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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization. The examination of documents and the visual inspection of Lake Suzanne 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.		

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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 4 percent of the PWF. The overtopping of the dam could cause the erosion of both abutments and the downstream face of the dam, particularly in the vicinity of the spillway-embankment contact resulting in 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 spillway section against overturning and sliding is inadequate for all loading conditions.

Notification of the owner of the dam and the Corps of Engineers has been made. Investigations of the structure shall 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 PWF. Within twelve months of the date of notification to the owner, modifications to the structure, deemed necessary as a result of studies, should have been completed. At the same time, a detailed investigation of the structural stability of the structure shall be conducted. In the interim, a detailed emergency action plan must be developed and implemented during periods of unusually heavy precipitation. Also, around-the-clock surveillance of the structure must be provided during these periods.

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 one year. These areas are:

1. Backfill the eroded area of the embankment downstream of the left spillway training wall (spillway-embankment contact).
2. The reservoir drain should be returned to operating condition.
3. Backfill the gully at the right abutment and divert the surface runoff from pavement and adjacent areas away from the right abutment.
4. Remove all brush and trees from the crest, embankment slopes and downstream channel. Provide a program of periodic inspection and cutting and mowing of the embankment surfaces and the downstream channel.
5. Remove and haul away debris from the downstream channel and at the spillway crest. Provide a program of periodic inspection and removal.
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.

AD A092220

HUDSON RIVER BASIN

LAKE SUZANNE

ROCKLAND COUNTY, NEW YORK
INVENTORY NO. N.Y. 760

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM



NEW YORK DISTRICT CORPS OF ENGINEERS

AUGUST 1980

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(6)

~~HUDSON RIVER BASIN~~

National Dam Safety Program

LAKE SUZANNE

~~ROCKLAND COUNTY, NEW YORK~~

(INVENTORY ^{Number} ~~NO.~~ N.Y. 760)

Hudson River Basin
Rockland County, New York

**PHASE I INSPECTION REPORT,
NATIONAL DAM SAFETY PROGRAM**

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NEW YORK DISTRICT CORPS OF ENGINEERS

AUGUST 1980

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
LAKE SUZANNE DAM
I.D. NO. N.Y. 760
D.E.C. NO. 196D-4179
HUDSON RIVER BASIN
ROCKLAND COUNTY, NEW YORK

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
LAKE SUZANNE DAM
I.D. NO. N.Y. 760
D.E.C. NO. 196D-4179
HUDSON RIVER BASIN
ROCKLAND COUNTY, NEW YORK

Name of Dam: Lake Suzanne, N.Y. 760
State Located: New York
County Located: Rockland
Basin: Hudson River
Stream: Pascack Brook (a tributary of
Hackensack River)
Date of Inspection: July 26, 1980

ASSESSMENT

The examination of documents and the visual inspection of Lake Suzanne 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 4 percent of the PMF. The overtopping of the dam could cause the erosion of both abutments and the downstream face of the dam, particularly in the vicinity of the spillway-embankment contact resulting in 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.

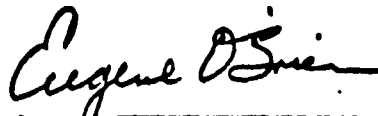
The classification of "unsafe" applied to a dam because of a "seriously inadequate" spillway is not meant to connote the same degree of emergency as would be associated with an "unsafe" classification applied for a structural deficiency. It does mean that there appears to be a serious deficiency in spillway 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 spillway section against overturning and sliding is inadequate for all loading conditions.

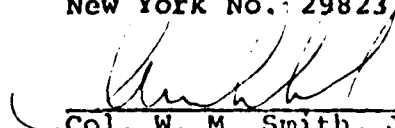
It is therefore recommended that within 3 months of notification to the owner, detailed hydrologic/hydraulic investigations of the structure should be undertaken to more accurately determine the site specific characteristics of the watershed and their affect upon the overtopping potential of the dam. 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 studies, should have been completed. At the same time, a detailed investigation of the structural stability of the spillway should be performed. In the interim, a detailed emergency action plan must be developed and implemented during periods of unusually heavy precipitation. Also, around-the-clock surveillance of the structure must be provided during these periods.

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 one year. These areas are:

1. Backfill the eroded area of the embankment downstream of the left spillway training wall (spillway-embankment contact).
2. The reservoir drain should be returned to operating condition.
3. Backfill the gully at the right abutment and divert the surface runoff from pavement and adjacent areas away from the right abutment.
4. Remove all brush and trees from the crest, embankment slopes and downstream channel. Provide a program of periodic inspection and cutting and mowing of the embankment surfaces and the downstream channel.
5. Remove and haul away debris from the downstream channel and at the spillway crest. Provide a program of periodic inspection and removal.
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:

50 5/11/80



1. OVERVIEW OF DAM

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
LAKE SUZANNE DAM
I.D. NO. N.Y. 760
D.E.C. NO. 196D-4179
HUDSON RIVER BASIN
ROCKLAND 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 Conservation, by 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 constitute hazards to life and property, and to recommend remedial measures where required.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam

The Lake Suzanne Dam consists of an earth embankment with a concrete spillway located on the right side of the embankment. From available information (See Appendix A), the embankment is estimated to be about 50 feet long and has a maximum height of about 8 feet. The width of the crest varies from 10 to 30 feet. The upstream slope is estimated to be about 1 vertical on 4 horizontal and the downstream slope, 1 vertical on 5 horizontal. It should be noted that during the visual inspection, the left abutment and the downstream toe of the embankment could not be accurately located because of flat topography, heavy vegetation and ground cover.

The spillway is about 24 feet wide, ungated and has a sill 2 feet wide and 1.6 feet below the top of the dam. The downstream face of the spillway has two steps. The spillway is flanked upstream by concrete training walls.

A 16-inch diameter cast iron reservoir drain is located near the left end of the spillway. Discharge from the drain is manually operated by a worm gear mechanism connected to a gate valve located downstream of the spillway.

The downstream channel of the spillway is a natural streambed consisting of gravel and boulders. Flow from the reservoir drain empties into the channel.

b. Location

The dam is located on Pascack Brook, a tributary of Hackensack River and the Hudson River, approximately 200 feet from the intersection of Suzanne Drive and Vincent Road in the northwest section of the Village of Spring Valley.

c. Size Classification

The dam is 8 feet high and impounds approximately 36.4 acre-feet. Therefore, the dam is in the "small" size category (less than 40 feet in height).

d. Hazard Classification

The dam is classified as high hazard due to several homes located 500 feet downstream from the dam and its location within the Village of Spring Valley.

e. Ownership

Lake Suzanne Dam is owned by Mr. Morton Elish, 4910 North Travellers, Palm Lane, Tamarac, Florida, Telephone No. (305) 278-5600.

f. Purpose of Dam

The impoundment provided by the dam is for recreational purposes.

g. Design and Construction History

Original design and construction records are not available. The date when the dam was built is unknown. From visual inspection of the dam, it appears that the spillway was widened to increase the discharge capacity and both spillway training walls were repaired. No records are available for the spillway widening and training wall repairs.

h. Normal Operating Procedures

Lake level is maintained at the crest of the spillway, depending upon the inflow into the lake. At present, the outflow from the lake is over the spillway only. The operating condition of the reservoir drain could not be determined because the owner or owner's representative was not present at the time of the inspection.

1.3 PERTINENT DATA

a. <u>Drainage Area</u> (sq. mi.)	1.48
b. <u>Discharge at Dam</u>	
<u>Maximum Known Flood at Site</u>	Unknown
<u>Ungated Spillway at Maximum Pool, cfs</u>	130

c.	<u>Elevation (feet USGS Datum)</u>	
	Top of Dam	481.0
	Spillway Crest	479.4
d.	<u>Reservoir</u>	
	Length of Normal Pool, Feet	700
	Surface Area of Maximum Pool, Acres	12
	Surface Area of Minimum Pool, Acres	8
e.	<u>Storage, Acre-Feet</u>	
	Spillway Crest	36.4
	Top of Dam	52.4
f.	<u>Dam</u>	
	Type	Earth
	Length	50 feet (estimated)
	Height	8 feet (estimated)
	Crest Width	Varies from 10 to 30 feet (estimated)
	Side Slopes	
	Upstream:	1V:4H (estimated)
	Downstream:	1V:5H (estimated)
g.	<u>Spillway</u>	
	Type	Uncontrolled Concrete
	Crest Width	24 feet
h.	<u>Reservoir Drain</u>	
	Type	16-Inch Cast Iron
	Control	Manually Operated Gate Valve

SECTION 2 - ENGINEERING DATA

2.1 GEOLOGY

Lake Suzanne is located in the Triassic Lowland physiographic province of New York State. This province includes a sedimentary rock sequence, the Brunswick Formation, overlying the Palisade diabase, both of the Newark group. The Brunswick Formation consists of sandstone, red shale conglomerate and limestone conglomerate. Drainage in the area is to the south and generally controlled by north-south joints.

2.2 SUBSURFACE INVESTIGATIONS

No subsurface investigation data could be located for the dam. However, there were three borings performed at the dam during Pascack Brook improvement studies in 1974. The location and the logs of borings are shown on the drawings prepared by William H. Youngblood Associates, Consulting Engineers and Surveyors, Monsey, N.Y., and are given in Appendix A. The borings indicate that the local soil is dense glacial till consisting mostly of fine to medium sand with varying proportions of gravel and silt.

2.3 DESIGN RECORDS

There are no design data, construction drawings or design memoranda available for the project features.

2.4 CONSTRUCTION RECORDS

There are no construction records available for the original dam and subsequent repairs.

2.5 OPERATION RECORDS

There are no records for operation of the reservoir kept by the owner. There are no records available of rainfall and operation of the gate.

2.6 EVALUATION OF DATA

Existing information was made available by the owner (by telephone), the New York State Department of Environmental Conservation and William H. Youngblood Associates, Consulting Engineers and Surveyors, Monsey, N.Y.

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

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

Visual inspection of Lake Suzanne Dam was made on Thursday, 26 July 1980. At the time of the inspection, the owner or owner's representative was not present. The weather was sunny and temperature ranged between 80-85°F. Rainfall occurred in the area the previous night. At the time of the inspection, the reservoir level was at spillway crest (El. 479.4).

b. Embankment

The left abutment and the downstream toe of the embankment could not be accurately located because of flat topography, heavy vegetation and ground cover. However, from available information, the length of the embankment is estimated to be about 50 feet; the upstream and downstream slopes are about 1 vertical and 4 horizontal and 1 vertical and 5 horizontal, respectively. The embankment appears generally to be in good condition except in the vicinity of the spillway-embankment contact, where the embankment fill downstream of the left spillway training wall has been eroded apparently as a result of overtopping. A portion of the eroded area was backfilled with a mass concrete blanket immediately downstream of the training wall leaving the remaining portion unrepaired. In addition, subsequent overtopping or runoff has eroded a 3 foot wide, 3 foot deep gully between the embankment and the concrete blanket (See Photograph 6).

The horizontal and vertical alignments of the crest are generally good. The crest is heavily covered with vegetation including trees, saplings, bushes and ground cover.

The upstream slope above reservoir level is in fair condition. The slope is covered with vegetation including trees, saplings and bushes.

The downstream slope of the embankment, which could not be accurately determined, appears to be in good condition. The slope is covered with vegetation including trees, saplings, bushes and heavy ground cover. No seepage was observed.

c. Spillway

The concrete spillway which is located on the right side of the embankment, appears to be in generally good condition. It appears that in order to increase the capacity of the spillway, portions of the training walls at both ends have been removed. The sill in these portions is irregular and is about 0.5 to 1 inch lower than the remainder of the crest. At the time of the inspection, flow was over these portions (See Photograph 4). There is some debris collected at the crest.

The downstream stepped face is in good condition, except at several locations where it is spalled (See Photograph 4). The left and right upstream training walls appear to be in fair condition. The entire upstream face of the right wall above the reservoir level is spalled. The top and downstream faces of the wall above the ground surface were repaired by capping with rough, finished concrete. The entire upstream face of the left training wall above the reservoir level is spalled.

The condition of the downstream face of the wall could not be determined because it is covered by the mass concrete blanket.

There is a wooden planked access bridge which spans the spillway and the eroded area.

d. Appurtenant Structures

The reservoir drain is rusted and appears that it has not been operated for many years. It is reported by the owner (telephone conversation) that the drain is in operating condition. However, the gate was not operated because the owner or the owner's representative was not present during the inspection.

e. Downstream Channel

The channel immediately downstream from the spillway is a natural bed consisting of gravel and boulders. There is minor vegetation and debris in the channel. There is some vegetation including large trees on the banks, however, these will not impede discharges from the spillway drain.

f. Abutments

The left abutment of the dam could not be accurately located due to flat topography, heavy vegetation and ground cover. No seepage was observed at the left or right abutments. At the right abutment-spillway contact there is a shallow gully caused by surface runoff from the roadway and adjacent areas (See Photograph 7).

g. Reservoir Area

In the vicinity of the dam, there was no evidence of sedimentation, sloughing, potentially unstable slopes, or other unusual conditions which would adversely affect the dam.

3.2 EVALUATION OF OBSERVATIONS

Visual observations made during the course of the investigation reveal several deficiencies which should be corrected before further deterioration leads to a hazardous condition. The deficiencies and recommended measures to improve these are as follows:

1. The eroded area of the embankment, downstream of the left spillway training wall, should be backfilled to the level of the embankment crest.
2. The reservoir drain should be returned to operating condition.
3. Divert the surface runoff at the right abutment away from the spillway by means of a drainage ditch. Also backfill the gully to the level of the right abutment.
4. Remove brush and trees from the crest, embankment slopes, and from the downstream channel. Provide a program of periodic cutting and mowing of the embankment surfaces and the downstream channel.
5. The debris from the downstream channel and at the spillway crest should be removed and hauled away. Provide a program of periodic inspection and removal.
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.

SECTION 4 - OPERATION AND MAINTENANCE PROCEDURES

4.1 PROCEDURES

There are no formal operation procedures for the project. The discharges from the reservoir are uncontrolled.

4.2 MAINTENANCE OF DAM

There is no operation and maintenance manual for the dam. The maintenance of the dam is inadequate as evidenced by the condition of the reservoir drain, erosion of the embankment downstream of the left training wall and heavy vegetation on the embankment slopes and crest.

4.3 WARNING SYSTEM IN EFFECT

There is no warning system in effect or in preparation.

4.4 EVALUATION

The operation and maintenance of Lake Suzanne is considered inadequate as noted in Section 3, "Visual Inspection".

SECTION 5 - HYDROLOGIC/HYDRAULIC

5.1 DRAINAGE AREA CHARACTERISTICS

Lake Suzanne Dam is located in the northwest section of the Village of Spring Valley, Rockland County, New York, Hydrologic Unit Code 02030103. The watershed contributing to the reservoir is 1.48 square miles, varying in relief from a lake elevation of 480 to about 700 feet MSL. Land cover is approximately 30 percent woods and orchards and 70 percent urban and suburban.

5.2 ANALYSIS CRITERIA

The analysis of Lake Suzanne Dam was performed using the U.S. Army Corps of Engineers HEC-1 DB computer program (Ref. 1). The Probable Maximum Precipitation (PMF) was taken from Hydro-meteorological Report No. 33 (Ref. 4) and distributed by the standard EM 1110-2-1411 method (Ref. 6). A unit hydrograph was developed using the Snyder method, and coefficient values of $C_t = 2.7$ and $C_p = 0.703$. The loss rates assumed were an initial loss of 2 inches and a constant loss rate of 0.05 inches per hour, and resulted in an excess rainfall of 22.33 inches in 72 hours with a total loss of 3.02 inches, and a PMF peak inflow of 3207 cfs.

5.3 SPILLWAY CAPACITY

The spillway is 24 feet in length with a crest width of about 2 feet at El 479.4, 1.6 feet below the top of the dam. The computed maximum discharge capacity of the spillway is 130 cfs.

5.4 RESERVOIR CAPACITY

The normal capacity of Lake Suzanne is reported to be 36.4 acre-feet. Surcharge storage between El 479.4 (spillway crest elevation) and the top of the dam, El 481, is 16 acre-feet which is equivalent to 0.2 inches of runoff over the entire basin. Maximum capacity of the reservoir is 52.4 acre-feet.

5.5 FLOODS OF RECORD

There are no records of floods available.

5.6 OVERTOPPING POTENTIAL

The potential of the dam being overtopped was investigated on the basis of the spillway capacity and the available

surcharge to meet the computed design flood inflows. Analysis indicates the spillway does not have sufficient capacity for one-half the Probable Maximum Flood (PMF), and overtopping would occur for all storm events exceeding 4 percent of the PMF.

The PMF, routed through the lake resulted in a peak outflow of 3182 cfs and a corresponding surface elevation of 484.31, 3.31 feet over the dam. One-half PMF routed through the lake resulted in a peak outflow of 1591 cfs and a corresponding surface elevation of 483.43, 2.43 feet over the 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 being "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 any serious structural problems with the dam. The observed erosion of embankment fill at the spillway contact are not detrimental to the dam's stability or safety at the present time.

b. Design and Construction Data

There are no design computations or other data pertaining to the structural stability of the dam available. There are two drawings prepared as part of the Pascack Brook improvement studies by William H. Youngblood Associates, Consulting Engineers and Surveyors, Monsey, New York. The drawings show the topography of the dam site and subsurface explorations.

c. Stability Analysis

Since there are no contract drawings or documents available showing the full geometry and the extent of the spillway section, the primary source of structural and subsurface information used in the stability analysis is as follows:

1. The crest and downstream face surface geometry of the exposed spillway was measured during the inspection using approximate methods (See sketch of the spillway section in Appendix A).

2. Other geometry of the non-exposed spillway structure and subsurface information was obtained from available data prepared by William H. Youngblood Associates.

The following table shows the results of the structural stability analysis of the spillway section. The computation for the analysis is given in Appendix E.

<u>Loading Condition</u>	<u>Location of Resultant</u>	<u>Sliding F.S.</u> <u>(See Appendix E)</u>
a. Normal loading condition, reservoir level at spillway crest, no ice load	1.3 feet outside middle third	0.95
b. Normal loading condition, reservoir level at spillway crest, with ice load	15 feet outside middle third	0.27
c. Unusual loading: flood level equal to 1/2 PMF at gravity section	3.5 feet outside middle half	0.35

<u>Loading Condition</u>	<u>Location of Resultant</u>	<u>Sliding F.S.</u> (See Appendix E)
d. Extreme loading: flood level equal to PMF at the gravity section	8.06 feet outside middle half	0.28
e. Unusual loading: reservoir level at spillway crest, and earthquake forces	1.25 feet outside middle half	0.86

The results of the structural analysis indicates that the stability of the spillway section against overturning and sliding are inadequate for all loading cases.

Since there is a lack of information regarding the exact geometry of the spillway, foundation conditions and the extent and magnitude of the uplift pressure under the spillway, the structural stability analysis could not be accurately assessed with any reliability. It is therefore recommended that in conjunction with the hydraulic/hydrologic studies, a more detailed structural stability analysis be performed. Field investigations should be carried out to obtain additional information regarding the uplift pressure within and under the base of the spillway; the quality of the foundation; the geometry and extent of the spillway structure; and the condition of the non-exposed concrete. The information should then be incorporated into a more detailed structural stability evaluation.

d. Operating Records

There are no records of the regulating gate operation.

e. Post-Construction Changes

There are no recorded post-construction changes.

f. Seismic Stability

The dam is located in Seismic Zone 1 in accordance with Phase I recommended guidelines. However, based on the past earthquake experience in the area, the New York State Geological Survey considers the area to be in Seismic 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 6.1c.

SECTION 7 - ASSESSMENT/RECOMMENDATIONS

7.1 ASSESSMENT

a. Safety

Examination of available documents and a visual inspection of the dam and the appurtenant structures 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 4 percent of the PMF. The overtopping of the dam could cause the erosion of both abutments and the downstream face of the dam, particularly in the vicinity of the spillway-embankment contact resulting in dam failure, thus significantly increasing the hazard to 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, however, that based on an initial screening and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam would take place, significantly increasing the hazard to loss of life downstream from the dam.

The results of the stability analysis indicates that the stability of the spillway against overturning and sliding are inadequate for all loading cases.

b. Adequacy of Information

The information and data available were adequate for performance of this investigation, except as noted in Section 6.1c.

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 1/2 PMF event. In addition, an investigation of the structural stability of the spillway portion of the dam is required.

d. Urgency

The additional hydrologic/hydraulic investigations and the stability investigation 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 these investigations must be initiated, with completion of these measures during the following year. In the interim, develop an emergency action plan for the notification of downstream residents and proper governmental authorities in the event of overtopping, and provide round-the-clock surveillance of the dam during periods of extreme runoff. The other problem areas listed below must be corrected within 1 year from notification.

7.2 RECOMMENDED MEASURES

1. Backfill the eroded area of the embankment downstream of the left spillway training wall (spillway-embankment contact).

2. The reservoir drain should be returned to operational condition.

3. Backfill the gully at the right abutment and divert surface runoff from pavement and adjacent areas away from the right abutment.

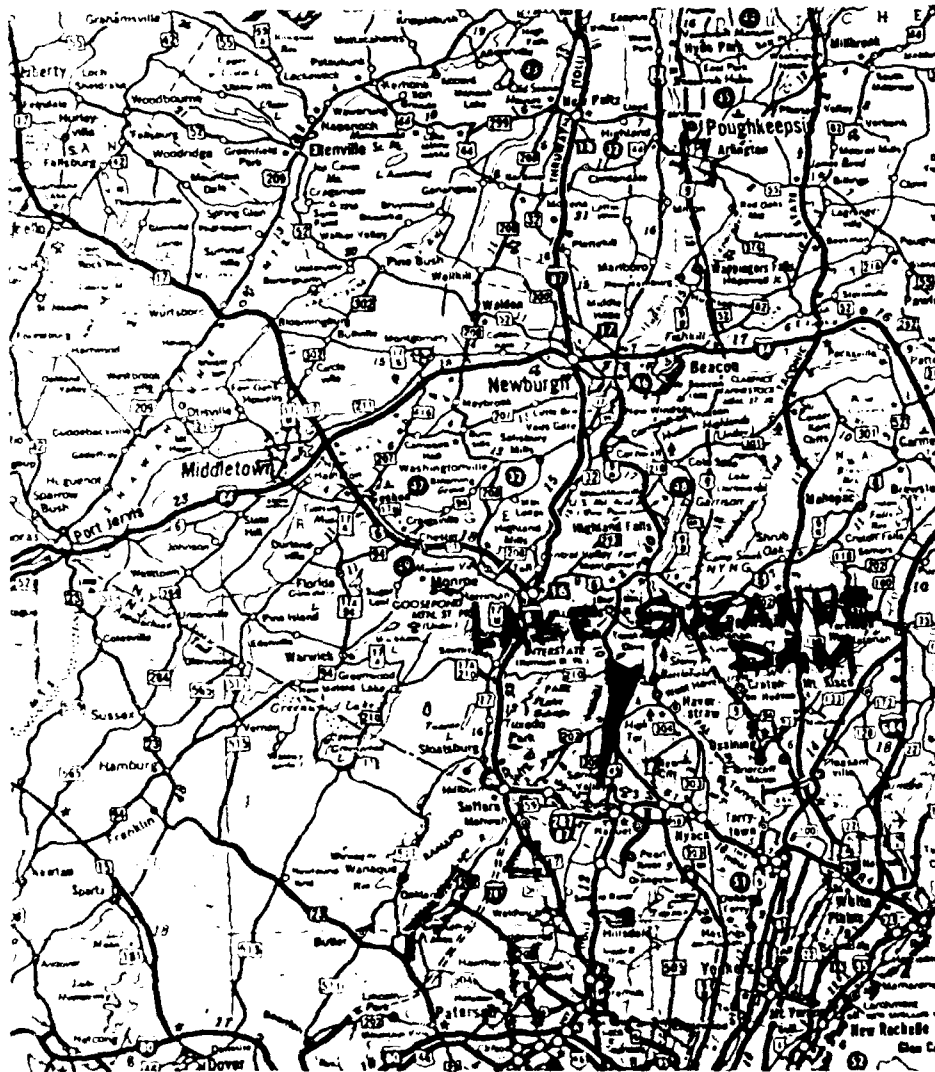
4. Remove all brush and trees from the crest, embankment slopes and downstream channel. Provide a program of periodic inspection and cutting and mowing of the embankment surfaces and the downstream channel.

5. Remove debris from the downstream channel and at the spillway crest. Provide a program of periodic inspection and removal.

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.

DRAWINGS

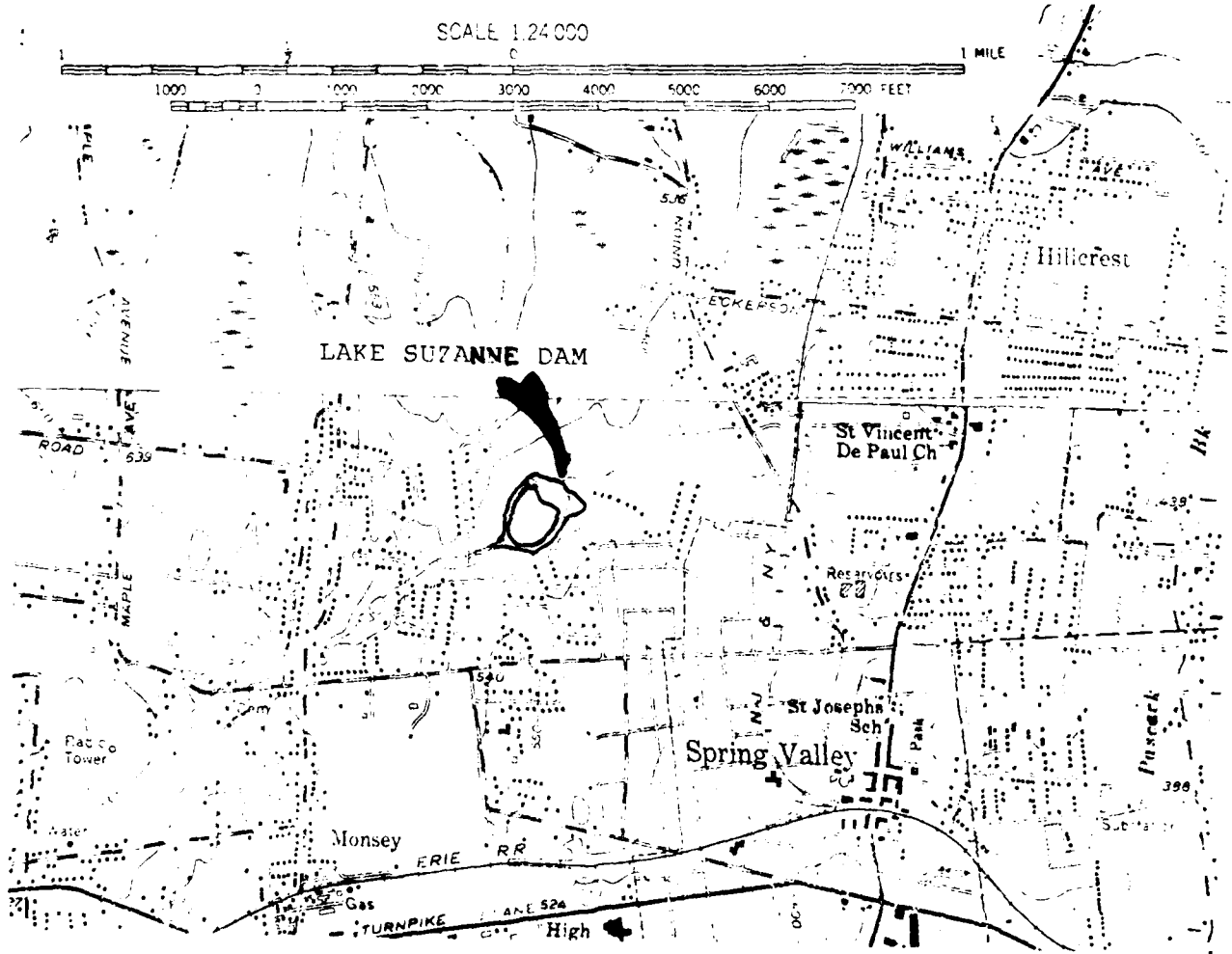
APPENDIX A



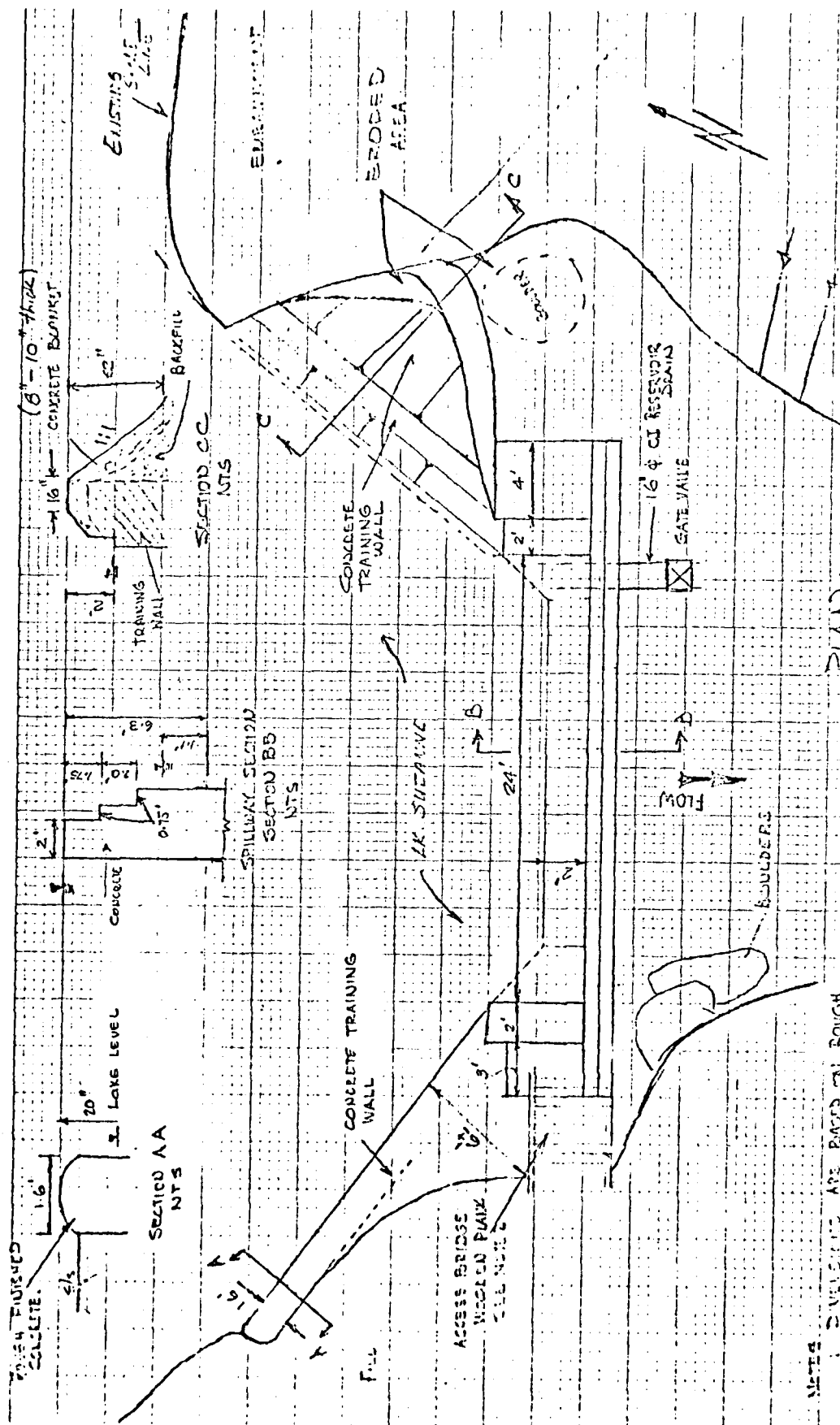
Scale: 1 inch = 11.2 Miles

VICINITY MAP
LAKE SUZANNE DAM

PARK RIDGE QUAD
New Jersey - New York



TOPOGRAPHIC MAP
LAKE SUZANNE DAM



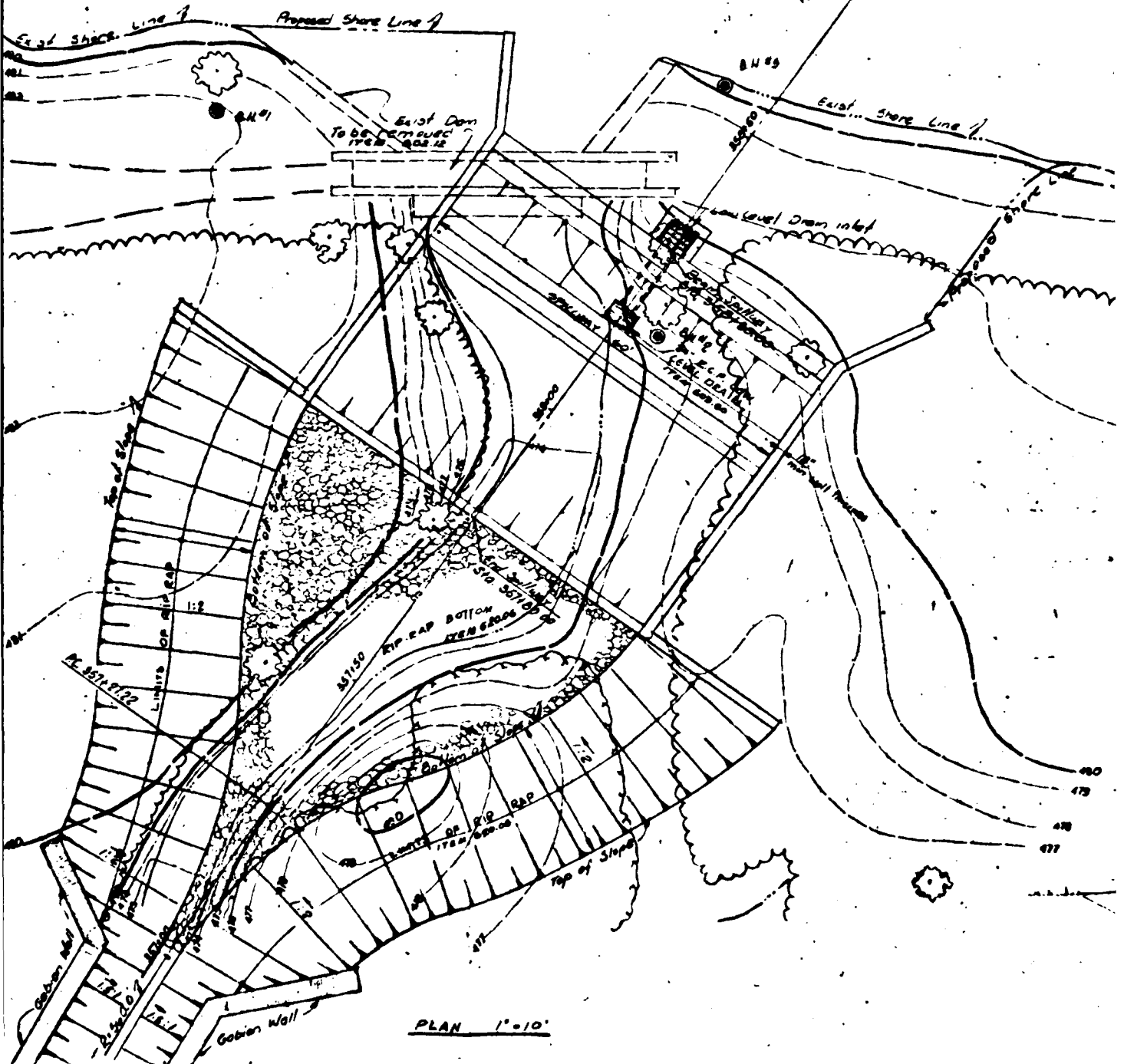
NOTES

1. DIMENSIONS ARE BASED ON ROUGH FIELD MEASUREMENT DURING VISUAL INSPECTION.
2. ACCESS BRIDGE FROM RIGHT ABUTMENT TO EMERGENT NOT SHOWN.

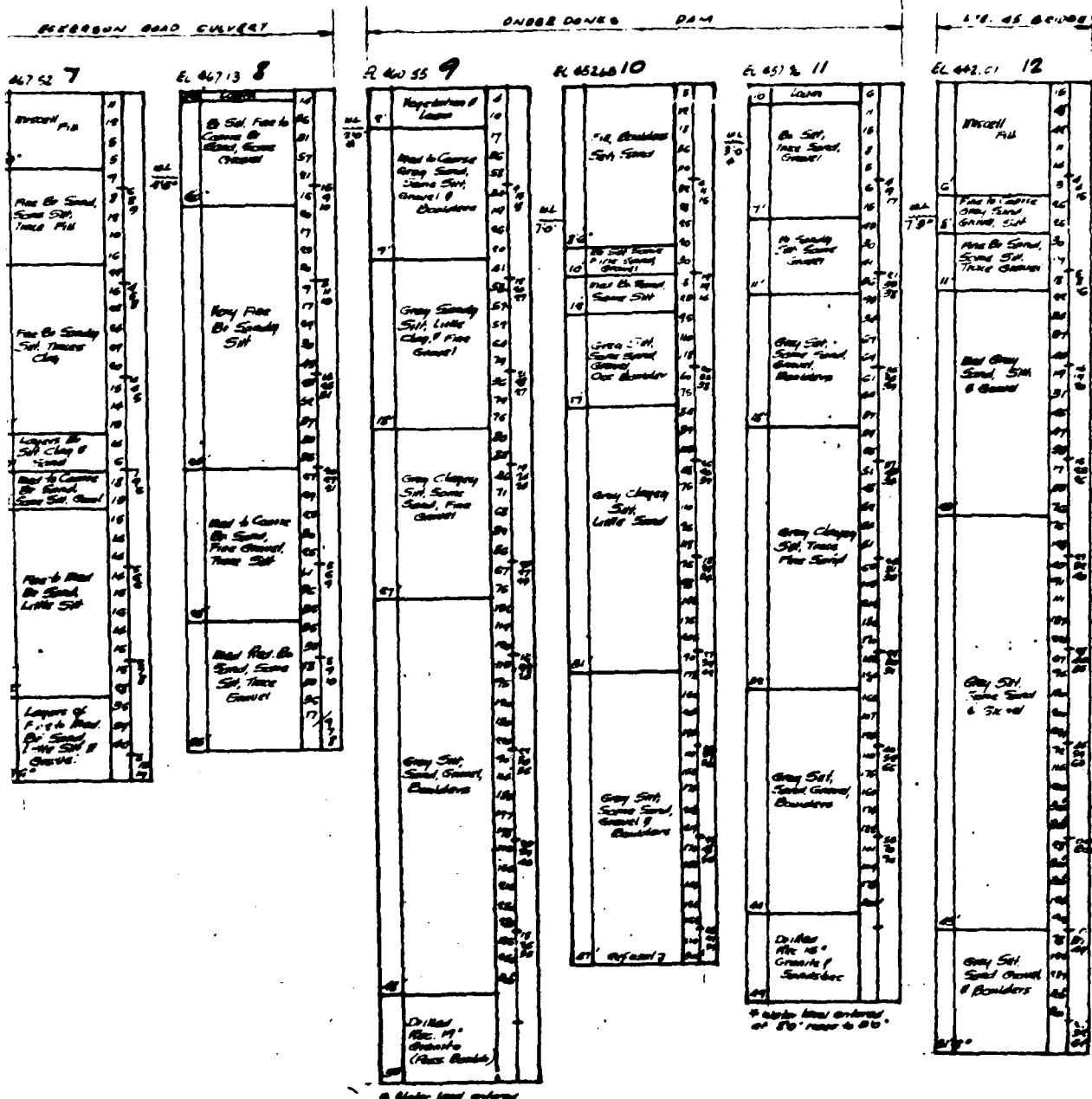
PLAN
NTS

LK. SUZANNE DAM
SECTION - PLAN & SECTIONS

LAKE SUZANNE



IN CHARGE OF _____



8 13
QUITTED

6 Meter level indicated at 55' near 7' 10"

* Meter level indicated at 50' near 11' 10"

Rockland County Drainage Agency
ROCKLAND COUNTY, NEW YORK

BROOK IMPROVEMENTS
PASCACK BROOK - STREAM NO (N.J.S.)

BORINGS 1 THRU 12

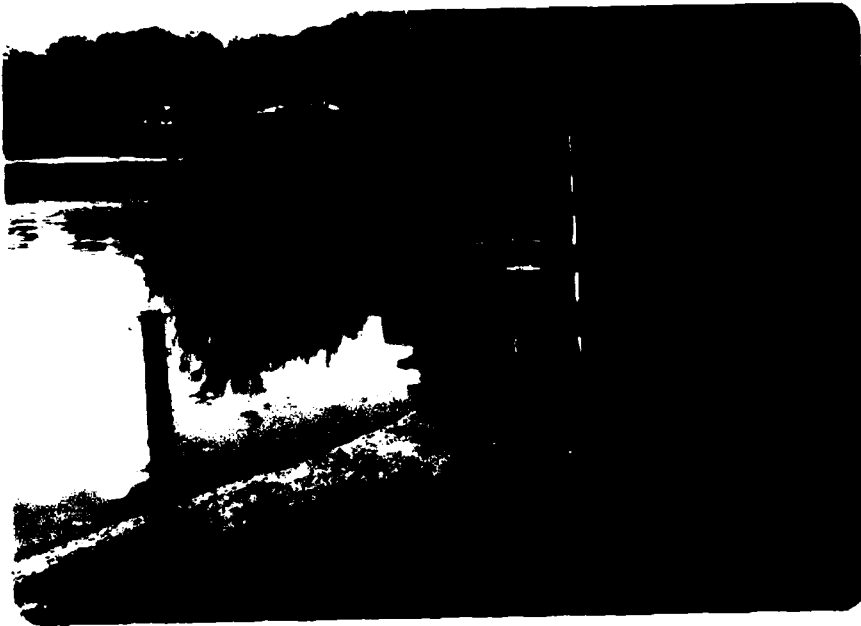
William Youngblood Associates
Consulting Engineers and Surveyors
244 Route 88, Monsey, N.Y. 10952
Route 17 E, Marree, N.Y. 10950

Date _____
Scale _____

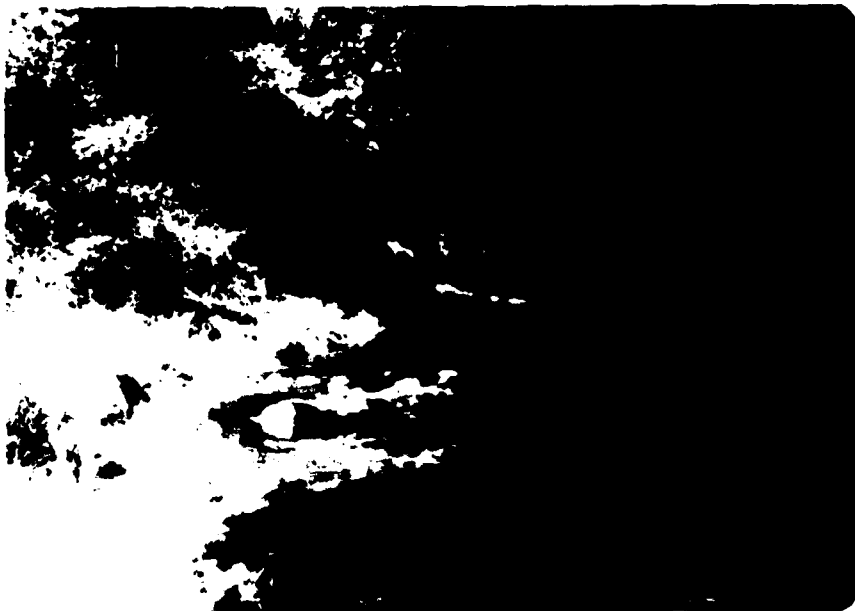


PHOTOGRAPHS

APPENDIX B



2. UPSTREAM VIEW OF DAM



3. VIEW OF DOWNSTREAM CHANNEL. NOTE VEGETATION.



4. VIEW OF SPILLWAY. NOTE SPALLING OF CONCRETE AT TRAINING WALL AND FACE OF SPILLWAY AND MINOR DEBRIS COLLECTED AT CREST.



5. VIEW OF REGULATING CONTROL FOR RESERVOIR
DRAIN.



6. VIEW AT CONTACT BETWEEN DOWNSTREAM FACE OF LEFT SPILLWAY TRAINING WALL AND THE EMBANKMENT. NOTE EROSION OF EMBANKMENT FILL.



7. VIEW OF RIGHT ABUTMENT. NOTE GULLY CAUSED BY SURFACE RUNOFF.

VISUAL INSPECTION CHECKLIST

APPENDIX C

VISUAL INSPECTION CHECKLIST

Basic Data

a. General

Name of Dam LAVE SURROUND

Fed. I.D. # 780 DEC Dam No. 196D-4179

River Basin LOWER HUDSON

Location: Town STEIN'S VALLEY County ROCKLAND

Stream Name DAGGON, BEAUM.

Tributary of HAVENSPO RIVER

Latitude (N) 41° 29' 15" Longitude (W) 73° 56' 30"

Type of Dam EARTH WITH CONCRETE SPILLWAY

Hazard Category HIGH

Date(s) of Inspection JULY 24, 1980

Weather Conditions SUNNY TEMP 80-85° F RAINED PREVIOUS NIGHT

Reservoir Level at Time of Inspection EL 479.4

b. Inspection Personnel HOWEN THOMAS AND JYOTINDA
VEEL

c. Persons Contacted (Including Address & Phone No.) OWNER OF
CAMP REPRESENTATIVE NOT PRESENT AT INSPECTION.
OWNER Address and DWG NO AS SHOWN BELOW

d. History:

Date Constructed UNKNOW Date(s) Reconstructed UNKNOW

Designer UNKNOW

Constructed By UNKNOW

Owner NO. HUDSON BLVD, 4910 NORTH TRAVELLERS, DELAWARE
TAMARAC, FLORIDA TEL NO. (305) 228-5500

Embankment

a. Characteristics

(1) Embankment Material _____

(2) Cutoff Type Upstream _____

(3) Impervious Core Upstream _____

(4) Internal Drainage System None _____

(5) Miscellaneous The length and size of the embankment
could not be accurately determined because of slight
topography, heavy vegetation, and ground cover.

b. Crest

(1) Vertical Alignment at the crest the embankment has ended due
to the slight contact the embankment has ended due
to topography.

(2) Horizontal Alignment None observed.

(3) Surface Cracks None observed.

(4) Miscellaneous Overgrown grass, vegetation and small
trees.

c. Upstream Slope

(1) Slope (Estimate) (V:H) 1:1 (from available drawings)

(2) Undesirable Growth or Debris, Animal Burrows Overgrown grass

(3) Sloughing, Subsidence or Depressions None observed.

(4) Slope Protection Natural ground

(5) Surface Cracks or Movement at Toe None observed

d. Downstream Slope From available drawing

(1) Slope (Estimate - V:H) 4:5 (H); Top of the slope outlet
be located because of flat topography, heavy vegetation and heavy

(2) Undesirable Growth or Debris, Animal Burrows heavy vegetation
including orange grass, trees, brush, etc.

(3) Sloughing, Subsidence or Depressions except at the
spillway outlet (see e abutment contact) could not
be observed because of heavy vegetation, brush and ground cover

(4) Surface Cracks or Movement at Toe None observed
because of heavy vegetation, brush and ground cover

(5) Seepage None observed

(6) External Drainage System (Ditches, Trenches; Blanket) None
checked

(7) Condition Around Outlet Structure See spillway

(8) Seepage Beyond Toe None observed, in the
area 60 feet downstream from shore line

e. Abutments - Embankment Contact

Left abutment contact is natural ground but
could not be determined because of flat topography
and heavy vegetation and ground cover. Right abutment
contact is with spillway.

(1) Erosion at Contact Left - None observed. The Right Contact -
The embankment full downstream of right spillway training wall is
~~eroded~~ ~~at the~~ ~~base~~ ~~of~~ ~~the~~ ~~wall~~. ~~Some~~ ~~erosion~~ ~~has~~ ~~occurred~~ ~~at~~ ~~the~~ ~~base~~ ~~of~~ ~~the~~ ~~wall~~.
backfilling with concrete lining built the downstream face of the wall.
~~(2) Seepage Along Contact~~
However there is still seepage and downstream of the wall

(2) Seepage Along Contact : None observed.

3) Drainage System

a. Description of System None

b. Condition of System _____

c. Discharge from Drainage System _____

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

None

5) Reservoir

- a. Slopes In vicinity of the dam are in generally
stable condition
- b. Sedimentation No evidence of excessive sedimentation
observed; No floating debris
- c. Unusual Conditions Which Affect Dam None.

6) Area Downstream of Dam

- a. Downstream Hazard (No. of Homes, Highways, etc.) Several homes
along the bank and village of Cherry Valley.
- b. Seepage, Unusual Growth None observed.
- c. Evidence of Movement Beyond Toe of Dam None observed.
- d. Condition of Downstream Channel Minor debris and vegetation
observed in good condition.

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

24 foot wide concrete spillway. Downstream channel of dam
is also spillway channel

- a. General _____

- b. Condition of Service Spillway Spillway is good condition.
Over the upstream drainage walls which are in fair condition.
The concrete face of the spillway at several
locations is spalled. The entire upstream face of the
both drainage walls are spalled.

c. Condition of Auxiliary Spillway None

d. Condition of Discharge Conveyance Channel channel in discharge
channel for the dam is good scrub brush
cutting and vegetation.

8) Reservoir Drain/Outlet

Type: Pipe Conduit _____ Other _____

Material: Concrete _____ Metal Other _____

Size: 16" Length Unknown

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 (Inoperative)

Present Condition (Describe): The operating condition
of the gate could not be determined because
owner or owner representative was not present at
the time of inspection, the gate is sealed.

9) Structural — Spillway

a. Concrete Surfaces Spillway downstream face is spalled at several locations; upstream training walls — both walls upstream face spalled and downstream face is severely cracked

b. Structural Cracking None at spillway face and right training wall. A crack observed above the top of left training wall near the abutment contact.

c. Movement - Horizontal & Vertical Alignment (Settlement) None observed

d. Junctions with Abutments or Embankments Right abutment is in good condition. The spillway and embankment contact is loaded. (See comments to embankment 2.e.)

e. Drains - Foundation, Joint, Face None observed.

f. Water Passages, Conduits, Sluices Downstream drain pipe is not seen.

g. Seepage or Leakage None through concrete structure. Where observed — Spillway flow and tail water show the typical migration of the downstream face and the spillway/foundation contact.

h. Joints - Construction, etc. Good as built

i. Foundation Unaffected

j. Abutments (See Component & layout 20 and Structural 9d.)

k. Control Gates None

l. Approach & Outlet Chamels None as built except for
training walls, which are in fair condition

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

n. Intake Structures None as built

o. Stability No visual indications that there
are any appreciable settlements

p. Miscellaneous _____

HYDROLOGIC DATA AND COMPUTATIONS

APPENDIX D

TAMS

Job No. 1551-09

Sheet 1 of 5

Project _____

Date July 20, 1970

Subject LAKE SUZANNE DAM INSPECTION

By JLC

HYDROLOGIC / HYDRAULIC COMPUTATIONS

Ch'k. by _____

SPILLWAY 24.0' x 1.6' - broad crested spill 2.5' wide.

"New" overflow section 50.0'

Reservoir

Area 9.1 acres

Volume 36.4 acrefeet.

DRAINAGE AREA 1.48 SQ MILES

$L = 5'' = 1.89 \text{ miles}$ $U_c C_T = 2.7$ $C_p = 0.703$

$L_{CA} = 2'' = 0.75 \text{ miles}$

$$T_p = 2.7(LL_{CA})^{0.3} = 30 \text{ hours}$$

24 hour 200 SQ Mile INDEX P.M.P. = 22 inches (Ref 1)

24 Hour Point RAINFALL: (% of INDEX P.M.P.)

6 hr. 12 hr. 24 hr 48 hr

111 121 133 144

Assume: 2 inch initial loss

0.05 in constant loss.

Impervious area 0.05% ~ 50 acres (reservoir, roads, houses etc)

TAMS

Job No. 1551-09 Sheet 2 of 5
 Project LAKE SUZANNE DAM INSPECTION Date JULY 23, 1981
 Subject HYDROLOGIC/HYDRAULIC COMPUTATIONS By D.L.C.
SPILLWAY Rating. Ch'k. by _____

LENGTH 24.0' Non overflow Section = 50.0'

Use $C = 2.70$.

EL.	Q_1	Q_2	Q_3	Q_T
479.4	0	0	0	0
480.	30	0	0	30
481.	130	0	0	130
483.	440	380	0	820
485.	860	1080	2480	4430
490.	2240	3640	16300	22170

Q_2 - discharge over non-overflow section. $L = 50$

Q_3 - discharge over earth embankment $L = 326'$

TAMS

Job No. 1551-09

Sheet 3 of 5

Project _____

Date Aug 1 1950

Subject LAKE SUZANNE DAM INSPECTION

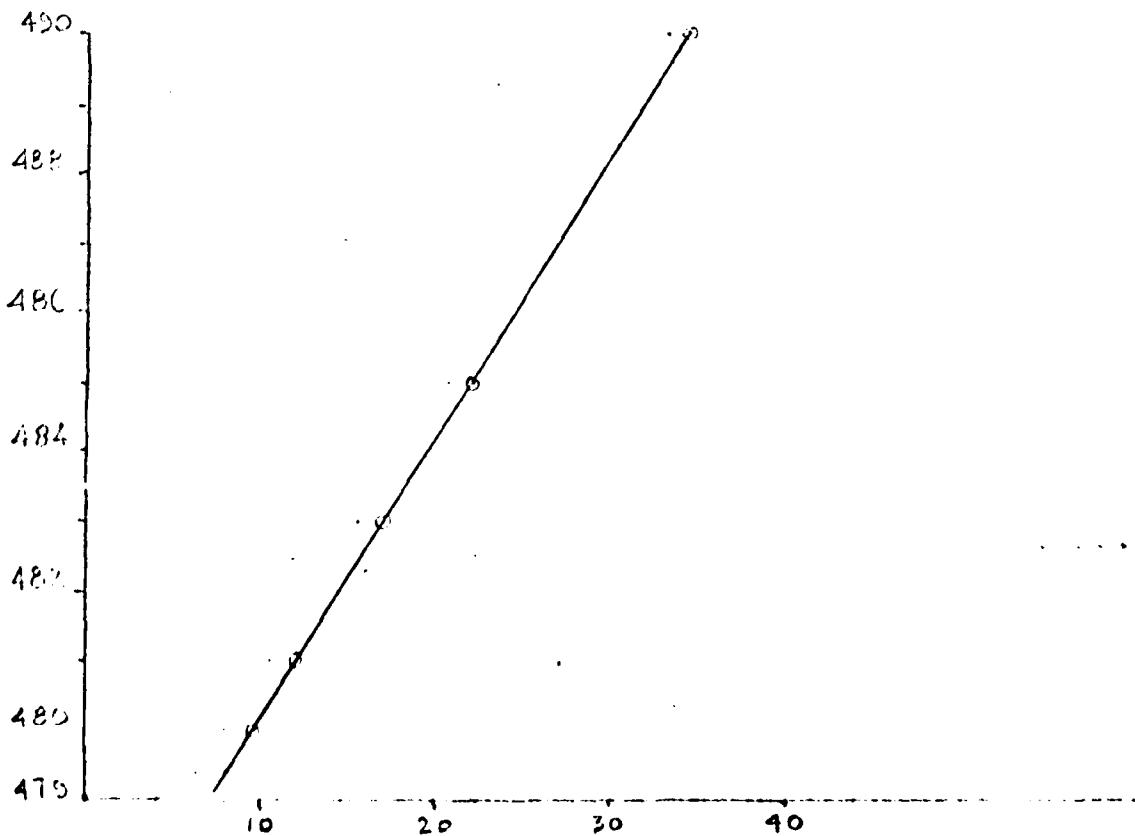
By DLC

HYDROLOGIC / HYDRAULIC COMPUTATIONS

Ch'k. by _____

ELEVATION / STORAGE

EL.	ΔH	AREA	MEAN AREA	$\Delta VOLUME$	STORAGE
479.4		8.0			36.4
	0.6		8.75	5.25	
480.		9.5			41.7
	1.0		10.75	10.75	
481		12.0			52.4
	2.0		14.5	29.0	
483		17.0			81.4
	2.0		19.5	39.0	
485		22.0			120.4
	5.0		28.15	140.75	
490.		34.3			261.2



TAMS

Job No. _____

Sheet 4 of 5

Project _____

Date JULY 21, 1970

Subject LAKE SUZANNE HYDROLOGIC/HYDRAULIC

By D.L.C.

COMPUTATIONS

Ch'k. by _____

ELEVATION	STORAGE AC FT	DISCHARGE CFS.
479.4	36.4	0
480	41.7	30
481	52.4	130
483	81.4	820
485	120.4	4430
490	261.2	28200.

14.9 AcFt of Surchage Storage equivalent to approx 0.2 inches of 2/0 over basin.

TAMS

Job No. 1551-09

Sheet 5 of 5

Project LAKE SUZANNE DAM INSPECTION

Date Aug 2, 1953

Subject D/S Valley Cross Sections.

By AKB.

Ch'k. by _____

STATION	DISTANCE	ELEVATION.
STATION 500 Slope = 0.01	2900	500
	4550	490
	4800	480
	4985	470
	5000	468
	5015	470
	5400	480
	5800	500
STATION 2500 Slope = 0.003	4100	475
	4400	470
	4985	465
	5000	462
	5015	465
	5200	470
	5350	475
5500	480	

FEASIBILITY STUDY
 FLOW IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
 AREA IN SQUARE FEET (SQUARE METERS)

STATION: 1+00 RATIO: 1:50 RATIO APPLIED TO FLOW

STATION	AREA	FLOW	RATIO	APPLIED FLOW
1	3,447	1,603	1:50	320.6
2	3,447	1,603	1:50	320.6
3	3,447	1,603	1:50	320.6
4	3,447	1,603	1:50	320.6

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1
 INITIAL VALUE SPILLWAY CREST TOP OF DAM
 479.00 476.00 481.00
 STORAGE 36. 32.
 DURATION 0. 0.

STAG. MAXIMUM MAXIMUM MAXIMUM DURATION TIME OF TIME OF
 OF PROTECTIVE DEPTH OVERFLOW OVER TOP MAX. OUTFLOW FAILURE
 PVE M.S.L.ELEV OVER DAM AD-CFT CFS HOURS HOURS HOURS
 1.00 424.21 3.31 107. 3492. 16.50 42.50 0.00
 1.50 422.60 3.14 90. 1591. 12.50 47.50 0.00

PLAN 1 STATION 3

RATIO	MAXIMUM FLOW/CFS	MAXIMUM STAGE/FT	TIME HOURS
1.00	3491.	473.1	42.50
1.50	1591.	472.0	42.50

PLAN 1 STATION 4

RATIO	MAXIMUM FLOW/CFS	MAXIMUM STAGE/FT	TIME HOURS
1.00	3184.	467.0	43.00
1.50	1596.	467.1	43.00

STABILITY ANALYSIS

APPENDIX E

TAMS

Job No. 1511

Project PHASE I INSPECTION

Subject LK SUZANNE STABILITY ANALYSIS

Sheet 1 of 12

Date 8-5-80

By JJ

Ch'k. by HSF

Assumptions

1. The unit weight of concrete is assumed to be 150 lbs/cuft.
2. Ice load of 5000 lbs/sqft acting about 1 ft from top of dam (Corps Engr. Criteria)
3. Angle of internal resistance of 'fill' is assumed to be 35°
4. Dam site is in Seismic Zone 2

LOADING CONDITIONS

- CASE I Normal loading; LK level at Spillway Crest EL. 477.0
no ice load
- CASE II Normal loading; LK level at Spillway Crest EL. 477.0
with ice load.
- CASE III Unusual loading LK level at $\frac{1}{2}$ PMF
- CASE IV Extreme loading LK level at PMF
- CASE V Unusual loading; LK level at Spillway Crest
and earthquake force on 5%

TAMS

Job No. 1511 Sheet 2 of 12
Project PHASE 1 INSPECTION Date 8-5-80
Subject LK. SUZANNE STABILITY ANALYSIS By JP
Ch'k. by _____

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 FFS exceeds 1.50 under normal loading conditions, 1.25 under unusual loading conditions and 1.1 under extreme loading conditions.

TAMS

Job No. 1551-

Sheet 3 of 12

Project PHASE I INSPECTION

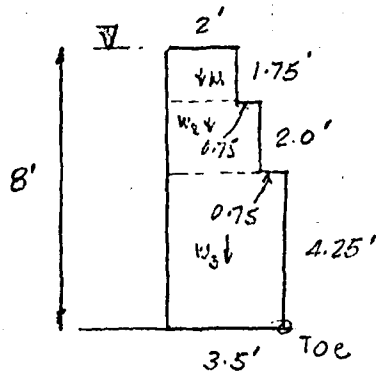
Date 8-5-80

Subject LK SUZANNE - STABILITY ANALYSIS

By JP

Ch'k. by _____

4. Dead Loads



EM at Toe

$$W_1 = 2 \times 1.75 \times 0.15 = 0.525 \text{ K} \times 2.5 = 1.31 \text{ KF}$$

$$W_2 = 2.75 \times 2.0 \times 0.15 = 0.825 \text{ K} \times 2.125 = 1.75 \text{ KF}$$

$$W_3 = 3.5 \times 4.25 \times 0.15 = 2.23 \text{ K} \times 1.75 = 3.90 \text{ KF}$$

$$F_V = 3.58$$

$$M_R = 6.96$$

$$\bar{y} = 1.94'$$

$$0.525 \times 7.125 = 3.74$$

$$0.825 \times 5.25 = 4.33$$

$$2.23 \times 2.125 = 4.74$$

$$F_V = 3.58$$

$$12.81$$

$$\bar{y} = 3.58'$$

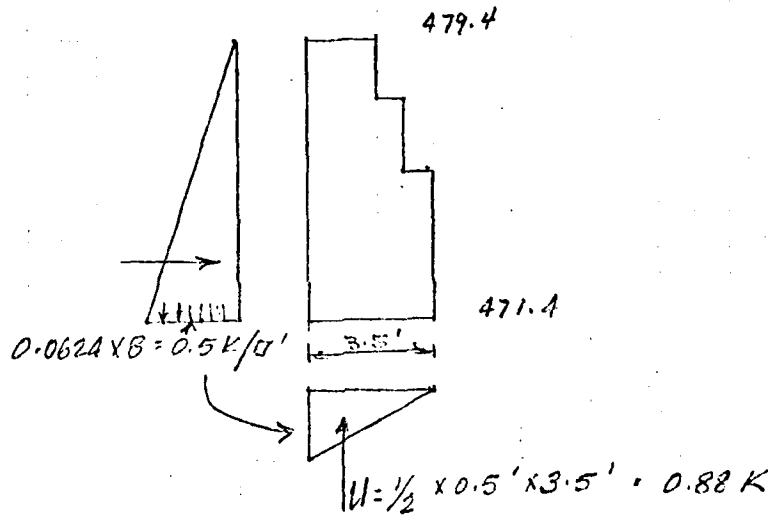
TAMS

Job No. 1511
 Project NYS Dam Inspection
 Subject LK SUZANNE - STABILITY ANALYSIS

Sheet 4 of 12
 Date 8-5-60
 By JP
 Ch'k. by _____

6 HYDROSTATIC FORCES

Normal loading: WL @ SPILLWAY CREST
 EL. 479.4



ΣM at Toe

$$P = \frac{1}{2} \times 0.5' \times 8' = 2.0 \overset{\text{K}}{\rightarrow} \times 2.67 = 5.33 \overset{\text{KF}}{\text{}}$$

$$U = \frac{1}{2} \times 0.5' \times 3.5' = 0.88 \overset{\text{K}}{\uparrow} \times 2.33 = 2.05 \overset{\text{KF}}{\text{}}$$

$$F_v = 0.88 \text{ K } \uparrow$$

$$F_H = 2.0 \text{ K } \rightarrow$$

$$M_R = 0$$

$$M_D = 7.33 \text{ KF}$$

TAMS

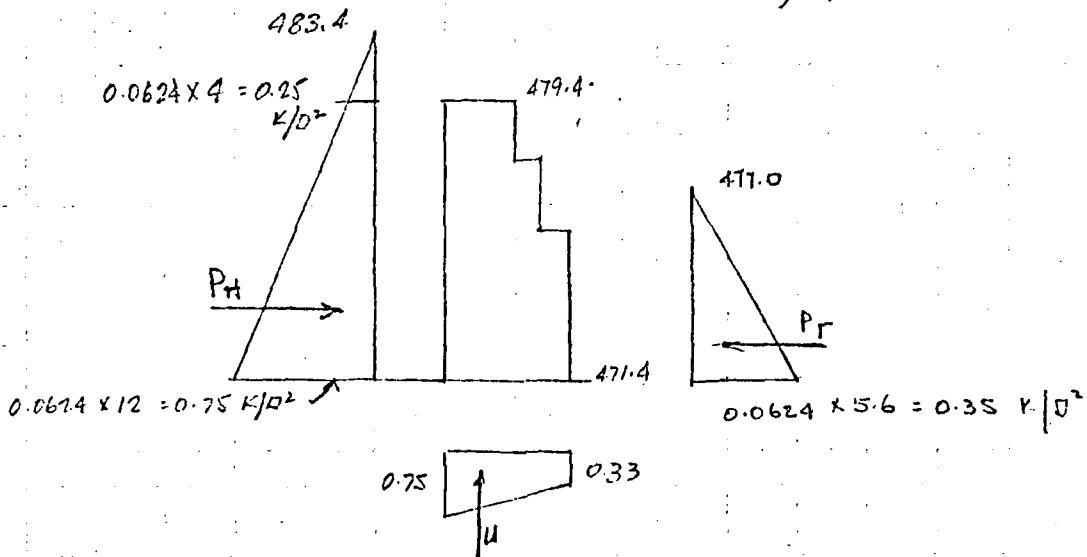
Job No. 1511
 Project NY S Dam Inspection
 Subject LK SVERRE - STABILITY ANALYSIS
OF SPILLWAY

Sheet 5 of 12
 Date 8-5-80
 By JP
 Ch'k. by _____

UNUSUAL LOADING

WL Equal to $\frac{1}{2}$ PMF

EI. 483.4 ; Tailwater EI. 477.0



$$P_H = \left(\frac{0.25 + 0.75}{2} \right) 8 = 4.0 \times 3.33' = 13.32 \text{ KF}$$

$$P_R = \left(\frac{1}{2} \times 0.35 \times 5.6 \right) 0.6 = 0.59 \times 1.9' = 1.12 \text{ KF} \quad 60\% \text{ TW Pressure}$$

$$U = \left(\frac{0.35 + 0.75}{2} \right) 3.5 = 1.93 \times 1.98' = 3.81$$

$$F_V = 1.93 \uparrow$$

$$F_H = 3.41 \text{ K} \rightarrow$$

$$M_R = 1.12 \text{ KF}$$

$$M_O = 17.13 \text{ KF}$$

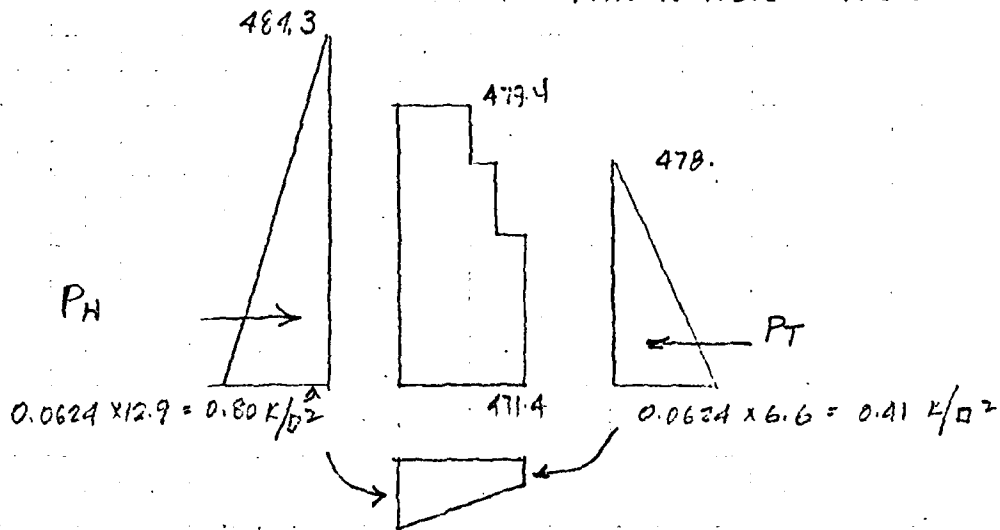
TAMS

Job No. 1511
 Project PHASE I DAM INSPECTION
 Subject STABILITY ANALYSIS - LK SUZZADE

Sheet 6 of 12
 Date 8-5-80
 By JP
 Ch'k. by _____

MAXIMUM LOADING

WL EQUAL TO PMF LEVEL 484.3
 TAIL WATER 478.0



Σ M @ Toe

$$P_H = \left(\frac{0.31 + 0.80}{2} \right) 8 = 4.44 \overset{K}{\rightarrow} \times 3.41 = 15.14$$

$$U = \left(\frac{0.41 + 0.80}{2} \right) 3.5 = 2.12 \overset{K}{\uparrow} \times 1.93 = 4.09$$

$$P_T = \left(\frac{1}{2} \times 0.41 \times 6.6 \right) 0.6 = 0.81 \overset{K}{\leftarrow} \times 2.2 = 1.78$$

$$F_V = 2.12 \overset{K}{\uparrow}$$

$$F_H = 3.63 \overset{K}{\leftarrow}$$

$$M_R = 1.78 \overset{KF}{\leftarrow}$$

$$M_O = 19.23$$

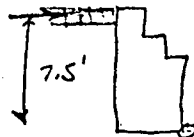
TAMS

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ICE LOAD

$$= 5 \times 7.5' = 37.5 \text{ KF}$$



CASE I NORMAL LOADING - WL at SPILLWAY CREST
 NO ICE LOAD

	F_v	F_H	M_R	M_o
Dead Load	3.58	-	6.96	-
Hydrostatic	0.88	2.0	-	7.38
	<u>2.70</u>	<u>2.0</u>	<u>6.96</u>	<u>7.38</u>

$$EM = 6.96 - 7.38 = -0.42 \text{ KF}$$

$$e = \frac{3.5}{2} - \frac{-0.42}{2.70} = 1.75 + 0.15 = 1.90' \text{ D/s From } \frac{\phi}{2}$$

Resultant location

$$\frac{-0.42}{2.70} - \frac{3.5}{3} = -0.15 - 1.17 = -1.32' \text{ outside middle third.}$$

$$p = \frac{2.70}{3.5} \left(1 \pm \frac{6 \times 1.90}{3.5} \right) \frac{1000}{144} =$$

23 psi at Toe
 -12 psi at Heel

FRICTION FACTOR OF SAFETY

$$FFS = \frac{2.70 \times \tan 35^\circ}{2} = 0.95$$

TAMS

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CASE II NORMAL LOADING WITH ICE LOAD; AND W.L. SPILLWAY CREST

	F_v	F_H	M_x	M_o
Dead load	3.58 ↓		6.96	
Hydrostatic	0.88 ↑	2.0		7.4
Ice load		5.0		37.5
	<u>2.70</u>	<u>7.0</u>	<u>6.96</u>	<u>44.9</u>

$$EM = 6.96 - 44.9 = -37.9 \text{ KF}$$

$$e = \frac{3.5}{2} - \frac{-37.9}{270} = 1.75 + 14.0 = 15.75 \text{ ' d/s from } \frac{E}{2}$$

Resultant location

$$- \frac{37.9}{2.70} - \frac{3.5}{3} = -14.0 - 1.17 = -15.17 \text{ ' outside middle third}$$

$$p = \frac{2.7 \text{ KF}}{3.5} \left(1 \pm \frac{6 \times 15.75}{3.5} \right) \frac{1000}{144} = (5 \pm 145)$$

= 150 psi @ toe.
 -140 psi @ heel.

Friction Factor of Safety

$$FFS = \frac{2.70 \tan 35^\circ}{7.0} = \frac{1.89}{7.0} = 0.27 < 1.5$$

TAMS

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Project N.Y.S. Dam Inspection

Date 8-5-80

Subject LK. SUEANNE DAM - PHASE 1 INSPECTION

By J.P.

Ch'k. by _____

CASE III UNUSUAL LOADING : 1/2 PMF

	F_v	F_H	M_r	M_o
Dead load	3.584	-	6.96	
Hydrostatic	1.931	3.41	1.12	17.13
	1.65	3.41	8.08	17.13

$$EM = 8.08 - 17.13 = -9.05 \text{ LF}$$

$$e = \frac{3.5}{2} - \frac{-9.05}{1.69} = 7.11 \text{ ' d/s from } \frac{1}{2}$$

RESULTANT LOCATION

$$- \frac{9.05}{1.65} - \frac{3.5}{3} = 6.65 \text{ ' out side middle third.}$$

$$p = \frac{1.65}{3.5} \left(1 + \frac{6 \times 7.11}{3.5} \right) \frac{1000}{144} = (3 \pm 55)$$

43 psi @ Toe
- 37 psi @ Heel.

FRICION FACTOR OF SAFETY

$$FFS = \frac{1.69 \tan 35^\circ}{3.41} = \frac{1.18}{3.41} = 0.35 < 1.25$$

TAMS

Job No. 1511

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Project N.Y.S. DAM. INSPECTION

Date 8-5-51

Subject CK SUZANNE DAM - STABILITY

By JP

ANALYSIS

Ch'k. by _____

CASE IV EXTREME LOADING = PMF

	F _V	F _H	M _R	M ₀
Dead load	3.58		6.96	
Hydrostatic	2.12	3.63	1.78	19.23
	<u>1.46</u>	<u>3.63</u>	<u>8.74</u>	<u>19.23</u>

$$\Sigma M = 8.74 - 19.23 = -10.49 \text{ KF}$$

$$e = \frac{3.5}{2} - \frac{-10.49}{1.46} = 1.75 + 7.18 = 8.93 \text{ ' d/s from } \frac{e}{2}$$

RESULTANT LOCATION

$$\frac{-10.49}{1.46} - \frac{3.5}{3} = -7.18 - 1.17 = 8.35 \text{ ' outside middle third}$$

$$p = \frac{1.46}{3.5} \left(1 \pm \frac{6 \times 8.93}{3.5} \right) \frac{1000}{144} =$$

47 psi @ toe
-41 psi @ heel.

FRICION FACTOR OF SAFETY

$$FFS = \frac{1.46 \tan 35^\circ}{3.63} = 0.28$$

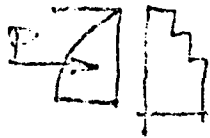
8/3/17

CASE IV : Normal loading with Earthquake
Reservoir level at EL. 877.4

$$Zono 2 = 0.05$$

$$\text{Zangens Method } C = 0.726 \text{ when } \theta = 0^\circ$$

1) Hydrodynamic Forces



$$P = 0.726 \times 0.05 \times 0.0624 \times 8^2 = 0.14 \text{ kPa}$$

$$M_p = 0.14 \times (0.4 \times 8) = 0.45 \text{ kF}$$

2) Dynamic Forces

$$W_D = 0.05(2.7) = 0.14 \text{ K}$$

$$M_{WD} = 0.14 \times \bar{y} = 0.14 \times 3.58 = 0.50 \text{ kF}$$

	F_V	F_H	M_C	M_D
Dead load	3.58 ↓	0.0	6.96	-
Hydrostatic	0.88 ↑	2.0 →	0	7.52
Hydrodynamic	-	0.14 →	-	0.45
Dynamic	-	0.14 →	-	0.50
Σ	2.7	2.28 →	6.96	8.33

Sheet 12 of 14
BY JP
E/S/10

$$\Sigma M = 6.96 - 8.33 = -1.37 \text{ k} \cdot \text{ft}$$

$$\text{Resultant location} = \frac{-1.37}{2.7} - \frac{3.5}{4} = -0.50 - 0.88$$

= -1.38' outside
neutral axis

$$e = \frac{3.5}{2} - -0.50 = 1.75 + 0.50 = 2.25' \text{ d/s from base}$$

$$p = \frac{2.7}{3.5} \left(1 \pm \frac{6 \times 2.25}{3.5} \right) \frac{1000}{114} = 5 \pm 19$$

24/1000
-19/1000

FRICTION FACTOR OF SAFETY

$$FFS = \frac{27 \tan 35^\circ}{2.2} = 0.86 < 1.25$$

REFERENCES

APPENDIX F

References

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