2</td>
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**HYDRODYNAMIC**

\[ \frac{Pe}{C} = \tan \beta \times \tan \phi \times \frac{V_c}{19.0} \]

\[ V_c = P \times 0.69 \times 0.05 \times 19.25 \times 1.92 = 0.778 \times 46.67 = 36.3 \]

\[ M_p = 0.4 \times 19 \times 36.3 = 276 \text{ in}^3 \]

\[ c = 0.69 \]

\[ \beta = 5.26^\circ \]
Job No. 1551-ou

TIPPETTS-ABBETT-McCARTHY-STRATTON
ENGINEERS AND ARCHITECTS
NEW YORK

Project: DAN CITY OF BEACON N.Y.

Subject: STABILITY ANALYSIS

OVERFLOW SECTION CASE 5 EQ (NO ICE)

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<td>1388.9</td>
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</table>

\[
SH.7 PL = \frac{108.6}{635.1} = 0.1715 \text{ and } 23.422 \text{ ft}
\]

\[
\Sigma M = 23,422 = 16.86 \text{ ft}
\]

\[
E = \frac{30}{2} = 15.86 \text{ ft from base}
\]

RESULTANT WITHIN MIDDLE THIRD

\[
\phi = \frac{29.75 (1 + 4 \times 1.86)}{30} = 0.992 (1 \pm 0.37)
\]

\[
\phi_{\text{max}} = 1.36 \text{ k/ft}^2 = 9.5 \text{ psi}
\]

\[
\phi_{\text{min}} = 0.62 \text{ k/ft}^2
\]

\[
E.F.S = \tan \phi \text{. } EV = \frac{1388.9}{671.4} = 2.07 > 1.25 \text{ or}
\]
LAKE LEVEL US. 1287, VS. 1266.7 (NEGLECT)

TAILWATER NEGLIGIBLE

\[ \text{TOE} \]

\[ \text{918 k} \]

\[ \text{612} \]

\[ \text{20'} \]

\[ 0.625 \times 2 \times 46.67 = 5.83 \]

\[ 0.625 \times 21 \times 46.67 = 6125 \]

\[ \frac{5.83}{55.42} \]

\[ U = 918 - 20 = 18360 \]

\[ P_1 = 526.5 \times 6.33 = 3333 \]

\[ P_2 = 110.8 \times 9.5 = 1053 \]

\[ \Sigma P = 637.3 \text{ kN} \]

\[ \Sigma E = 2219.9 \]

\[ \frac{2219.9 - 918}{1301.9} \]

\[ \Sigma M = 21,755 \text{ kNm} \]

\[ \frac{21,755}{1301.9} = 16.71 \]

\[ e = \frac{30}{2} = 16.71 = 1.71 \text{ US FROM CASE 1} \]

RESULTANT WITHIN MIDDLE THIRD

\[ \begin{align*}
\text{FFS} &= \tan \theta \times \frac{E}{E_1} = \frac{1301.9}{637.3} = 2.04 > 1.25
\end{align*} \]
LAKE LEVEL U/S 1287.35  D/S 1267

BY INSPECTION, COMPARE WITH CASE 3, UNUSUAL L/C
LOADS ALMOST SAME AS \( \frac{1}{2} \) PMF
CASE 4 NOT CRITICAL
ASSUMPTIONS

1) THE UNIT WT OF CONCRETE ASSUMED 150pcf
2) ICE LOAD OF 5000. psf ACTING 1.foot
   FROM TOP OF DAM (C.O.E. CRITERIA)
3) DAM SITE IS SEISMIC ZONE 2

LOADING CONDITION

CASE 1) NLC LAKE LEVEL @ SPILLWAY CREST, NO ICE LOAD

CASE 2) NLC

   1) UNUSUAL
   2) EXCEPT LC LAKE LEVEL @ H/2 PMF
   4) EXTREME LC LAKE LEVEL @ PMF

STABILITY CRITERIA:

The stability criteria against overturning and sliding were evaluated as follows.

Overturning - Stability is considered adequate if the resultant of all forces falls within the middle third of the base under the normal loading condition and within middle half of the base under the unusual and extreme loading conditions.

Sliding - Stability along the base of the structure is evaluated using the friction factor of safety (FFS) which is equal to

\[ V \tan \phi / H \]

where \( V \) is the sum of vertical forces acting on the base, \( H \) is the sum of all horizontal forces and \( \tan \phi \) is Friction Factor. The stability with respect to sliding is considered adequate if the factor \( \phi \) exceeds 1.50 under normal loading conditions, 1.25 under unusual loading conditions and 1.1 under extreme loading conditions.
Subject: STABILITY ANALYSIS CASE I
NON OVERFLOW SECTION

H=35  46.7
35  11.7

1"=6'-0"

E1=46.7
E1=45.2

SECTION B-B
### Dead Loads

<table>
<thead>
<tr>
<th>Case</th>
<th>Load Description</th>
<th>Load Calculation</th>
<th>Total Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>33.5 x 5.0 x 1.37 x 0.150</td>
<td>268.84 x 36.17</td>
<td>9,724</td>
</tr>
<tr>
<td>II</td>
<td>33.5 x 3.5 x 2.137 x 0.150</td>
<td>375.85 x 32.75</td>
<td>12,309</td>
</tr>
<tr>
<td>III</td>
<td>1.5 x 3.5 x 1.37 x 0.150</td>
<td>26.97 x 32.17</td>
<td>868</td>
</tr>
<tr>
<td>IV</td>
<td>35 x 4.75 x 2.137 x 0.150</td>
<td>112.19 x 28.62</td>
<td>3211</td>
</tr>
<tr>
<td>V</td>
<td>3.5 x 12 x 1.37 x 0.150</td>
<td>673.16 x 22.25</td>
<td>14,978</td>
</tr>
<tr>
<td>VI</td>
<td>33.5 x 6.5 x 2.137 x 0.150</td>
<td>40.83 x 17.5</td>
<td>715</td>
</tr>
<tr>
<td>VII</td>
<td>16 x 14.25 x 2.137 x 0.150</td>
<td>42.75 x 9.5</td>
<td>406</td>
</tr>
<tr>
<td>VIII</td>
<td>3 x 14.25 x 2.137 x 0.150</td>
<td>16.03 x 7.13</td>
<td>114</td>
</tr>
</tbody>
</table>

**Note:** The total load calculation for Case V includes a factor of 0.30.

**Result:** The total load is 27,191 kN.

**Cross-Check:**

\[
\frac{27,191}{3,205} = 8.48
\]

**Check:**

\[
\frac{27,191}{4,232} = 6.44
\]
Hydrostatic Forces

\[ W_1 = 5 \times 33.5 \times \frac{1}{2} \times 0.625 = 5.23 \times 23.87 = 124.84 \times 36.17 = 4515 \]

\[ P = 837 \times 11.17 = 9349 \]

\[ U_1 = 5.65 \times 31.08 = 17860 \]

\[ U_2 = 103.5 \times 26.33 = 2725 \]

\[ U_1 = \frac{668.5}{2963.4} \]

\[ U_1 = 2.094 \]

\[ U_2 = 5.24 \]

\[ P = 33.5 \times 0.625 = 2.094 \times 33.5 \times \frac{1}{2} = 35 \times 23.87 = 837 \]

\[ U_1 = 44.75 \times 25.25 \times \frac{1}{2} = 565 \]

\[ U_2 = 5.24 \times 39.5 \times \frac{1}{2} = 103.5 \]

\[ 1" = 10^{-4} " \]

\[ 1" = 10^{-4} " \]
Case 1: Normal Loading, No Ice

SH. 3
\[ \sqrt{1556.62} \]
\[ 42.325 \text{ k} \]

SH. 4
\[ \sqrt{124.84} \]
\[ 1681.46 \text{ k} \]
\[ 46,840 \text{ k} \]

\[ \Sigma V = 1012.96 \]

\[ \Sigma H = 837 \text{ k} \]

FFS = \[ \frac{\Sigma V \tan\phi}{\Sigma H} = 1.21 \]

\[ \frac{\Sigma M}{\Sigma V} = 17206 = 16.99' \]

Case 2: Normal Loading, with Ice 13° Below Crest

Ice
\[ 23.87 \times 5 = 119.35 \times 32.5 = 3879 \text{ k} \]

\[ \Sigma H = 837 + 119.35 = 956.35 \text{ k} \]

FFS = \[ \frac{\Sigma V \tan\phi}{\Sigma H} = 1012.96 = 1.06 \]

\[ \Sigma M = 17206 - 3879 = 13327 \text{ k} \]

\[ \bar{x} = \frac{\Sigma M}{\Sigma V} = 13.16' \]

Resultant from N.A.

Note: If entire base is not in compression, revise uplift forces.
### CASE 5  \( E.Q. = 0.05 \)  ZONE 2

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>2.6884 × 0.05 = 13.4</td>
<td>× 11.17 = 150</td>
</tr>
<tr>
<td>II</td>
<td>375.85</td>
<td>18.8</td>
</tr>
<tr>
<td>III</td>
<td>26.97</td>
<td>1.35</td>
</tr>
<tr>
<td>IV</td>
<td>112.19</td>
<td>5.6</td>
</tr>
<tr>
<td>V</td>
<td>673.16</td>
<td>33.7</td>
</tr>
<tr>
<td>VI</td>
<td>40.83</td>
<td>2.0</td>
</tr>
<tr>
<td>VII</td>
<td>42.75</td>
<td>2.1</td>
</tr>
<tr>
<td>VIII</td>
<td>16.03</td>
<td>0.8</td>
</tr>
</tbody>
</table>

\[
\text{HYDRODYNAMIC EQUILIBRUM, ZANGERS METHOD:}
\]

\[
C = 0.67 \quad @ \text{BASE}
\]

\[
\tan \psi = \frac{5}{33.5} = 0.14925 \quad \psi = 8.5\degree
\]

\[
C = 0.67
\]

\[
\begin{align*}
P &= 0.05 \times 0.67 \times 0.0625 \\ 
V_e &= P_e \text{cubic feet} \\
V_e &= P_e \times 33.5 \\
V_e &= 2.35 \times 23.87 = 55 \text{ cubic feet} \\
M_p &= 0.4 \times 33.5 \times 56 = 750 \text{ cubic feet}
\end{align*}
\]
WATER LEVEL @ SPILLWAY CREST  
EQ = 0.059

DEAD LOADS  
\[ F_{\text{dead}} = 1557 \text{k} \]

HYDRO  
\[ F_{\text{hydro}} = 837 \text{k} \]

LOCATION OF RESULTANT  
\[ \Sigma M = \frac{2053}{1013} = 2.03' \]

RESULTANT OUTSIDE MIDDLE HALF  
AND ALMOST OUTSIDE OF STRUCTURE  

ROCK BEARING STRESS  
133 kip/ft² IS EXCESSIVE
CASE 1

\[ \begin{align*}
15.05 & , \\
52.90 & , \\
67.95 & , \\
39.5 & , \\
1.7 & , \\
6.13 & , \\
14.25 & , \\
4.69 & , \\
6.29 & , \\
7.62 & , \\
0 & , \\
\end{align*} \]

\[ \frac{67.95}{39.5} = \frac{15.05}{x}, \]

\[ x = 8.75 \]

\[ \frac{7.62}{16.5} - \frac{30.75}{x}, \]

\[ x = 4.09 \text{ k.ft}^{-2} \]

\[ \frac{20.86}{2} \times 14.25 \times 2.5 = 805 \]

\[ 16.5 \times 23.87 \times 4.09 \frac{1}{2} = 805 \]

\[ A_{\text{TOTAL}} = 633.4 \text{ ft}^2 \]

\[ 8.75 \times 23.87 = 209 \text{ ft} \]

\[ 33 \% \text{ IN CONTACT} \]

\[ 15.05 \times 23.87 = 384.5 \text{ in contact} \]

\[ 15.05 \times 4.09 = 60.3 \% \]

CASE 2

\[ \begin{align*}
13.16 & , \\
22.38 & , \\
16.12 & , \\
72.05 & , \\
104.5 & , \\
176.55 & , \\
40.8 & , \\
5.88 & \text{ k.ft}^{-2} \\
\end{align*} \]

\[ \left( \frac{5.88 + 15.05}{2} \right) \times 14.25 \times 2.5 = 372.8 \]

\[ 9.13 \times 23.87 \times 5.88 \frac{1}{2} = 640.7 \]

\[ 1612 \times 23.87 = 384.5 \text{ in contact} \]

\[ 384.8 \times 15.05 = 60.3 \% \]
COMPUTER CHECK

\[ \frac{171}{1.24} = \frac{171}{2.16} \]

\[ x = 98.17 \text{ in} \]

\[ 8.18 \text{ ft} \]

\[ X = 132.5 \text{ ft}^2 \]

\[ 171 \text{ in} = 14.25 \text{ ft} \]

\[ 6.07 \text{ in} = 0.54 \text{ ft} \]

\[ 8.18 \text{ ft} \]

\[ Y_1 = 9.2 \]

\[ Y_2 = \frac{171}{9.2} = 19.0 \]

\[ x = 72.8 \text{ in} = 6.07 \text{ ft} \]
1551-04

DAM CITY OF BEACON, N.Y.

NON-OVERFLOW SECTION CASE I

STRESS PSI

39.5

14.25

4 - 28.3

25.25

6 - 28.3

1013 k

67% OF BASE AREA IN COMPRESSION

8.75

33% OF BASE AREA IS NOT IN COMPRESSION

8-7-80

HBC
NON OVERFLOW SECTION

CASE 1) NORMAL LOADING CONDITION: RESERVOIR LEVEL AT SPILLWAY CREST EL. 1285; NO ICE LOAD

FIRST TRIAL - Base area assumed 100% in compression with uplift varying linearly from 100% of headwater at heel to zero at toe. Calculations indicate that, with this assumption, only 67% of base area is actually in compression and sliding F.S. = 1.21. These results indicate that the section is inadequate especially since a second trial would produce a lower percentage of base in compression and a lower sliding factor. A revised uplift diagram would decrease the vertical load and reduce the stabilizing moment. The base area should be 100% in compression for the normal loading condition.

CASE 2)

Same as CASE 1 with ice load added.

FIRST TRIAL: With base area assumed 100% in compression, calculations indicate that only 39.7% of base area is in compression and sliding F.S. = 1.06. These results indicate that the section is inadequate for CASE 2. See comments to CASE 1.
CASES 3 AND 4) These cases are less critical than Case 2 because of the magnitude of the \( \frac{1}{2} \) PMF and PMF water levels which are only slightly higher than the normal loading conditions.

\( \frac{1}{2} \) PMF is considered an **UNUSUAL LOADING CONDITION**.

PMF is considered an **EXTREME LOADING CONDITION**.

CASE 5) **UNUSUAL LOADING CONDITION**

Lake level at spillway crest EL. 1285 plus ER. = 0.059 ft.

**FIRST TRIAL** - Base assumed 100% in compression calculation, indicate a sliding F.S. = 1.05.

Pressure on rock = 133 kips per square foot and a very small percentage of the base in compression. A second trial with a revised uplift diagram would indicate less favorable results. The section is inadequate for Case 5.
<table>
<thead>
<tr>
<th>SHEET NO.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. ASSUMPTIONS, LOADING CONDITIONS &amp; STABILITY CRITERIA</td>
<td></td>
</tr>
<tr>
<td>1) PLAN – BETWEEN BUTTRESSES</td>
<td></td>
</tr>
<tr>
<td>2) TYPICAL CROSS SECTION – D.L. MARKS</td>
<td></td>
</tr>
<tr>
<td>3) DEAD LOADS</td>
<td></td>
</tr>
<tr>
<td>4) HYDROSTATIC FORCES</td>
<td></td>
</tr>
<tr>
<td>5) CASE 1 SUMMARY – NORMAL LOADING W/O ICE</td>
<td></td>
</tr>
<tr>
<td>F.S. = 1.21 &lt; 1.50 N.G.</td>
<td></td>
</tr>
<tr>
<td>CASE 2.</td>
<td></td>
</tr>
<tr>
<td>F.S. = 1.06 &lt; 1.50 N.G.</td>
<td></td>
</tr>
<tr>
<td>6) CASE 5 LONG-TERM LOADING, WITH E.Q. = 0.05 – LAKE LEVEL 1285</td>
<td></td>
</tr>
<tr>
<td>D.L. &amp; HYDRODYNAMIC LOADS</td>
<td></td>
</tr>
<tr>
<td>7) CASE 5 SUMMARY – RESULTANT OUTSIDE MIDDLE HALF</td>
<td></td>
</tr>
<tr>
<td>F.S. = 1.04 &lt; 1.25</td>
<td></td>
</tr>
<tr>
<td>8) COMPUTER CHECKED – MANUALLY</td>
<td></td>
</tr>
<tr>
<td>9) CASES 3 AND 4 ARE LESS CRITICAL THAN CASE 2.</td>
<td></td>
</tr>
<tr>
<td>BY INSPECTION</td>
<td></td>
</tr>
<tr>
<td>10) BASE AREA IN COMPRESSION</td>
<td></td>
</tr>
</tbody>
</table>
REFERENCES

APPENDIX F
References


4. "Seasonal Variation of the Probable Maximum Precipitation East of the 105th Meridian for Areas from 10 to 1,000 Square Miles and Durations of 6, 12, 24 and 48 Hours", Hydrometeorological report No. 33. April 1956.

5. "National Program of Inspection of Dams", Vol. 3, Department of the Army, Office of the Chief of Engineers, 1975


7. "Recommended Guidelines for Safety Inspection of Dams", Department of the Army, Office of the Chief of Engineers, Appendix D


APPLICATION FOR CONSTRUCTION OR RECONSTRUCTION OF A DAM

Beacon, N.Y.

Application is hereby made to the Conservation Commission of the State of New York, in compliance with the provisions of Chap. LXV of the Consolidated Laws, the Conservation Law, for approval of the detailed specifications and plans, marked herewith submitted, for the [construction] [reconstruction] of the dam herein described. All provisions of law will be complied with in the erection of the said dam, whether specified herein or not.

October 4th, 1913

[Signature of Applicant]

[Name]
LOCATION AND GENERAL DATA

Site of dam: is on a branch of within the limits of the town of County of

Purpose of dam: 

Reasons for making changes in existing structure:

DATA AND DIMENSIONS

General:

Materials of which dam is to be constructed: The dam is to be constructed of concrete, steel, and cement.

Area of watershed above dam: 0.27 square miles.

Area of water surface of pond at level of spillway crest: 28 acres.

Capacity of reservoir (at above level): 25,000 cubic feet.

Length of spillway crest: feet.

Maximum depth of water on spillway crest: feet.

Maximum discharging capacity of spillway: cubic feet per second.

Maximum discharging capacity of spillway per square mile of drainage area: cubic feet per second.
<table>
<thead>
<tr>
<th>Description</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length on top</td>
<td>About 3.00</td>
</tr>
<tr>
<td>Length in stream bed</td>
<td>2.50</td>
</tr>
<tr>
<td>Maximum height above stream bed</td>
<td>3.0</td>
</tr>
<tr>
<td>Maximum height above foundation bed</td>
<td>3.5</td>
</tr>
<tr>
<td>Maximum width of base</td>
<td>About 1.9</td>
</tr>
<tr>
<td>Maximum width of top</td>
<td>2.1</td>
</tr>
<tr>
<td>Elevation of top above maximum water level in pond</td>
<td>1.5</td>
</tr>
<tr>
<td>Elevation of top above spillway crest</td>
<td></td>
</tr>
<tr>
<td>Nature of foundations</td>
<td>Earth</td>
</tr>
<tr>
<td>Earth portion</td>
<td></td>
</tr>
<tr>
<td>Embankment</td>
<td></td>
</tr>
<tr>
<td>Length on top</td>
<td></td>
</tr>
<tr>
<td>Length in stream bed</td>
<td></td>
</tr>
<tr>
<td>Maximum height above stream bed</td>
<td></td>
</tr>
<tr>
<td>Maximum width of base</td>
<td></td>
</tr>
<tr>
<td>Maximum width of top</td>
<td></td>
</tr>
<tr>
<td>Elevation of top above maximum water level in pond</td>
<td></td>
</tr>
<tr>
<td>Elevation of top above spillway crest</td>
<td></td>
</tr>
<tr>
<td>Slope, upstream face</td>
<td></td>
</tr>
<tr>
<td>Slope, downstream face</td>
<td></td>
</tr>
<tr>
<td>Core wall</td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td></td>
</tr>
<tr>
<td>Elevation of top above spillway crest</td>
<td></td>
</tr>
<tr>
<td>Width of top</td>
<td></td>
</tr>
<tr>
<td>Batter of faces</td>
<td></td>
</tr>
<tr>
<td>Maximum height above foundations</td>
<td></td>
</tr>
<tr>
<td>Maximum width of base</td>
<td></td>
</tr>
</tbody>
</table>
Fill out a form as complete as possible for each dam in your district and send to State Conservation Commission, Albany, N. Y.

1. Name and address of owners: Village of Mastic, N. Y.
2. Date of construction: 1889 - 1893 - 1901
3. Uses of impounded water: Household and Municipal
4. Character of foundation bed: Rock
5. Material of waste spill: Concrete
6. Length of waste and depth below dam: 4.2 ft - 183.34 ft
7. Total length of dam including waste: 34.6 ft
8. Material of dam: Stone and Concrete Masonry
9. Discharges, size and location: 2.0 in pipe 7800 ft from bottom of dam

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

A. J. Stokeling, Mastic, N. Y.
(Signature, address and date)

May 2nd

Nearest town: Patchogue
REPORT ON COMPLETION OF WORK

CONSERVATION COMMISSION — DIVISION OF INLAND WATERS

Albany........................................................................

On.................................................. I inspected the above work and found that it
had been completed in a satisfactory manner.

Approved: ......................................................................

Inspector of Docks and Dams.

Chief Engineer.

INSTRUCTIONS TO APPLICANTS

Requirements for Plans.—Before beginning the construction, reconstruction, alteration or extension of a
structure for impounding water, the owner of the proposed structure shall submit, in duplicate, to the Conservation
Commission complete drawings showing the location of the dam, the flow line of the impounded water, the boundary lines and the ownership of the property affected, the nature of the foundation bed, the character of the materials to be employed, the size and the location of the discharge and control gates, the general and special features of the dam, and such dimensions as are necessary for the calculation of the stresses and the erection of the structure.

Drawings shall be on sheets of uniform size 24 inches wide by 36 inches long. Each sheet shall have a white space 21 inches high by 51 inches long below the title to receive the stamp of approval. On each sheet of every set of drawings there shall be clearly printed a conspicuous title in which shall appear the name of the county, the name of the city, village or town, and the name of the stream in which the dam is located, and the name of the owner thereof. The scale of the drawings shall be stated under the title. When the designs have been approved by the Commission, one set will be returned to the owner, with such approval endorsed thereon. Copies in duplicate of the specifications under which the dam is to be constructed shall accompany the plans.

Inspection.—The name of the inspector and a statement of his experience in such work must be sent to the Commission. There must also be sent a sample of at least one-half a cubic foot of sand and of cement, and twenty cubic inches of the stone for concrete or masonry to be used in the structure, and of the natural materials in the foundation bed. The foundation bed, after it has been cleared and prepared, must be inspected subject to approval by the Inspector of the Commission. The inspection of materials takes about ten days in the laboratory. On request tags will be sent for labeling the materials.
Application for the Construction or Reconstruction 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

Dana Beeson Reservoir

City of Beeson, Dutchess County, 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 a [branch of Fishkill Creek, in the town of].

2. The name and address of the owner is [City of Beeson, N.Y.].

3. The dam will be used for [water supply].

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 [less than 100 square miles].

6. The proposed dam will have a pond area at the spillcrest elevation of [150 acres] and will impound [cubic feet of water].

7. The lowest part of the natural shore of the pond is [very high] feet vertically above the spillcrest, and everywhere else the shore will be at least [100] feet above the spillcrest.

8. The maximum known flow of the stream at the dam site was [cubic feet per second].

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. [Considerable].

10. The natural material of the bed on which the proposed dam will rest is (clay, sand, gravel, boulders, granite, shale, slate, limestone, etc.) [ledge].
11. The material of the right bank, in the direction with the current, is: [specific material]. At the spillcrest elevation this material has a top slope of [specific slope] inches to a foot horizontal on the center line of the dam, a vertical thickness at this elevation of [specific thickness] feet, and the top surface extends for a vertical height of [specific height] feet above the spillcrest.

12. The material of the left bank is: [specific material]. It has a top slope of [specific slope] inches to a foot horizontal, a thickness of [specific thickness] feet, and a height of [specific height] 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. [Hard or impervious]

14. If the bed is in layers, are the layers horizontal or inclined? 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?

16. Are there any porous seams or fissures?

17. SPILLWAY. The spillway of the proposed dam will be [specific length] feet long in the clear; the waters will be held at the right end by [specific height] feet, the top of which will be [specific height] feet above the spillcrest, and have a top width of [specific width] feet; and at the left end by [specific height] feet, the top of which will be [specific height] feet above the spillcrest, and have a top width of [specific width] feet.

18. There will be also for flood discharge a pipe [specific diameter] inches in diameter and the bottom will be [specific depth] feet below the spillcrest, a sluice or gate [specific width] feet wide in the clear by [specific height] feet high, and the bottom will be [specific depth] feet below the spillcrest.

19. APRON. Below the proposed dam there will be an apron built of [specific material] feet long, [specific width] feet wide and [specific thickness] feet thick. The downstream side of the apron will have a thickness of [specific thickness] feet for a width of [specific width] 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. Geographical 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.

\[ \text{Spans between new and old concrete shown on plan to have three (3) millites in each panel between butresses!} \]
The above information is correct to the best of my knowledge and belief.

To. Box 116, Cohocton, N.Y.

George A. Kriegel Jr.
Consulting Engineer

Address of Applicant

July 22, 1922

(A person signing for Applicant should indicate his title or authority).
March 7, 1974

Mr. George A. VanEtten
Dam Safety Program
N. Y. State Dept. of Environmental Conservation
50 Wolf Road--Room 601
Albany, New York 12201

Re: Registered Dam No. 537
Upper Water Supply Reservoir
City of Beacon

Dear Mr. Van Etten:

Referring to your letter of March 1, 1974 regarding resurfacing of Dam 537. This dam has been completely rehabilitated.

All loose concrete has been removed and where evidence of cracking was indicated all concrete was notched and mortistically replaced. 10 x 10 wire mesh was placed over all surfaces and 1/2" rebars were placed on upstream face. Complete surface was then covered with gunite to a minimum depth of 2" to as much as 6" in some areas. The entire structure was grouted internally.

I consider the Dam in A-1 condition at this time.

Very truly yours,

Harry C. Ingerson
City Engineer

cc: Com. Flynn
January 17, 1973

Honorable Robert L. Cahill
City Hall
Beacon, New York 12508

Dear Mayor Cahill:

Registered Dam No. 537
Water Supply Reservoir
City of Beacon

Last summer, our dam inspection team, as part of the Department’s program on Dam Safety, made a visual survey of the above-subject dam. The dam was not classified as unsafe, but the inspectors did note that maintenance was needed.

The report indicates that concrete surfaces at or near the overflow section were spalled and leakage was observed near the spillway about 18 inches below the crest.

If the impoundment and height of the dam were less, the report would have been routine.

However, the hazard is high enough to mention that a program of maintenance and repair should be followed by the City.

If you have any questions, please contact this office at (518) 457-7418.

Very truly yours,

Stanford Zeccolo
Senior Hydraulic Engineer

SZ:ls
### GENERAL OBSERVATION OF NON-OVERFLOW SECTION

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<thead>
<tr>
<th>Item</th>
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<tbody>
<tr>
<td>1</td>
<td>Settlement of Embankment</td>
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<tr>
<td>2</td>
<td>Cracks</td>
</tr>
<tr>
<td>3</td>
<td>Surface of Concrete</td>
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<tr>
<td>4</td>
<td>Deflections</td>
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<tr>
<td>5</td>
<td>Settlement of Embankment</td>
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<td>6</td>
<td>Leaksage</td>
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<td>7</td>
<td>Crest of Dam</td>
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<td>8</td>
<td>Toe of Slope</td>
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### GENERAL COND. OF SP'WAY AND OUTLET WORKS

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<tr>
<th>Item</th>
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<td>Deflections</td>
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<tr>
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</tr>
<tr>
<td>8</td>
<td>Drain</td>
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</tbody>
</table>

### Maintenance

- **Hazard Class**: 3
- **Inspector**: 2

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Surface of concrete is spald

Some leakage near spillway about 18” below crest
A - Small mix of wet soil
B - Along this section there is a little grading