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NATIONAL DAM SAFETY PROGRAM. HEMPSTEAD LAKE DAM (INVENTORY NUMB--ETC(U)

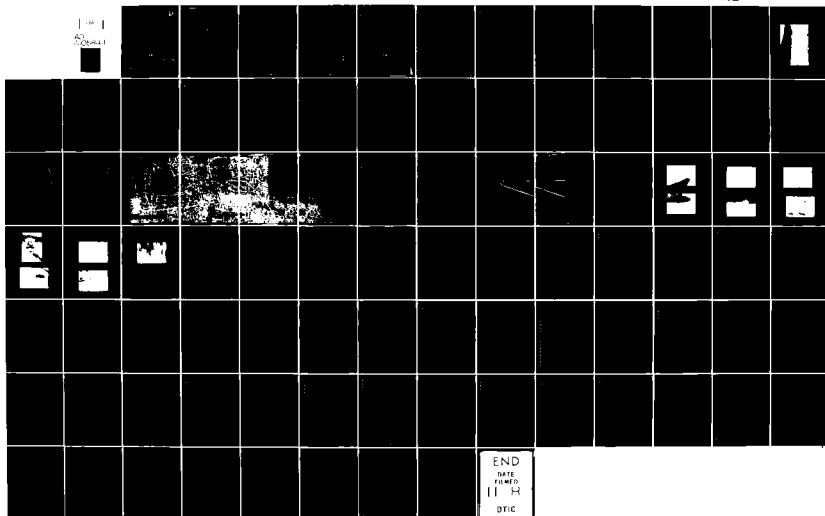
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LONG ISLAND BASIN

HEMPSTEAD LAKE DAM

NASSAU COUNTY, NEW YORK  
INVENTORY NO. N.Y. 108

PHASE I INSPECTION REPORT  
NATIONAL DAM SAFETY PROGRAM

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| 20. ABSTRACT (Continue on reverse side if necessary and identify by block number)<br>This report provides information and analysis of the physical condition of the<br>dam as of the report date. Information and analysis are based on visual<br>inspection of the dam by the performing organization.<br>The examination of documents and the visual inspection<br>of Hempstead Lake Dam did not reveal conditions which constitute<br>an immediate hazard to human life or property. However, the<br>dam has some deficiencies which require further investigation<br>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 2 percent of the PMF. The overtopping of the dam could cause the erosion of both abutments and the downstream face of the dam 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.

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 12 months of the date of notification to the owner, modifications to the structure, deemed necessary as a result of studies, should have been completed. 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.

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**LONG ISLAND BASIN**

**HEMPSTEAD LAKE DAM**

**NASSAU COUNTY, NEW YORK  
INVENTORY NO. N.Y. 108**

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



**NEW YORK DISTRICT CORPS OF ENGINEERS**

**JULY 1981**

## 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  
HEMPSTEAD LAKE DAM  
I.D. NO. N.Y. 108  
D.E.C. NO. 193  
LONG ISLAND BASIN  
NASSAU COUNTY, N.Y.

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PHASE I INSPECTION REPORT  
NATIONAL DAM SAFETY PROGRAM

|                    |                            |
|--------------------|----------------------------|
| NAME OF DAM        | Hempstead Lake Dam, NY 108 |
| STATE LOCATED      | New York                   |
| COUNTY LOCATED     | Nassau                     |
| STREAM             | Mill River                 |
| BASIN              | Long Island                |
| DATE OF INSPECTION | March 13, 1981             |

ASSESSMENT

The examination of documents and the visual inspection of Hempstead Lake 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 2 percent of the PMF. The overtopping of the dam could cause the erosion of both abutments and the downstream face of the dam 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.

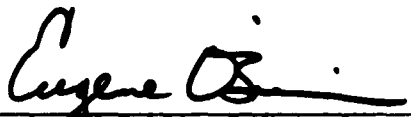
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It is therefore recommended that within 3 months of notification to the owner, detailed hydrologic/hydraulic investigations of the structure should be undertaken to more accurately determine the site specific characteristics of the watershed and their affect

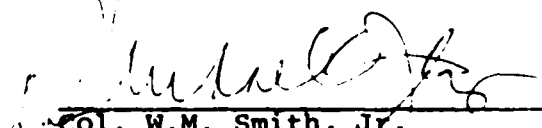
upon the overtopping potential of the dam. The results of these investigations will determine the appropriate remedial measures which will be required to achieve a spillway capacity adequate to discharge the outflow from at least the one-half PMF. Within 12 months of the date of notification to the owner, modifications to the structure, deemed necessary as a result of studies, should have been completed. 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 are:

1. The gates for the low level outlets should be repaired and made operable.
2. The brush, saplings and debris should be removed from the downstream slope. All coniferous trees should be removed while larger hardwood trees should not be removed, but should be inventoried and their condition monitored. If a tree dies, the area around the tree should then be monitored for possible seepage. A program of periodic mowing and cutting should be provided.
3. All trees and brush on the upstream face should be removed and periodic mowing and cutting provided.
4. Slope paving stones missing from the upstream face should be replaced.
5. The aqueduct and outlet pipelines should be carefully inspected and their capacity confirmed.
6. Provide a program of periodic inspection and maintenance of the dam and appurtenances including yearly operation and lubrication of the reservoir drain sytem. Document this information for future reference. The emergency action plan described in section 7.1d 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:

5 AUG 1981



1. OVERVIEW OF DAM

PHASE I INSPECTION REPORT  
NATIONAL DAM SAFETY PROGRAM  
HEMPSTEAD LAKE DAM  
I.D. NO. N.Y. 108  
D.E.C. NO. 193  
LONG ISLAND BASIN  
NASSAU COUNTY, N.Y.

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

The Phase I inspection reported herein was authorized by the Department of the Army, New York District, Corps of Engineers by Contract No. DACW 51-81-C-0008 dated 14 December 1981 in fulfillment of the requirements of the National Dam Inspection Act, Public Law 92-367, 8 August 1972.

b. Purpose of Inspection

The 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 THE PROJECT

a. Description of the Dam and Appurtenant Structures

The Hempstead Lake Dam is composed of an approximately 1,200 foot long earth embankment. The crest of the dam is 74 feet wide and its maximum height above the river is 24 feet. The upstream face of the dam is paved with stone and the upper part of the dam has a slope of 1V:1H, while the lower part of the dam has a slope of 1V:3H. The downstream slope of the dam varies non-uniformly due to highway embankment fill which has been placed over the years.

An intake tower located to the left of the center of the dam contains five gated openings at three different elevations. These intakes supply two 36-inch cast iron pipes which supply a horseshoe-shaped (6' Wide x 5" High) water supply aqueduct which passes under the dam. The gates are controlled from a house located at the top of the intake tower. Located below the gate-house within the tower are four uncontrolled spillway openings (6' Wide, 2'-2" High) which discharge into the same aqueduct as the low level water supply intakes.

b. Location

Hempstead Lake Dam is located on the Mill River in Hempstead Lake State Park near the Village of Rockville Centre, New York. Lake Drive near its intersection with Peninsula Boulevard, passes over the top of the dam.

c. Size Classification

The dam is 24 feet high and has a reservoir with a maximum storage capacity of 2,300 acre-feet and therefore is classified as an intermediate dam (storage capacity >1,000 acre-feet, <50,000 acre-feet).

d. Hazard Classification

The dam is in the "high" hazard potential category because of its location within a developed suburban area and the close downstream proximity of major highways and residences.

e. Ownership

Hempstead Lake Dam is owned by the New York City Bureau of Water Supply. The person to contact is Mr. Edward Conway, Acting Borough Engineer, Queens at 119-45 Union Turnpike, Forest Hills, New York, 11375, Telephone Number (212) 520-3467.

f. Purpose of Dam

The dam impounds water as part of the New York City Water Supply. The water has not been used for this purpose, however, in several years.

g. Design and Construction History

The dam was designed and constructed in 1873 for the Brooklyn Water Company. The designer and constructors are not known.

h. Normal Operating Procedure

There is no normal operating procedure nor records of past operating procedures.

1.3 PERTINENT DATA

|                                        |      |
|----------------------------------------|------|
| a. <u>Drainage Area</u> , Square Miles | 14.9 |
| b. <u>Discharge at Damsite</u> , cfs   |      |
| Ungated Spillways Inlets               | ---- |
| Maximum Capacity - Two 36-Inch         |      |
| CI Pipes                               | 320  |
| Total Discharge Maximum Pool           | 320  |
| c. <u>Elevation</u> , Feet Above MSL,  |      |
| USGS Datum                             |      |
| Top of Dam                             | 34.0 |
| Maximum Pool                           | 34.0 |



The intake discharges into a common chamber 6 feet x 20 feet. From the chamber, two 36-inch diameter cast iron outlet pipes about 38 foot long joint and enter a brick horseshoe-shaped aqueduct. The aqueduct can provide discharges into either the NYC Water Supply System or into South Pond located about 1/4 mile downstream

## SECTION 2 - ENGINEERING DATA

### 2.1 GEOLOGY

The records of the owner contain no data on site geology. However, there is data available in the literature on the general geology of the area. The Hempstead Lake Dam is located in the northeast portion of the Atlantic Coastal Plain Physiographic Province. This province is characterized by sediments which lack a definite coherence. The area around Hempstead Lake Dam is characteristic of the south shore of Long Island exhibiting topography of very low relief and consisting of glacial outwash plain sediments of clayey sand, sand and gravel deposits. These Quaternary deposits overlie the Magothy Formation of the Upper Cretaceous. These are also primarily clayey sand, sand and gravel.

### 2.2 SUBSURFACE INVESTIGATIONS

There are no records of subsurface investigations carried out at the site. It is known that the surficial soils in the vicinity of the Hempstead Lake Dam are glacial outwash plain clayey sands, sands and gravels.

### 2.3 DAM AND APPURTENANT STRUCTURES

There are no records or drawings available with regard to the original construction of the dam in 1873. There is only a sketch of a typical section and some property ownership plans. No records are available of the subsequent changes to the crest width.

### 2.4 CONSTRUCTION RECORDS

No information has been located in relation to the construction of the project. The name(s) of the contractor(s) is (are) unknown.

### 2.5 OPERATION RECORDS

In recent years there has been no regular operation of the dam and no records are kept of reservoir operation. The dam is monitored and routine maintenance is carried out by the Long Island State Park Commission (LISPC). No systematic monitoring of the performance of the dam is in effect.

### 2.6 EVALUATION OF DATA

There is sufficient data available to support a Phase I evaluation of the dam.

## SECTION 3 - VISUAL INSPECTION

### 3.1 FINDINGS

#### a. General

The visual inspection of the Hempstead Lake Dam was made on 13 March 1981. The weather was clear and the temperature was in the low fifties. At the time of the inspection, the lake level was at two uppermost lowlevel water supply inlets, El 18, about 11 feet below the spillway crest.

#### b. Dam

The earth embankment appears to be in good condition. The vertical and horizontal alignment of the crest appears to be good (see Photograph 2 ). The crest width of the dam has been widened (to 74 feet) from the original design width (24 feet) to accommodate a highway.

The upstream slope shows no signs of erosion or distress. The stone paving is in good condition with only a few stones missing and some small (3-inch) trees growing near the crest through joints. Additionally, there is some minor sediment buildup on the upstream face near the left abutment.

The downstream slope of the dam has been altered as a result of the widening of the crest. The resulting slope is non-uniform with its steepest section on the upper portions of the dam. The downstream slope is completely overgrown with undesirable brush and tree growth with trees of up to 18 inches in diameter. There is no sloughing or subsidence, although local depressions exist due to surface runoff along various footpaths perpendicular and parallel to the slope. No seepage was evident on the downstream slope.

There is no emergency action plan for the project.

#### c. Spillway

The visible portion of the overflows and tower which serve as a spillway are in good condition; it was not possible, however, to ascertain the condition of the tailraces.

#### d. Outlets and Pipeline

The upstream regulating gates of the water supply intakes and the reservoir drain are not in operating condition. The gates are rusted in position, the two upper gates are opened about six inches and the other three gates are rusted closed. The operating mechanisms are not operable. It was not possible to ascertain the condition of the outlet pipes or the brick aqueduct.

e. Abutments

The abutment contacts and the abutments are in good condition. There does not appear to be any portion of the abutments lower than the crest elevation of the dam.

f. Reservoir Area

The reservoir area is located within the park bordered on its northern end by the Southern State Parkway. It is relatively flat land. There are neither slides, rockfalls or sloughing around the reservoir. There are only minor sedimentation problems visible.

3.2 EVALUATION OF OBSERVATIONS

Visual observations made during the course of the inspection did not indicate any serious problems which would adversely affect the adequacy of the dam and appurtenant facilities. The following is a list, in order of importance, of problem areas encountered which should be corrected before further deterioration results in a hazardous condition. Appropriate remedies are also included.

1. The gates for all outlets, which are rusted closed, and are inoperable, should be repaired.

2. Clear all brush, saplings and debris from the downstream slope. All coniferous trees should be removed while larger hardwood trees should not be removed, but should be inventoried and their condition monitored. If a tree dies, the area around the tree should then be monitored for possible seepage. A program of periodic mowing and cutting should be provided.

3. All trees and brush on the upstream face should be removed and a program of periodic cutting provided.

4. Slope paving stones missing from the upstream face should be replaced.

5. The aqueduct and outlet pipelines should be carefully inspected and their capacity confirmed.

6. Develop an emergency action plan for the project.

## SECTION 4 - OPERATION AND MAINTENANCE PROCEDURES

### 4.1 PROCEDURES

No written operation and maintenance procedures exist for the project. There is no normal operation of the project.

### 4.2 MAINTENANCE OF THE DAM

There is no regular maintenance schedule for the dam. The responsibility for day-to-day maintenance of the dam reportedly belongs to the Long Island State Park Commission Staff.

### 4.3 WARNING SYSTEM IN EFFECT

No warning system is in effect or in preparation.

### 4.4 EVALUATION

The overall maintenance of the Hempstead Lake Reservoir is considered inadequate in the following areas:

1. The reservoir outlets are inoperable due to an absence of operation and maintenance.
2. Control of trees and vegetation on the downstream face and to a limited extent on the upstream face.
3. No formal operation and maintenance manuals exist for the project.

## SECTION 5 - HYDROLOGIC/HYDRAULIC

### 5.1 DRAINAGE AREA CHARACTERISTICS

Hempstead Lake is located in the town of Hempstead, Nassau County, the State of New York (Hydrologic Unit Code 02030202). It is situated in the Hempstead Lake State Park just south of the Southern State Parkway. The Hempstead Lake drainage area, as can be outlined on the USGS quadrangle map, is 14.9 square miles. However, as in the adjacent East Meadow Brook which has a similar drainage area as the Hempstead Lake basin, it is estimated that only 9.8 square miles of the basin contributes to the storm runoff at the lake. The remaining 5.1 square miles north of the Northern State Parkway consist mainly of largely forested estates, and all the precipitation in this area, even during intense storms, infiltrates into the highly permeable sandy ground.

It has been estimated that in the "effective drainage area", some 32 percent of the area is impervious due to the roads, buildings, etc. and that the construction of storage ponds, for aquifer recharge, accounts for about a 15 percent rainfall loss. This "effective drainage area" is almost 100 percent urbanized and is drained by a number of storm-sewer sub-basins, which may or may not discharge within the basin. The detailed evaluation of the impact of these storm-sewers on the flood hydrographs is outside the scope of this Phase I investigation.

### 5.2 ANALYSIS CRITERIA

The Hempstead Lake drainage basin is ungauged. However, the adjacent East Meadow Brook basin is gauged and a unit hydrograph has been developed for the 10 square mile Hempstead sub-area. It is assumed, for the purposes of this study, that the basin characteristics are similar enough to transfer this unit hydrograph without any alterations. Loss parameters were estimated in accordance with U.S.G.S. Professional Paper 627-F (Ref.1) to reflect the high infiltration capacity of the pervious soil found in this basin. (Initial loss 2.2 inches; constant loss 0.24 inches per hour.) The Probable Maximum Precipitation (PMP) was taken from the National Weather Service Hydrometeorological Report No. 33. In accordance with the "Recommended Guidelines for Safety Inspections of Dam", the adequacy of the spillway was analyzed using the Probable Maximum Flood (PMF). A multi-plan analysis was performed to test the spillway under the full, 0.75, 0.50 and 0.25 PMF.

### 5.3 SPILLWAY CAPACITY

The spillway at Hempstead Lake is included as part of the inlet tower works. The spillway consists of four arched

openings six feet wide with a maximum height of 26 inches. The four openings have an invert elevation of 29 feet. The capacity of the spillway is limited to the capacity of the two 36-inch low level outlet pipes (323 cfs).

#### 5.4 RESERVOIR CAPACITY

The normal capacity of the Hempstead Lake is listed as 2,700 acre-feet (117.65 million gallons). However, it is estimated that the present capacity is about 1,400 acre-feet since the construction of the Southern State Parkway, which crosses through the original storage area. The computed surcharge storage between the spillway crest elevation (29.0 feet) and the top of the dam is 140 acre-feet, which is equivalent to approximately 0.17 inches of runoff over the "effective" drainage area.

#### 5.5 FLOODS OF RECORD

There are no records available of floods of maximum lake elevations. However, it is reported that the dam has not been overtopped in the last 20 years.

#### 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.

The analysis was performed assuming that the lake level was at spillway crest elevation (29.0 feet) at the start of the flood event. The computed inflow peak (PMF) is 15,460 cfs. The HEC-1B computer analysis indicated that the spillway is capable of passing about 2 percent of the PMF without the dam being overtopped. A summary of the results are as follows:

| <u>RATIO OF PMF</u> | <u>PEAK INFLOW</u> | <u>PEAK OUTFLOW</u> | <u>OVERTOPPING</u> |
|---------------------|--------------------|---------------------|--------------------|
| 1.00                | 15,460 cfs         | 15,370 cfs          | 2.54 ft            |
| 0.75                | 11,600 cfs         | 11,520 cfs          | 2.09 ft            |
| 0.50                | 7,730 cfs          | 7,610 cfs           | 1.57 ft            |
| 0.25                | 3,870 cfs          | 3,700 cfs           | 0.94 ft            |

#### 5.7 EVALUATION

The dam does not have sufficient spillway capacity to pass either the PMF or one-half (1/2) PMF, without overtopping the dam. The overtopping of the dam could cause the failure of the dam, thus significantly increasing the hazard for the loss of life downstream. The spillway is, therefore, 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 Observations

Visual observations did not indicate any structural problems with the embankment or appurtenant structures with the reservoir at its present level. There seems to be no adverse conditions which would affect the stability of the dam at the present time.

#### b. Design and Construction Data

Design and construction data is limited to a sketch of a typical original cross section of the dam. There are no design calculations or construction data available.

On the basis of performance, visual inspection as well as engineering judgment, the embankment and appurtenant structures appear to be adequate with the reservoir at its present level.

#### c. Operating Records

There are no operating records kept or available. There are no records or reports of any operational problems which would effect the stability of the dam.

#### d. Post-Construction Changes

It is reported that the dam was constructed in 1873 as shown on the sketch included in the drawings. Subsequent to the construction, at some unknown date, the crest was widened to 74 feet. Details of the changes are not available.

Visual observations, performance and engineering judgment indicate that the changes do not adversely effect the stability of the dam with the reservoir at its present level.

#### e. Stability Analysis

There is no concrete gravity structure, therefore the recommended Phase I guidelines do not warrant a structural stability analysis.

#### f. Seismic Stability

The dam is located in Seismic Zone 1 and in accordance with recommended Phase 1 guidelines, does not warrant seismic analysis.

## 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 two percent of the PMF. The overtopping of the dam could cause the erosion of the abutments and the downstream face of the dam resulting in dam failure, thus significantly increasing the hazard for 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.

#### 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 one-half (1/2) PMF event.

#### d. Urgency

The additional hydrologic/hydraulic 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 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 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. The gates for all low level outlets should be made operable.
2. Clear all brush, saplings and debris from the downstream slope. All coniferous trees should be removed, while larger hardwood trees should not be removed but should be inventoried and their condition monitored. If a tree dies, the area around the tree should then be monitored for possible seepage. A program of periodic mowing and cutting should be provided.
3. All trees and brush on the upstream face should be removed and periodic mowing and cutting provided.
4. Slope paving stones missing from the upstream face should be replaced.
5. The aqueduct and outlet pipeline should be carefully inspected and their capacity confirmed.
6. Provide a program of periodic inspection and maintenance of the dam and appurtenances including yearly operation and lubrication of the reservoir outlet system. Document this information for future reference. The emergency action plan described in Section 7.1d should be maintained and updated periodically during the life of the structure.

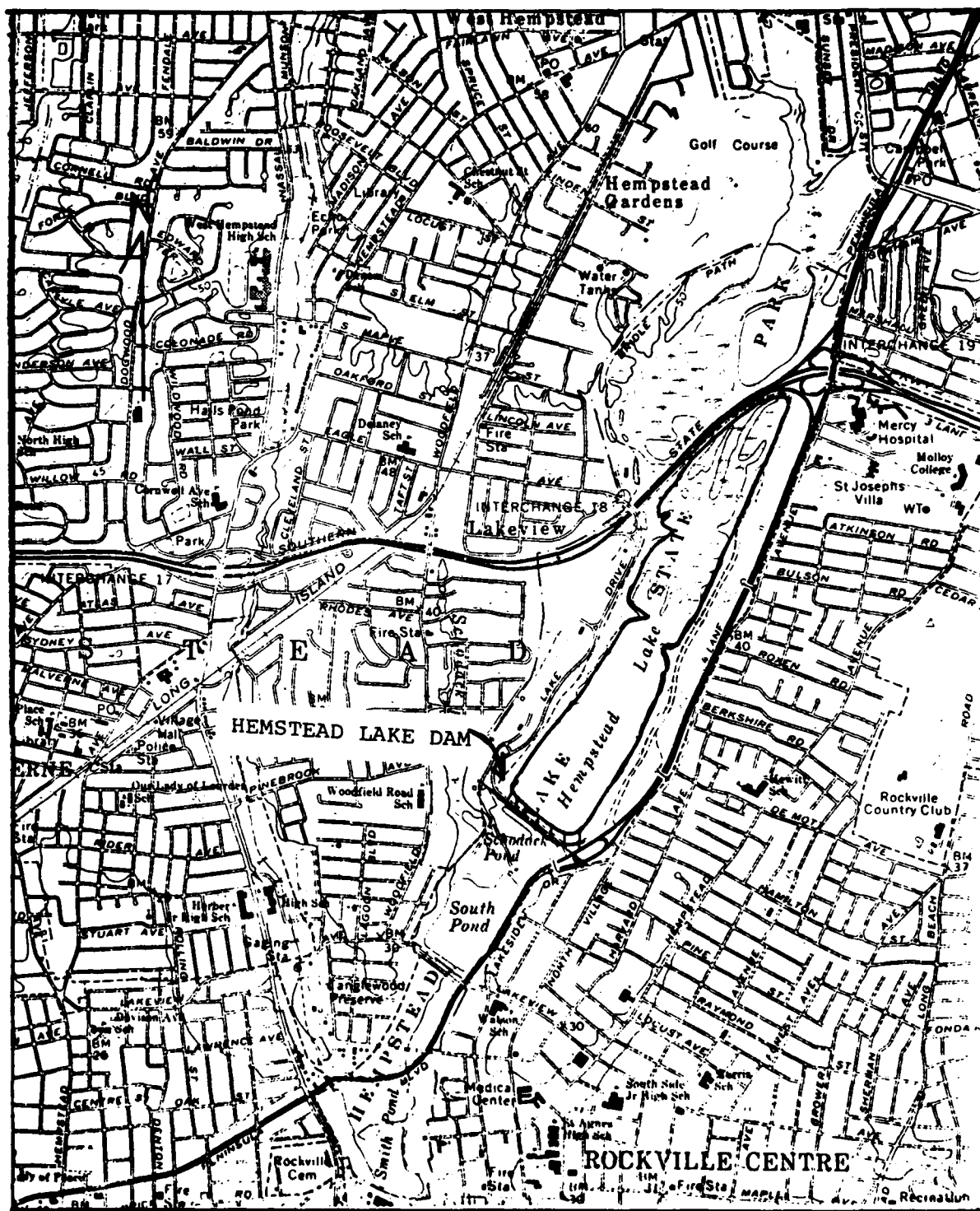
DRAWINGS

APPENDIX A

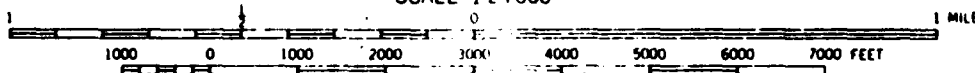


Scale 1" = 1.3 miles

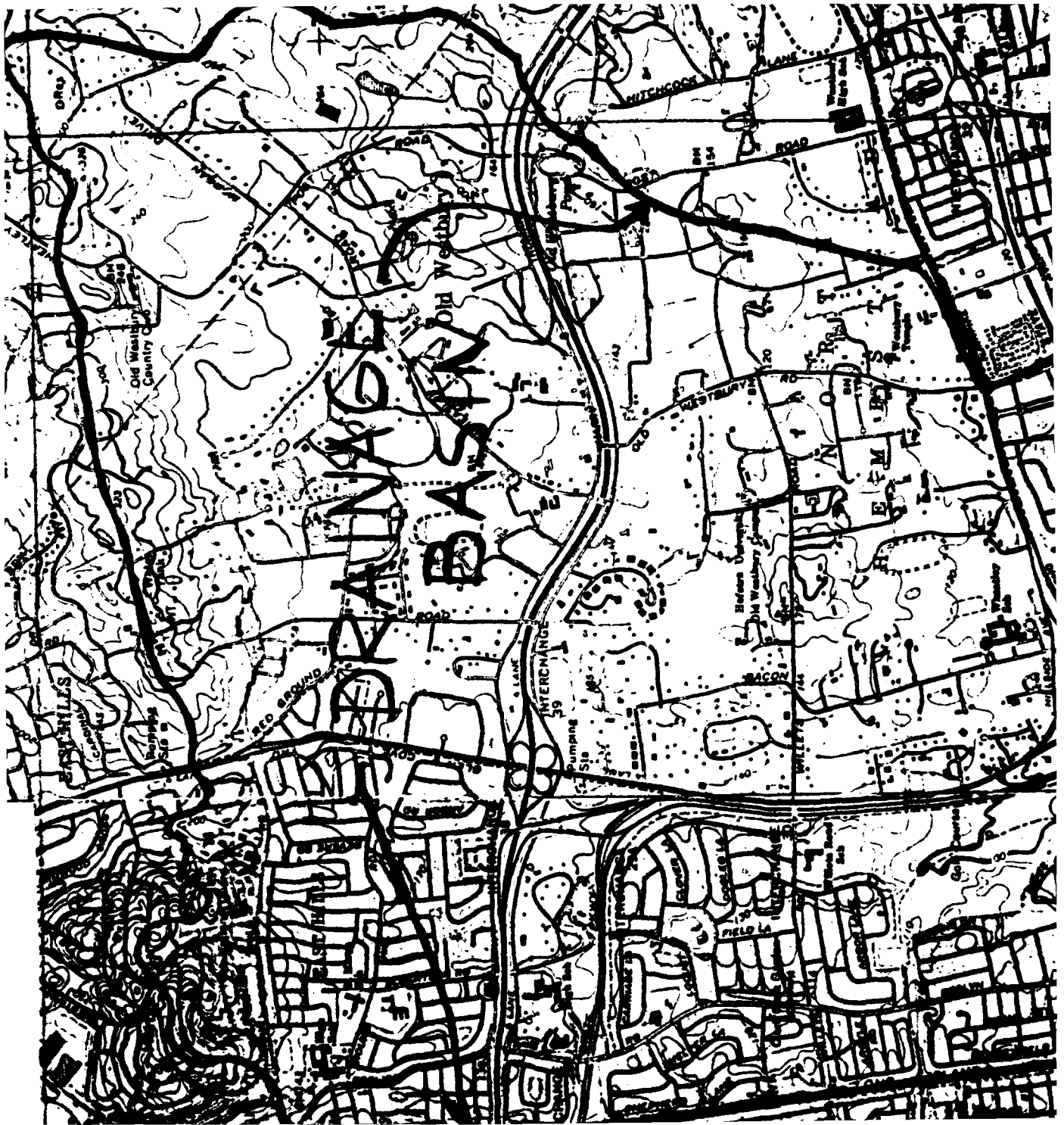
HEMSTEAD LAKE  
DAM  
VICINITY MAP



SCALE 1:24000



LYNBROOK, NEW YORK QUAD TOPOGRAPHIC MAP  
HEMSTEAD LAKE DAM





LYNBROOK, N.Y. QUAD  
FREEPORT, N.Y. QUAD  
HICKSVILLE, N.Y. QUAD  
SEA CLIFF, N.Y. QUAD

30  
TOPOGRAPHIC MAP  
HEMPSTEAD LAKE DAM

FREEPORT, N.Y.  
HEMPSTEAD LAKE DAM



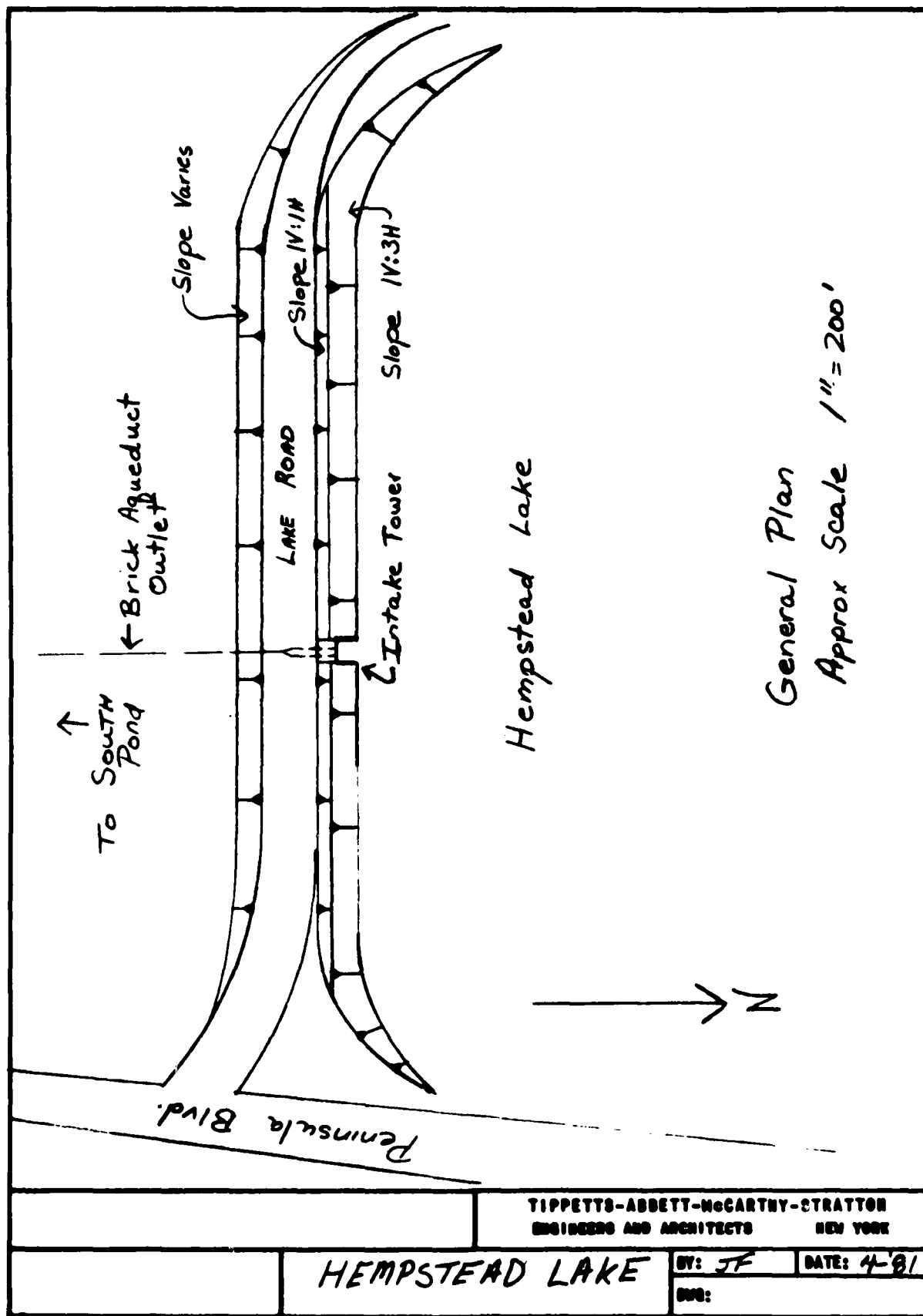
OOK, N.Y. QUAD  
ORT, N.Y. QUAD  
VILLE, N.Y. QUAD  
LIFF, N.Y. QUAD

30

TOPOGRAPHIC MAP  
EMPSTEAD LAKE DAM



4



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

HEMPSTEAD LAKE

BY: JF

DATE: 4-81

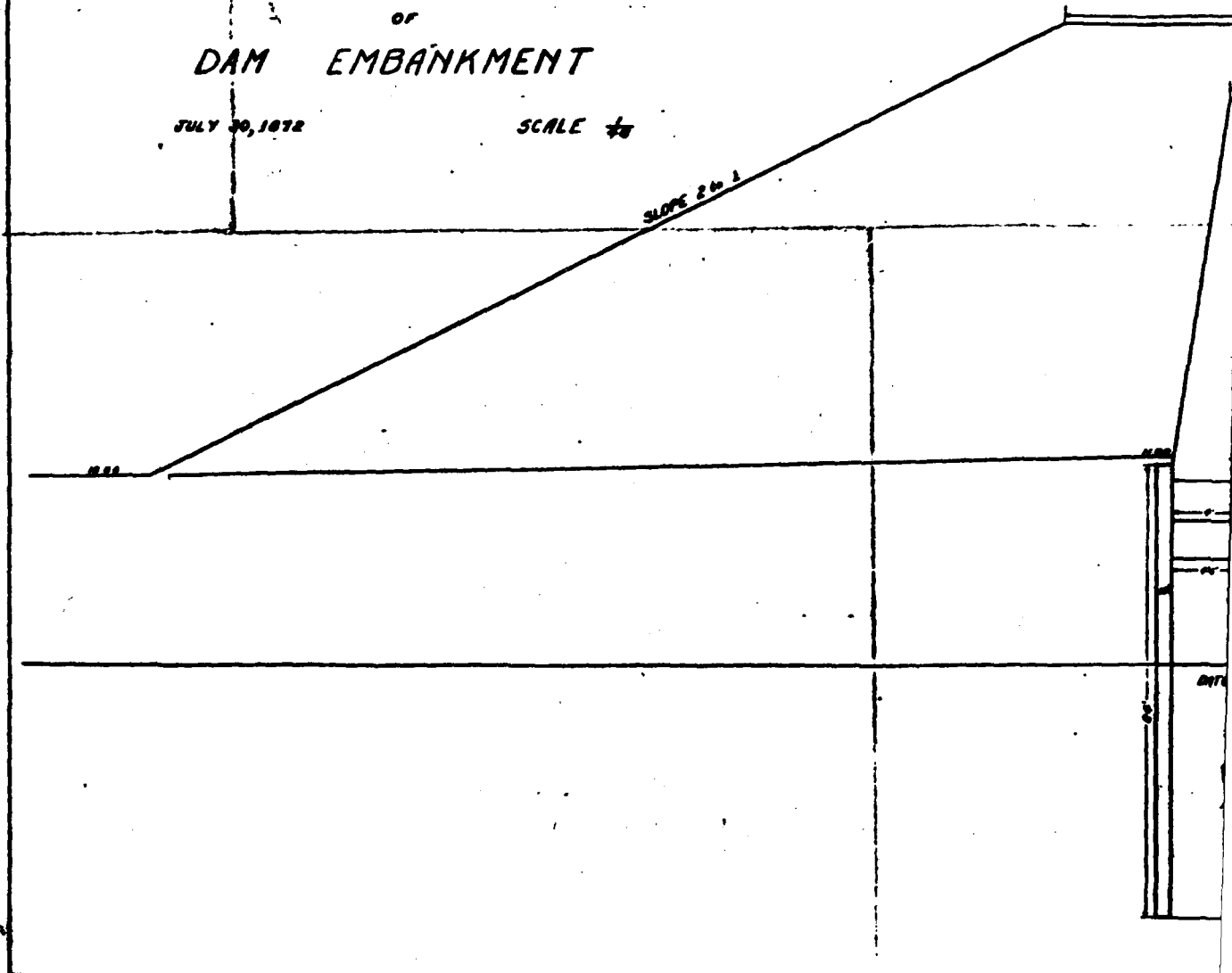
CHK:

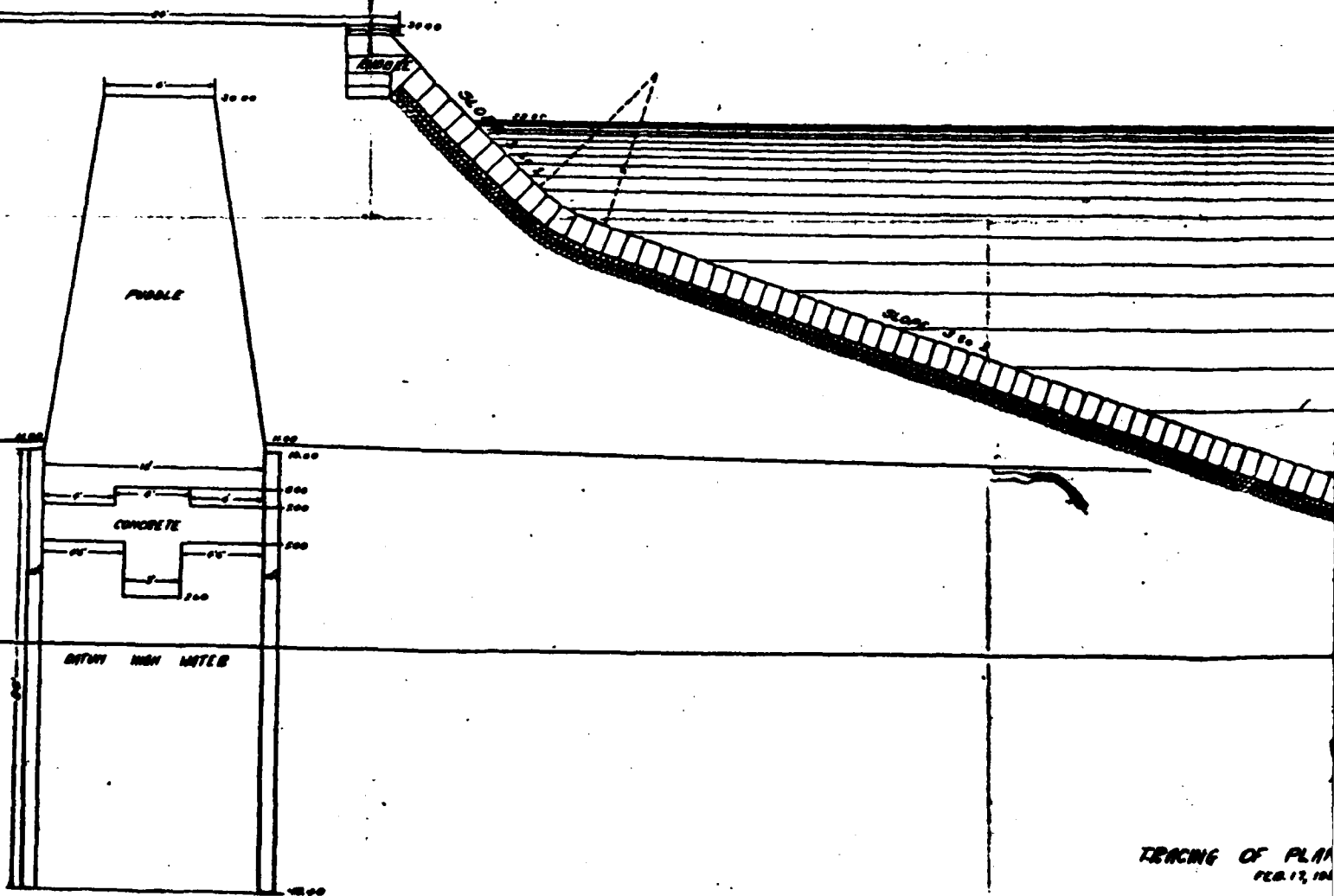
N.M.D.  
NORTH PLATEAU  
STORAGE RESERVOIR

SECTION  
OF  
DAM EMBANKMENT

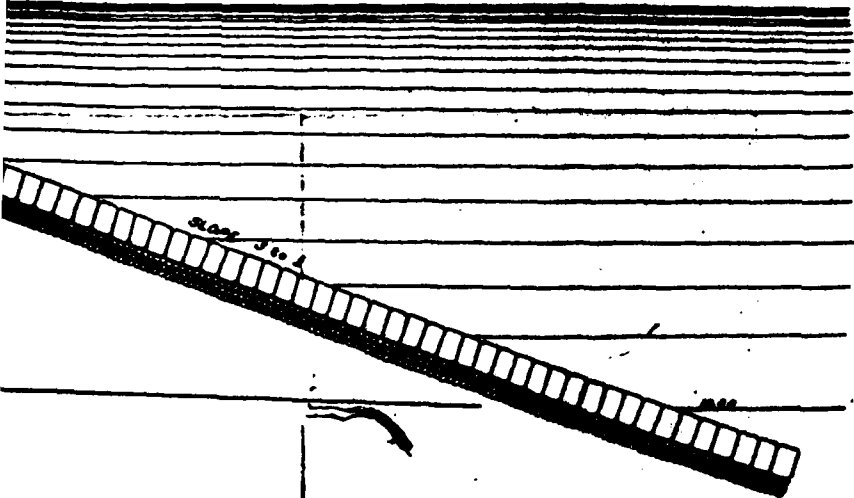
JULY 30, 1972

SCALE  $\frac{1}{4}$ "





DESIGN OF DAM  
 FEB. 17, 1941  
 FILE N-2

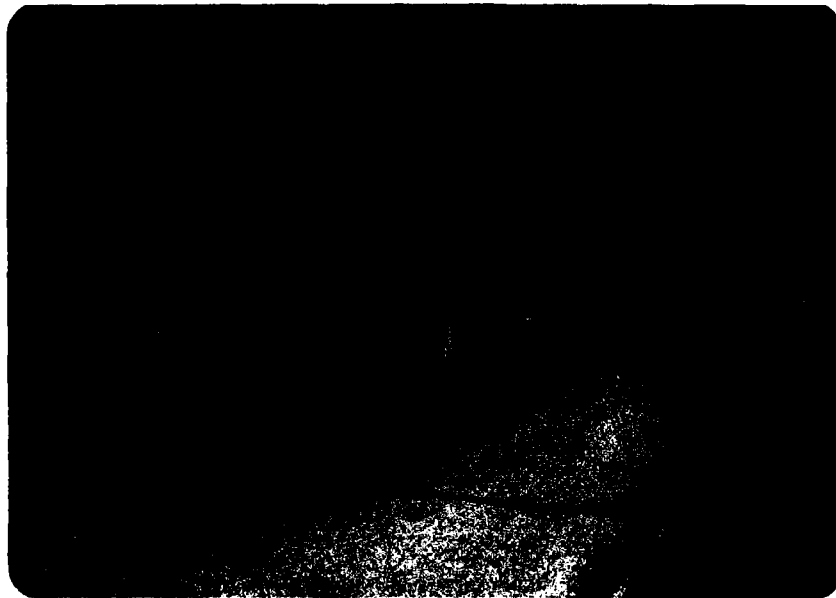


173  
1.1

TRACING OF PLAN - 704  
FEB 12, 1908  
FILE M-2

PHOTOGRAPHS

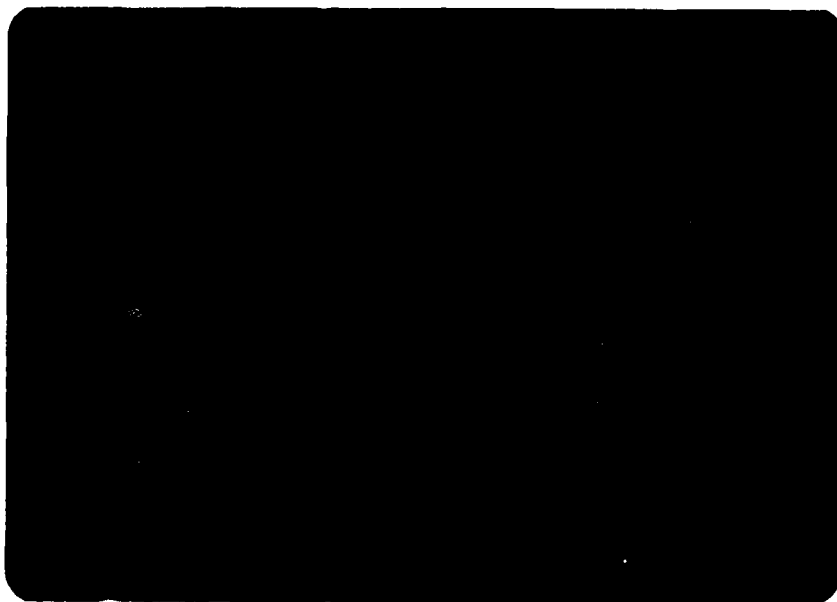
APPENDIX B



2. VIEW OF CREST LOOKING TOWARDS  
RIGHT ABUTMENT



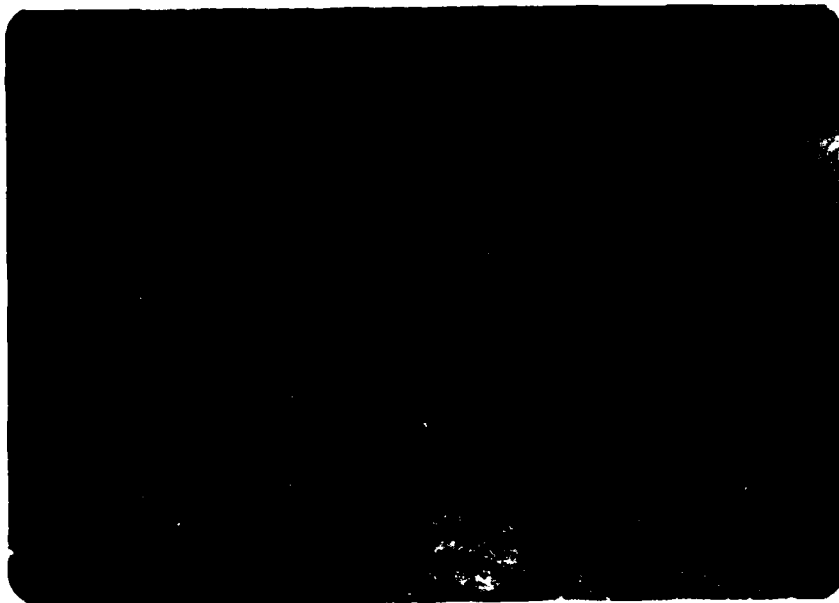
3. VIEW OF UPSTREAM SIDE OF DAM



4. VIEW OF UPSTREAM FACE LOOKING TOWARDS  
RIGHT ABUTMENT FROM GATEHOUSE



5. VIEW OF UPSTREAM FACE LOOKING TOWARDS  
LEFT ABUTMENT FROM GATEHOUSE



6. VIEW OF DOWNSTREAM FACE OF DAM



7. OUTLET OF AQUEDUCT FROM HEMPSTEAD LAKE  
AT SOUTH POND



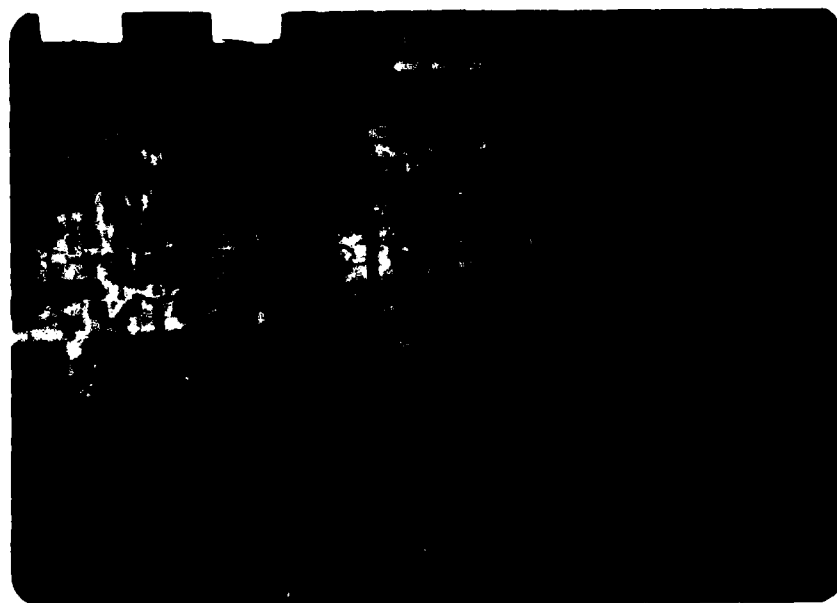
8. VIEW OF GATE-  
HOUSE SHOWING  
EMERGENCY SPILL-  
OVER INLETS



9. VIEW OF SPILLOVER INLETS AND INTERIOR OF  
INTAKE STRUCTURE



10. CONTROL VALVES FOR GATES (TWO RIGHT GATES)



11. CONTROL VALVES FOR GATES (TWO LEFT GATES)



12. TWO UPPERMOST LOW LEVEL WATER SUPPLY INLETS

**VISUAL INSPECTION CHECKLIST**

**APPENDIX C**

VISUAL INSPECTION CHECKLIST

1) Basic Data

a. General

Name of Dam Hempstead Lake Dam

Fed. I.D. # Ny 108 DEC Dam No. 234-193

River Basin Long Island

Location: Town Rockville Centre County Nassau

Stream Name Mill River

Tributary of

Latitude (N) 40°-40.4' Longitude (W) 73°-38.9'

Type of Dam Earth

Hazard Category HIGH (1)

Date(s) of Inspection March 13, 1981

Weather Conditions Sunny - Temp. LOW 50°F

Reservoir Level at Time of Inspection

b. Inspection Personnel Harvey Feldman, Joe Fiteni, Jr.

c. Persons Contacted (Including Address & Phone No.) MR Art LARSON

N.Y.C. Bureau of Water Supply, 119-45 Union TPK, Forest

Hills, N.Y. 11375. (212) 520-3467. Also MR Ed Conway at  
same address.

MR. Leonard Vencott, Maintenance Assis LISPC. Hempstead Lake State Park.

d. History:

Date Constructed July 1872 Date(s) Reconstructed

Designer Not known

Constructed By Not known

Owner New York City

Embankment

a. Characteristics

- (1) Embankment Material Granular with impervious core and stone pavement on upstream face
- (2) Cutoff Type Walled cutoff trench with "puddled" fill, type unknown
- (3) Impervious Core yes but material type not known
- (4) Internal Drainage System none
- (5) Miscellaneous See sketch

b. Crest

- (1) Vertical Alignment good
- (2) Horizontal Alignment good, not the original as shown on plan # 784, Crest has been widened to 74' by adding fill to d/s side
- (3) Surface Cracks None visible
- (4) Miscellaneous Crest width has been tripled to accomodate highway

c. Upstream Slope

- (1) Slope (Estimate) (V:H) Upper 1V:1H, Lower 3V:1H
- (2) Undesirable Growth or Debris, Animal Burrows Few small trees growing through stone paving
- (3) Sloughing, Subsidence or Depressions None visible

(4) Slope Protection Stone paving in excellent condition, well maintained, Few small paving stones missing

(5) Surface Cracks or Movement at Toe None visible

d. Downstream Slope

(1) Slope (Estimate - V:H) 1V:1H, originally 1V:2H, changed due to widening of crest for highway

(2) Undesirable Growth or Debris, Animal Burrows Fully overgrown with brush & trees up to 18"  $\phi$ .

(3) Sloughing, Subsidence or Depressions No sloughing or subsidence. Some depressions due to footpaths (parallel & perpendicular) and surface drainage running in footpaths

(4) Surface Cracks or Movement at Toe None evident

(5) Seepage None evident

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

(7) Condition Around Outlet Structure Outlet structure not visible

(8) Seepage Beyond Toe None evident

e. Abutments - Embankment Contact

Good

(1) Erosion at Contact None

(2) Seepage Along Contact None

**(3) Drainage System**

a. Description of System None

b. Condition of System None

c. Discharge from Drainage System None

**(4) Instrumentation (Monumentation/Surveys, Observation Wells, Weirs, Piezometers, Etc.) None present**

5) Reservoir

- a. Slopes Very minor relief in the area. No large slopes, small slopes are stable
- b. Sedimentation Some fine sand on upstream face, particularly near left abutment.
- c. Unusual Conditions Which Affect Dam Inflow to reservoir from overflow of reservoir to north through conduits under Southern State Hwy.

6) Area Downstream of Dam

- a. Downstream Hazard (No. of Homes, Highways, etc.) High - Dam located in suburban area, adjacent to and upstream of major highways and two smaller dams.
- b. Seepage, Unusual Growth some growth downstream
- c. Evidence of Movement Beyond Toe of Dam None
- d. Condition of Downstream Channel No downstream channel

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

"Spillways" consist of overflows in outlet works and therefore discharge into Aqueducts.

- a. General Spillways are four high level uncontrolled broadcrested openings in outlet works. Discharge is into Aqueduct works
- b. Condition of Service Spillway Not known.  
Openings are the only visible part of spillway. These are in good condition.

c. Condition of Auxiliary Spillway

None

d. Condition of Discharge Conveyance Channel

Not Visible, part of Aqueduct System.

Reservoir Drain/Outlet

Type: Pipe

Conduit

Other

Horseshoe Aqueduct

Material: Concrete

Metal

Other

Brick

Size: 6' base width 4 1/2' high Length unknown 2 1/4 mile minimum

Invert Elevations: Entrance ≈ 10 fmsl Exit 25' msl

Physical Condition (Describe):

Unobservable

☒

Material:

Not Visible

Joints:

Alignment

Structural Integrity:

Hydraulic Capability:

Means of Control: Gate 5 gates Valve

Uncontrolled

Operation: Operable

Inoperable

Other

☒

Present Condition (Describe):

gates are rusted in position  
rods missing etc. Not maintained

9) Structural

a. Concrete Surfaces See items 7, and 8

b. Structural Cracking See items 7, and 8

c. Movement - Horizontal & Vertical Alignment (Settlement) NA

d. Junctions with Abutments or Embankments NA

e. Drains - Foundation, Joint, Face NA

f. Water Passages, Conduits, Sluices See items 7, and 8

g. Seepage or Leakage NA

h. Joints - Construction, etc. See items 7, and 8

i. Foundation N/A

j. Abutments N/A

k. Control Gates See items 8

l. Approach & Outlet Channels See items 6 and 8

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

n. Intake Structures See items 6 and 8

o. Stability N/A

p. Miscellaneous N/A

10) Appurtenant Structures (Powerhouse, Lock, Gatehouse, Other)

a. Description and Condition

No Appurtenant  
Structures present.

HYDROLOGIC DATA AND COMPUTATIONS

APPENDIX D

CHECK LIST FOR DAMS  
HYDROLOGIC AND HYDRAULIC  
ENGINEERING DATA

1

AREA-CAPACITY DATA:

|                                            | <u>Elevation</u><br>(ft.) | <u>Surface Area</u><br>(acres) | <u>Storage Capacity</u><br>(acre-ft.) |
|--------------------------------------------|---------------------------|--------------------------------|---------------------------------------|
| 1) Top of Dam                              | <u>+34.0</u>              | <u>179</u>                     | <u>2300</u>                           |
| 2) Design High Water<br>(Max. Design Pool) |                           |                                |                                       |
| 3) Auxiliary Spillway<br>Crest             | <u>None</u>               |                                |                                       |
| 4) Pool Level with<br>Flashboards          | <u>None</u>               |                                |                                       |
| 5) Service Spillway<br>Crest               | <u>+ 29.0</u>             | <u>148</u>                     | <u>1400</u>                           |

DISCHARGES

|                                                   | <u>Volume</u><br>(cfs)                                 |
|---------------------------------------------------|--------------------------------------------------------|
| 1) Average Daily                                  | <u>unknown</u>                                         |
| 2) Spillway @ Maximum High Water                  | <u>323</u>                                             |
| 3) Spillway @ Design High Water                   | <u>unknown</u>                                         |
| 4) Spillway @ Auxiliary Spillway Crest Elevation  | <u>unknown</u>                                         |
| 5) Low Level Outlet                               | <u>unknown</u>                                         |
| 6) Total (of all facilities) @ Maximum High Water | <u>capacity coincident with<br/>Spillway Capacity.</u> |
| 7) Maximum Known Flood                            | <u>unknown</u>                                         |
| 8) At Time of Inspection                          | <u>None</u>                                            |

## CREST:

ELEVATION: 34 ftType: MACADAM Paved RoadwayWidth: 74 ft Length: 1200 ftSpillover: PART OF OUTLET WORKSLocation: IN Tower

## SPILLWAY:

## SERVICE

NONE

## AUXILIARY

Elevation + 29.0'Type 4 Broad Crested SillsWidth 6.0 ft x 4Type of ControlUncontrolled ✓

Controlled:

Type  
(Flashboards; gate)

Number

Size/Length

Invert Material

Anticipated Length  
of operating serviceChute Length Not KnownHeight Between Spillway Crest  
& Approach Channel Invert  
(Weir Flow) ≈ 10 ft.

HYDROMETEROLOGICAL GAGES: None Used in Calcs.

Type : \_\_\_\_\_

Location: \_\_\_\_\_

Records: NONE AVAILABLE

Date - \_\_\_\_\_

Max. Reading - \_\_\_\_\_

FLOOD WATER CONTROL SYSTEM:

Warning System: None

Method of Controlled Releases (mechanisms):

5 Low Level Outlets in Tower feeding  
Single Brick Aqueduct.

4

DRAINAGE AREA: 14.9 sq. miles

DRAINAGE BASIN RUNOFF CHARACTERISTICS:

Land Use - Type: URBAN

Terrain - Relief: Flat

Surface - Soil: Highly Permeable Sandy Soil

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

Urban development is estimated to cover 32% of basin (roads, parking lots etc). Natural runoff affected by storm sewers and detention basins

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

Unknown

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

Parkway Constructed Across Original reservoir, potential for backwater in this area

Dikes - Floodwalls (overflow & non-overflow) - Low reaches along the  
Reservoir perimeter: None observed

Location: \_\_\_\_\_

Elevation: \_\_\_\_\_

Reservoir:

Length @ Maximum Pool 1.2 (Miles)

Length of Shoreline (@ Spillway Crest) 2.7 (Miles)

# TAMS

Job No. \_\_\_\_\_  
 Project HEMPSTEAD LAKE DAM INSPECTION  
 Subject HYDROLOGIC & HYDRAULIC COMPUTATIONS

Sheet 1 of 24  
 Date MAR 21 1981  
 By DLC  
 Chk. by \_\_\_\_\_

TOTAL BASIN AREA 14.9 SQ MILES  
 AREA N of PARKWAY (NON CONTRIBUTING) = 5.1 SQ MILES  
 SUBAREA for RUNOFF COMPUTATION = 9.8 SQ MILES

UNIT Hydrograph developed for 10 sq mile sub-area  
 of East Meadow Brook adapted for use (USGS Prof Paper 627-B)

| TIME | Q   |
|------|-----|
| 0    | 0   |
| 1    | 20  |
| 2    | 50  |
| 3    | 220 |
| 4    | 620 |
| 5    | 860 |
| 6    | 920 |
| 7    | 780 |
| 8    | 600 |
| 9    | 430 |
| 10   | 340 |
| 11   | 260 |
| 12   | 200 |
| 13   | 170 |
| 14   | 130 |
| 15   | 120 |
| 16   | 100 |
| 17   | 85  |
| 18   | 75  |
| 19   | 65  |
| 20   | 58  |
| 21   | 50  |
| 22   | 42  |
| 23   | 32  |
| 24   | 20  |
| 25   | 15  |
| 26   | 10  |
| 27   | 5   |
| 28   | 0   |

Runoff  $\frac{6315 \cdot 60 \times 60 \times 12}{9.8 \times 640 \times 43560} = 1 \text{ inch.}$

Assume INITIAL Loss = 2.2"

CONSTANT Loss = 0.24 in/hr

% Impervious BASIN = 32 %

$\Sigma 6315$

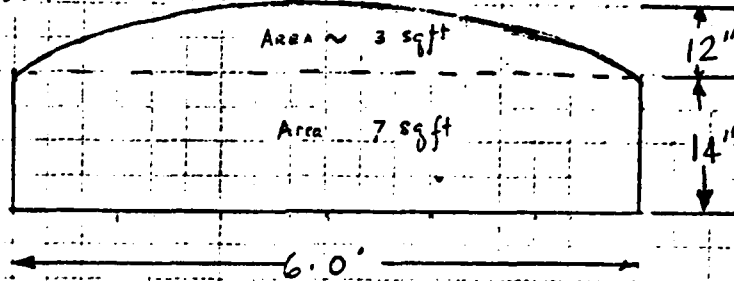
# TAMS

Job No. \_\_\_\_\_  
 Project HEMPSTEAD LAKE DAM  
 Subject HYDRAULIC COMPUTATIONS

Sheet 2 of 24  
 Date 3/31/81  
 By DLC  
 Ch'k. by \_\_\_\_\_

TOWER OPENING

Crest El. 29.0 MSL



| El            | h  | $Q \cdot CLH^{3/2} (x 4)$ | $Q \cdot C.O.S \cdot CL \sqrt{gh}$ | $x 4$ | $Q$   |
|---------------|----|---------------------------|------------------------------------|-------|-------|
| 29.0          | 0  | 0                         |                                    |       | INLET |
| 30            | 1  | 18.6                      | 74                                 |       | 74    |
| 31            | 2  | 50                        | 200                                |       | 200   |
| 32            | 3  |                           | 70                                 | 280   | 280   |
| Top of Dam 34 | 5  |                           | 90                                 | 360   | 360   |
| 36            | 7  |                           | 106                                | 424   | 420   |
| 38            | 9  |                           | 120                                | 480   | 480   |
| 40            | 11 |                           | 133                                | 532   | 530   |

| Outlet | 36" $\phi$ | CI Pipe | Invert |
|--------|------------|---------|--------|
| El     | H          | Q       |        |
| 31     | 19.5       | 150     | 300    |
| 32     | 20.5       | 154     | 308    |
| 34     | 22.5       | 161.5   | 323    |
| 36     | 24.5       | 168.5   | 337    |
| 38     | 26.5       | 175     | 350    |

10, A = 7.07, C = 0.6

# TAMS

Job No. \_\_\_\_\_

Project \_\_\_\_\_

Subject \_\_\_\_\_

HEMPSTEAD LAKE DAM

HYDROLOGIC / HYDRAULIC COMPUTATIONS

Sheet 3 of 24

Date APRIL 81

By D.L.C

Ch'k. by \_\_\_\_\_

Assume CRITICAL FLOW OVER DAM (EL - 34.0)  
L = 1200'

C = 3.09

| EL | Q     |
|----|-------|
| 34 | 0     |
| 36 | 10487 |
| 38 | 29664 |

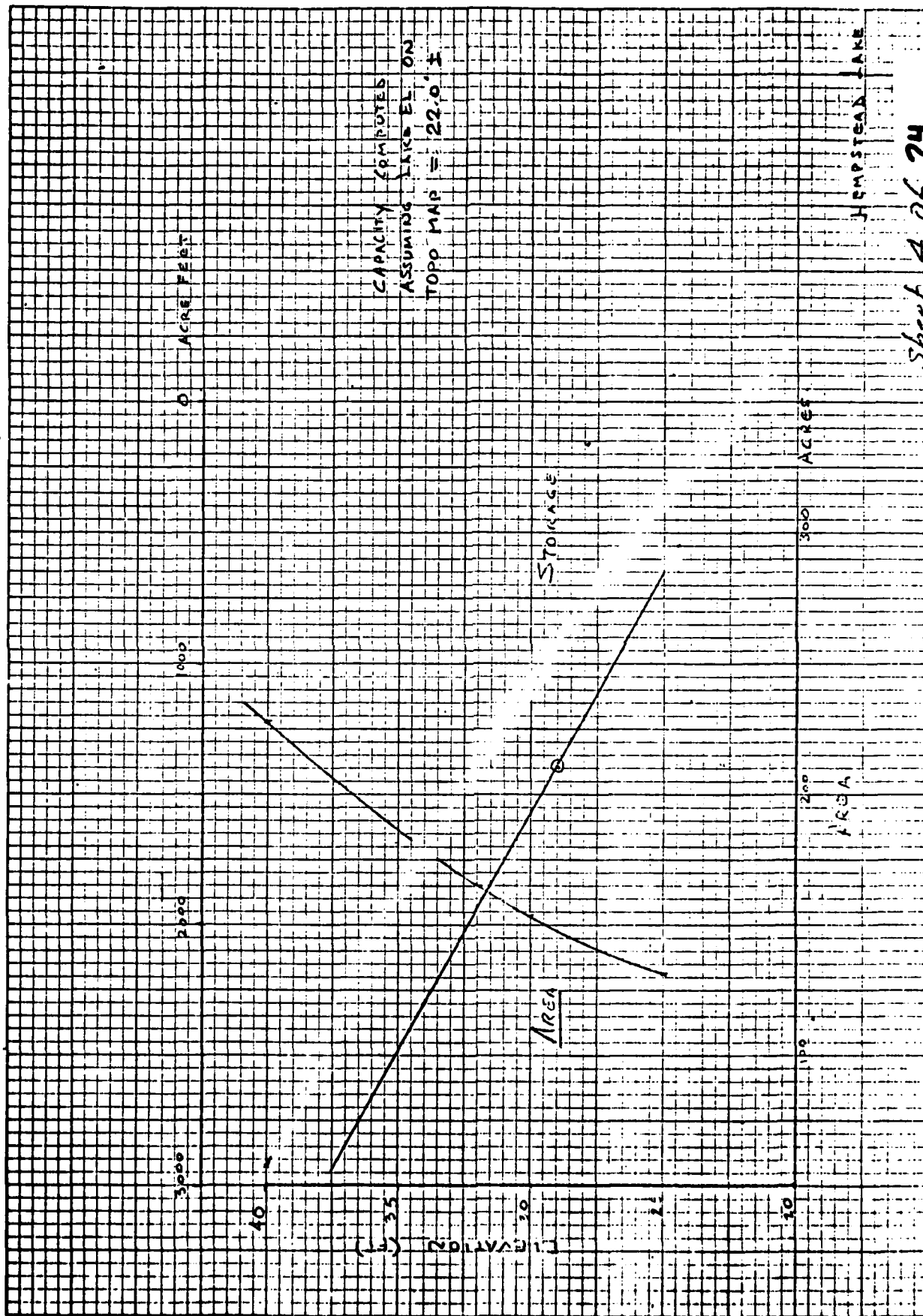
Spillway DISCHARGE

| EL   | Q   |
|------|-----|
| 29   | 0   |
| 30   | 74  |
| 31   | 200 |
| 32   | 280 |
| * 34 | 323 |
| 36   | 337 |
| 38   | 350 |

Spillway DISCHARGE CONTROLLED BY  
CI Pipes at & above EL 34.

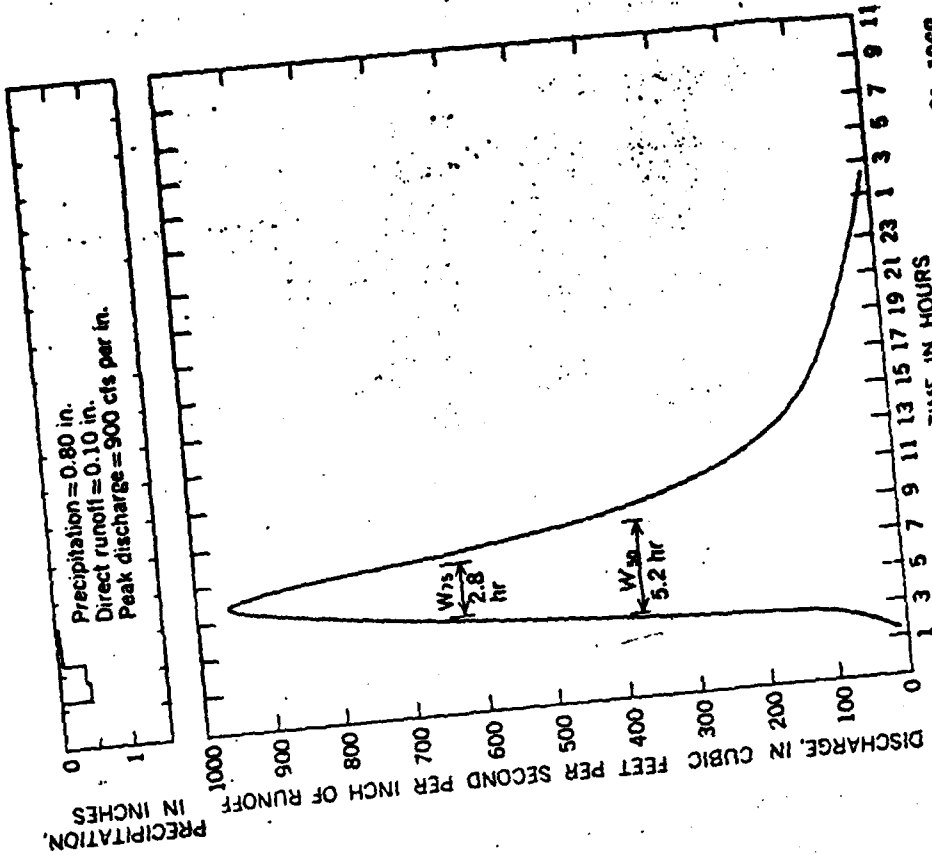
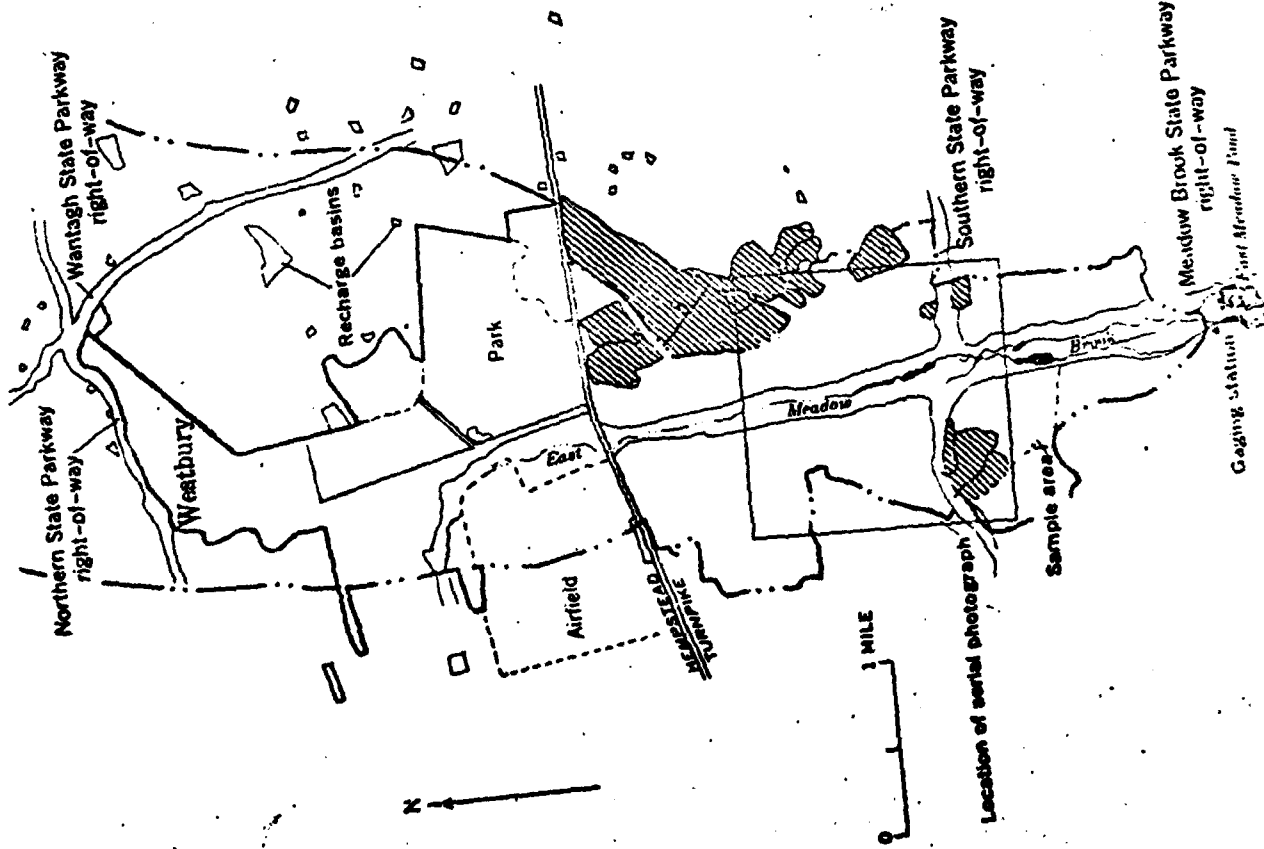
ESTIMATED LAKE STORAGE

| EL | STORAGE |
|----|---------|
| 25 | 650     |
| 29 | 1400    |
| 34 | 2300    |
| 36 | 2660    |



Sheet 4 of 24

REFERENCE NO.



M. One-hour unit hydrograph of the storm on August 21, 1962, in the Hempstead subarea

MAP OF EAST MEADOW BROOK DRAINAGE AREA  
AND 1-HOUR UNIT HYDROGRAPH OF STORM  
ON AUGUST 21, 1962, IN THE HEMPSTEAD SUBAREA.

000170-10A-1AB-1-AP-10-1-100

## PREFVIEW OF SEQUENCE OF STREAP NETWORK CALCULATIONS

Sheet 6 of 24

Sheet 7 of 24

UNITED STATES DEPARTMENT OF JUSTICE  
FEDERAL BUREAU OF INVESTIGATION  
WASHINGTON, D. C. 20535

DATE: 01/08/07.  
TIME: 12.25.43.

WEMPSTEAD LAKE DAM INSPECTION  
SOUTH POND DAM INSPECTION  
HEC-1DB PMF ANALYSIS

| JOB SPECIFICATION |     |      |      |     |      |       |      |      |       |
|-------------------|-----|------|------|-----|------|-------|------|------|-------|
| NO                | NMR | MWTH | IDAY | INR | IMIN | METRC | IPLT | JPRY | WSTAN |
| 00                | 1   | Q    | Q    | Q   | Q    | Q     | Q    | Q    | Q     |
|                   |     |      | JOPR | 5   |      | TRACE |      |      |       |

MULTI-PLAN ANALYSES TO BE PERFORMED  
NPLAN= 1 NRATIO= 4 LATIO= 1  
RTIO= 1.00 .75 .50 .25

## SUB-AREA RINGOFF COMPUTATION

## 1 HEMPSTEAD LAKE INFLOW

| ISTAQ | ICOMP | IECON | IIAPE | JPLY | JPRY | INAME | ISTAGE | IAUTO |
|-------|-------|-------|-------|------|------|-------|--------|-------|
| 1     | 0     | 0     | 0     | 0    | 0    | 1     | 0      | 0     |

| HYDROGRAPH DATA |      |       |      |       |       |       |       |       |       |
|-----------------|------|-------|------|-------|-------|-------|-------|-------|-------|
| JUN96           | JUNE | YAREA | SNAP | TASDA | THSPC | RATIO | ISNOV | ISARE | LOCAL |
| 1               | -1   | 9.20  | 0.00 | 14.90 | 0.00  | 0.000 | 0     | 1     | 0     |

| PRECIP DATA |       |        |        |        |        |      |
|-------------|-------|--------|--------|--------|--------|------|
| SPFE        | PR'S  | R6     | R17    | R24    | R48    | R72  |
| 0.00        | 23.00 | 110.00 | 120.00 | 128.00 | 140.00 | 0.00 |
|             |       |        |        |        |        | 0.00 |

| LOSS DATA |      |      |       |       |       |       |       |       |       |       |
|-----------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|
| LCRPT     | STRN | DLTK | RTIOL | ENAIN | STNKS | RTIOK | STRTL | CNSTL | ALSHX | RTIMP |
| 0         | 0.00 | 0.00 | 1.00  | 0.00  | 0.00  | 1.00  | 2.20  | .24   | 0.00  | .32   |

|                   |                           |                                  |      |      |
|-------------------|---------------------------|----------------------------------|------|------|
|                   | GIVEN UNIT GRAPH, NUMERO= | 30                               |      |      |
| 220.              | 660.                      | 920.                             | 780. | 600. |
| 170.              | 130.                      | 100.                             | 85.  | 75.  |
| 32.               | 20.                       | 15.                              | 10.  | 3.   |
| UNIT GRAPH TOTALS | 6315.                     | CFS OR 1.00 INCHES OVER THE AREA | 0.   | 0.   |
|                   |                           |                                  | 430. | 360. |
|                   |                           |                                  | 65.  | 58.  |
|                   |                           |                                  | 0.   | 0.   |

```

RECESSION DATA
STRTO= -1.00  QMCSN= -.05  RTTOR= 1.50
END-OF-PERIOD FLOW

```

Sheet 8 of 24

| MO-DA | HR-MN | PERIOD | RAIN | EXCS | LOSS | COMP Q | WQ-DA | HR-MN | PERIOD | RAIN | FHCS | LOSS | COMP Q |
|-------|-------|--------|------|------|------|--------|-------|-------|--------|------|------|------|--------|
| 1-01  | 1-00  | 1      | .01  | .00  | .01  | 9.     | 1-02  | 7-00  | 31     | .31  | .15  | .16  | 188.   |
| 1-01  | 2-00  | 2      | .01  | .00  | .01  | 9.     | 1-02  | 8-00  | 12     | .31  | .15  | .16  | 203.   |
| 1-01  | 3-00  | 3      | .01  | .00  | .01  | 10.    | 1-02  | 9-00  | 33     | .31  | .15  | .16  | 233.   |
| 1-01  | 4-00  | 4      | .01  | .00  | .01  | 11.    | 1-02  | 10-00 | 34     | .31  | .15  | .16  | 316.   |
| 1-01  | 5-00  | 5      | .01  | .00  | .01  | 13.    | 1-02  | 11-00 | 35     | .31  | .15  | .16  | 416.   |
| 1-01  | 6-00  | 6      | .01  | .00  | .01  | 16.    | 1-02  | 12-00 | 36     | .31  | .15  | .16  | 526.   |
| 1-01  | 7-00  | 7      | .01  | .01  | .01  | 18.    | 1-02  | 13-00 | 37     | 2.06 | 1.90 | .16  | 649.   |
| 1-01  | 8-00  | 8      | .01  | .01  | .01  | 18.    | 1-02  | 14-00 | 38     | 2.06 | 1.90 | .16  | 831.   |

|            | PEAK   | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|------------|--------|--------|---------|---------|--------------|
| CS         | 15462. | 12669. | 5341.   | 7235.   | 134304.      |
| CS         | 434.   | 359.   | 151.    | 62.     | 3003.        |
| INCHES     |        | 12.03  | 20.28   | 21.25   | 21.25        |
| PM         |        | 305.45 | 515.09  | 539.68  | 539.68       |
| AC-FT      |        | 6282.  | 10594.  | 11100.  | 11100.       |
| THOUS CU M |        | 7749.  | 12667.  | 13691.  | 13691.       |

HYDROGRAPH AT STA 1 FOR PLAN 1, RICH 1

| HYDROGRAPH AT STA. _____ |  |        |  |        |  |        |  |        |  |
|--------------------------|--|--------|--|--------|--|--------|--|--------|--|
| 9.                       |  | 10.    |  | 11.    |  | 12.    |  | 13.    |  |
| 33.                      |  | 46.    |  | 53.    |  | 68.    |  | 11.    |  |
| 497.                     |  | 312.   |  | 292.   |  | 233.   |  | 111.   |  |
| 148.                     |  | 203.   |  | 314.   |  | 416.   |  | 14.    |  |
| 4763.                    |  | 12194. |  | 14720. |  | 15467. |  | 649.   |  |
| 3486.                    |  | 2631.  |  | 2427.  |  | 2040.  |  | 11402. |  |
|                          |  |        |  |        |  |        |  | 1754.  |  |
|                          |  |        |  |        |  |        |  | 1512.  |  |
|                          |  |        |  |        |  |        |  | 1305.  |  |
|                          |  |        |  |        |  |        |  | 1129.  |  |
|                          |  |        |  |        |  |        |  | 20.    |  |
|                          |  |        |  |        |  |        |  | 270.   |  |
|                          |  |        |  |        |  |        |  | 398.   |  |
|                          |  |        |  |        |  |        |  | 162.   |  |
|                          |  |        |  |        |  |        |  | 1278.  |  |
|                          |  |        |  |        |  |        |  | 2686.  |  |
|                          |  |        |  |        |  |        |  | 5318.  |  |
|                          |  |        |  |        |  |        |  | 6839.  |  |
|                          |  |        |  |        |  |        |  | 949.   |  |

Sheet 9 of 24

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2

| HYDROGRAPH AT STA |     | 1 FOR PLAN 1, RTO 2 |      |
|-------------------|-----|---------------------|------|
| 7.                | 7.  | 10.                 | 15.  |
| 7.                | 8.  | 12.                 | 14.  |
| 7.                | 9.  | 11.                 | 13.  |
| 7.                | 10. | 12.                 | 14.  |
| 7.                | 11. | 13.                 | 15.  |
| 7.                | 12. | 14.                 | 16.  |
| 7.                | 13. | 15.                 | 17.  |
| 7.                | 14. | 16.                 | 18.  |
| 7.                | 15. | 17.                 | 19.  |
| 7.                | 16. | 18.                 | 20.  |
| 7.                | 17. | 19.                 | 21.  |
| 7.                | 18. | 20.                 | 22.  |
| 7.                | 19. | 21.                 | 23.  |
| 7.                | 20. | 22.                 | 24.  |
| 7.                | 21. | 23.                 | 25.  |
| 7.                | 22. | 24.                 | 26.  |
| 7.                | 23. | 25.                 | 27.  |
| 7.                | 24. | 26.                 | 28.  |
| 7.                | 25. | 27.                 | 29.  |
| 7.                | 26. | 28.                 | 30.  |
| 7.                | 27. | 29.                 | 31.  |
| 7.                | 28. | 30.                 | 32.  |
| 7.                | 29. | 31.                 | 33.  |
| 7.                | 30. | 32.                 | 34.  |
| 7.                | 31. | 33.                 | 35.  |
| 7.                | 32. | 34.                 | 36.  |
| 7.                | 33. | 35.                 | 37.  |
| 7.                | 34. | 36.                 | 38.  |
| 7.                | 35. | 37.                 | 39.  |
| 7.                | 36. | 38.                 | 40.  |
| 7.                | 37. | 39.                 | 41.  |
| 7.                | 38. | 40.                 | 42.  |
| 7.                | 39. | 41.                 | 43.  |
| 7.                | 40. | 42.                 | 44.  |
| 7.                | 41. | 43.                 | 45.  |
| 7.                | 42. | 44.                 | 46.  |
| 7.                | 43. | 45.                 | 47.  |
| 7.                | 44. | 46.                 | 48.  |
| 7.                | 45. | 47.                 | 49.  |
| 7.                | 46. | 48.                 | 50.  |
| 7.                | 47. | 49.                 | 51.  |
| 7.                | 48. | 50.                 | 52.  |
| 7.                | 49. | 51.                 | 53.  |
| 7.                | 50. | 52.                 | 54.  |
| 7.                | 51. | 53.                 | 55.  |
| 7.                | 52. | 54.                 | 56.  |
| 7.                | 53. | 55.                 | 57.  |
| 7.                | 54. | 56.                 | 58.  |
| 7.                | 55. | 57.                 | 59.  |
| 7.                | 56. | 58.                 | 60.  |
| 7.                | 57. | 59.                 | 61.  |
| 7.                | 58. | 60.                 | 62.  |
| 7.                | 59. | 61.                 | 63.  |
| 7.                | 60. | 62.                 | 64.  |
| 7.                | 61. | 63.                 | 65.  |
| 7.                | 62. | 64.                 | 66.  |
| 7.                | 63. | 65.                 | 67.  |
| 7.                | 64. | 66.                 | 68.  |
| 7.                | 65. | 67.                 | 69.  |
| 7.                | 66. | 68.                 | 70.  |
| 7.                | 67. | 69.                 | 71.  |
| 7.                | 68. | 70.                 | 72.  |
| 7.                | 69. | 71.                 | 73.  |
| 7.                | 70. | 72.                 | 74.  |
| 7.                | 71. | 73.                 | 75.  |
| 7.                | 72. | 74.                 | 76.  |
| 7.                | 73. | 75.                 | 77.  |
| 7.                | 74. | 76.                 | 78.  |
| 7.                | 75. | 77.                 | 79.  |
| 7.                | 76. | 78.                 | 80.  |
| 7.                | 77. | 79.                 | 81.  |
| 7.                | 78. | 80.                 | 82.  |
| 7.                | 79. | 81.                 | 83.  |
| 7.                | 80. | 82.                 | 84.  |
| 7.                | 81. | 83.                 | 85.  |
| 7.                | 82. | 84.                 | 86.  |
| 7.                | 83. | 85.                 | 87.  |
| 7.                | 84. | 86.                 | 88.  |
| 7.                | 85. | 87.                 | 89.  |
| 7.                | 86. | 88.                 | 90.  |
| 7.                | 87. | 89.                 | 91.  |
| 7.                | 88. | 90.                 | 92.  |
| 7.                | 89. | 91.                 | 93.  |
| 7.                | 90. | 92.                 | 94.  |
| 7.                | 91. | 93.                 | 95.  |
| 7.                | 92. | 94.                 | 96.  |
| 7.                | 93. | 95.                 | 97.  |
| 7.                | 94. | 96.                 | 98.  |
| 7.                | 95. | 97.                 | 99.  |
| 7.                | 96. | 98.                 | 100. |

US C

7769. 13067. 13691. 11691.

| HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2 |       |       |        |        |        |       |       |       |       |
|----------------------------------------|-------|-------|--------|--------|--------|-------|-------|-------|-------|
| 7.                                     | 8.    | 9.    | 10.    | 11.    | 12.    | 13.   | 14.   | 15.   | 16.   |
| 25.                                    | 30.   | 34.   | 39.    | 43.    | 47.    | 51.   | 55.   | 59.   | 63.   |
| 372.                                   | 336.  | 270.  | 219.   | 175.   | 141.   | 111.  | 87.   | 68.   | 53.   |
| 561.                                   | 332.  | 175.  | 235.   | 342.   | 393.   | 427.  | 471.  | 518.  | 568.  |
| 3772.                                  | 5932. | 9146. | 11040. | 11597. | 10409. | 8551. | 6564. | 5129. | 3989. |
| 3728.                                  | 2615. | 2423. | 1820.  | 1530.  | 1345.  | 1134. | 978.  | 847.  | 712.  |

| HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2 |       |       |        |        |        |       |       |       |       |
|----------------------------------------|-------|-------|--------|--------|--------|-------|-------|-------|-------|
| 7.                                     | 8.    | 9.    | 10.    | 11.    | 12.    | 13.   | 14.   | 15.   | 16.   |
| 25.                                    | 30.   | 34.   | 39.    | 43.    | 47.    | 51.   | 55.   | 59.   | 63.   |
| 372.                                   | 336.  | 270.  | 219.   | 175.   | 141.   | 111.  | 87.   | 68.   | 53.   |
| 561.                                   | 332.  | 175.  | 235.   | 342.   | 393.   | 427.  | 471.  | 518.  | 568.  |
| 3772.                                  | 5932. | 9146. | 11040. | 11597. | 10409. | 8551. | 6564. | 5129. | 3989. |
| 3728.                                  | 2615. | 2423. | 1820.  | 1530.  | 1345.  | 1134. | 978.  | 847.  | 712.  |

| HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2 |       |       |        |        |        |       |       |       |       |
|----------------------------------------|-------|-------|--------|--------|--------|-------|-------|-------|-------|
| 7.                                     | 8.    | 9.    | 10.    | 11.    | 12.    | 13.   | 14.   | 15.   | 16.   |
| 25.                                    | 30.   | 34.   | 39.    | 43.    | 47.    | 51.   | 55.   | 59.   | 63.   |
| 372.                                   | 336.  | 270.  | 219.   | 175.   | 141.   | 111.  | 87.   | 68.   | 53.   |
| 561.                                   | 332.  | 175.  | 235.   | 342.   | 393.   | 427.  | 471.  | 518.  | 568.  |
| 3772.                                  | 5932. | 9146. | 11040. | 11597. | 10409. | 8551. | 6564. | 5129. | 3989. |
| 3728.                                  | 2615. | 2423. | 1820.  | 1530.  | 1345.  | 1134. | 978.  | 847.  | 712.  |

| HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2 |       |       |        |        |        |       |       |       |       |
|----------------------------------------|-------|-------|--------|--------|--------|-------|-------|-------|-------|
| 7.                                     | 8.    | 9.    | 10.    | 11.    | 12.    | 13.   | 14.   | 15.   | 16.   |
| 25.                                    | 30.   | 34.   | 39.    | 43.    | 47.    | 51.   | 55.   | 59.   | 63.   |
| 372.                                   | 336.  | 270.  | 219.   | 175.   | 141.   | 111.  | 87.   | 68.   | 53.   |
| 561.                                   | 332.  | 175.  | 235.   | 342.   | 393.   | 427.  | 471.  | 518.  | 568.  |
| 3772.                                  | 5932. | 9146. | 11040. | 11597. | 10409. | 8551. | 6564. | 5129. | 3989. |
| 3728.                                  | 2615. | 2423. | 1820.  | 1530.  | 1345.  | 1134. | 978.  | 847.  | 712.  |

| HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2 |       |       |        |        |        |       |       |       |       |
|----------------------------------------|-------|-------|--------|--------|--------|-------|-------|-------|-------|
| 7.                                     | 8.    | 9.    | 10.    | 11.    | 12.    | 13.   | 14.   | 15.   | 16.   |
| 25.                                    | 30.   | 34.   | 39.    | 43.    | 47.    | 51.   | 55.   | 59.   | 63.   |
| 372.                                   | 336.  | 270.  | 219.   | 175.   | 141.   | 111.  | 87.   | 68.   | 53.   |
| 561.                                   | 332.  | 175.  | 235.   | 342.   | 393.   | 427.  | 471.  | 518.  | 568.  |
| 3772.                                  | 5932. | 9146. | 11040. | 11597. | 10409. | 8551. | 6564. | 5129. | 3989. |
| 3728.                                  | 2615. | 2423. | 1820.  | 1530.  | 1345.  | 1134. | 978.  | 847.  | 712.  |

| HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2 |       |       |        |        |        |       |       |       |       |
|----------------------------------------|-------|-------|--------|--------|--------|-------|-------|-------|-------|
| 7.                                     | 8.    | 9.    | 10.    | 11.    | 12.    | 13.   | 14.   | 15.   | 16.   |
| 25.                                    | 30.   | 34.   | 39.    | 43.    | 47.    | 51.   | 55.   | 59.   | 63.   |
| 372.                                   | 336.  | 270.  | 219.   | 175.   | 141.   | 111.  | 87.   | 68.   | 53.   |
| 561.                                   | 332.  | 175.  | 235.   | 342.   | 393.   | 427.  | 471.  | 518.  | 568.  |
| 3772.                                  | 5932. | 9146. | 11040. | 11597. | 10409. | 8551. | 6564. | 5129. | 3989. |
| 3728.                                  | 2615. | 2423. | 1820.  | 1530.  | 1345.  | 1134. | 978.  | 847.  | 712.  |

| HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2 |       |       |        |        |        |       |       |       |       |
|----------------------------------------|-------|-------|--------|--------|--------|-------|-------|-------|-------|
| 7.                                     | 8.    | 9.    | 10.    | 11.    | 12.    | 13.   | 14.   | 15.   | 16.   |
| 25.                                    | 30.   | 34.   | 39.    | 43.    | 47.    | 51.   | 55.   | 59.   | 63.   |
| 372.                                   | 336.  | 270.  | 219.   | 175.   | 141.   | 111.  | 87.   | 68.   | 53.   |
| 561.                                   | 332.  | 175.  | 235.   | 342.   | 393.   | 427.  | 471.  | 518.  | 568.  |
| 3772.                                  | 5932. | 9146. | 11040. | 11597. | 10409. | 8551. | 6564. | 5129. | 3989. |
| 3728.                                  | 2615. | 2423. | 1820.  | 1530.  | 1345.  | 1134. | 978.  | 847.  | 712.  |

| HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2 |       |       |        |        |        |       |       |       |       |
|----------------------------------------|-------|-------|--------|--------|--------|-------|-------|-------|-------|
| 7.                                     | 8.    | 9.    | 10.    | 11.    | 12.    | 13.   | 14.   | 15.   | 16.   |
| 25.                                    | 30.   | 34.   | 39.    | 43.    | 47.    | 51.   | 55.   | 59.   | 63.   |
| 372.                                   | 336.  | 270.  | 219.   | 175.   | 141.   | 111.  | 87.   | 68.   | 53.   |
| 561.                                   | 332.  | 175.  | 235.   | 342.   | 393.   | 427.  | 471.  | 518.  | 568.  |
| 3772.                                  | 5932. | 9146. | 11040. | 11597. | 10409. | 8551. | 6564. | 5129. | 3989. |
| 3728.                                  | 2615. | 2423. | 1820.  | 1530.  | 1345.  | 1134. | 978.  | 847.  | 712.  |

| HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2 |       |       |        |        |        |       |       |       |       |
|----------------------------------------|-------|-------|--------|--------|--------|-------|-------|-------|-------|
| 7.                                     | 8.    | 9.    | 10.    | 11.    | 12.    | 13.   | 14.   | 15.   | 16.   |
| 25.                                    | 30.   | 34.   | 39.    | 43.    | 47.    | 51.   | 55.   | 59.   | 63.   |
| 372.                                   | 336.  | 270.  | 219.   | 175.   | 141.   | 111.  | 87.   | 68.   | 53.   |
| 561.                                   | 332.  | 175.  | 235.   | 342.   | 393.   | 427.  | 471.  | 518.  | 568.  |
| 3772.                                  | 5932. | 9146. | 11040. | 11597. | 10409. | 8551. | 6564. | 5129. | 3989. |
| 3728.                                  | 2615. | 2423. | 1820.  | 1530.  | 1345.  | 1134. | 978.  | 847.  | 712.  |

| HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2 |       |       |        |        |        |       |       |       |       |
|----------------------------------------|-------|-------|--------|--------|--------|-------|-------|-------|-------|
| 7.                                     | 8.    | 9.    | 10.    | 11.    | 12.    | 13.   | 14.   | 15.   | 16.   |
| 25.                                    | 30.   | 34.   | 39.    | 43.    | 47.    | 51.   | 55.   | 59.   | 63.   |
| 372.                                   | 336.  | 270.  | 219.   | 175.   | 141.   | 111.  | 87.   | 68.   | 53.   |
| 561.                                   | 332.  | 175.  | 235.   | 342.   | 393.   | 427.  | 471.  | 518.  | 568.  |
| 3772.                                  | 5932. | 9146. | 11040. | 11597. | 10409. | 8551. | 6564. | 5129. | 3989. |
| 3728.                                  | 2615. | 2423. | 1820.  | 1530.  | 1345.  | 1134. | 978.  | 847.  | 712.  |

Sheet 10 of 24

HYDROGRAPH ROUTING

3 RESERVOIR ROUTING HEMPHREY LAK

DATE: 11/11/11 TIME: 10:00 AM PAGE: 10 OF 24

.....

# HYDROGRAPH ROUTING

## 3 RESERVOIR ROUTING HEMPSTEAD LAKE

ISTAG 3 ICOMP 1 IECON 0 IIAPE 0 JPLY 0 JPRT 0 INAME 1 IASTAGE 0

ROUTING DATA

LAG 0 AMSKE 0 X TSK STORA ISPRAT -1

STAGE 29.00 30.00 31.00 32.00 33.00 34.00 35.00 36.00 37.00 38.00

FLOW 0.00 74.00 200.00 280.00 323.00 337.00 350.00

CAPACITY 520. 650. 1400. 2300. 3450.

ELEVATION 22. 25. 29. 34. 40.

CREL 29.0 SPWID 0.0 CQW 0.0 EXPW 0.0 ELEV 0.0 CQCL 0.0 CAREA 0.0 EXPL 0.0

### DAM DATA

TOPEL 34.0 CQOD 3.1 EXPD 1200.

STATION 3, PLAN 1, RATIO 1

### END-OF-PERIOD HYDROGRAPH ORIGINATES

| OUTFLOW | 1.    | 2.    | 3.     | 4.    |
|---------|-------|-------|--------|-------|
| 0.      | 1.    | 2.    | 3.     | 4.    |
| 5.      | 7.    | 11.   | 18.    | 35.   |
| 63.     | 110.  | 124.  | 127.   | 128.  |
| 135.    | 150.  | 160.  | 202.   | 221.  |
| 321.    | 1418. | 1453. | 12113. | 9564. |
| 4640.   | 3793. | 2615. | 1008.  | 1651. |
|         |       |       |        | 1431. |
|         |       |       |        | 1243. |
|         |       |       |        | 1071. |

### STORAGE

|          |          |          |          |          |            |          |          |          |          |
|----------|----------|----------|----------|----------|------------|----------|----------|----------|----------|
| 1401.    | 1402.    | 1403.    | 1404.    | 1405.    | 1406.      | 1407.    | 1408.    | 1409.    | 1411.    |
| 1413.    | 1415.    | 1418.    | 1422.    | 1432.    | 1443.      | 1459.    | 1485.    | 1517.    | 1537.    |
| 1553.    | 1596.    | 1613.    | 1631.    | 1644.    | 1653.      | 1654.    | 1660.    | 1663.    | 1667.    |
| 1667.    | 1672.    | 1679.    | 1689.    | 1706.    | 1716.      | 1764.    | 1807.    | 1874.    | 2015.    |
| 2091.    | 2122.    | 2157.    | 2197.    | 2243.    | 2294.      | 2350.    | 2414.    | 2486.    | 2566.    |
| 2612.    | 2643.    | 2679.    | 2721.    | 2767.    | 2816.      | 2868.    | 2924.    | 2984.    | 3048.    |
| 3112.    | 3162.    | 3214.    | 3268.    | 3324.    | 3382.      | 3442.    | 3504.    | 3568.    | 3634.    |
| 3691.    | 3751.    | 3812.    | 3874.    | 3938.    | 4004.      | 4072.    | 4142.    | 4214.    | 4288.    |
| 4354.    | 4428.    | 4504.    | 4582.    | 4662.    | 4744.      | 4828.    | 4914.    | 4992.    | 5072.    |
| 5154.    | 5236.    | 5320.    | 5406.    | 5494.    | 5584.      | 5676.    | 5770.    | 5866.    | 5964.    |
| 6064.    | 6164.    | 6266.    | 6370.    | 6476.    | 6584.      | 6694.    | 6806.    | 6920.    | 7036.    |
| 7154.    | 7272.    | 7392.    | 7514.    | 7638.    | 7764.      | 7892.    | 8022.    | 8154.    | 8288.    |
| 8424.    | 8560.    | 8698.    | 8838.    | 8980.    | 9124.      | 9270.    | 9418.    | 9568.    | 9720.    |
| 9874.    | 10028.   | 10184.   | 10342.   | 10502.   | 10664.     | 10828.   | 10994.   | 11162.   | 11332.   |
| 11504.   | 11676.   | 11850.   | 12026.   | 12204.   | 12384.     | 12566.   | 12750.   | 12936.   | 13124.   |
| 13314.   | 13506.   | 13700.   | 13896.   | 14094.   | 14294.     | 14496.   | 14700.   | 14906.   | 15114.   |
| 15324.   | 15536.   | 15750.   | 15966.   | 16184.   | 16404.     | 16626.   | 16850.   | 17076.   | 17304.   |
| 17534.   | 17766.   | 17992.   | 18220.   | 18450.   | 18682.     | 18916.   | 19152.   | 19390.   | 19630.   |
| 19872.   | 20116.   | 20362.   | 20610.   | 20860.   | 21112.     | 21366.   | 21622.   | 21880.   | 22140.   |
| 22402.   | 22666.   | 22932.   | 23200.   | 23470.   | 23742.     | 24016.   | 24292.   | 24570.   | 24850.   |
| 25132.   | 25414.   | 25698.   | 25984.   | 26272.   | 26562.     | 26854.   | 27148.   | 27444.   | 27742.   |
| 28042.   | 28344.   | 28648.   | 28954.   | 29262.   | 29572.     | 29884.   | 30198.   | 30514.   | 30832.   |
| 31152.   | 31472.   | 31794.   | 32118.   | 32444.   | 32772.     | 33102.   | 33434.   | 33768.   | 34104.   |
| 34442.   | 34784.   | 35128.   | 35474.   | 35822.   | 36172.     | 36524.   | 36878.   | 37234.   | 37592.   |
| 37952.   | 38312.   | 38674.   | 39038.   | 39404.   | 39772.     | 40142.   | 40514.   | 40888.   | 41264.   |
| 41642.   | 42018.   | 42396.   | 42776.   | 43158.   | 43542.     | 43928.   | 44316.   | 44706.   | 45098.   |
| 45492.   | 45886.   | 46282.   | 46680.   | 47080.   | 47482.     | 47886.   | 48292.   | 48692.   | 49094.   |
| 49498.   | 49902.   | 50308.   | 50716.   | 51126.   | 51538.     | 51952.   | 52368.   | 52786.   | 53206.   |
| 53628.   | 54052.   | 54478.   | 54906.   | 55336.   | 55768.     | 56202.   | 56638.   | 57076.   | 57516.   |
| 57958.   | 58394.   | 58832.   | 59272.   | 59714.   | 60158.     | 60604.   | 61052.   | 61502.   | 61954.   |
| 62408.   | 62864.   | 63322.   | 63782.   | 64244.   | 64708.     | 65174.   | 65642.   | 66112.   | 66584.   |
| 67058.   | 67532.   | 68008.   | 68486.   | 68966.   | 69448.     | 69932.   | 70418.   | 70906.   | 71396.   |
| 71888.   | 72382.   | 72878.   | 73376.   | 73876.   | 74378.     | 74882.   | 75388.   | 75896.   | 76406.   |
| 76918.   | 77432.   | 77948.   | 78466.   | 78986.   | 79508.     | 80032.   | 80558.   | 81086.   | 81616.   |
| 82148.   | 82672.   | 83198.   | 83726.   | 84256.   | 84788.     | 85322.   | 85858.   | 86396.   | 86936.   |
| 87478.   | 88022.   | 88568.   | 89116.   | 89666.   | 90218.     | 90772.   | 91328.   | 91886.   | 92446.   |
| 93008.   | 93572.   | 94138.   | 94706.   | 95276.   | 95848.     | 96422.   | 96998.   | 97576.   | 98156.   |
| 98738.   | 99322.   | 99908.   | 100496.  | 101086.  | 101678.    | 102272.  | 102868.  | 103466.  | 104066.  |
| 104668.  | 105272.  | 105878.  | 106486.  | 107096.  | 107708.    | 108322.  | 108938.  | 109556.  | 110176.  |
| 110798.  | 111422.  | 112048.  | 112676.  | 113306.  | 113938.    | 114572.  | 115208.  | 115846.  | 116486.  |
| 117128.  | 117772.  | 118418.  | 119066.  | 119716.  | 120368.    | 121022.  | 121678.  | 122336.  | 122996.  |
| 123658.  | 124322.  | 124988.  | 125656.  | 126326.  | 126998.    | 127672.  | 128348.  | 129026.  | 129706.  |
| 130388.  | 131072.  | 131758.  | 132446.  | 133136.  | 133828.    | 134522.  | 135218.  | 135916.  | 136616.  |
| 137318.  | 138022.  | 138728.  | 139436.  | 140146.  | 140858.    | 141572.  | 142288.  | 143006.  | 143726.  |
| 144448.  | 145172.  | 145898.  | 146626.  | 147356.  | 148088.    | 148822.  | 149558.  | 150296.  | 151036.  |
| 151778.  | 152522.  | 153268.  | 154016.  | 154766.  | 155518.    | 156272.  | 157028.  | 157786.  | 158546.  |
| 159308.  | 160072.  | 160838.  | 161606.  | 162376.  | 163148.    | 163922.  | 164698.  | 165476.  | 166256.  |
| 167038.  | 167822.  | 168608.  | 169396.  | 170186.  | 170978.    | 171772.  | 172568.  | 173366.  | 174166.  |
| 174968.  | 175772.  | 176578.  | 177386.  | 178196.  | 179008.    | 179822.  | 180638.  | 181456.  | 182276.  |
| 183098.  | 183922.  | 184748.  | 185576.  | 186406.  | 187238.    | 188072.  | 188908.  | 189746.  | 190586.  |
| 191428.  | 192272.  | 193118.  | 193966.  | 194816.  | 195668.    | 196522.  | 197378.  | 198236.  | 199096.  |
| 199958.  | 200822.  | 201688.  | 202556.  | 203426.  | 204298.    | 205172.  | 206048.  | 206926.  | 207806.  |
| 208688.  | 209572.  | 210458.  | 211346.  | 212236.  | 213128.    | 214022.  | 214918.  | 215816.  | 216716.  |
| 217618.  | 218522.  | 219428.  | 220336.  | 221246.  | 222158.    | 223072.  | 223988.  | 224906.  | 225826.  |
| 226748.  | 227672.  | 228598.  | 229526.  | 230456.  | 231388.    | 232322.  | 233258.  | 234196.  | 235136.  |
| 236078.  | 237022.  | 237968.  | 238916.  | 239866.  | 240818.    | 241772.  | 242728.  | 243686.  | 244646.  |
| 245608.  | 246572.  | 247538.  | 248506.  | 249476.  | 250448.    | 251422.  | 252398.  | 253376.  | 254356.  |
| 255338.  | 256322.  | 257308.  | 258296.  | 259286.  | 260278.    | 261272.  | 262268.  | 263266.  | 264266.  |
| 265268.  | 266272.  | 267278.  | 268286.  | 269296.  | 270308.    | 271322.  | 272338.  | 273356.  | 274376.  |
| 275398.  | 276422.  | 277448.  | 278476.  | 279506.  | 280538.    | 281572.  | 282608.  | 283646.  | 284686.  |
| 285728.  | 286772.  | 287818.  | 288866.  | 289916.  | 290968.    | 292022.  | 293078.  | 294136.  | 295196.  |
| 296258.  | 297322.  | 298388.  | 299456.  | 300526.  | 301598.    | 302672.  | 303748.  | 304826.  | 305906.  |
| 306988.  | 308072.  | 309158.  | 310246.  | 311336.  | 312428.    | 313522.  | 314618.  | 315716.  | 316816.  |
| 317918.  | 319022.  | 320128.  | 321236.  | 322346.  | 323458.    | 324572.  | 325688.  | 326806.  | 327926.  |
| 329048.  | 330172.  | 331298.  | 332426.  | 333556.  | 334688.    | 335822.  | 336958.  | 338096.  | 339236.  |
| 340378.  | 341522.  | 342668.  | 343816.  | 344966.  | 346118.    | 347272.  | 348428.  | 349586.  | 350746.  |
| 351908.  | 353072.  | 354238.  | 355406.  | 356576.  | 357748.    | 358922.  | 360098.  | 361276.  | 362456.  |
| 363638.  | 364822.  | 366008.  | 367196.  | 368386.  | 369578.    | 370772.  | 371968.  | 373166.  | 374366.  |
| 375568.  | 376772.  | 377978.  | 379186.  | 380396.  | 381608.    | 382822.  | 384038.  | 385256.  | 386476.  |
| 387698.  | 388922.  | 390148.  | 391376.  | 392606.  | 393838.    | 395072.  | 396308.  | 397546.  | 398786.  |
| 399928.  | 401172.  | 402418.  | 403666.  | 404916.  | 406168.    | 407422.  | 408678.  | 409936.  | 411196.  |
| 412458.  | 413722.  | 414988.  | 416256.  | 417526.  | 418798.    | 420072.  | 421348.  | 422626.  | 423906.  |
| 425188.  | 426472.  | 427758.  | 429046.  | 430336.  | 431628.    | 432922.  | 434218.  | 435516.  | 436816.  |
| 438118.  | 439422.  | 440728.  | 442036.  | 443346.  | 444658.    | 445972.  | 447288.  | 448606.  | 449926.  |
| 451248.  | 452572.  | 453898.  | 455226.  | 456556.  | 457888.    | 459222.  | 460558.  | 461896.  | 463236.  |
| 464578.  | 465922.  | 467268.  | 468616.  | 469966.  | 471318.    | 472672.  | 474028.  | 475386.  | 476746.  |
| 478108.  | 479472.  | 480838.  | 482206.  | 483576.  | 484948.    | 486322.  | 487698.  | 489076.  | 490456.  |
| 491838.  | 493222.  | 494608.  | 495996.  | 497386.  | 498778.    | 500172.  | 501568.  | 502966.  | 504366.  |
| 505768.  | 507172.  | 508578.  | 509986.  | 511396.  | 512808.    | 514222.  | 515638.  | 517056.  | 518476.  |
| 519898.  | 521322.  | 522748.  | 524176.  | 525606.  | 527038.    | 528472.  | 529908.  | 531346.  | 532786.  |
| 534228.  | 535672.  | 537118.  | 538566.  | 539916.  | 541368.    | 542822.  | 544278.  | 545736.  | 547196.  |
| 548658.  | 550122.  | 551588.  | 553056.  | 554526.  | 555998.    | 557472.  | 558948.  | 560426.  | 561906.  |
| 563388.  | 564872.  | 566358.  | 567846.  | 569336.  | 570828.    | 572322.  | 573818.  | 575316.  | 576816.  |
| 578318.  | 579822.  | 581328.  | 582836.  | 584346.  | 585858.    | 587372.  | 588888.  | 590406.  | 591926.  |
| 593448.  | 594972.  | 596498.  | 598026.  | 599556.  | 601088.    | 602622.  | 604158.  | 605696.  | 607236.  |
| 608778.  | 610322.  | 611868.  | 613416.  | 614966.  | 616518.    | 618072.  | 619628.  | 621186.  | 622746.  |
| 624308.  | 625872.  | 627438.  | 628996.  | 630556.  | 632118.    | 633682.  | 635248.  | 636816.  | 638386.  |
| 639958.  | 641532.  | 643108.  | 644686.  | 646266.  | 647848.    | 649432.  | 651018.  | 652606.  | 654196.  |
| 655788.  | 657382.  | 658978.  | 660576.  | 662176.  | 663778.    | 665382.  | 666988.  | 668596.  | 670206.  |
| 671818.  | 673432.  | 675048.  | 676666.  | 678286.  | 679908.    | 681532.  | 683158.  | 684786.  | 686416.  |
| 688048.  | 689672.  | 691298.  | 692926.  | 694556.  | 696188.    | 697822.  | 699458.  | 701096.  | 702736.  |
| 704378.  | 706022.  | 707668.  | 709316.  | 710966.  | 712618.    | 714272.  | 715928.  | 717586.  | 719246.  |
| 720908.  | 722572.  | 724238.  | 725906.  | 727576.  | 729248.    | 730922.  | 732598.  | 734276.  | 735956.  |
| 737638.  | 739322.  | 741008.  | 742696.  | 744386.  | 746078.    | 747772.  | 749468.  | 751166.  | 752866.  |
| 754568.  | 756272.  | 757978.  | 759686.  | 761396.  | 763108.    | 764822.  | 766538.  | 768256.  | 769976.  |
| 771698.  | 773422.  | 775148.  | 776876.  | 778606.  | 780338.    | 782072.  | 783808.  | 785546.  | 787286.  |
| 789028.  | 790772.  | 792518.  | 794266.  | 796016.  | 797768.    | 799522.  | 801278.  | 803036.  | 804796.  |
| 806558.  | 808322.  | 810088.  | 811856.  | 813626.  | 815398.    | 817172.  | 818948.  | 820726.  | 822506.  |
| 824288.  | 826072.  | 827858.  | 829646.  | 831436.  | 833228.    | 835022.  | 836818.  | 838616.  | 840416.  |
| 842218.  | 844022.  | 845828.  | 847636.  | 849446.  | 851258.    | 853072.  | 854888.  | 856706.  | 858526.  |
| 860348.  | 862172.  | 864008.  | 865846.  | 867686.  | 869528.    | 871372.  | 873218.  | 875066.  | 876916.  |
| 878768.  | 880622.  | 882478.  | 884336.  | 886196.  | 888058.    | 889922.  | 891788.  | 893656.  | 895526.  |
| 897398.  | 899272.  | 901148.  | 903026.  | 904906.  | 906788.    | 908672.  | 910558.  | 912446.  | 914336.  |
| 916228.  | 918122.  | 920018.  | 921916.  | 923816.  | 925718.    | 927622.  | 929528.  | 931436.  | 933346.  |
| 935258.  | 937172.  | 939088.  | 941006.  | 942926.  | 944848.    | 946772.  | 948698.  | 950626.  | 952556.  |
| 954488.  | 956422.  | 958358.  | 960296.  | 962236.  | 964178.    | 966122.  | 968068.  | 970016.  | 971966.  |
| 973918.  | 975872.  | 977828.  | 979786.  | 981746.  | 983708.    | 985672.  | 987638.  | 989606.  | 991576.  |
| 993548.  | 995522.  | 997508.  | 999496.  | 1001486. | 1003478.   | 1005472. | 1007468. | 1009466. | 1011466. |
| 1013468. | 1015472. | 1017478. | 1019486. | 1021496. | 1023508.   | 1025522. | 1027538. | 1029556. | 1031576. |
| 1033598. | 1035622. | 1037648. | 1039676. | 1041706. | 1043738.   | 1045772. | 1047808. | 1049846. | 1051886. |
| 1053928. | 1055972. | 1058018. | 1060066. | 1062116. | 1064168.   | 1066222. | 1068278. | 1070336. | 1072396. |
| 1074458. | 1076522. | 1078588. | 1080656. | 1082726. | 1084798.   | 1086872. | 1088948. | 1091026. | 1093106. |
| 1095188. | 1097272. | 1099358. | 1101446. | 1103536. | 1105628.</ |          |          |          |          |

CFS  
 PEAK 15374  
 12477  
 435  
 INCHES  
 11.84  
 300.23  
 6187  
 AC-FT  
 17000 CU M  
 7632  
 12784  
 12501  
 72-HOUR  
 2044  
 38  
 19.40  
 402.76  
 10134  
 12501  
 TOTAL VOLUME  
 127677  
 3472  
 19.40  
 492.76  
 10134  
 12501

STATION 3. PLAN 1, RATIO 2

END-OF-PERIOD HYDROGRAPH ORDINATES

| OUTFLOW |      | STORAGE |      |
|---------|------|---------|------|
| 0.      | 1.   | 0.      | 1.   |
| 47      | 66   | 1401    | 1402 |
| 57      | 77   | 1411    | 1414 |
| 67      | 88   | 1421    | 1424 |
| 77      | 99   | 1431    | 1434 |
| 87      | 100  | 1441    | 1444 |
| 97      | 110  | 1451    | 1454 |
| 107     | 120  | 1461    | 1464 |
| 117     | 130  | 1471    | 1474 |
| 127     | 140  | 1481    | 1484 |
| 137     | 150  | 1491    | 1494 |
| 147     | 160  | 1501    | 1504 |
| 157     | 170  | 1511    | 1514 |
| 167     | 180  | 1521    | 1524 |
| 177     | 190  | 1531    | 1534 |
| 187     | 200  | 1541    | 1544 |
| 197     | 210  | 1551    | 1554 |
| 207     | 220  | 1561    | 1564 |
| 217     | 230  | 1571    | 1574 |
| 227     | 240  | 1581    | 1584 |
| 237     | 250  | 1591    | 1594 |
| 247     | 260  | 1601    | 1604 |
| 257     | 270  | 1611    | 1614 |
| 267     | 280  | 1621    | 1624 |
| 277     | 290  | 1631    | 1634 |
| 287     | 300  | 1641    | 1644 |
| 297     | 310  | 1651    | 1654 |
| 307     | 320  | 1661    | 1664 |
| 317     | 330  | 1671    | 1674 |
| 327     | 340  | 1681    | 1684 |
| 337     | 350  | 1691    | 1694 |
| 347     | 360  | 1701    | 1704 |
| 357     | 370  | 1711    | 1714 |
| 367     | 380  | 1721    | 1724 |
| 377     | 390  | 1731    | 1734 |
| 387     | 400  | 1741    | 1744 |
| 397     | 410  | 1751    | 1754 |
| 407     | 420  | 1761    | 1764 |
| 417     | 430  | 1771    | 1774 |
| 427     | 440  | 1781    | 1784 |
| 437     | 450  | 1791    | 1794 |
| 447     | 460  | 1801    | 1804 |
| 457     | 470  | 1811    | 1814 |
| 467     | 480  | 1821    | 1824 |
| 477     | 490  | 1831    | 1834 |
| 487     | 500  | 1841    | 1844 |
| 497     | 510  | 1851    | 1854 |
| 507     | 520  | 1861    | 1864 |
| 517     | 530  | 1871    | 1874 |
| 527     | 540  | 1881    | 1884 |
| 537     | 550  | 1891    | 1894 |
| 547     | 560  | 1901    | 1904 |
| 557     | 570  | 1911    | 1914 |
| 567     | 580  | 1921    | 1924 |
| 577     | 590  | 1931    | 1934 |
| 587     | 600  | 1941    | 1944 |
| 597     | 610  | 1951    | 1954 |
| 607     | 620  | 1961    | 1964 |
| 617     | 630  | 1971    | 1974 |
| 627     | 640  | 1981    | 1984 |
| 637     | 650  | 1991    | 1994 |
| 647     | 660  | 2001    | 2004 |
| 657     | 670  | 2011    | 2014 |
| 667     | 680  | 2021    | 2024 |
| 677     | 690  | 2031    | 2034 |
| 687     | 700  | 2041    | 2044 |
| 697     | 710  | 2051    | 2054 |
| 707     | 720  | 2061    | 2064 |
| 717     | 730  | 2071    | 2074 |
| 727     | 740  | 2081    | 2084 |
| 737     | 750  | 2091    | 2094 |
| 747     | 760  | 2101    | 2104 |
| 757     | 770  | 2111    | 2114 |
| 767     | 780  | 2121    | 2124 |
| 777     | 790  | 2131    | 2134 |
| 787     | 800  | 2141    | 2144 |
| 797     | 810  | 2151    | 2154 |
| 807     | 820  | 2161    | 2164 |
| 817     | 830  | 2171    | 2174 |
| 827     | 840  | 2181    | 2184 |
| 837     | 850  | 2191    | 2194 |
| 847     | 860  | 2201    | 2204 |
| 857     | 870  | 2211    | 2214 |
| 867     | 880  | 2221    | 2224 |
| 877     | 890  | 2231    | 2234 |
| 887     | 900  | 2241    | 2244 |
| 897     | 910  | 2251    | 2254 |
| 907     | 920  | 2261    | 2264 |
| 917     | 930  | 2271    | 2274 |
| 927     | 940  | 2281    | 2284 |
| 937     | 950  | 2291    | 2294 |
| 947     | 960  | 2301    | 2304 |
| 957     | 970  | 2311    | 2314 |
| 967     | 980  | 2321    | 2324 |
| 977     | 990  | 2331    | 2334 |
| 987     | 1000 | 2341    | 2344 |
| 997     | 1010 | 2351    | 2354 |
| 1007    | 1020 | 2361    | 2364 |
| 1017    | 1030 | 2371    | 2374 |
| 1027    | 1040 | 2381    | 2384 |
| 1037    | 1050 | 2391    | 2394 |
| 1047    | 1060 | 2401    | 2404 |
| 1057    | 1070 | 2411    | 2414 |
| 1067    | 1080 | 2421    | 2424 |
| 1077    | 1090 | 2431    | 2434 |
| 1087    | 1100 | 2441    | 2444 |
| 1097    | 1110 | 2451    | 2454 |
| 1107    | 1120 | 2461    | 2464 |
| 1117    | 1130 | 2471    | 2474 |
| 1127    | 1140 | 2481    | 2484 |
| 1137    | 1150 | 2491    | 2494 |
| 1147    | 1160 | 2501    | 2504 |
| 1157    | 1170 | 2511    | 2514 |
| 1167    | 1180 | 2521    | 2524 |
| 1177    | 1190 | 2531    | 2534 |
| 1187    | 1200 | 2541    | 2544 |
| 1197    | 1210 | 2551    | 2554 |
| 1207    | 1220 | 2561    | 2564 |
| 1217    | 1230 | 2571    | 2574 |
| 1227    | 1240 | 2581    | 2584 |
| 1237    | 1250 | 2591    | 2594 |
| 1247    | 1260 | 2601    | 2604 |
| 1257    | 1270 | 2611    | 2614 |
| 1267    | 1280 | 2621    | 2624 |
| 1277    | 1290 | 2631    | 2634 |
| 1287    | 1300 | 2641    | 2644 |
| 1297    | 1310 | 2651    | 2654 |
| 1307    | 1320 | 2661    | 2664 |
| 1317    | 1330 | 2671    | 2674 |
| 1327    | 1340 | 2681    | 2684 |
| 1337    | 1350 | 2691    | 2694 |
| 1347    | 1360 | 2701    | 2704 |
| 1357    | 1370 | 2711    | 2714 |
| 1367    | 1380 | 2721    | 2724 |
| 1377    | 1390 | 2731    | 2734 |
| 1387    | 1400 | 2741    | 2744 |
| 1397    | 1410 | 2751    | 2754 |
| 1407    | 1420 | 2761    | 2764 |
| 1417    | 1430 | 2771    | 2774 |
| 1427    | 1440 | 2781    | 2784 |
| 1437    | 1450 | 2791    | 2794 |
| 1447    | 1460 | 2801    | 2804 |
| 1457    | 1470 | 2811    | 2814 |
| 1467    | 1480 | 2821    | 2824 |
| 1477    | 1490 | 2831    | 2834 |
| 1487    | 1500 | 2841    | 2844 |
| 1497    | 1510 | 2851    | 2854 |
| 1507    | 1520 | 2861    | 2864 |
| 1517    | 1530 | 2871    | 2874 |
| 1527    | 1540 | 2881    | 2884 |
| 1537    | 1550 | 2891    | 2894 |
| 1547    | 1560 | 2901    | 2904 |
| 1557    | 1570 | 2911    | 2914 |
| 1567    | 1580 | 2921    | 2924 |
| 1577    | 1590 | 2931    | 2934 |
| 1587    | 1600 | 2941    | 2944 |
| 1597    | 1610 | 2951    | 2954 |
| 1607    | 1620 | 2961    | 2964 |
| 1617    | 1630 | 2971    | 2974 |
| 1627    | 1640 | 2981    | 2984 |
| 1637    | 1650 | 2991    | 2994 |
| 1647    | 1660 | 3001    | 3004 |
| 1657    | 1670 | 3011    | 3014 |
| 1667    | 1680 | 3021    | 3024 |
| 1677    | 1690 | 3031    | 3034 |
| 1687    | 1700 | 3041    | 3044 |
| 1697    | 1710 | 3051    | 3054 |
| 1707    | 1720 | 3061    | 3064 |
| 1717    | 1730 | 3071    | 3074 |
| 1727    | 1740 | 3081    | 3084 |
| 1737    | 1750 | 3091    | 3094 |
| 1747    | 1760 | 3101    | 3104 |
| 1757    | 1770 | 3111    | 3114 |
| 1767    | 1780 | 3121    | 3124 |
| 1777    | 1790 | 3131    | 3134 |
| 1787    | 1800 | 3141    | 3144 |
| 1797    | 1810 | 3151    | 3154 |
| 1807    | 1820 | 3161    | 3164 |
| 1817    | 1830 | 3171    | 3174 |
| 1827    | 1840 | 3181    | 3184 |
| 1837    | 1850 | 3191    | 3194 |
| 1847    | 1860 | 3201    | 3204 |
| 1857    | 1870 | 3211    | 3214 |
| 1867    | 1880 | 3221    | 3224 |
| 1877    | 1890 | 3231    | 3234 |
| 1887    | 1900 | 3241    | 3244 |
| 1897    | 1910 | 3251    | 3254 |
| 1907    | 1920 | 3261    | 3264 |
| 1917    | 1930 | 3271    | 3274 |
| 1927    | 1940 | 3281    | 3284 |
| 1937    | 1950 | 3291    | 3294 |
| 1947    | 1960 | 3301    | 3304 |
| 1957    | 1970 | 3311    | 3314 |
| 1967    | 1980 | 3321    | 3324 |
| 1977    | 1990 | 3331    | 3334 |
| 1987    | 2000 | 3341    | 3344 |
| 1997    | 2010 | 3351    | 3354 |
| 2007    | 2020 | 3361    | 3364 |
| 2017    | 2030 | 3371    | 3374 |
| 2027    | 2040 | 3381    | 3384 |
| 2037    | 2050 | 3391    | 3394 |
| 2047    | 2060 | 3401    | 3404 |
| 2057    | 2070 | 3411    | 3414 |
| 2067    | 2080 | 3421    | 3424 |
| 2077    | 2090 | 3431    | 3434 |
| 2087    | 2100 | 3441    | 3444 |
| 2097    | 2110 | 3451    | 3454 |
| 2107    | 2120 | 3461    | 3464 |
| 2117    | 2130 | 3471    | 3474 |
| 2127    | 2140 | 3481    | 3484 |
| 2137    | 2150 | 3491    | 3494 |
| 2147    | 2160 | 3501    | 3504 |
| 2157    | 2170 | 3511    | 3514 |
| 2167    | 2180 | 3521    | 3524 |
| 2177    | 2190 | 3531    | 3534 |
| 2187    | 2200 | 3541    | 3544 |
| 2197    | 2210 | 3551    | 3554 |
| 2207    | 2220 | 3561    | 3564 |
| 2217    | 2230 | 3571    | 3574 |
| 2227    | 2240 | 3581    | 3584 |
| 2237    | 2250 | 3591    | 3594 |
| 2247    | 2260 | 3601    | 3604 |
| 2257    | 2270 | 3611    | 3614 |
| 2267    | 2280 | 3621    | 3624 |
| 2277    | 2290 | 3631    | 3634 |
| 2287    | 2300 | 3641    | 3644 |
| 2297    | 2310 | 3651    | 3654 |
| 2307    | 2320 | 3661    | 3664 |
| 2317    | 2330 | 3671    | 3674 |
| 2327    | 2340 | 3681    | 3684 |
| 2337    | 2350 | 3691    | 3694 |
| 2347    | 2360 | 3701    | 3704 |
| 2357    | 2370 | 3711    | 3714 |
| 2367    | 2380 | 3721    | 3724 |
| 2377    | 2390 | 3731    | 3734 |
| 2387    | 2400 | 3741    | 3744 |
| 2397    | 2410 | 3751    | 3754 |
| 2407    | 2420 | 3761    | 3764 |
| 2417    | 2430 | 3771    | 3774 |
| 2427    | 2440 | 3781    | 3784 |
| 2437    | 2450 | 3791    | 3794 |
| 2447    | 2460 | 3801    | 3804 |
| 2457    | 2470 | 3811    | 3814 |
| 2467    | 2480 | 3821    | 3824 |
| 2477    | 2490 | 3831    | 3834 |
| 2487    | 2500 | 3841    | 3844 |
| 2497    | 2510 | 3851    | 3854 |
| 2507    | 2520 | 3861    | 3864 |
| 2517    | 2530 | 3871    | 3874 |
| 2527    | 2540 | 3881    | 3884 |
| 2537    | 2550 | 3891    | 3894 |
| 2547    | 2560 | 3901    | 3904 |
| 2557    | 2570 | 3911    | 3914 |
| 2567    | 2580 | 3921    | 3924 |
| 2577    | 2590 | 3931    | 3934 |
| 2587    | 2600 | 3941    | 3944 |
| 2597    | 2610 | 3951    | 3954 |
| 2607    | 2620 | 3961    | 3964 |
|         |      |         |      |



PEAK OUTFLOW IS 3704. AT TIME 46.00 HOURS

CFS 3704.3 36.3 36.2 36.1 36.0 36.0  
CMS 105.  
INCHES 26.  
MM 3.59  
AC-FT 91.09  
THOUS CU M 1874.  
2311.

6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME  
240P. 425. 178. 22669.  
4H. 26. 11. 642.  
3.59 3.59  
58.06 91.09  
1194. 1874.  
1473. 2311.

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SUB-AREA RUNOFF COMPUTATION

4 SUB-BASIN RUNOFF TO SOUTH POND

ISTAB ICOMP ISECON ITAPE JPLY JPRT IMAVE ISTAGE IAUTO  
1 0 0 0 0 0 1 0 0

HYDROGRAPH DATA

INRSG JUNG TAREA SNAP TRSDA TRSPC RATIO ISHOW ISAME LOCAL  
1 1 1.10 0.00 14.90 0.00 0.000 0 1 0

PRECIP DATA

SPFC PMS R6 R72 R24 R48 R72 R96  
0.00 23.00 110.00 120.00 122.00 140.00 0.00 0.00 0.00

TRSPC COMPUTED BY THE PROGRAM IS .114

LOSS DATA

LAGDET STGRK OLTER RTIOL FRAIN STRES RTIOK STRTL CNSTL ALSHK RTIMP  
0 0.00 0.00 1.00 0.00 0.00 1.00 2.20 .24 0.00 .32

UNIT HYDROGRAPH DATA

TP= 2.90 CD= .70 N1A= 0

RECESSION DATA

STRTG= -1.00 ONCSH= .05 RTIUR= 1.50  
APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SWDEP CP AND TP ARE TC= 3.70 AND W= 1.71 INTERVALS

UNIT HYDROGRAPH 12 END-OF-PERIOD ORDINATES, LAG= 2.8P HOURS, CP= .49 VOL= 1.00  
31. 103. 165. 164. 111. 61. 34. 18. 10. 4.

END-OF-PERIOD FLOW

COMP Q

EXCS

LOSS

RAIN

PERIOD

HR. MM

COMP Q

EXCS

LOSS

RAIN

PERIOD

HR. MM

COMP Q

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LOSS

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PERIOD

HR. MM

COMP Q

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RAIN

PERIOD

HR. MM

COMP Q

EXCS

LOSS

Sheet 14 of 24

30 2.47 2.31 .16 350.

|      |       |    |     |     |     |     |      |       |    |      |      |      |       |
|------|-------|----|-----|-----|-----|-----|------|-------|----|------|------|------|-------|
| 1.01 | 9.00  | 9  | .03 | .01 | .02 | 5.  | 1.07 | 15.00 | 39 | 3.09 | 2.92 | .16  | 700.  |
| 1.01 | 10.00 | 10 | .04 | .01 | .02 | 6.  | 1.07 | 16.00 | 40 | 2.82 | 2.66 | .16  | 1264. |
| 1.01 | 11.00 | 11 | .03 | .01 | .02 | 6.  | 1.07 | 17.00 | 41 | 2.88 | 2.72 | .16  | 1568. |
| 1.01 | 12.00 | 12 | .03 | .01 | .02 | 7.  | 1.02 | 18.00 | 42 | 2.26 | 2.10 | .16  | 2870. |
| 1.01 | 13.00 | 13 | .19 | .04 | .13 | 9.  | 1.02 | 19.00 | 43 | .15  | .05  | .10  | 2858. |
| 1.01 | 14.00 | 14 | .23 | .07 | .16 | 15. | 1.02 | 20.00 | 44 | .15  | .05  | .10  | 1946. |
| 1.01 | 15.00 | 15 | .29 | .09 | .20 | 25. | 1.02 | 21.00 | 45 | .15  | .05  | .10  | 1291. |
| 1.01 | 16.00 | 16 | .73 | .23 | .50 | 42. | 1.02 | 22.00 | 46 | .15  | .05  | .10  | 768.  |
| 1.01 | 17.00 | 17 | .27 | .09 | .12 | 63. | 1.02 | 23.00 | 47 | .15  | .05  | .10  | 436.  |
| 1.01 | 18.00 | 18 | .21 | .07 | .14 | 78. | 1.03 | 24.00 | 48 | .15  | .05  | .10  | 255.  |
| 1.01 | 19.00 | 19 | .01 | .00 | .01 | 78. | 1.03 | 25.00 | 49 | 0.00 | 0.00 | 0.00 | 152.  |
| 1.01 | 20.00 | 20 | .01 | .00 | .01 | 62. | 1.03 | 26.00 | 50 | 0.00 | 0.00 | 0.00 | 121.  |
| 1.01 | 21.00 | 21 | .01 | .00 | .01 | 42. | 1.03 | 27.00 | 51 | 0.00 | 0.00 | 0.00 | 116.  |
| 1.01 | 22.00 | 22 | .01 | .00 | .01 | 26. | 1.03 | 28.00 | 52 | 0.00 | 0.00 | 0.00 | 111.  |
| 1.01 | 23.00 | 23 | .01 | .00 | .01 | 16. | 1.03 | 29.00 | 53 | 0.00 | 0.00 | 0.00 | 107.  |
| 1.02 | 0.00  | 24 | .01 | .00 | .01 | 19. | 1.03 | 30.00 | 54 | 0.00 | 0.00 | 0.00 | 103.  |
| 1.02 | 1.00  | 25 | .10 | .03 | .07 | 8.  | 1.03 | 31.00 | 55 | 0.00 | 0.00 | 0.00 | 99.   |
| 1.02 | 2.00  | 26 | .10 | .03 | .07 | 9.  | 1.03 | 32.00 | 56 | 0.00 | 0.00 | 0.00 | 95.   |
| 1.02 | 3.00  | 27 | .10 | .03 | .07 | 13. | 1.03 | 33.00 | 57 | 0.00 | 0.00 | 0.00 | 91.   |
| 1.02 | 4.00  | 28 | .10 | .03 | .07 | 17. | 1.03 | 34.00 | 58 | 0.00 | 0.00 | 0.00 | 87.   |
| 1.02 | 5.00  | 29 | .10 | .03 | .07 | 19. | 1.03 | 35.00 | 59 | 0.00 | 0.00 | 0.00 | 84.   |
| 1.02 | 6.00  | 30 | .10 | .03 | .07 | 21. | 1.03 | 36.00 | 60 | 0.00 | 0.00 | 0.00 | 81.   |

SUM 26.20 21.49 4.50 16286.  
( 665. ) ( 551. ) ( 114. ) ( 461. )

|            |        |         |         |              |
|------------|--------|---------|---------|--------------|
| PEAK       | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
| 2470.      | 1856.  | 639.    | 271.    | 16243.       |
| 70.        | 53.    | 18.     | R.      | 460.         |
| CFS        | 15.71  | 21.60   | 22.89   | 22.89        |
| CMS        | 399.06 | 548.61  | 581.51  | 581.51       |
| INCHES     | 921.   | 1266.   | 1342.   | 1342.        |
| AC-FT      | 1136.  | 1562.   | 1656.   | 1656.        |
| THOUS CU M |        |         |         |              |

HYDROGRAPH AT STA 3 FOR PLAN 1, RTIO 1

| HYDROGRAPH AT STA. 3 FOR PLAN 1, RILD 1 |       |       |       |      |      |      |
|-----------------------------------------|-------|-------|-------|------|------|------|
| 1.                                      | 1.    | 2.    | 3.    | 4.   | 5.   | 6.   |
| 6.                                      | 7.    | 9.    | 25.   | 42.  | 78.  | 62.  |
| 42.                                     | 26.   | 16.   | 10.   | 6.   | 17.  | 21.  |
| 38.                                     | 57.   | 77.   | 90.   | 97.  | 155. | 350. |
| 1966.                                   | 2470. | 2458. | 1946. | 769. | 436. | 755. |
| 116.                                    | 107.  | 103.  | 99.   | 95.  | 91.  | 84.  |
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|                                         |       |       |       |      |      |      |
|                                         |       |       |       |      |      |      |
|                                         |       |       |       |      |      |      |
|                                         |       |       |       |      |      |      |
|                                         |       |       |       |      |      |      |
|                                         |       |       |       |      |      |      |
|                                         |       |       |       |      |      |      |
|                                         |       |       |       |      |      |      |
|                                         |       |       |       |      |      |      |
|                                         |       |       |       |      |      |      |
|                                         |       |       |       |      |      |      |
|                                         |       |       |       |      |      |      |
|                                         |       |       |       |      |      |      |
|                                         |       |       |       |      |      |      |
|                                         |       |       |       |      |      |      |
|                                         |       |       |       |      |      |      |

HYDROGRAPH AT STA 3 FOR PLAN 1, RTIO 2

| HYDROGRAPH AT STA. 3 FOR PLAN 10 MILE 2 |        |         |         |              |        |        |
|-----------------------------------------|--------|---------|---------|--------------|--------|--------|
| 1.                                      | 2.     | 3.      | 4.      | 5.           | 6.     | 7.     |
| 1.                                      | 19.    | 31.     | 47.     | 59.          | 58.    | 47.    |
| 5.                                      | 6.     | 8.      | 7.      | 10.          | 12.    | 15.    |
| 20.                                     | 43.    | 58.     | 71.     | 116.         | 262.   | 948.   |
| 32.                                     | 19.    | 28.     | 969.    | 576.         | 327.   | 191.   |
| 1435.                                   | 1848.  | 1459.   | 576.    | 327.         | 191.   | 91.    |
| PEAK                                    | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |        |        |
| 1435.                                   | 1848.  | 969.    | 576.    | 327.         | 191.   | 91.    |
| 52.                                     | 39.    | 14.     | 6.      | 6.           | 345.   | 345.   |
| CFS                                     | 1435.  | 1848.   | 969.    | 576.         | 327.   | 191.   |
| CMS                                     | 399.06 | 548.61  | 581.51  | 581.51       | 581.51 | 581.51 |
| INCHES                                  | 921.   | 1266.   | 1342.   | 1342.        | 1342.  | 1342.  |
| AC-FT                                   | 1136.  | 1562.   | 1656.   | 1656.        | 1656.  | 1656.  |
| THOUS CU M                              |        |         |         |              |        |        |

Sheet 150824

|            |        |         |         |              |        |
|------------|--------|---------|---------|--------------|--------|
| 77.        | 74.    | 71.     | 68.     | 63.          | 40.    |
| PEAK       | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |        |
| 1435.      | 1848.  | 969.    | 576.    | 327.         | 191.   |
| 52.        | 39.    | 14.     | 6.      | 6.           | 345.   |
| CFS        | 1435.  | 1848.   | 969.    | 576.         | 327.   |
| CMS        | 399.06 | 548.61  | 581.51  | 581.51       | 581.51 |
| INCHES     | 921.   | 1266.   | 1342.   | 1342.        | 1342.  |
| AC-FT      | 1136.  | 1562.   | 1656.   | 1656.        | 1656.  |
| THOUS CU M |        |         |         |              |        |

87. 84. 80. 77. 74. 71. 68. 66. 63. 60.

PEAK 1132.  
CFS 1395.  
CMS 39.  
INCHES 14.  
PM 16.20  
299.30  
411.46  
436.14  
691.  
950.  
1007.  
1242.  
1242.

HYDROGRAPH AT STA 3 FOR PLAN 1, RTIO 3

1. 1. 1. 2. 3.  
2. 1. 1. 39. 31.  
3. 13. 21. 5. 10.  
4. 5. 4. 10. 10.  
5. 4. 4. 175. 432.  
6. 45. 40. 77. 40.  
7. 29. 38. 218. 127.  
8. 1229. 973. 646. 784. 76.  
9. 54. 51. 49. 47. 42.  
10. 56. 49. 45. 44. 40.

PEAK 1235.  
CFS 929.  
CMS 26.  
INCHES 9.  
PM 7.86  
199.53  
276.30  
290.76  
290.76  
671.  
671.  
628.

HYDROGRAPH AT STA 3 FOR PLAN 1, RTIO 4

0. 0. 1. 1. 1.  
1. 2. 4. 6. 10.  
2. 7. 10. 16. 20.  
3. 11. 13. 2. 4.  
4. 14. 19. 24. 30.  
5. 492. 615. 323. 192. 100.  
6. 617. 27. 25. 23. 64.  
7. 28. 26. 24. 22. 30.  
8. 20. 21. 20. 20.

PEAK 617.  
CFS 464.  
CMS 17.  
INCHES 13.  
PM 3.93  
99.77  
137.15  
145.18  
230.  
284.  
391.

COMBINE HYDROGRAPHS

5 COMBINE 2 HYDROGRAPHS

LETA 3 ICOMP 2 IECON 0 ITAPE 0 JPLT 0 JPR1 0 INAME 1 ISTAGE 0 IAUTO 0

SUM OF 2 HYDROGRAPHS AT 3 PLAN 1 RTIO 1

1. 2. 3. 4. 5. 6. 7. 8. 9. 10.  
12. 13. 16. 23. 36. 55. 102. 112. 110.  
105. 106. 113. 120. 127. 133. 170. 143. 150.  
141. 177. 200. 227. 252. 277. 356. 571. 1533.  
2289. 8504. 13382. 16115. 16665. 15221. 12550. 7576. 5961.  
4750. 3904. 3226. 2719. 2411. 2003. 1742. 1519. 1327. 1152.

Sheet 16 of 24

| SUM OF 2 HYDROGRAPHS AT |       | 3 PLAN 1 RTIO 1 |       |
|-------------------------|-------|-----------------|-------|
| 1.                      | 2.    | 3.              | 4.    |
| 12.                     | 13.   | 5.              | 6.    |
| 105.                    | 113.  | 55.             | 102.  |
| 161.                    | 177.  | 130.            | 145.  |
| 229.                    | 254.  | 277.            | 356.  |
| 4756.                   | 5004. | 15221.          | 1742. |
|                         |       | 2003.           | 1518. |
|                         |       |                 | 1327. |
|                         |       |                 | 1152. |

| SUM OF 2 HYDROGRAPHS AT |       | 3 PLAN 1 RTIO 2 |       |
|-------------------------|-------|-----------------|-------|
| 1.                      | 2.    | 3.              | 4.    |
| 12.                     | 13.   | 5.              | 6.    |
| 105.                    | 113.  | 55.             | 102.  |
| 161.                    | 177.  | 130.            | 145.  |
| 229.                    | 254.  | 277.            | 356.  |
| 4756.                   | 5004. | 15221.          | 1742. |
|                         |       | 2003.           | 1518. |
|                         |       |                 | 1327. |
|                         |       |                 | 1152. |

| SUM OF 2 HYDROGRAPHS AT |       | 3 PLAN 1 RTIO 3 |       |
|-------------------------|-------|-----------------|-------|
| 1.                      | 2.    | 3.              | 4.    |
| 12.                     | 13.   | 5.              | 6.    |
| 105.                    | 113.  | 55.             | 102.  |
| 161.                    | 177.  | 130.            | 145.  |
| 229.                    | 254.  | 277.            | 356.  |
| 4756.                   | 5004. | 15221.          | 1742. |
|                         |       | 2003.           | 1518. |
|                         |       |                 | 1327. |
|                         |       |                 | 1152. |

| SUM OF 2 HYDROGRAPHS AT |       | 3 PLAN 1 RTIO 4 |       |
|-------------------------|-------|-----------------|-------|
| 1.                      | 2.    | 3.              | 4.    |
| 12.                     | 13.   | 5.              | 6.    |
| 105.                    | 113.  | 55.             | 102.  |
| 161.                    | 177.  | 130.            | 145.  |
| 229.                    | 254.  | 277.            | 356.  |
| 4756.                   | 5004. | 15221.          | 1742. |
|                         |       | 2003.           | 1518. |
|                         |       |                 | 1327. |
|                         |       |                 | 1152. |

| SUM OF 2 HYDROGRAPHS AT |       | 3 PLAN 1 RTIO 5 |       |
|-------------------------|-------|-----------------|-------|
| 1.                      | 2.    | 3.              | 4.    |
| 12.                     | 13.   | 5.              | 6.    |
| 105.                    | 113.  | 55.             | 102.  |
| 161.                    | 177.  | 130.            | 145.  |
| 229.                    | 254.  | 277.            | 356.  |
| 4756.                   | 5004. | 15221.          | 1742. |
|                         |       | 2003.           | 1518. |
|                         |       |                 | 1327. |
|                         |       |                 | 1152. |

| SUM OF 2 HYDROGRAPHS AT |       | 3 PLAN 1 RTIO 6 |       |
|-------------------------|-------|-----------------|-------|
| 1.                      | 2.    | 3.              | 4.    |
| 12.                     | 13.   | 5.              | 6.    |
| 105.                    | 113.  | 55.             | 102.  |
| 161.                    | 177.  | 130.            | 145.  |
| 229.                    | 254.  | 277.            | 356.  |
| 4756.                   | 5004. | 15221.          | 1742. |
|                         |       | 2003.           | 1518. |
|                         |       |                 | 1327. |
|                         |       |                 | 1152. |

| SUM OF 2 HYDROGRAPHS AT |       | 3 PLAN 1 RTIO 7 |       |
|-------------------------|-------|-----------------|-------|
| 1.                      | 2.    | 3.              | 4.    |
| 12.                     | 13.   | 5.              | 6.    |
| 105.                    | 113.  | 55.             | 102.  |
| 161.                    | 177.  | 130.            | 145.  |
| 229.                    | 254.  | 277.            | 356.  |
| 4756.                   | 5004. | 15221.          | 1742. |
|                         |       | 2003.           | 1518. |
|                         |       |                 | 1327. |
|                         |       |                 | 1152. |

| SUM OF 2 HYDROGRAPHS AT |       | 3 PLAN 1 RTIO 8 |       |
|-------------------------|-------|-----------------|-------|
| 1.                      | 2.    | 3.              | 4.    |
| 12.                     | 13.   | 5.              | 6.    |
| 105.                    | 113.  | 55.             | 102.  |
| 161.                    | 177.  | 130.            | 145.  |
| 229.                    | 254.  | 277.            | 356.  |
| 4756.                   | 5004. | 15221.          | 1742. |
|                         |       | 2003.           | 1518. |
|                         |       |                 | 1327. |
|                         |       |                 | 1152. |

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Sheet 19 of 24

[illegible]

Sheet 19 of 24

Sheet 20 of 24

.....  
FLOOD HYDROGRAPH PACKAGE (HEC-1)  
SAN SAFETY VERSION JULY 1978  
LAST MODIFICATION 63 APR 80  
.....

RUN DATE: 81/08/67.  
TIME: 12.25.43.

STATION 6, PLAN 1, RATIO 3  
END-OF-PERIOD HYDROGRAPH ORDINATES

| OUTFLOW |       | STORAGE |      | STAGE |      |
|---------|-------|---------|------|-------|------|
| 0.      | 1.    | 0.      | 1.   | 0.    | 1.   |
| 0.      | 1.    | 0.      | 1.   | 12.0  | 12.0 |
| 3.      | 7.    | 83.     | 83.  | 12.1  | 12.1 |
| 37.     | 21.   | 84.     | 83.  | 12.2  | 12.2 |
| 59.     | 52.   | 97.     | 91.  | 12.3  | 12.3 |
| 913.    | 33.   | 106.    | 102. | 12.4  | 12.4 |
| 2537.   | 430.  | 107.    | 103. | 12.5  | 12.5 |
|         | 3051. | 201.    | 104. | 12.6  | 12.6 |
|         | 626.  | 204.    | 105. | 12.7  | 12.7 |
|         |       |         |      | 12.8  | 12.8 |
|         |       |         |      | 12.9  | 12.9 |
|         |       |         |      | 13.0  | 13.0 |
|         |       |         |      | 13.1  | 13.1 |
|         |       |         |      | 13.2  | 13.2 |
|         |       |         |      | 13.3  | 13.3 |
|         |       |         |      | 13.4  | 13.4 |
|         |       |         |      | 13.5  | 13.5 |
|         |       |         |      | 13.6  | 13.6 |
|         |       |         |      | 13.7  | 13.7 |
|         |       |         |      | 13.8  | 13.8 |
|         |       |         |      | 13.9  | 13.9 |
|         |       |         |      | 14.0  | 14.0 |
|         |       |         |      | 14.1  | 14.1 |
|         |       |         |      | 14.2  | 14.2 |
|         |       |         |      | 14.3  | 14.3 |
|         |       |         |      | 14.4  | 14.4 |
|         |       |         |      | 14.5  | 14.5 |
|         |       |         |      | 14.6  | 14.6 |
|         |       |         |      | 14.7  | 14.7 |
|         |       |         |      | 14.8  | 14.8 |
|         |       |         |      | 14.9  | 14.9 |
|         |       |         |      | 15.0  | 15.0 |
|         |       |         |      | 15.1  | 15.1 |
|         |       |         |      | 15.2  | 15.2 |
|         |       |         |      | 15.3  | 15.3 |
|         |       |         |      | 15.4  | 15.4 |
|         |       |         |      | 15.5  | 15.5 |
|         |       |         |      | 15.6  | 15.6 |
|         |       |         |      | 15.7  | 15.7 |
|         |       |         |      | 15.8  | 15.8 |
|         |       |         |      | 15.9  | 15.9 |
|         |       |         |      | 16.0  | 16.0 |

PEAK OUTFLOW IS 8515. AT TIME 45.00 HOURS

| 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|--------|---------|---------|--------------|
| 6494.  | 2572.   | 1046.   | 62741.       |
| 154.   | 73.     | 30.     | 1777.        |
| 5.54   | 8.92    | 8.92    |              |
| 140.77 | 226.67  | 226.67  |              |
| 3220.  | 5102.   | 5185.   |              |
| 3972.  | 4396.   | 6396.   |              |

STATION 6, PLAN 1, RATIO 4  
END-OF-PERIOD HYDROGRAPH ORDINATES

| OUTFLOW |     | STORAGE |      | STAGE |      |
|---------|-----|---------|------|-------|------|
| 0.      | 1.  | 0.      | 1.   | 0.    | 1.   |
| 0.      | 1.  | 0.      | 1.   | 12.0  | 12.0 |
| 2.      | 5.  | 83.     | 83.  | 12.1  | 12.1 |
| 19.     | 25. | 84.     | 83.  | 12.2  | 12.2 |
| 30.     | 26. | 97.     | 91.  | 12.3  | 12.3 |
| 310.    | 27. | 106.    | 102. | 12.4  | 12.4 |
|         | 28. | 107.    | 103. | 12.5  | 12.5 |
|         | 29. | 201.    | 104. | 12.6  | 12.6 |
|         | 30. | 204.    | 105. | 12.7  | 12.7 |
|         | 31. |         |      | 12.8  | 12.8 |
|         | 32. |         |      | 12.9  | 12.9 |
|         | 33. |         |      | 13.0  | 13.0 |
|         | 34. |         |      | 13.1  | 13.1 |
|         | 35. |         |      | 13.2  | 13.2 |
|         | 36. |         |      | 13.3  | 13.3 |
|         | 37. |         |      | 13.4  | 13.4 |
|         | 38. |         |      | 13.5  | 13.5 |
|         | 39. |         |      | 13.6  | 13.6 |
|         | 40. |         |      | 13.7  | 13.7 |
|         | 41. |         |      | 13.8  | 13.8 |
|         | 42. |         |      | 13.9  | 13.9 |
|         | 43. |         |      | 14.0  | 14.0 |
|         | 44. |         |      | 14.1  | 14.1 |
|         | 45. |         |      | 14.2  | 14.2 |
|         | 46. |         |      | 14.3  | 14.3 |
|         | 47. |         |      | 14.4  | 14.4 |
|         | 48. |         |      | 14.5  | 14.5 |
|         | 49. |         |      | 14.6  | 14.6 |
|         | 50. |         |      | 14.7  | 14.7 |
|         | 51. |         |      | 14.8  | 14.8 |
|         | 52. |         |      | 14.9  | 14.9 |
|         | 53. |         |      | 15.0  | 15.0 |
|         | 54. |         |      | 15.1  | 15.1 |
|         | 55. |         |      | 15.2  | 15.2 |
|         | 56. |         |      | 15.3  | 15.3 |
|         | 57. |         |      | 15.4  | 15.4 |
|         | 58. |         |      | 15.5  | 15.5 |
|         | 59. |         |      | 15.6  | 15.6 |
|         | 60. |         |      | 15.7  | 15.7 |
|         | 61. |         |      | 15.8  | 15.8 |
|         | 62. |         |      | 15.9  | 15.9 |
|         | 63. |         |      | 16.0  | 16.0 |

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| 1310. | 1063. | 893. | 752. | 657. | 500. | 551. | 507. | 453. | 409. |
|-------|-------|------|------|------|------|------|------|------|------|
| 12.0  | 12.0  | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 |
| 12.0  | 12.0  | 12.0 | 12.0 | 12.0 | 12.1 | 12.1 | 12.1 | 12.2 | 12.2 |
| 12.3  | 12.3  | 12.3 | 12.3 | 12.3 | 12.3 | 12.3 | 12.4 | 12.4 | 12.4 |
| 12.4  | 12.4  | 12.4 | 12.5 | 12.5 | 12.6 | 12.7 | 12.8 | 13.1 | 13.6 |
| 14.4  | 15.3  | 15.9 | 15.9 | 16.4 | 16.9 | 16.7 | 16.5 | 16.4 | 16.2 |
| 16.1  | 16.0  | 16.0 | 15.9 | 15.8 | 15.7 | 15.5 | 15.3 | 15.1 | 14.8 |

PEAK OUTFLOW IS 3892. AT TIME 46.00 HOURS

| PEAK       | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|------------|--------|---------|---------|--------------|
| 3692.      | 2522.  | 1053.   | 430.    | 25772.       |
| CFS        | 71.    | 30.     | 12.     | 730.         |
| CMS        | 2.15   | 3.59    | 3.67    | 3.67         |
| INCHES     | 54.66  | 91.31   | 93.11   | 93.11        |
| MM         | 1250.  | 2089.   | 2130.   | 2130.        |
| AC-FT      | 1542.  | 2576.   | 2627.   | 2627.        |
| THOUS CU M |        |         |         |              |

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

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

OPERATION STATION AREA PLAN RATIO 1 RATIO 2 RATIO 3 RATIO 4  
 1.00 .75 .50 .25

HYDROGRAPH AT 1 9.40 1 15462 11597 7731 3866  
 ( 25.34) ( 437.45) ( 326.36) ( 218.97) ( 109.46)  
 ROUTED TO 3 9.40 1 15374 11520 7614 3704  
 ( 25.34) ( 435.15) ( 326.20) ( 215.60) ( 104.58)  
 HYDROGRAPH AT 3 1.10 1 2470 1852 1235 617  
 ( 2.65) ( 69.93) ( 52.45) ( 34.97) ( 17.48)  
 2 COMBINED 3 10.90 1 16665 12488 8260 3894  
 ( 28.23) ( 471.90) ( 353.63) ( 233.88) ( 110.32)  
 ROUTED TO 6 10.40 1 16194 12261 8515 3992  
 ( 26.23) ( 478.50) ( 347.19) ( 241.11) ( 110.20)

Sheet 23 of 24

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ..... INITIAL VALUE 29.00 29.00 34.00 2300. 173.  
 ELEVATION STORAGE 1400. 1400. 1400. 1400. 1400.  
 0011102

# HEMSTEAD LK DAM

## SUMMARY OF DAM SAFETY ANALYSIS

| PLAN 1 ..... |               |                |            | SUMMARY OF DAM SAFETY ANALYSIS |               |                |            |
|--------------|---------------|----------------|------------|--------------------------------|---------------|----------------|------------|
| ELEVATION    | INITIAL VALUE | SPILLWAY CREST | TOP OF DAM | ELEVATION                      | INITIAL VALUE | SPILLWAY CREST | TOP OF DAM |
| STORAGE      | 29.00         | 29.00          | 34.00      | STORAGE                        | 29.00         | 29.00          | 34.00      |
| OUTFLOW      | 1400.         | 1400.          | 2300.      | OUTFLOW                        | 1400.         | 1400.          | 2300.      |
|              | 0.            | 0.             | 323.       |                                | 0.            | 0.             | 323.       |

| RATIO<br>OF<br>PME | MAXIMUM<br>DEPTH<br>OVER DAM | MAXIMUM<br>STORAGE<br>AC-FT | MAXIMUM<br>OUTFLOW<br>CFS | DURATION<br>OVER TOP<br>HOURS | TIME OF     |         |
|--------------------|------------------------------|-----------------------------|---------------------------|-------------------------------|-------------|---------|
|                    |                              |                             |                           |                               | MAX OUTFLOW | FAILURE |
|                    |                              |                             |                           |                               | HOURS       | HOURS   |

|      |      |       |        |       |       |      |
|------|------|-------|--------|-------|-------|------|
| 1.00 | 2.54 | 2777. | 15374. | 19.00 | 45.00 | 0.00 |
| .75  | 2.09 | 2700. | 11520. | 19.00 | 45.00 | 0.00 |
| .50  | 1.57 | 2601. | 7614.  | 18.00 | 45.00 | 0.00 |
| .25  | .94  | 2420. | 3704.  | 16.00 | 44.00 | 0.00 |

Sheet 24 of 24

## SUMMARY OF DAM SAFETY ANALYSIS

| PLAN 1 ..... |               |                |            | SUMMARY OF DAM SAFETY ANALYSIS |               |                |            |
|--------------|---------------|----------------|------------|--------------------------------|---------------|----------------|------------|
| ELEVATION    | INITIAL VALUE | SPILLWAY CREST | TOP OF DAM | ELEVATION                      | INITIAL VALUE | SPILLWAY CREST | TOP OF DAM |
| STORAGE      | 12.00         | 12.00          | 15.75      | STORAGE                        | 12.00         | 12.00          | 15.75      |
| OUTFLOW      | 83.           | 83.            | 187.       | OUTFLOW                        | 83.           | 83.            | 187.       |
|              | 0.            | 0.             | 400.       |                                | 0.            | 0.             | 400.       |

REFERENCES

APPENDIX E

### References

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OTHER DATA

APPENDIX F

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RB

CRY

YR AP.

DAM NO.

INS. DATE

N. H. C.

USE

W-5

TYPE

## AS BUILT INSPECTION

☒Location of Sp'way  
and outlet☒

Elevations

☒Size of Sp'way  
and Outlet☒Geometry of  
Non-overflow section☒

## GENERAL CONDITION OF NON-OVERFLOW SECTION

☒

Settlement

☒

Cracks

☒

Deflections

☒

Joints

☒Surface of  
Concrete☒

Leakage

☒

Undermining

☒Settlement of  
Embankment☒

Crest of Dam

☒Downstream  
Slope☒Upstream  
Slope☒Toe of  
Slope☒

## GENERAL COND. OF SP'WAY AND OUTLET WORKS

☒Auxiliary  
Spillway☒Service or  
Concrete Sp'way☒Stilling  
Basis☒

Joints

☒Surface of  
Concrete☒Spillway  
Toe☒Mechanical  
Equipment☒Plunge  
Pool☒

Drain

☒

Maintenance

☒

Hazard Class

☒

Evaluation

☒

Inspector

## COMMENTS:

EXCELLENT CON DITION

193 21

## STATE OF NEW YORK

## DEPARTMENT OF

## State Engineer and Surveyor

ALBANY

## Report of a Structure Impounding Water

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

## Hempstead Storage Reservoir

1. The structure is on Hempstead Street flowing ~~xxx~~ Long Island in the Town of Hempstead County of Nassau ~~xxx~~ New York, about halfway between Rockville Center and Hempstead.

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

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

3. The name and address of the owner is The City of New York

4. The structure is used for impounding water for water supply.

5. The material of the right bank, in the direction with the current, is \_\_\_\_\_; at the spillway crest elevation this material has a top slope of \_\_\_\_\_ inches vertical to a foot horizontal on the center line of the structure, a vertical thickness at this elevation of \_\_\_\_\_ feet, and the top surface extends for a vertical height of \_\_\_\_\_ feet above the spillway crest.

6. The material of the left bank is \_\_\_\_\_; has a top slope of \_\_\_\_\_ inches to a foot horizontal, a thickness of \_\_\_\_\_ feet and a height of \_\_\_\_\_ feet.

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

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

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

10. What is the thickness of the layers?.....

11. Are there any porous seams or fissures?.....

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

13. The pond area at the spillway crest elevation is 237.6 acres and the pond impounds 117,647.000 cubic feet of water.

14. The maximum known flow of the stream at the structure was.....cubic feet per second on

(Date) .....

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

Can any possible flood flow from the pond otherwise than through the wastes noted under 17 and 18 of this report?..... If so, give the location, the length and the elevation relative to the spillway crest and the character and slopes of the ground of such possible wastes.....

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

If the dam should fail considerable damage would be done to the  
Long Island Railroad to the City's pipe lines and to the lower parts  
of Rockville Center.....

17. WASTES. The spillway of the above structure is.....feet long in the clear; the waters are held at the right end by a.....the top of which is.....feet above the spillway crest, and has a top width of.....feet; and at the left end by a.....the top of which is.....feet above the spillway crest, and has a top width of.....feet.

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

19. APRON. Below the spillway there is <sup>no</sup>~~an~~ apron built of \_\_\_\_\_  
(Material)  
feet wide and \_\_\_\_\_ feet thick. The downstream side of the apron has a thickness of \_\_\_\_\_ feet  
for a width of \_\_\_\_\_ feet.

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

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

22. WATER SUPPLY. The waters impounded by the above structure have ~~not~~ been used for a public water supply since 1879 by the City of New York.

For profiles of the dams of the Hempstead Reservoir see print attached

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

Municipal Building New York  
(Address of signer)

February 1925

*Wendell A. Smith*  
(Signature)

Chief Engineer Bureau of Water Supply

(A sworn statement for record should only be made by a duly authorized person)

END

DATE  
FILMED

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