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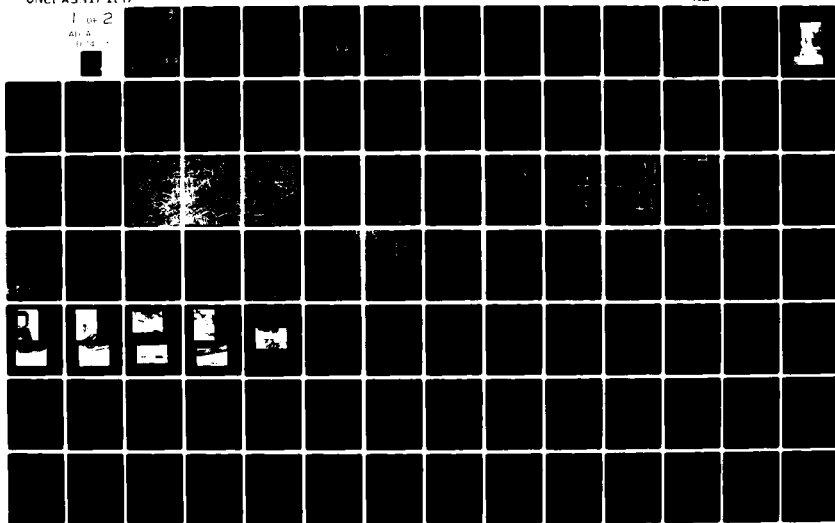
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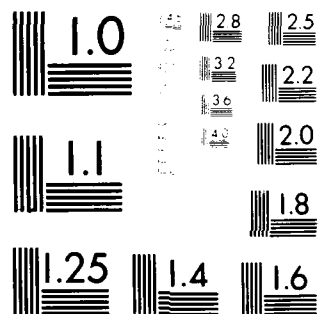
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LONG ISLAND BASIN

MAMARONECK RESERVOIR DAM

**WESTCHESTER COUNTY, NEW YORK
INVENTORY NO. N.Y. 111**

**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) This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization. The examination of documents and the visual inspection findings of the dam and its appurtenant structures did not reveal conditions which constitute an immediate hazard to		

human life and property. However, the dam has some deficiencies which require further investigations and remedial action.

Using the Corps of Engineers' screening criteria for initial review of the adequacy of the overflow section (spillway), it has been determined that the spillway structure is inadequate for all floods in excess of 23 percent of the Probable Maximum Flood (PMF). Overtopping of the dam could cause breaching of the embankment section of the dam: this would significantly increase the hazard to loss of life and property. The overflow section is therefore judged to be "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 an inadequacy in the spillway capacity, such that if a severe storm were to occur, overtopping would significantly increase the hazard to life downstream of the dam.

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LONG ISLAND BASIN

MAMARONECK RESERVOIR DAM

**WESTCHESTER COUNTY, NEW YORK
INVENTORY NO. N.Y. 111**

**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
MAMARONECK RESERVOIR DAM
I.D. NO. N.Y. 111
LONG ISLAND BASIN
WESTCHESTER COUNTY, N.Y.

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

NAME OF DAM: Mamaroneck Reservoir (N.Y. 111)
STATE LOCATED: New York
COUNTY LOCATED: Westchester
STREAM: Mamaroneck River
BASIN: Long Island
DATE OF INSPECTION: 02 April 1981

ASSESSMENT

The examination of documents and the visual inspection findings of the dam and its appurtenant structures did not reveal conditions which constitute an immediate hazard to human life and property. However, the dam has some deficiencies which require further investigations and remedial action.

Using the Corps of Engineers' screening criteria for initial review of the adequacy of the overflow section (spillway), it has been determined that the spillway structure is inadequate for all floods in excess of 23 percent of the Probable Maximum Flood (PMF). Overtopping of the dam could cause breaching of the embankment section of the dam: this would significantly increase the hazard to loss of life and property. The overflow section is therefore judged to be "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 an inadequacy in the spillway capacity, such that if a severe storm were to occur, overtopping would significantly increase the hazard to life downstream of the dam.

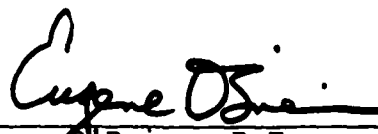
It is therefore recommended that within 3 months from the date of notification to the owner, detailed hydrological/hydraulic investigations of the structure should be undertaken to more accurately determine the site specific characteristics of the watershed. Analyses should include investigations to obtain more information regarding the upstream and downstream

control facilities and their affect upon the overtopping potential and stability of the dam. In addition, it has been found on the basis of screening analyses of stability, that the overflow section of the dam is inadequate for overturning and sliding under extreme flooding conditions equal to $\frac{1}{2}$ PMF and PMF. Further analysis of the structural stability of the spillway should be performed at the same time.

Within 18 months of the date of notification to the owner, modifications to the structure, deemed necessary as a result of studies, should have been completed. A detailed emergency operation plan and warning system should be promptly developed in the interim. Also, around-the-clock surveillance should be provided during periods of unusually heavy precipitation.

The dam has a number of additional problem areas which, if left uncorrected, have the potential for the development of hazardous conditions and must be corrected within 12 months.

1. Monitor periodically the leakage at the left abutment. Document this information for future reference.
2. Repair the concrete slab on the crest of the embankment.
3. A program of periodic inspection and maintenance of the dam and appurtenances, including yearly operation and lubrication of all gates should be established. This information should be documented for future reference. An emergency action plan should be developed and 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

05 AUG 1981

Date:



OVERVIEW

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
MAMARONECK RESERVOIR DAM
I.D. NO. N.Y. 111
MAMARONECK RIVER BASIN
WESTCHESTER 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 Contract No. DACW 51-81-C-0008 in a letter dated 14 December 1980 in fulfillment of the requirements of the National Dam Inspection Act, Public Law 92-367 dated 8 August 1972.

b. Purpose of Inspection

This inspection was conducted to evaluate the existing condition of the dam, to identify deficiencies and hazardous conditions, to determine if these deficiencies constitute hazards to life and property, and to recommend remedial measures where required.

1.2 DESCRIPTION OF PROJECT

a. Description of the Dam and Appurtenant Structures

Mamaroneck Reservoir Dam consists of a concrete buttress section (Ambursen type) and an earth embankment section. The length of each section is 130 feet and 55 feet, respectively. The crest of the buttress section is at El 40 (MSL); the crest elevation of the embankment is 4 feet higher, at El 44.

According to the available drawings, the embankment contains a concrete corewall at its downstream crest edge. The wall is approximately 1 foot thick and extends the full length of the embankment. The upstream slope is approximately 1V:2H (vertical to horizontal) and is protected with small stones and boulders. The downstream slope is gently sloping from the embankment crest to the downstream waterwork facilities. The crest of the embankment is covered by a 7 foot wide concrete slab.

The concrete buttress section acts as an ogee-type spillway. The buttresses are constructed of reinforced concrete and are spaced 15 feet on center. Water bearing reinforced concrete slabs form the upstream and downstream surfaces. The upstream slabs are supported at its inner surface by reinforced concrete haunches at each buttress and by a continuous concrete footing at the upstream base of the dam.

Two uncontrolled reinforced concrete box water conduits (3 foot high by 6 foot wide) are located between adjacent buttress sections at the approximate center of the dam. The box conduits are at invert El 33 and extend the full width of the dam. Bar-screens are located at the upstream end of each conduit.

A 24-inch steel or cast iron pipe serves as a reservoir drain for the project. The pipe is regulated by a 24-inch gate valve which is located within the buttress dam. Access to the operating facilities is via a concrete chamber located at the crest of the embankment section.

The spillway discharge channel is primarily a rock and earth channel of varying width and depth.

At the crest of the embankment dam is a gatehouse structure which has been used to regulate flow to the downstream water treatment facilities. Neither the regulating facilities nor the treatment facilities are operated since the reservoir is no longer used for water supply.

b. Location

The dam is located in Mamaroneck, Westchester County, New York. The dam is located adjacent to Mamaroneck Avenue approximately 1 mile south of the Hutchinson Parkway-Mamaroneck Avenue intersection.

c. Size Classification

The dam has a structural height of 19 feet and a reservoir storage capacity of 107 acre-feet. The dam is considered small in size (50 to 1,000 acre-feet).

d. Hazard Classification

The dam is classified as "high" hazard due to the number of homes located 1000 feet downstream of the dam.

e. Ownership

The dam is owned by the Westchester Joint Waterworks, 1625 Mamaroneck Ave., Mamaroneck, New York, 10543, Telephone No. (914) 698-3500. The person to contact is Mr. Joe Morgan, Engineer. The dam is maintained by the Village of Mamaroneck, 169 Mt. Pleasant Avenue, Mamaroneck, New York, 10543, Telephone No. (914) 698-0052. The person to contact is Mr. Frank Feed, Village Engineer.

f. Purpose

Prior to the mid-1970's the impoundment created by the dam was used for water supply. The dam presently serves as a flood control structure.

g. Design and Construction History

The dam was designed by Mr. Alexander Potter, 50 Church Street, New York, New York, circa 1930. The constructor of the dam is unknown. The original contract drawings show a

sluice gate structure at the left abutment; this structure has not been constructed. Modifications have been performed at the right abutment, adjacent to Mamaroneck Avenue, since the original construction drawings do not show the present elevated roadway. It is uncertain as to when these changes had been made. In 1978 the two water conduits at the approximate center of the buttress dam were constructed. These structures were designed by Hazen and Sawyer Engineers, 360 Lexington Avenue, New York, New York, 10017.

h. Normal Operating Procedures

Discharge is uncontrolled through the two water passage conduits. It is uncertain as to the normal operating procedure of the reservoir drain.

1.3 PERTINENT DATA

a. <u>Drainage Area</u> , Square Miles	15.24
b. <u>Discharge at Damsite</u> , cfs	
Maximum Known Flood at Damsite	Unknown
Overflow Section (Maximum Pool - Top of Earth Embankment)	4240 cfs
Reservoir Drain: Maximum Pool	Unknown
Water Conduits: Maximum Pool (Combined)	560 cfs
c. <u>Elevation, USGS Datum, MSL</u>	
Top of Overflow Section (Normal Pool)	40 feet
Top of Earth Embankment (Maximum Pool)	44 feet
Top of Flashboards	42.5 feet
Conduit Invert	33 feet
d. <u>Reservoir</u>	
Length of Maximum Pool	500 feet*
Length of Normal Pool	500 feet*
e. <u>Storage</u>	
Maximum Pool	320 acre-feet
Normal Pool	107 acre-feet
f. <u>Reservoir Surface</u>	
Maximum Pool	49 acres
Normal Pool	33.5 acres

* 500 feet is the fetch, as measured perpendicular from the dam to Mamaroneck Avenue

- | | | |
|----|-------------------------------|-----------------------------------|
| g. | <u>Embankment Dam</u> | |
| | Type | Earthfill with Concrete Core Wall |
| | Length | 55 feet |
| | Height | 15 feet |
| | Concrete Apron Width at Crest | 7 feet |
| | Side Slopes: Upstream (V:H) | 1:2 |
| | Downstream (V:H) | Unknown |
| h. | <u>Overflow Section</u> | |
| | Type | Concrete Buttress (Ambursen) |
| | Height | 19 feet |
| | Upstream Slab (Slope) | Concrete (1V:2H) |
| | Downstream Slab (Slope) | Concrete (1H:1V) |
| | Buttress Width | 1 foot |
| i. | <u>Reservoir Drain</u> | |
| | Type | Concrete |
| | Diameter | 24-inch |
| | Closure | Gate Valve |

SECTION 2 - ENGINEERING DATA

2.1 GEOLOGY

Mamaroneck Reservoir Dam is located in the New England Upland Section of the New England Maritime Physiographic Province(6). The bedrock in this Section consists of metamorphic, igneous and sedimentary rocks which have undergone a complex sequence of deposition, folding, faulting and erosion. In the vicinity of the damsite, the rock is gniess of Precambrian Age(7). The rock at the damsite has discontinuities which appear to run both parallel and perpendicular to the dam. The local relief is that of a maturely dissected peneplain modified by continental glaciation.

2.2 SUBSURFACE INVESTIGATIONS

The only subsurface investigation which exists at the immediate damsite is a longitudinal ground surface profile. This profile is shown in Appendix A.

The soil deposits in the vicinity of the damsite are primarily glacial tills deposited during the Late Pleistocene Age. The till is composed primarily of gravels, sands and silts.

2.3 DESIGN RECORDS

The original construction drawings and the modification drawings which exist for the project are shown in Appendix A.

2.4 CONSTRUCTION RECORDS

The original construction records are not available for the project. Construction records, however, for the construction of the water passage conduits are kept at the Westchester Joint Waterworks, 1625 Mamaroneck Avenue, Mamaroneck, New York, 10543, Tel. No. (914) 698-3500.

2.5 OPERATION RECORDS

Operation records exist for the project and are available at the Westchester Joint Waterworks, 1625 Mamaroneck Avenue, Mamaroneck, New York, 10543.

2.6 EVALUATION OF DATA

The information obtained from the available documents and a visual inspection was considered adequate for the Phase I inspection and evaluations.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

A visual inspection of Mamaroneck Reservoir Dam was made on 2 April 1981. The weather was sunny and clear and the temperature was 60°F. At the time of the inspection, the reservoir level was a few inches above the water conduit invert.

b. Embankment and Buttress Dam

The overall condition of the embankment dam appears good. The concrete slab on the crest of the dam is deteriorated at the location of the concrete core wall (See PHOTOGRAPH 1). The vertical and horizontal alignments of the crest is good.

The upstream slope of the dam appears to be in good condition. A gravel access road exists along the slope (See PHOTOGRAPH 2); this road was constructed during construction of the water passage conduits. The existing downstream slope is gently sloping and differs from the slope shown on the drawings. The dimension of this slope was probably modified during reconstruction of the adjacent Mamaroneck Avenue.

The gatehouse and regulating facilities, which are no longer operational since the project is no longer used for water supply purposes, appear to be in fair condition (See PHOTOGRAPH 3).

The overall condition of the buttress dam is good. The upstream and downstream outer surfaces of the reinforced concrete slabs appear to be in good condition (See PHOTOGRAPHS 4 and 5). The inner concrete surface of the slabs, the upstream concrete haunches, and the concrete buttresses were also in good condition. Little to no deterioration and/or spalling exist along the horizontal or vertical construction joints (See PHOTOGRAPHS 4 and 5). The flashboards and metal supporting rods are also in good condition (See PHOTOGRAPH 6).

The concrete surfaces of the water passage conduits are in good condition (See PHOTOGRAPH 6). The bar-screens which exist at the upstream side are also in good condition, and clear of debris (See PHOTOGRAPH 5).

The overflow section sidewalls appear to be in good condition (See PHOTOGRAPHS 4 and 7). The rock which forms the sides of the upstream channel at the left abutment also appears to be intact, with no signs of erosion and/or deterioration (See PHOTOGRAPH 5).

No emergency action plan exists for the project.

c. Appurtenant Structures

The concrete which encases the 24-inch reservoir drain, both within the buttress dam and downstream of the dam (See PHOTOGRAPH 4), appears to be in good condition.

At the time of this inspection, there was flow through the drain. The gate valve which regulates this flow could not be operated. The valve is poorly maintained, as evidenced by the rusted surfaces and lack of lubrication.

d. Downstream Channel

The downstream channel is the Mamaroneck River (See OVERVIEW). In the immediate vicinity of the dam, the channel floor and side slopes are rock. There exists some large trees and shrubs in the channel; however, these will not impede flow over the dam.

Approximately 800 feet downstream of the dam is a concrete retaining wall which forms the left channel sidewall; it is uncertain as to the origin of this wall.

e. Reservoir Area

In the vicinity upstream of the dam, there was no evidence of sloughing, potentially unstable slopes or other unusual conditions which would adversely affect the dam. There appears to be no sedimentation problems in the reservoir.

f. Abutments

Seepage was observed immediately downstream of the left abutment contact (See PHOTOGRAPH 7). The flow was small and was emerging from the discontinuities in the rock.

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 at the present time. The following is a summary of the problem areas encountered, in order of importance, with the appropriate recommended action:

1. Monitor regularly the leakage at the left abutment with the aid of weirs or other measuring devices. Document this information for future reference.

2. Repair the concrete slab at the crest of the embankment.

3. Provide a program of periodic inspection and maintenance of the dam and appurtenances including yearly operation and maintenance of the reservoir drain and its control facilities. Document this information for future reference. Also develop an emergency action plan.

SECTION 4 - OPERATION AND MAINTENANCE PROCEDURES

4.1 PROCEDURES

No written operation and maintenance procedures exist for the project. The normal operation is to allow flow through the water conduit passage.

4.2 MAINTENANCE OF DAM

It is reported that maintenance of the dam is performed on a regular basis by the Village of Mamaroneck, 169 Mt. Pleasant Avenue, Mamaroneck, New York, 10543.

4.3 WARNING SYSTEM IN EFFECT

No warning system is in effect or in preparation.

4.4 EVALUATION

The overall condition of the dam and appurtenant structures appears to be good. Recommendations in connection with regular maintenance are discussed in Section 7.

SECTION 5 - HYDROLOGIC/HYDRAULIC

5.1 DRAINAGE AREA CHARACTERISTICS

The Mamaroneck Reservoir Dam is located on the Mamaroneck River in Westchester County, State of New York (Hydrologic Unit Code No. 02030102) just upstream of Interchange 10 on the New England Thruway. The drainage area contributing to the reservoir is 15.24 square miles and rises from a lake elevation of 33.0 to over 500 feet just south of Kensico Reservoir. The basin is about 40 percent urban-suburban and 60 percent woods or brushwood, with some storage in the form of lakes and wooded marsh.

The Mamaroneck River flows in a southerly direction for about 7 miles to the Hutchinson River Parkway and its junction with its tributary, the West Branch Mamaroneck and the upstream end of the reservoir.

5.2 ANALYSIS CRITERIA

The analysis of the spillway adequacy was performed using the Corps of Engineers HEC-1DB computer program⁽¹⁾. The basin was divided into seven (7) sub-basins and Snyder unit hydrograph coefficients for each obtained from a previous study⁽²⁾ (See Appendix D). The all season Probable Maximum Precipitation (PMF) of 22.5 inches (for Zone 6) was taken from Hydrometeorological Report No. 33⁽³⁾. In accordance with the "Recommended Guidelines for Safety Inspection of Dams"⁽⁴⁾, the adequacy of the spillway was analyzed using the Probable Maximum Flood (PMF).

5.3 SPILLWAY CAPACITY

The Mamaroneck Dam was constructed as a "run of River" dam and the entire dam length is an overflow section with a crest elevation of 40 feet (MSL). Two uncontrolled outlets were subsequently constructed at an elevation of 33 feet. These openings are 6.3 feet x 3.0 feet and have a computed discharge of 560 cfs with a head of 9.5 feet (water surface at top of embankment dam). The discharge over the overflow section with water surface at 44.0 feet (MSL) is 4,240 cfs.

5.4 RESERVOIR CAPACITY

The normal storage capacity of the reservoir is listed as 107 acre-feet. The surcharge storage between spillway crest elevation (40 feet) and the top of the embankment (44 feet) is 213 acre-feet, which is equivalent to about 0.3 inches of runoff over the entire drainage basin.

5.5 FLOODS OF RECORD

No records of maximum lake elevations nor discharges are available, however, the Mamaroneck River is gauged, and the station records indicate a peak discharge at the gauge (drainage area 23.4 square miles) of 3,700 cfs on September 26, 1975 (Gauge #01301000-Ref. No. 5).

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 computed PMF, with a peak inflow of 21,460 cfs (1,390 cfs/square mile), routed through the reservoir resulted in a maximum water surface elevation of 58.35 feet (MSL), 18.35 feet above the crest of the dam. The corresponding peak outflow was 21,390 cfs. One-half (1/2) PMF resulted in a peak elevation of 50.91 and a peak outflow of 10,680 cfs. The dam will discharge 22.6 percent of the PMF without overtopping its abutments.

The results of a multi-plan HEC-1DB analysis are listed below.

<u>RATIO OF PMF</u>	<u>PEAK INFLOW cfs</u>	<u>PEAK OUTFLOW cfs</u>	<u>OVERTOPPING IN FEET</u>
1.00	21462	21392	14.35
0.75	16097	16035	10.75
0.50	10731	10680	6.91
0.25	5366	5330	2.68

5.7 EVALUATION

The Mamaroneck Reservoir Dam, a run of the river dam, is designed to be overtopped; however, 13 hours of flow over the abutments may cause serious damage to the embankment dam. The overtopping could cause failure of the embankment, 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 conditions which would adversely effect the structural stability of the dam. The observed seepage at the left abutment is not considered detrimental to the dam's stability or safety at the present time.

b. Design and Construction Data

The original design computations regarding the structural stability of the embankment or the concrete buttress are not available.

c. Operating Records

There are no available records of reservoir elevation and gate operation. No major operational problems which would affect the stability of the dam were reported.

d. Post-Construction Changes

Two water conduit passages were constructed at the approximate center of the buttress dam in 1978. The details of this modification are shown on the drawings in Appendix A. No other post-construction changes have been reported.

e. Seismic Stability

According to the recommended Corps guidelines, the dam is located in Seismic Zone 1, therefore, no seismic stability analysis was performed.

6.2 STRUCTURAL STABILITY ANALYSIS

A structural stability analysis on what was determined from the drawings to be the maximum typical section was performed. In addition the analysis was performed in accordance with recommended Corps of Engineers guidelines. The following tables list each of the cases analyzed and the results of the analyses (Ref. 4).

<u>Case</u>	<u>Description of Loading Conditions</u>
I	Normal Loading (Top of Flashboards), Lake Level at El 42.5, no Tailwater, Full Uplift
II	Normal Loading, Lake Level at El 40. with 1.24 K/LF , Ice Load, Full Uplift
III	Unusual Loading, $\frac{1}{2}$ PMF, Lake Level at El 50.91, Tailwater 12.5 Feet, no Flashboards

<u>Case</u>	<u>Description of Loading Conditions</u>
IV	Extreme Loading, Full PMF, Lake Level at El 50.91, Tailwater 15 Feet, no Flashboards.

<u>Case</u>	<u>Location of Resultant</u>	<u>Friction Factor of Safety</u>
I	Inside Middle Third	3.8
II	Inside Middle Third	3.1
III	Inside Middle Third	2.9
IV	Inside Middle Third	1.9

The results of the analyses indicate that the stability of the section analyzed is adequate in overturning for all the loading conditions considered and inadequate in sliding under the half ($\frac{1}{2}$) PMF and PMF events.

SECTION 7 - ASSESSMENT/RECOMMENDATIONS

7.1 ASSESSMENT

a. Safety

Examination of the 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 5.9 percent of the Probable Maximum Flood (PMF). The overtopping of the dam could result in a failure of the embankment and abutments thus increasing the hazard to loss of life downstream. The spillway is, therefore, adjudged as "seriously inadequate" and the dam is assessed as unsafe, non-emergency.

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

The structure stability analyses based on available information and visual inspection indicates that the stability against overturning for the buttress dam is adequate for all cases of loading considered and inadequate in sliding for the $\frac{1}{2}$ PMF and full PMF events.

b. Adequacy of Information

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

c. Need for Additional Investigations

A detailed hydrological/hydraulic investigations of the structure should be undertaken to more accurately determine the site specific characteristics of the watershed. Analyses should include investigations to obtain more information regarding the upstream and downstream control facilities and their affect upon the overtopping potential and stability of the dam. In addition, it has been found on the basis of screening analyses of stability, that the overflow section of the dam does not meet current criteria under flooding conditions equal to half ($\frac{1}{2}$) PMF and PMF. Further analysis of the structural stability of the spillway should be performed at the same time to improve the stability of the dam from the one-half ($\frac{1}{2}$) PMF and PMF events.

d. Urgency

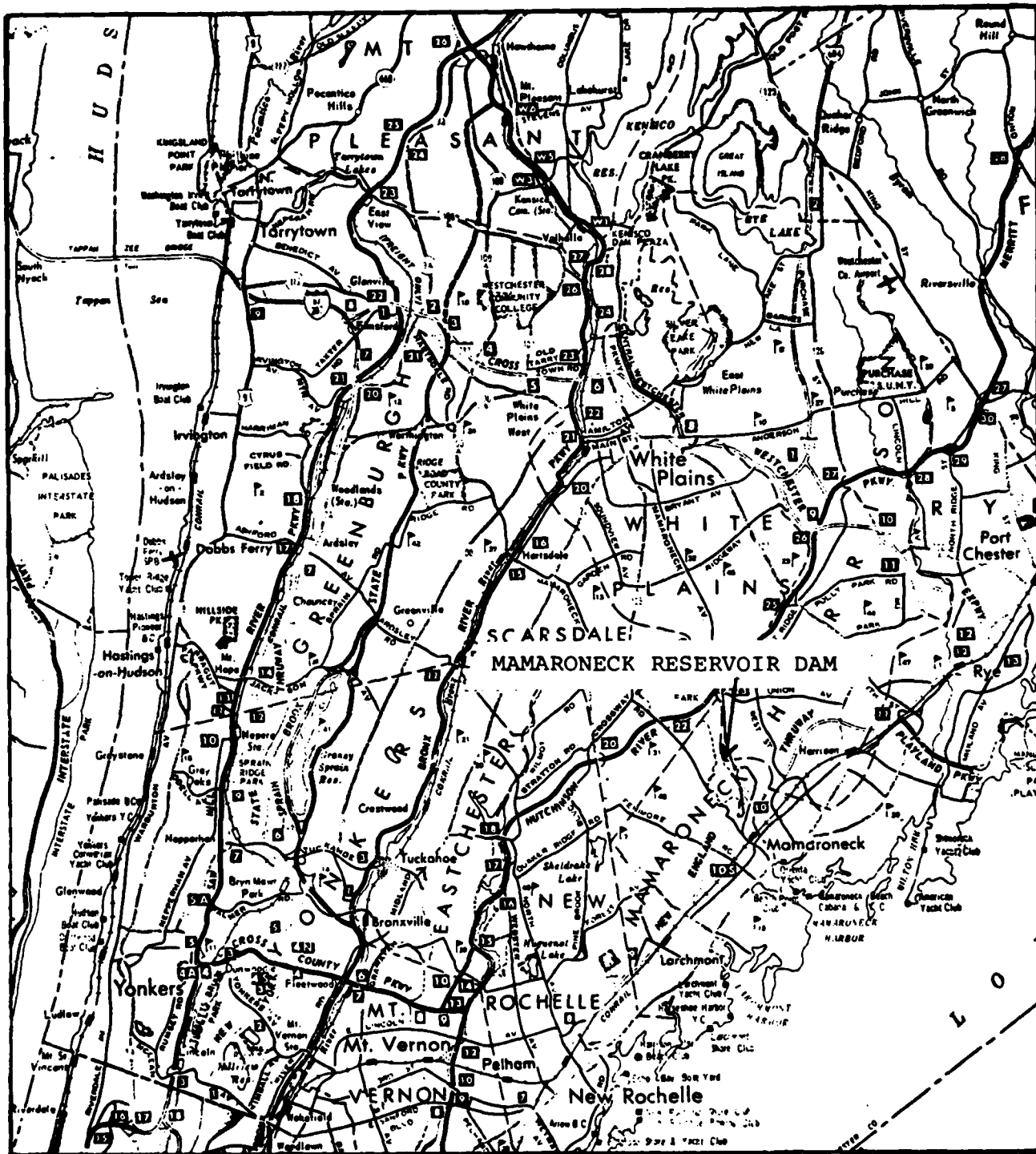
The additional hydrologic/hydraulic investigations and the structural stability investigations which are required must be initiated within 3 months from the date of notification. Within 18 months of notification, remedial measures as a result of these investigations must be initiated, with completion of these measures during the following year. In the interim, develop an emergency action plan for the notification of downstream residents and proper 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 results of the aforementioned investigations will determine the appropriate remedial measures required.
2. Monitor the leakage regularly at the left abutment. Document this information for future reference.
3. Repair the concrete apron at the crest of the embankment.
4. Provide a program of periodic inspection and maintenance of the dam and appurtenance including yearly operation and lubrication of the reservoir drain and its control facilities. Document this information for future reference. Establish an emergency action plan and maintain and update it periodically during the life of the structure.

DRAWINGS

APPENDIX A



LOCATION MAP

Mamaroneck Reservoir Dam

Plate 1

SCALE







MAMARONECK, N.Y. - CONN
 GLENVILLE, N.Y.
 WHITE PLAINS, N.Y.
 MOUNT VERNON, N.Y.

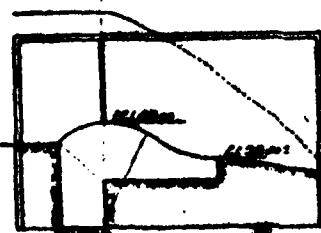
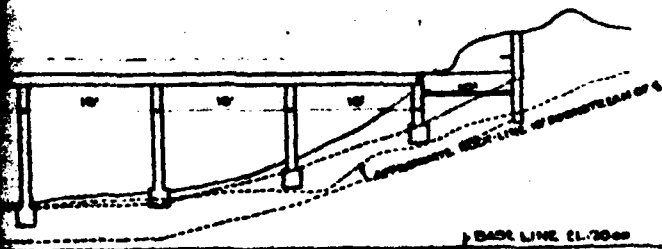
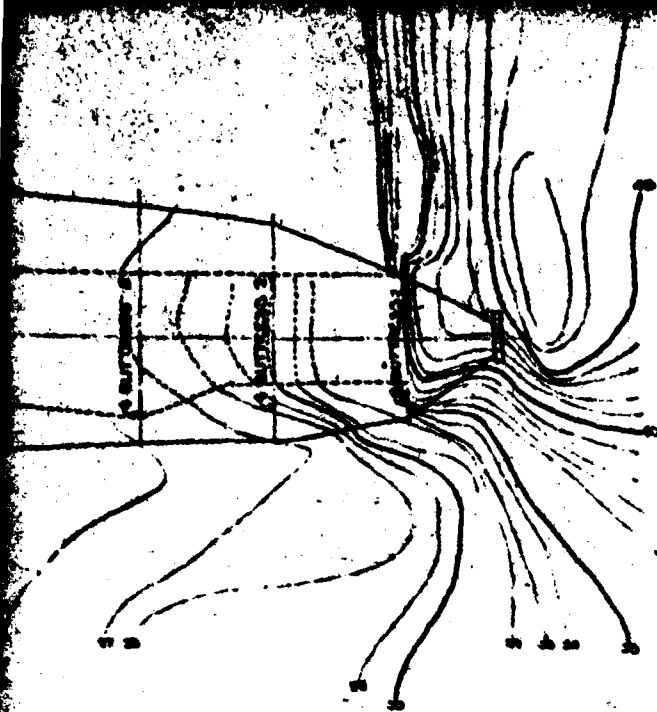
DAM

SCARBOROUGH

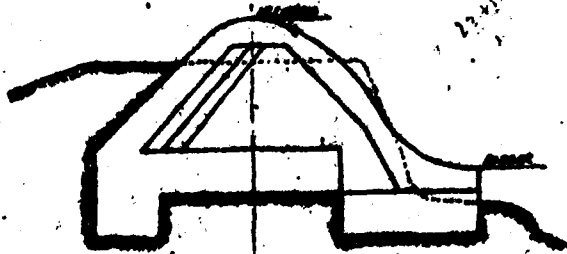
PLATE-2

TOPOGRAPHIC MAP
 MAMARONECK RESERVOIR DAM

TOPOGRAPHIC MAP
MAMARONECK RESERVOIR DAM

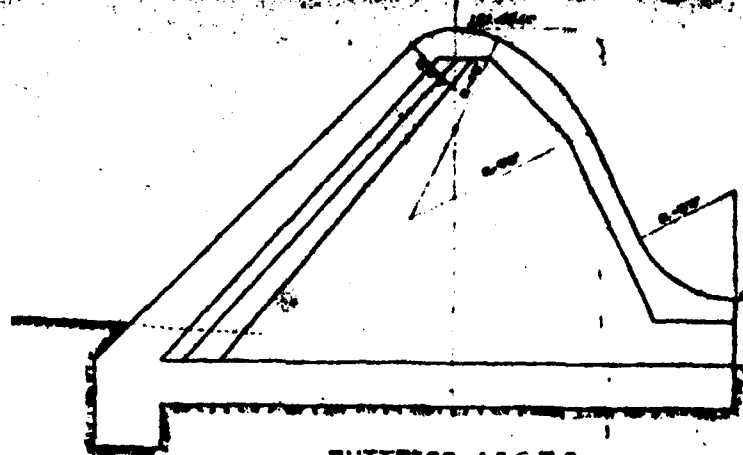


NORTH ADJUTMENT
10'-10"

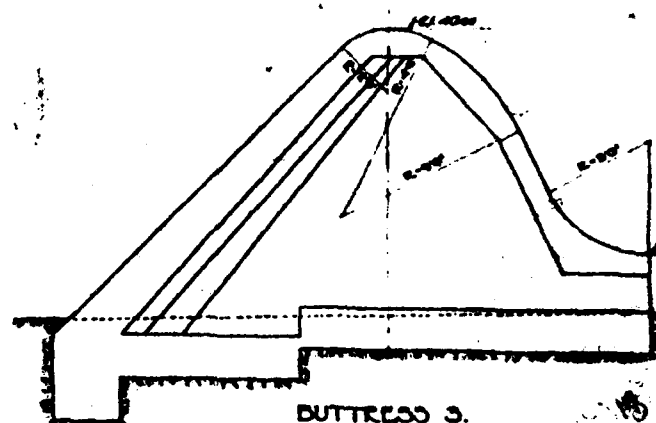


BUTTRESS 1
10'-10"

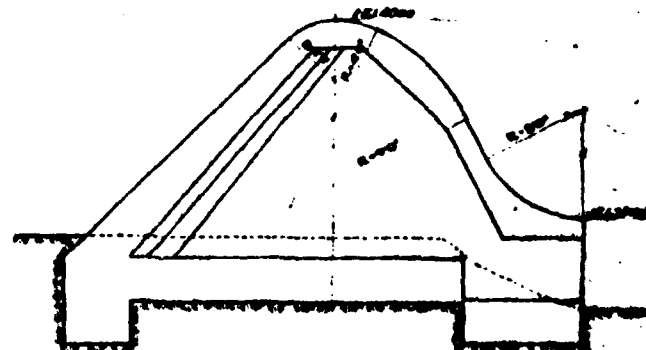
NOT TO SCALE. SEE ELEVATION AND SECTION.



BUTTRESS 4,5,6,7,8.
10'-10"



BUTTRESS 3.
10'-10"



BUTTRESS 2.
10'-10"

WESTCHESTER JOINT WATER WORKS NO. 1
PLANS AND SECTIONS
DAM AT FILTER PLANT.

LOCATION II
SCALE AS SHOWN

Plate 3.

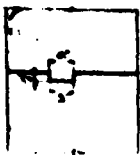
Handwritten signature

DESIGNED BY

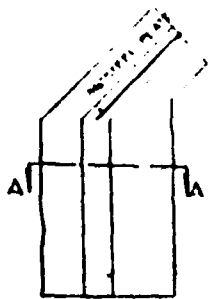
NEW YORK CITY

1920

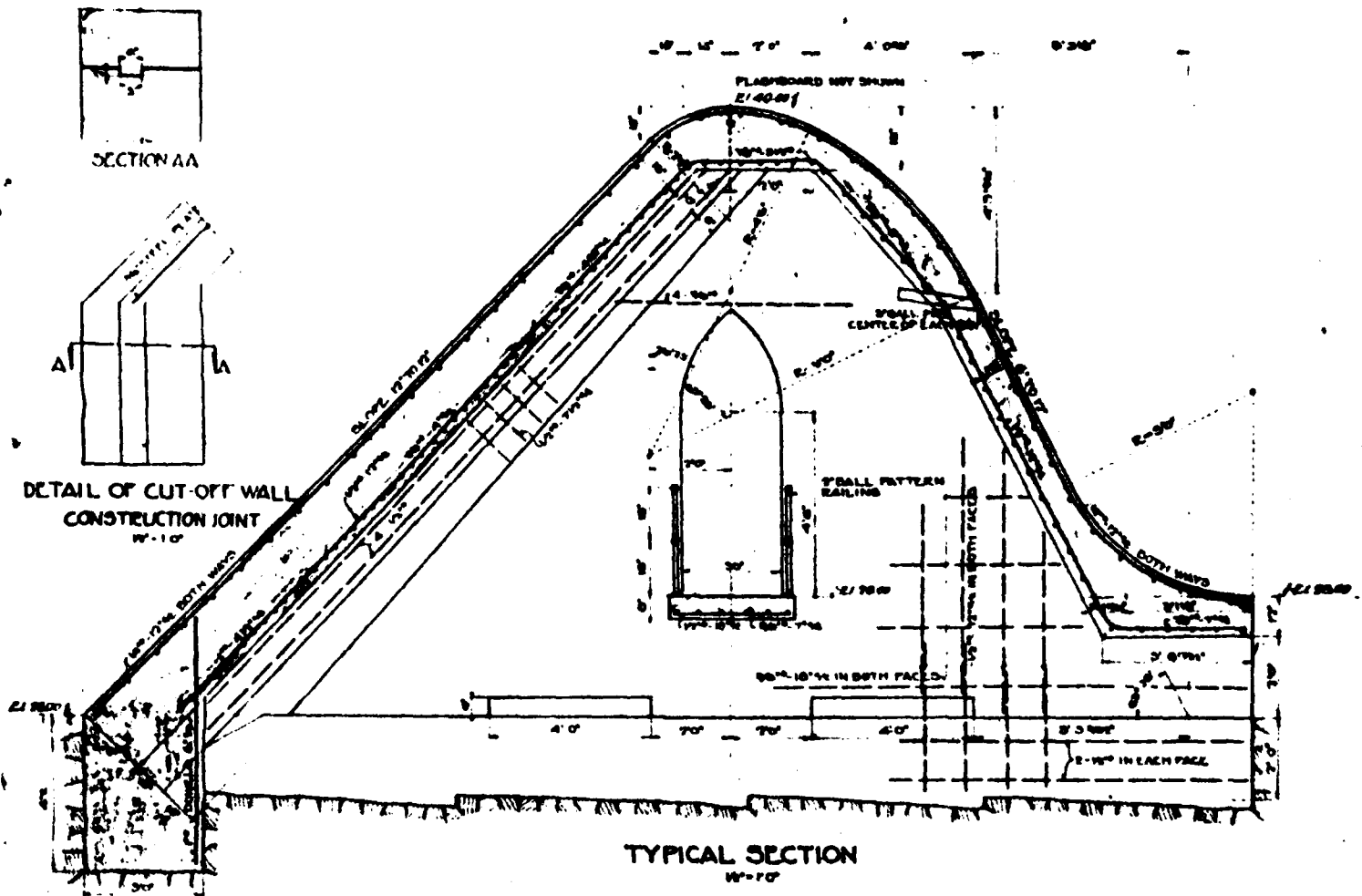
LABORATORY



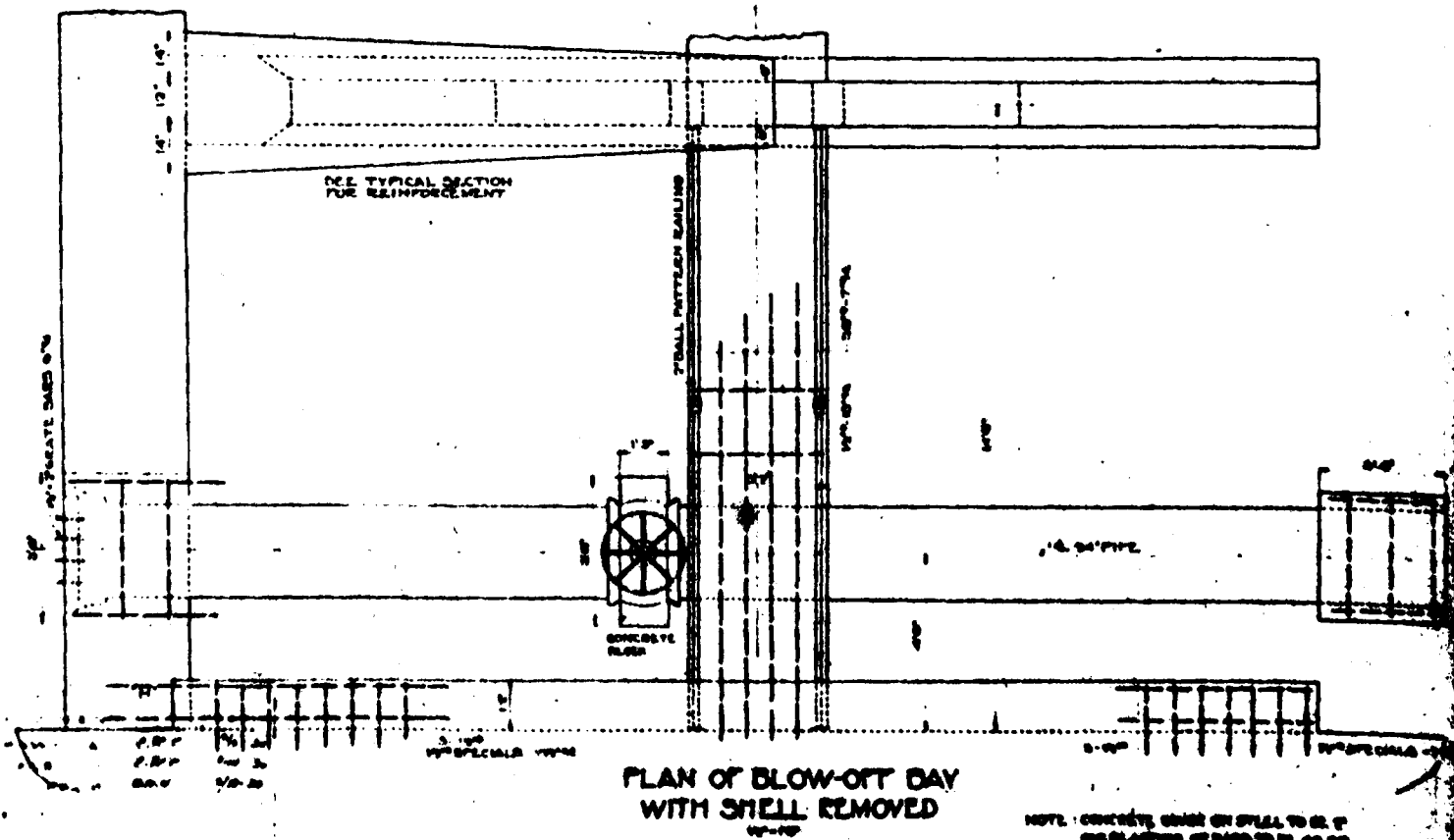
SECTION AA



DETAIL OF CUT-OFF WALL
CONSTRUCTION JOINT
W-10'

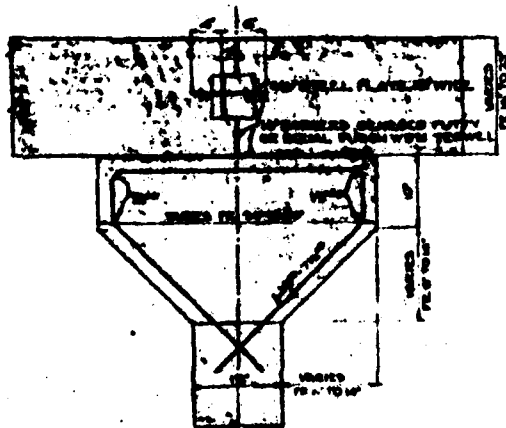
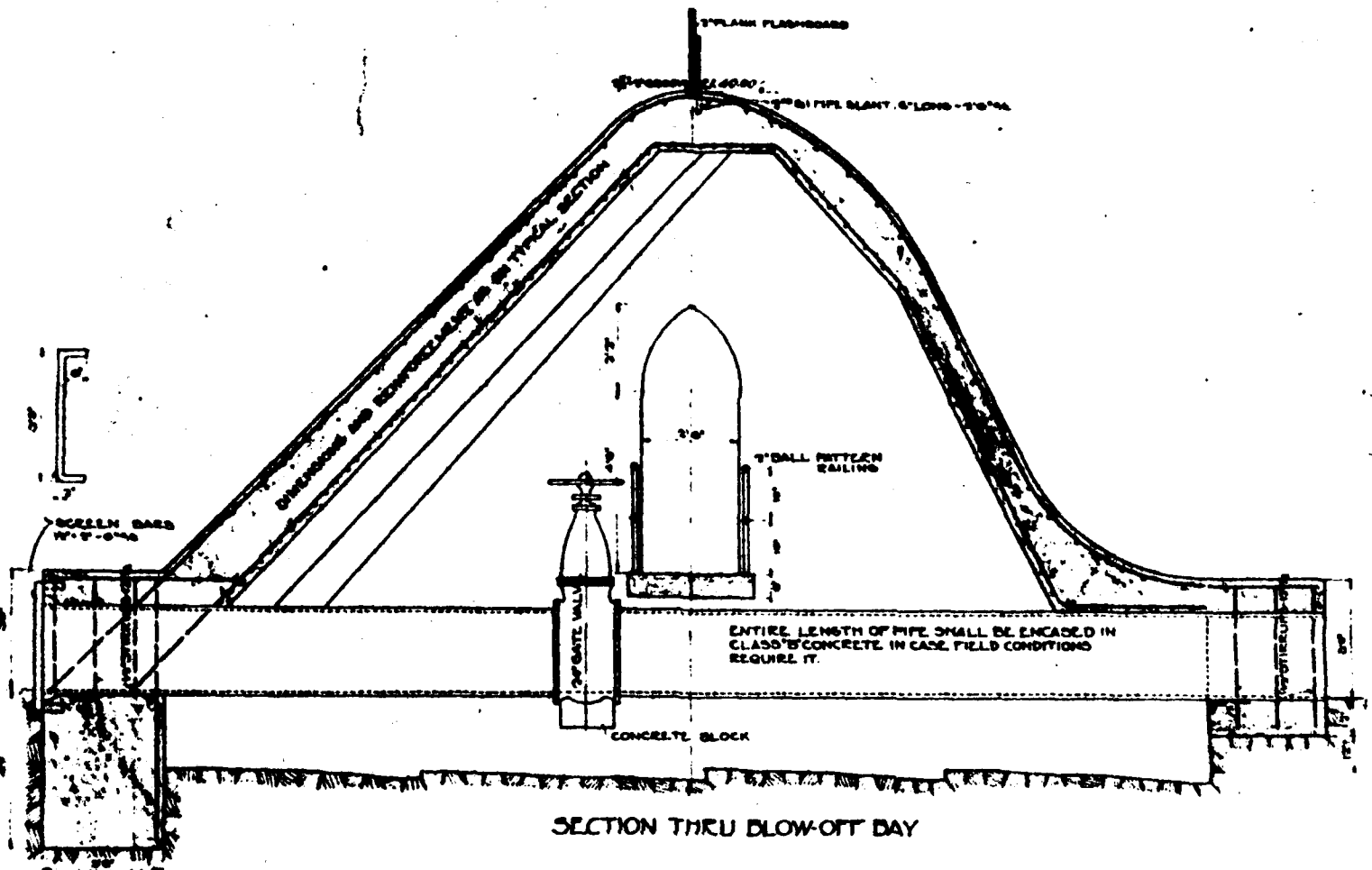


TYPICAL SECTION
W-10'

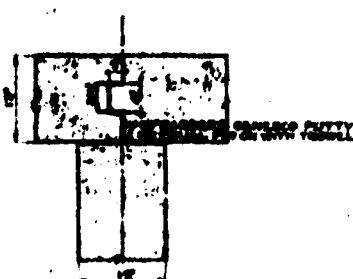


PLAN OF BLOW-OFF BAY
WITH SHELL REMOVED
W-10'

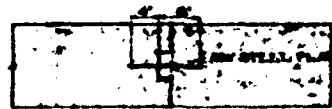
NOTE: CONCRETE CURB ON PILE TO BE 1' OVERLAPPING OF BAY TO BE 40.00.



DECK CONSTRUCTION JOINT



ROLLWAY CONSTRUCTION JOINT



TYPICAL WATERTIGHT
CONSTRUCTION JOINT

WESTCHESTER JOINT WATER WORKS NO. 1
DETAILS OF
DAM AT FILTER PLANT.
LOCATION IV
SCALES AS SHOWN

Plate 4

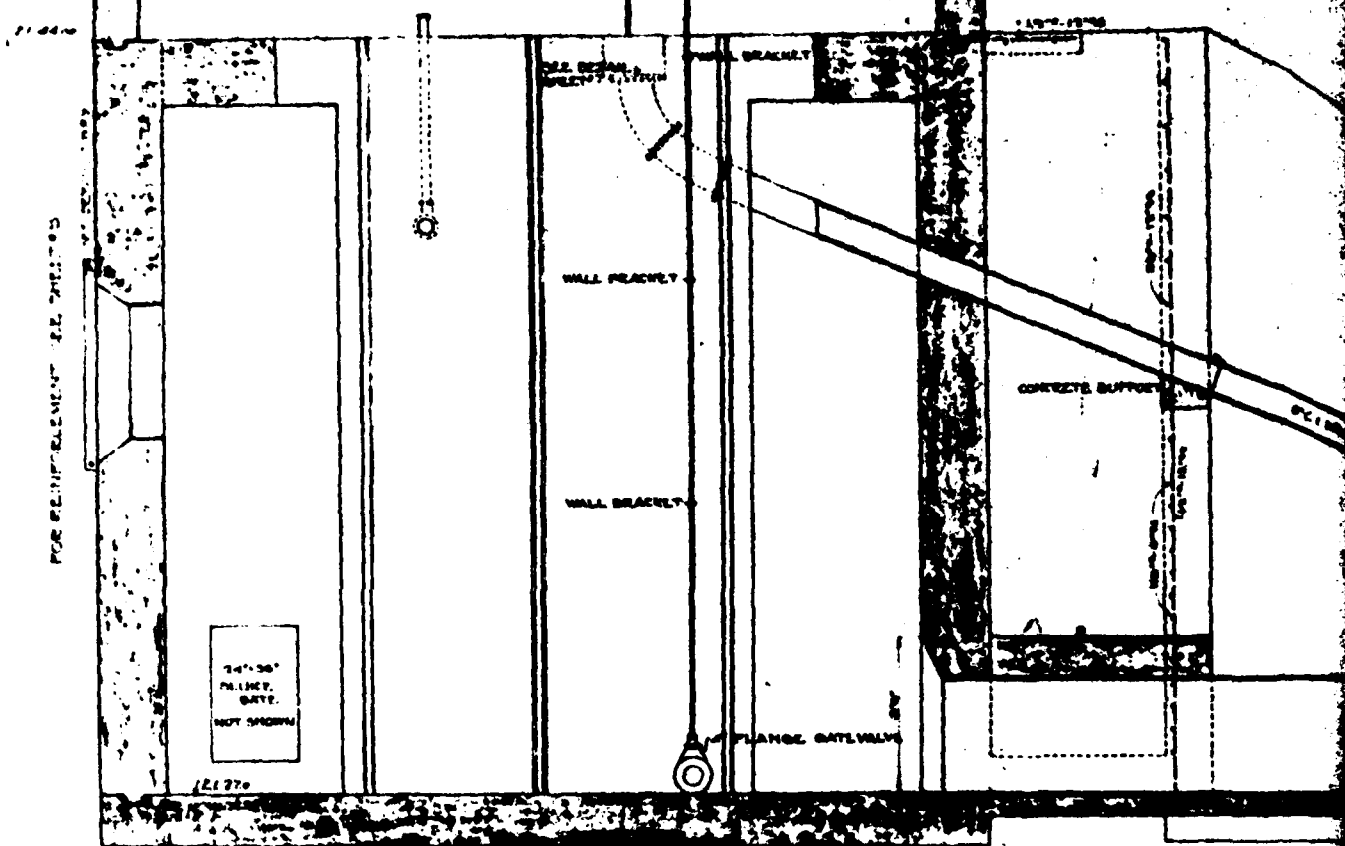
Handwritten signature

ASSOCIATE ENGINEER

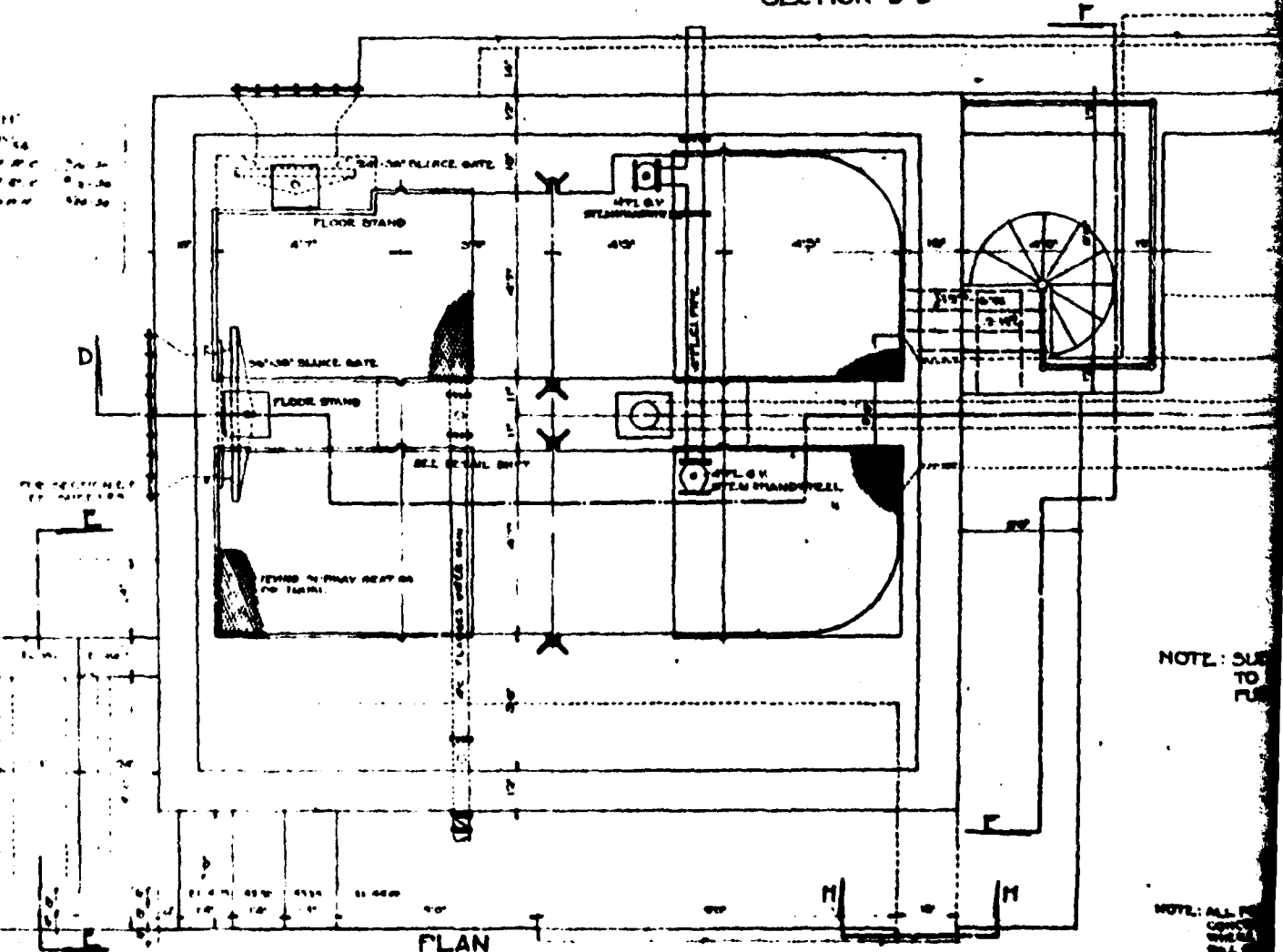
80 CHURCH ST. NEW YORK CITY

JANUARY 1930

LARCHMONT, N.Y.



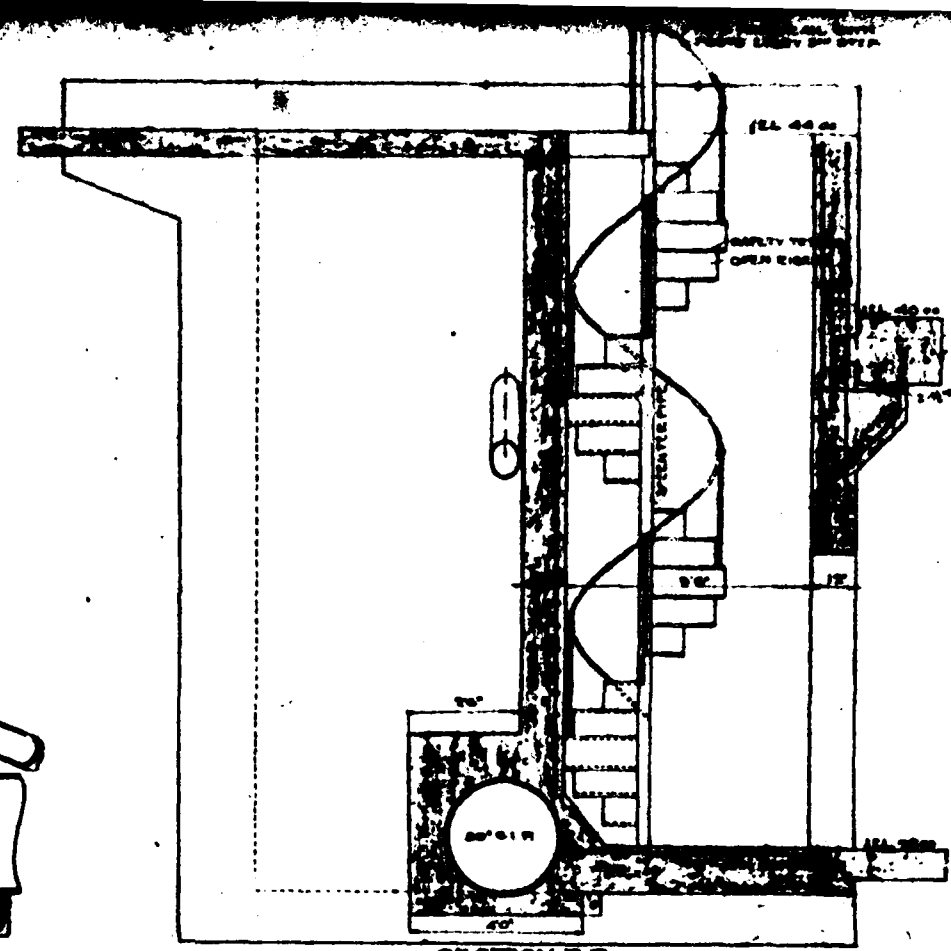
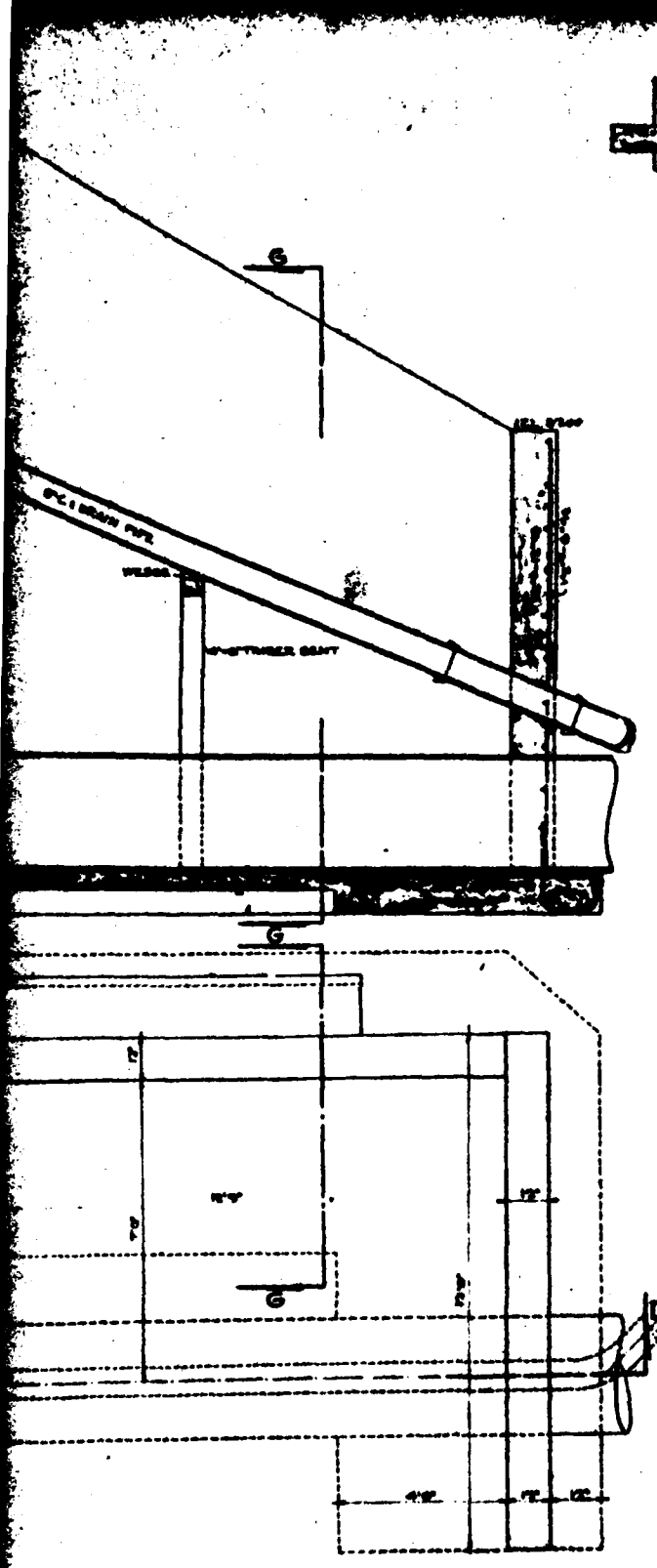
SECTION D-D



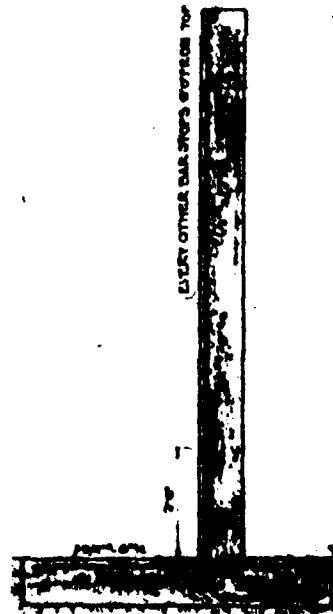
PLAN

NOTE: SEE TO F

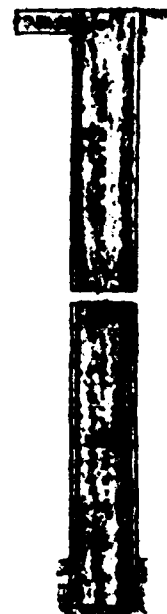
NOTE: ALL P
COPY
WALL
ONLY



SECTION F-F



SECTION G-G



SECTION H-H

2. SUB STRUCTURE SUBJECT TO CHANGE IN ORDER TO MEET REQUIREMENTS OF TYPE OF SCREEN PURCHASED

WESTCHESTER JOINT WATER WORKS NO. 1
 DETAIL OF
 INTAKE SCREEN HOUSE AND RETAINING WALLS
 DAM AT FILTER PLANT
 LOCATION 12

SCALE: 1/4" = 1'-0"

Plate 5

Handwritten signature

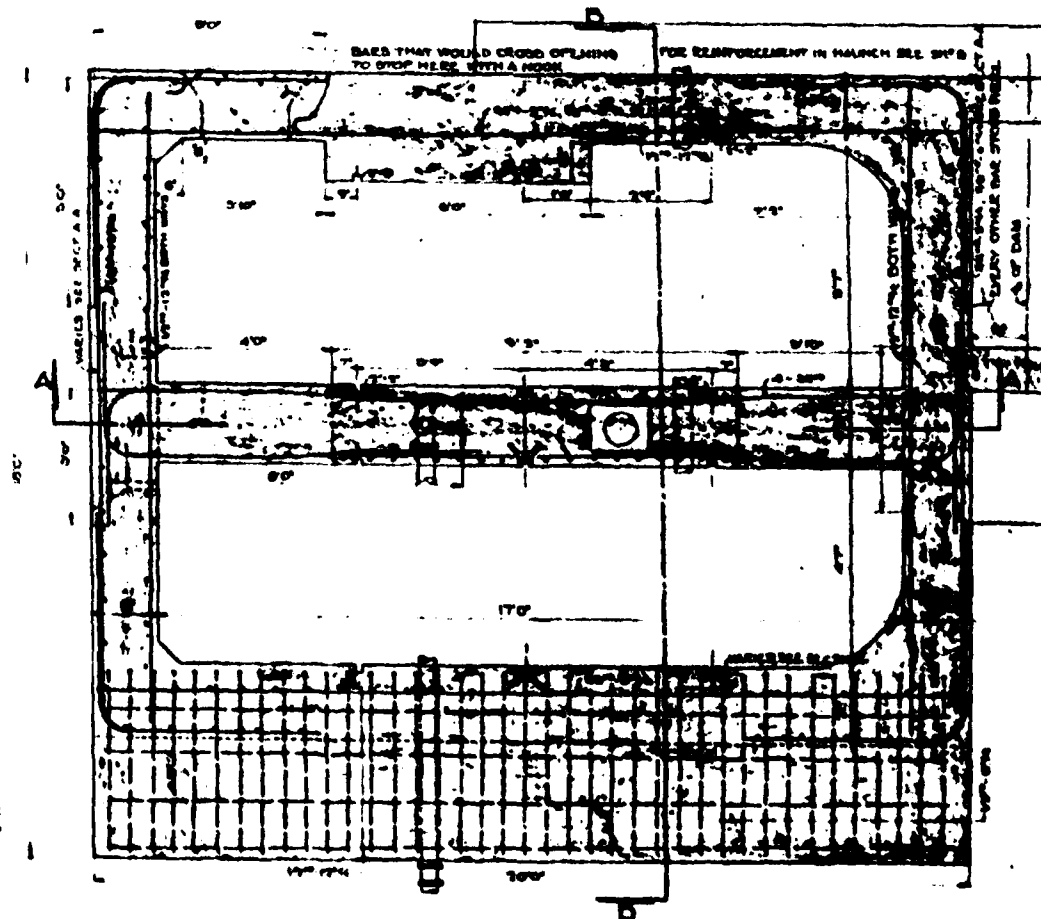
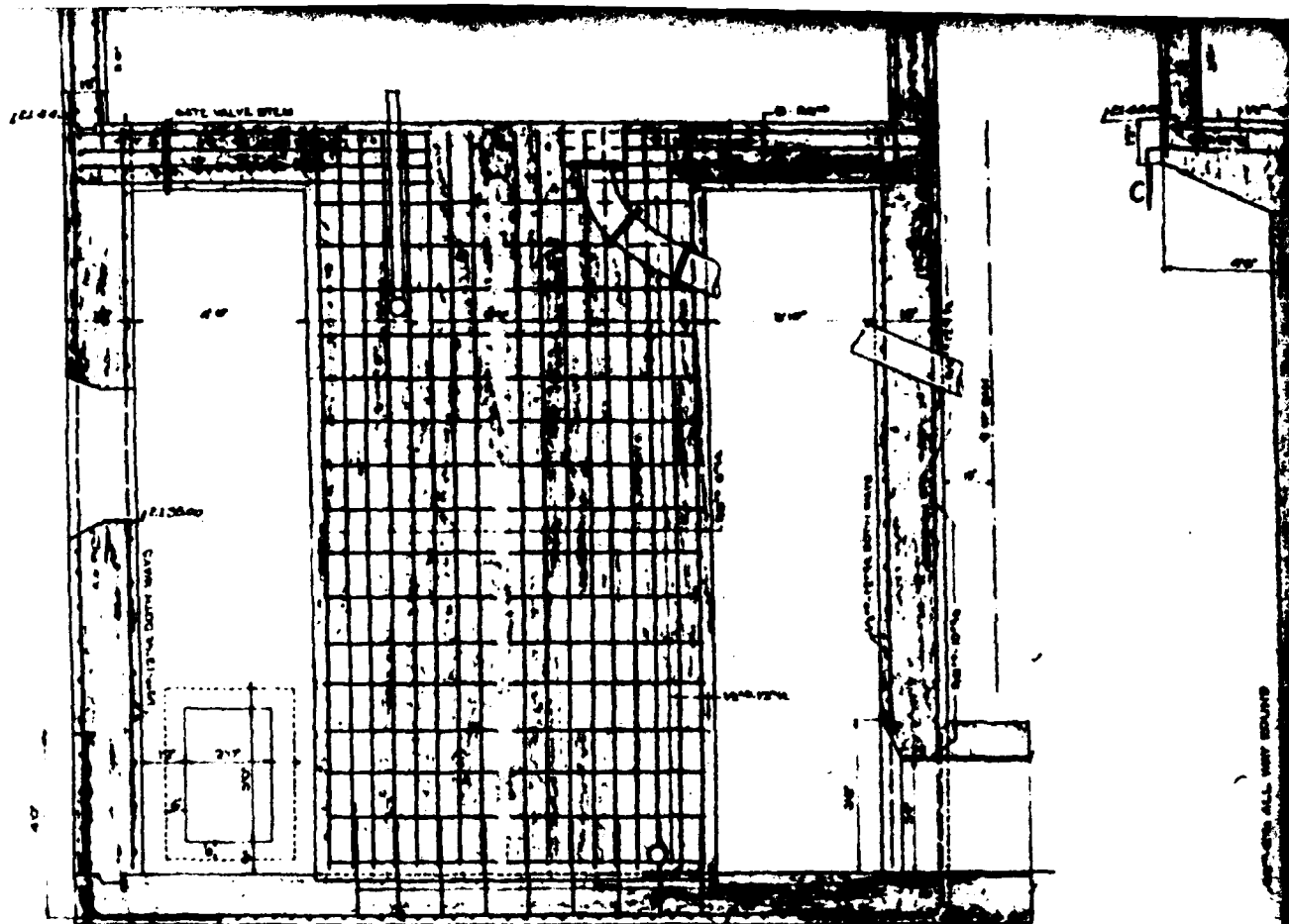
ASSOCIATE ENGINEERS

80 CHURCH ST. NEW YORK CITY

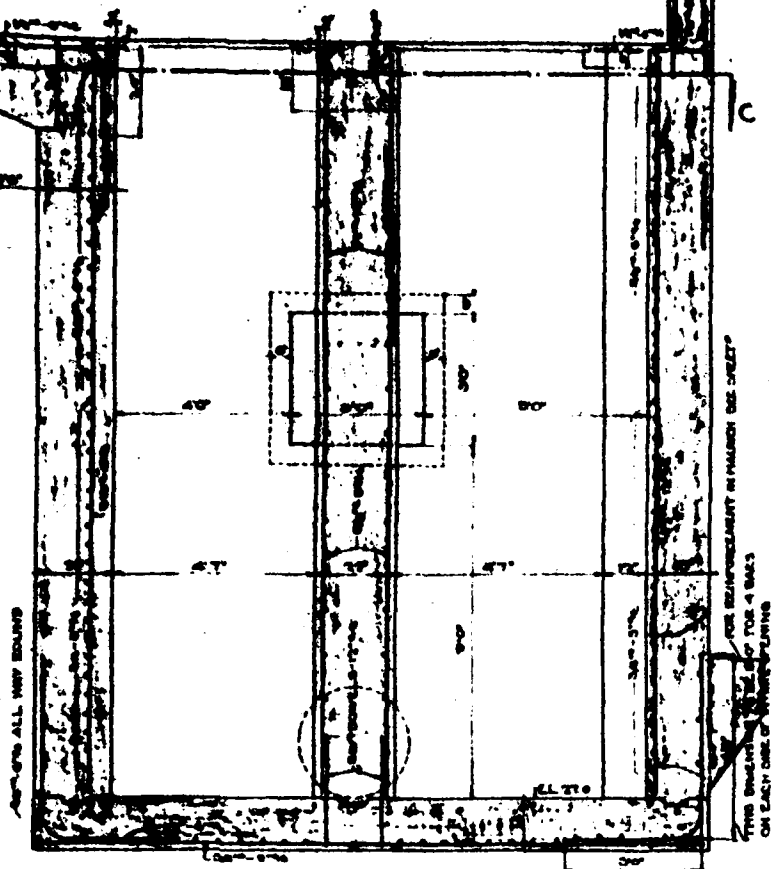
JANUARY 1930

LARCHMONT, N.Y.

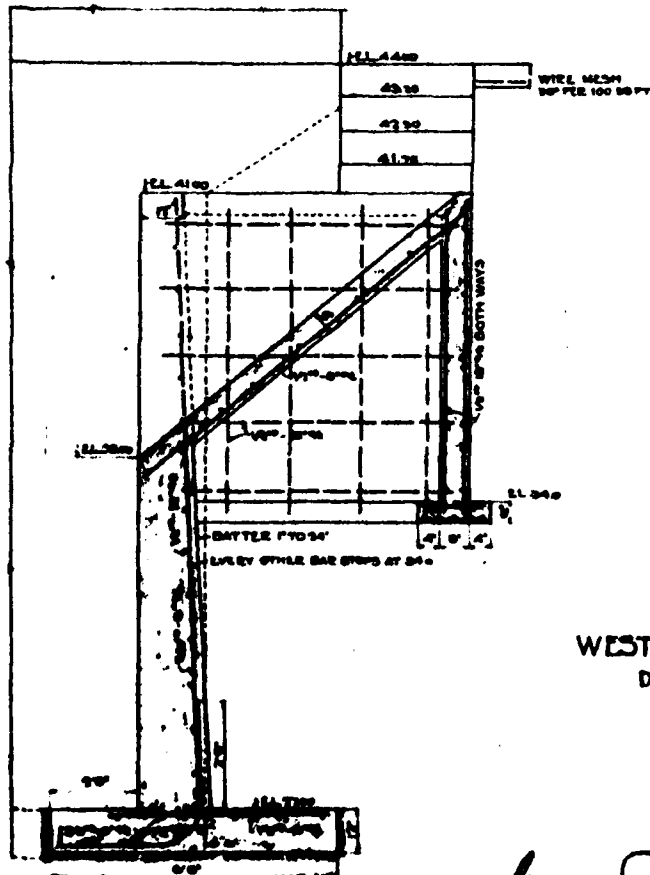
ALL FOOTINGS GO TO ROCK
 CONCRETE CURBS ON STEEL T
 WELLS PIPES PASS THROUGH WALLS. WALL SLEEVED WITH WELD LUGS
 WELLS PIPES PASS THROUGH WALLS. WALL SLEEVED WITH WELD LUGS
 WELLS PIPES PASS THROUGH WALLS. WALL SLEEVED WITH WELD LUGS



NOTE: CONCRETE COVER ON



SECTION B-B



SECTION E-E
SEE SHEET 1710

WESTCHESTER JOINT WATER WORKS NO. 1
DETAILS OF REINFORCED CONCRETE
INTAKE AND SCREEN CHAMBER
DAM AT FILTER PLANT.

LOCATION IV

SCALE: 1/4"=1'-0"

Plate 6

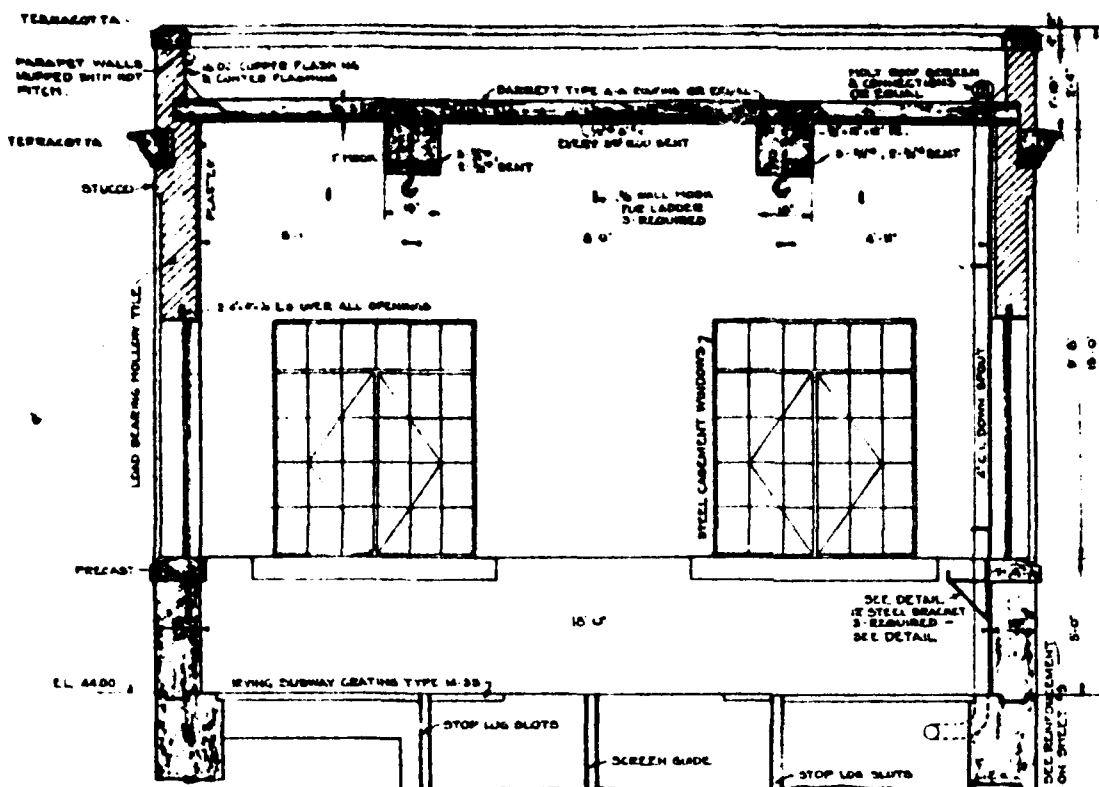
Alfred J. [Signature]

ASSOCIATE ENGINEERS

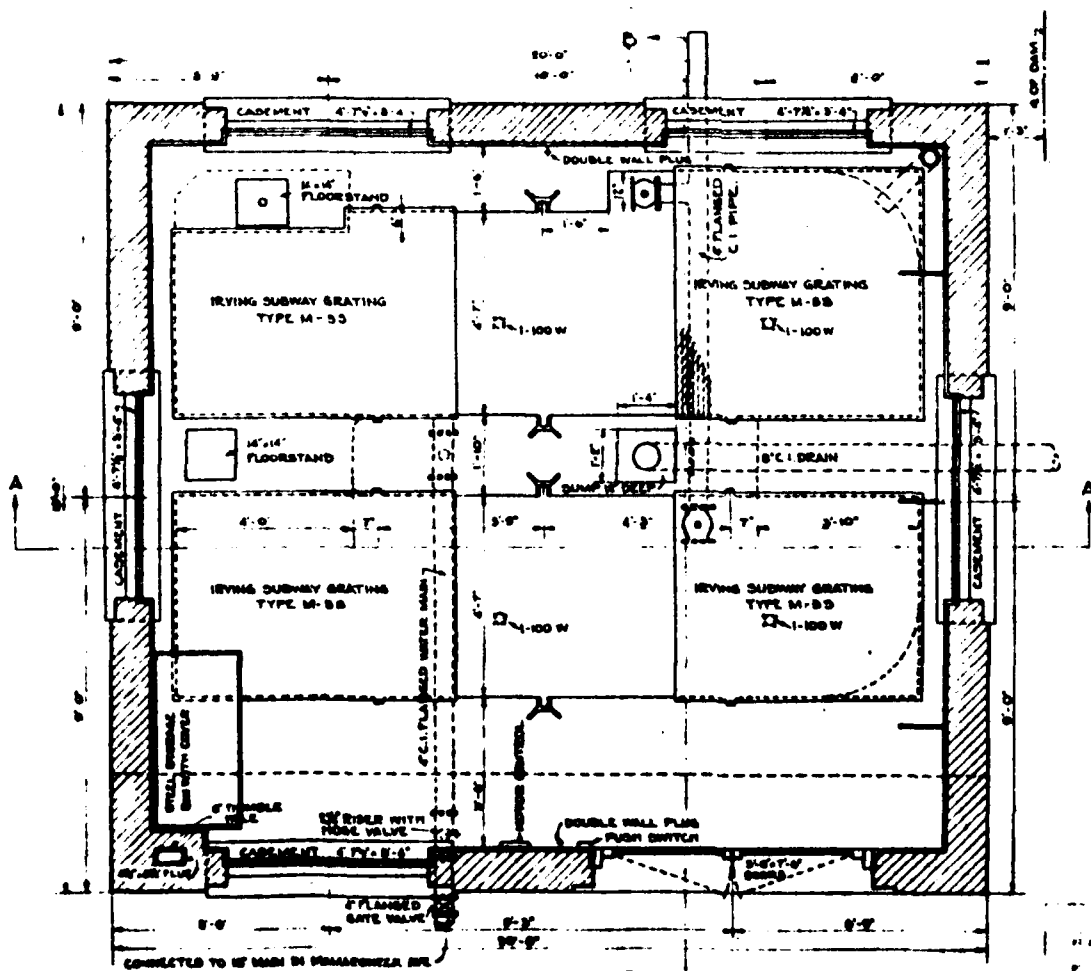
30 CHURCH ST. NEW YORK CITY

JANUARY 1936

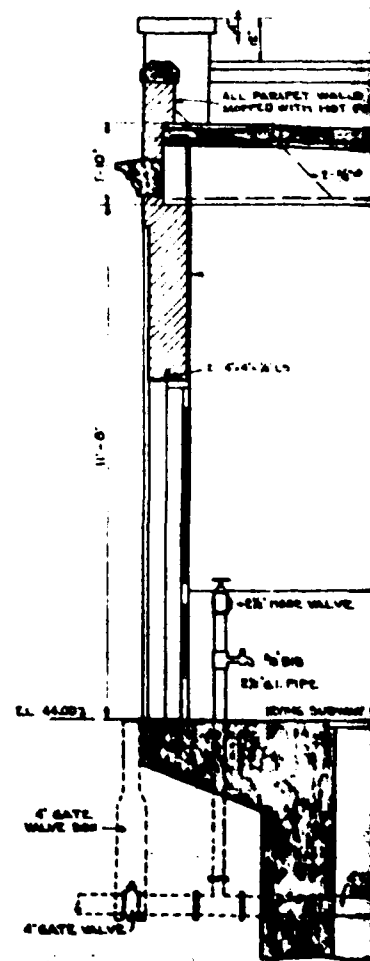
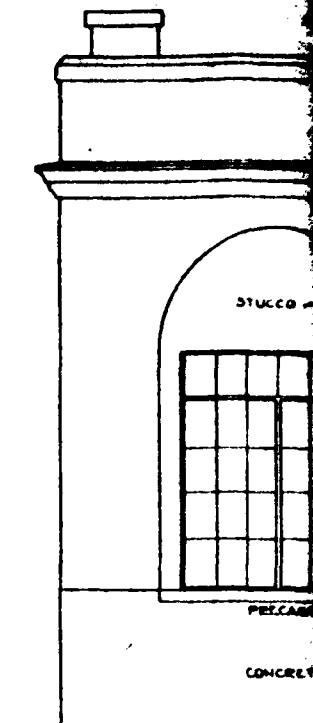
LARCHMONT N.Y.



SECTION A-A



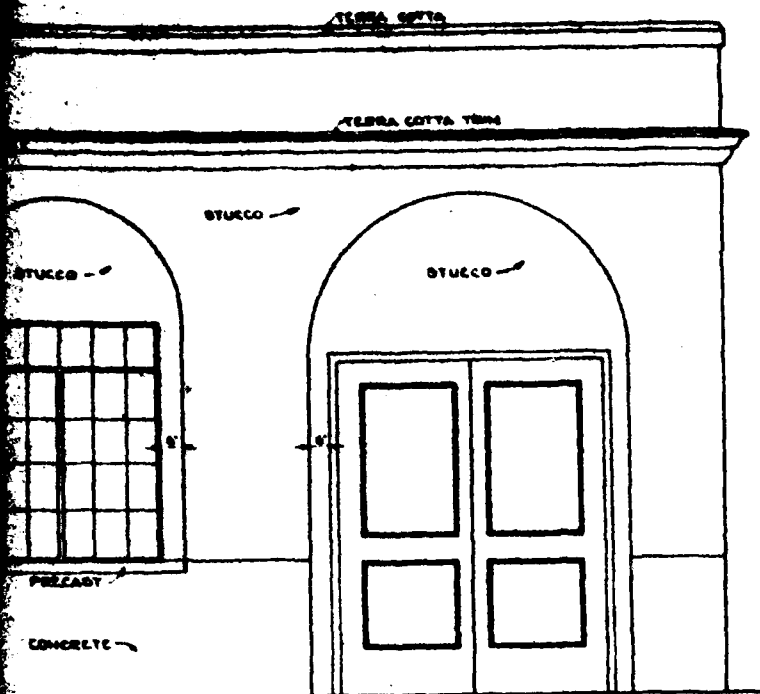
FLOOR PLAN
SCALE: 1/4\"/>



ALL PARAPET WALLS SHIPPED WITH HOT PITCH

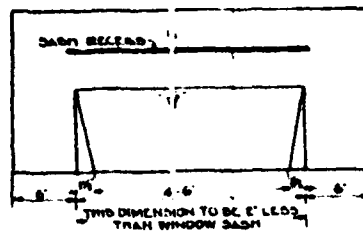
1-100 W

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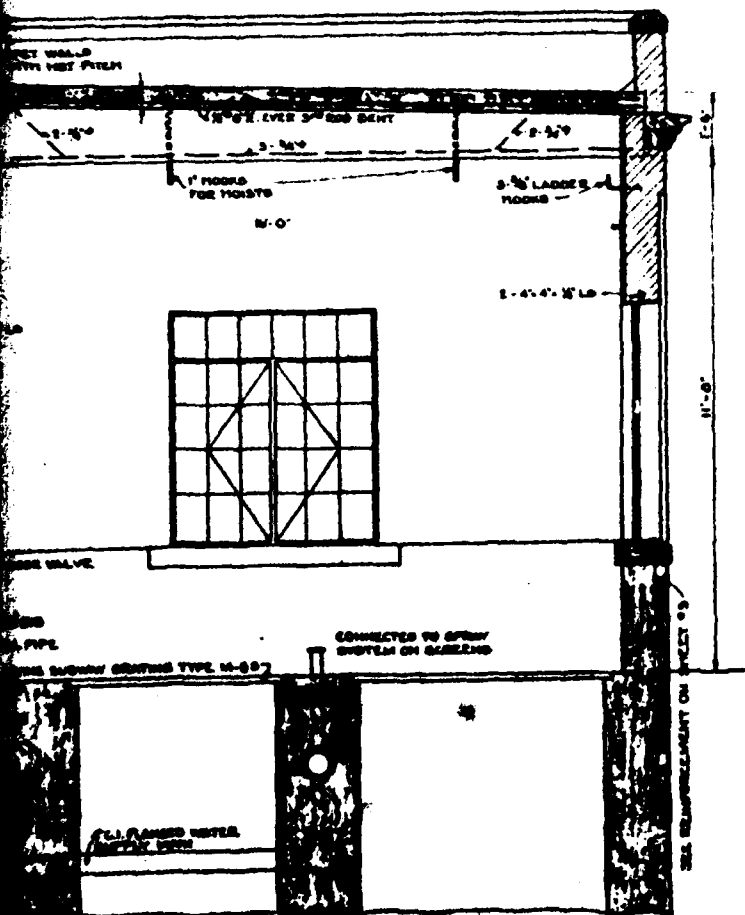


WEST ELEVATION

DETAIL OF
TERRA COTTA TRIM
SCALE: 1/4" = 1'-0"



DETAIL OF PRECAST WINDOW SILL
SCALE: 1/4" = 1'-0"



SECTION B-B
SCALE: 1/4" = 1'-0"

WESTCHESTER JOINT WATER WORKS NO. 1.
INTAKE SCREEN HOUSE
DAM AT FILTER PLANT
LOCATION IV
SCALES AS SHOWN

Plate 7.

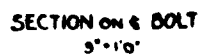
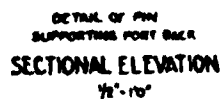
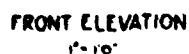
Alvan Peters

ASSOCIATE ENGINEERS

50 CHURCH ST., NEW YORK CITY

JANUARY 1950

LARCHMONT, N.Y.



Technical drawing of a mechanical assembly, likely a door or panel, showing dimensions and labels.

Top View: A cross-shaped component with a central vertical section and a horizontal section. The horizontal section has a width of 4" and a height of 1". The vertical section has a width of 1" and a height of 1". The overall width is 4" and the overall height is 1".

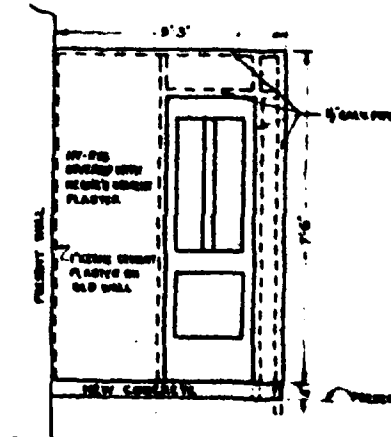
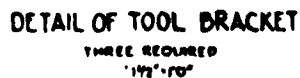
Side View: A vertical component with a width of 1" and a height of 1". The overall width is 1" and the overall height is 1".

Front View: A rectangular component with a width of 4" and a height of 1". The overall width is 4" and the overall height is 1".

Labels:

- 4" (width of top horizontal section)
- 1" (height of top horizontal section)
- 1" (width of top vertical section)
- 1" (height of top vertical section)
- 4" (width of front horizontal section)
- 1" (height of front horizontal section)
- 1" (width of front vertical section)
- 1" (height of front vertical section)
- 4" (width of bottom horizontal section)
- 1" (height of bottom horizontal section)
- 1" (width of bottom vertical section)
- 1" (height of bottom vertical section)

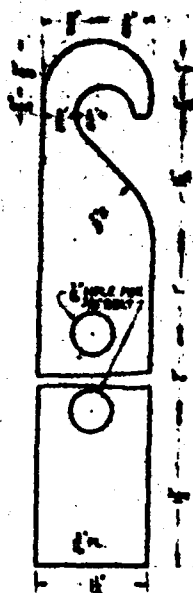
IF ONE SCREEN IS INSTALLED
TWO SETS OF 4' 10"
AND
ONE SET OF 5' 10"
'9' 10"



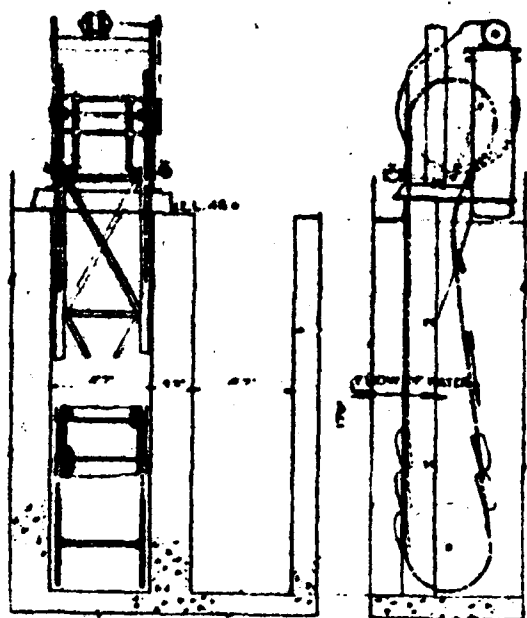
LAVATORY TO BE INSTALLED IN
SW COR OF PRESENT PUMP ROOM
* * *

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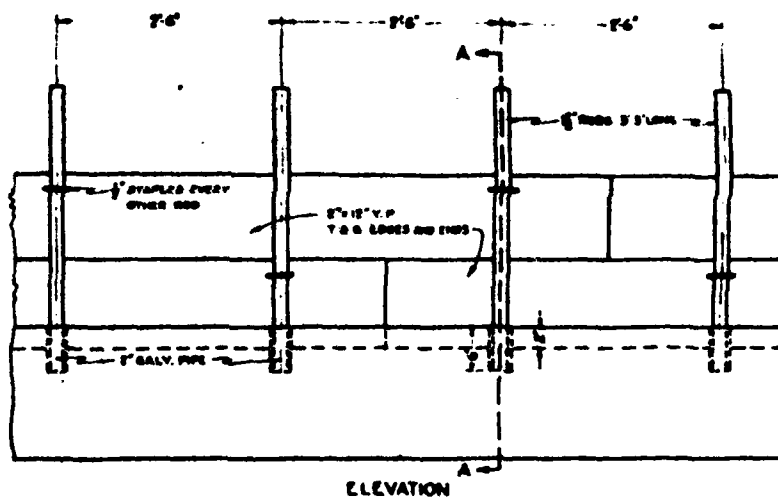
IF TWO SCREENS ARE INSTALLED.
TWO SETS OF 4'-10"
AND
ONE SET OF 5'-10"
1/2'-10"



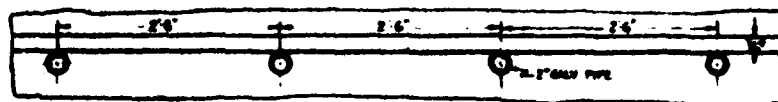
**DETAIL OF HOOKS
FOR STOP PLANKS
TWO REQUIRED FOR EACH PLANK
1'-10"**



MECHANICALLY OPERATED VERTICAL SCREEN
10" x 10"



SECTION A-A



PLAN
RODS AND PLANKS REMOVED

DETAIL OF FLASH BOARD CONSTRUCTION

DELETED AS SPENDING

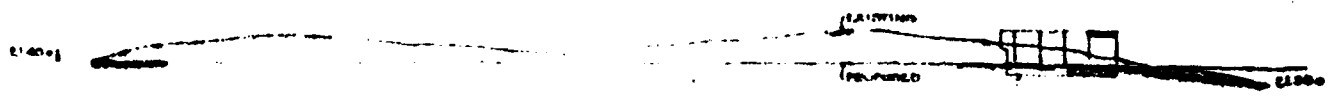
Plate 8

ASSOCIATE CASHIER

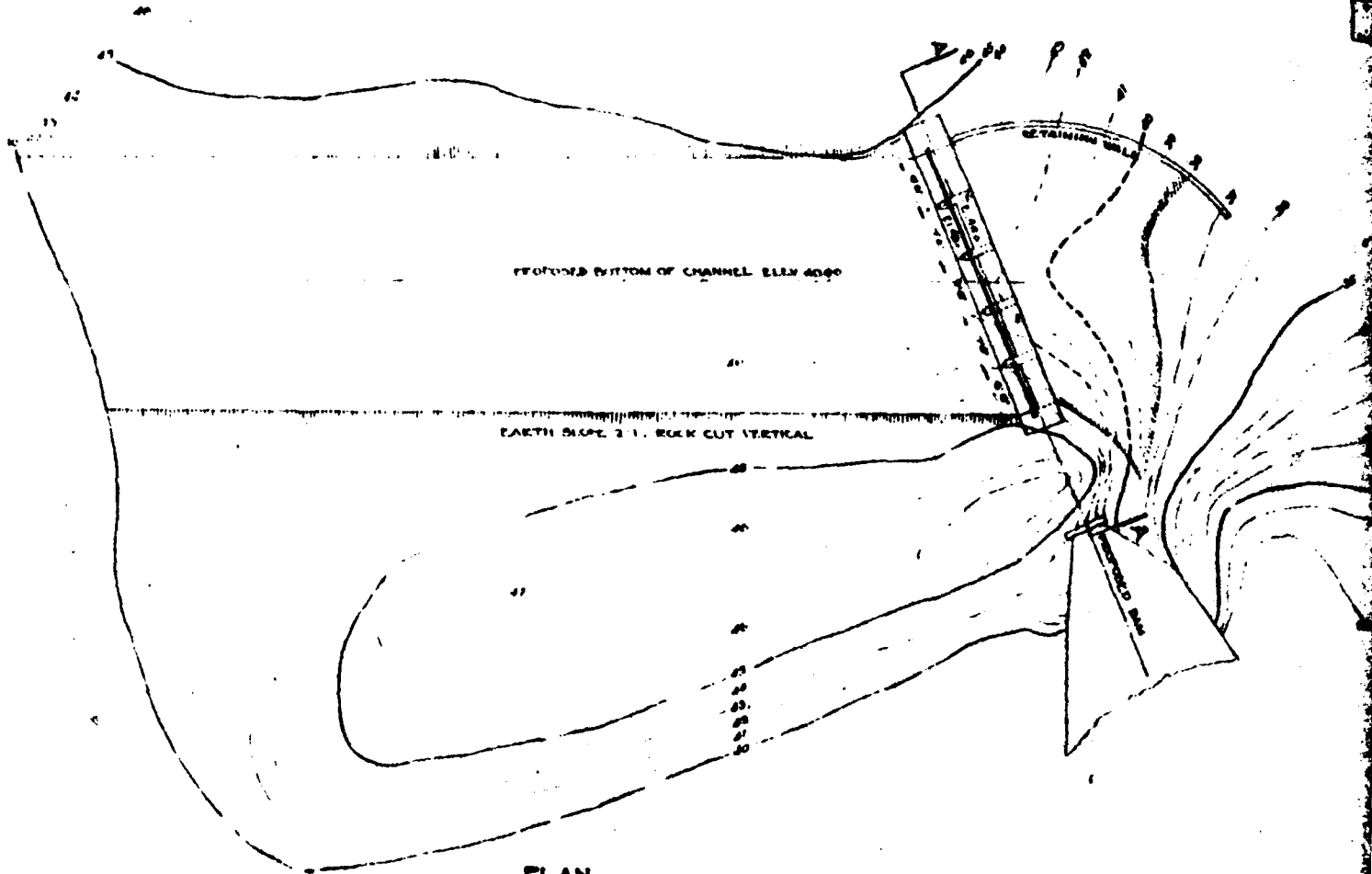
80 CHURCH ST., NEW YORK CITY

Abstract

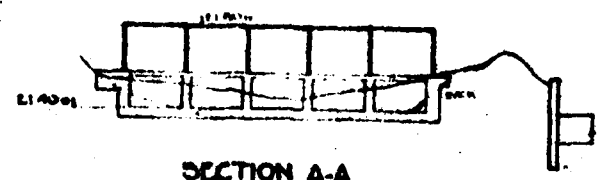
LAST REPORT: MAY



PROFILE ALONG & OF CHANNEL

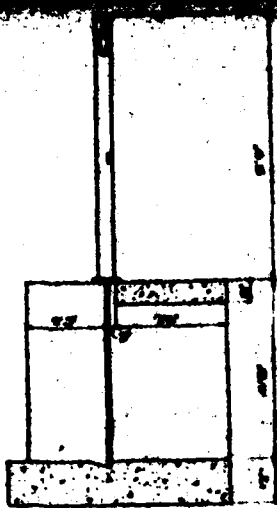


PLAN

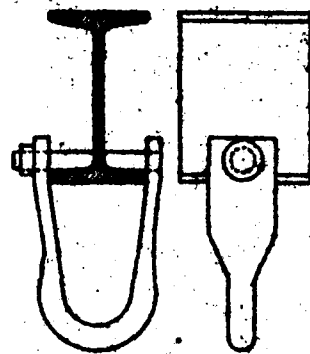


SECTION A-A

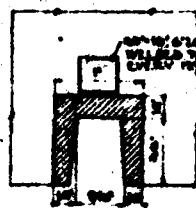
DRAWN BY
 CHECKED BY
 DESIGNED BY
 APPROVED BY
 INCH PAPER



SECTION D-D
1"=10'



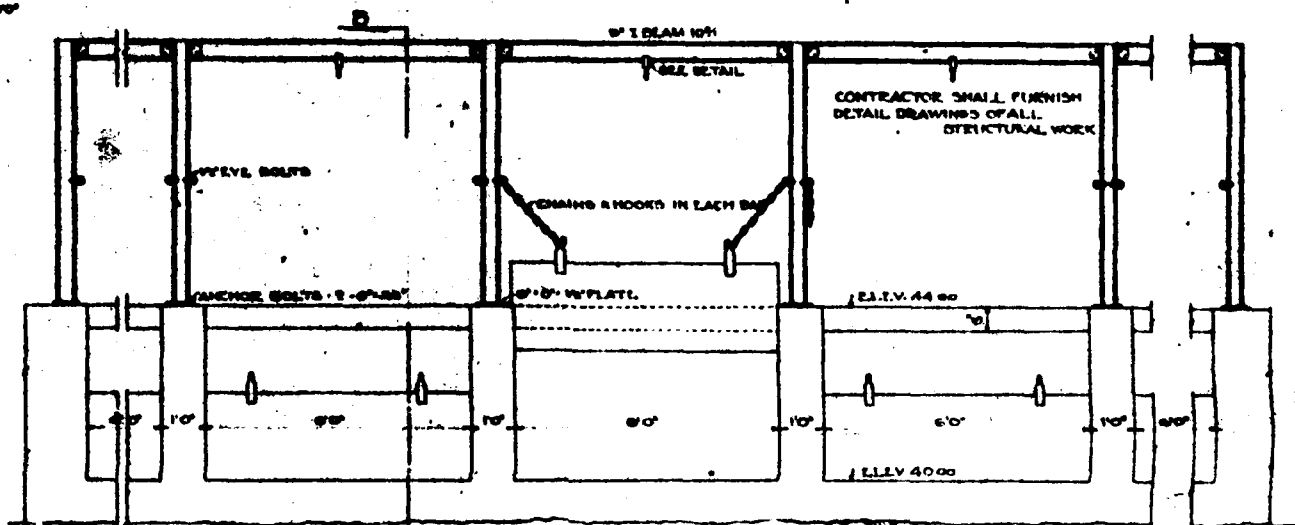
TACKLE HOOK DETAIL
3/8"=1"



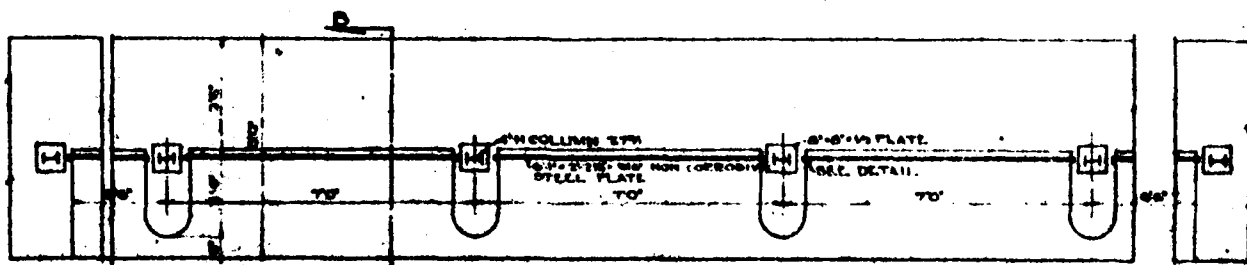
SLOT DETAIL
1"=8"



BOTTOM GROOVE DETAIL
1/2"=1"



ELEVATION OF SLUICE GATES
1 1/2"=10'



PLAN OF SLUICE GATES
1 1/2"=10'

WESTCHESTER JOINT WATER WORKS NO. 1
SLUICE GATES
DAM AT FILTER PLANT
LOCATION 12
SCALES AS SHOWN

Plate 9

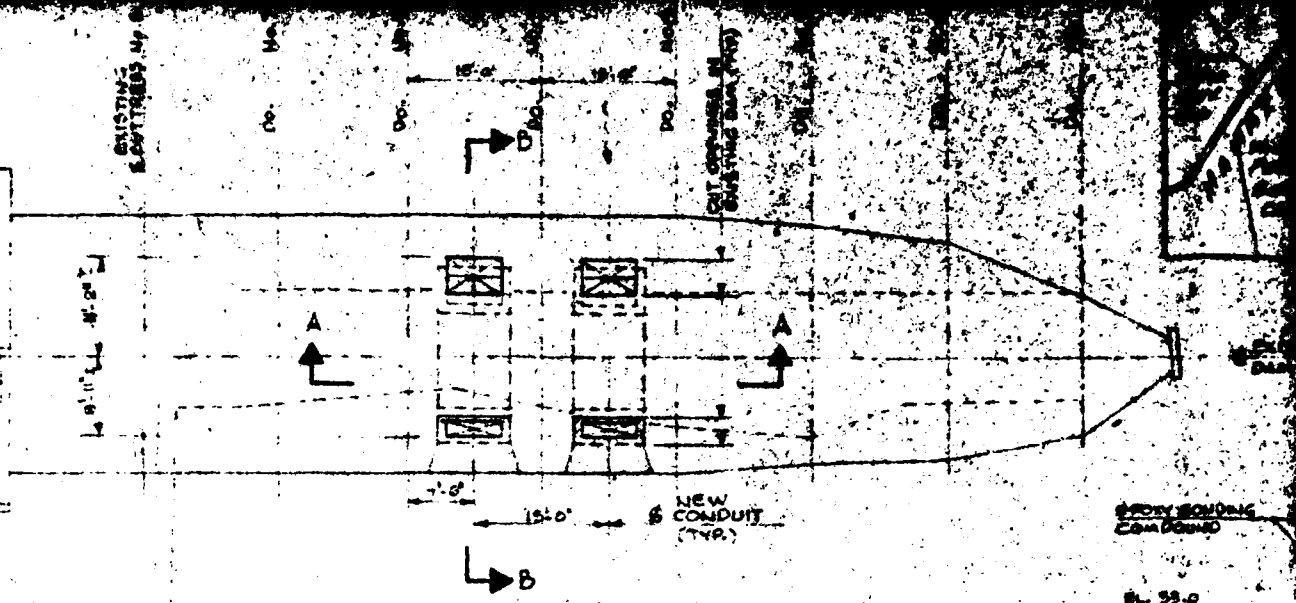
Handwritten signature

ASSOCIATE ENGINEERS

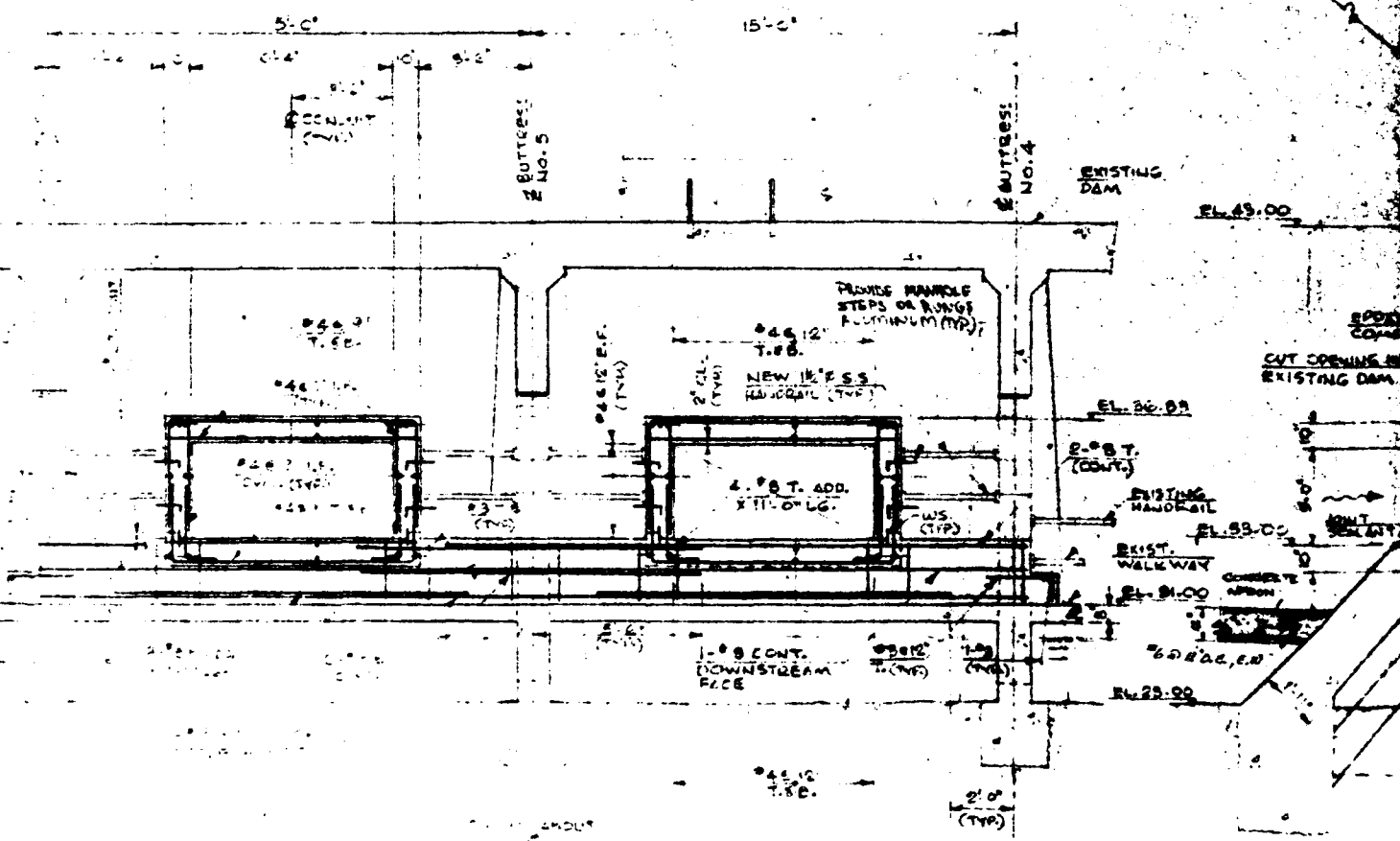
50 SPURIN BL. NEW YORK CITY

FEBRUARY 1920

LARCHMONT, N.Y.



PLAN
1"=10'-0"



SECTION A-A

COUNTY OF WESTCHESTER
DEPARTMENT OF PUBLIC WORKS

VILLAGE OF MA

RECOMMENDED
RUDOLPH C. PETRUCELLI
DESIGN COORDINATOR

Edward M. McCabe
RECOMMENDED

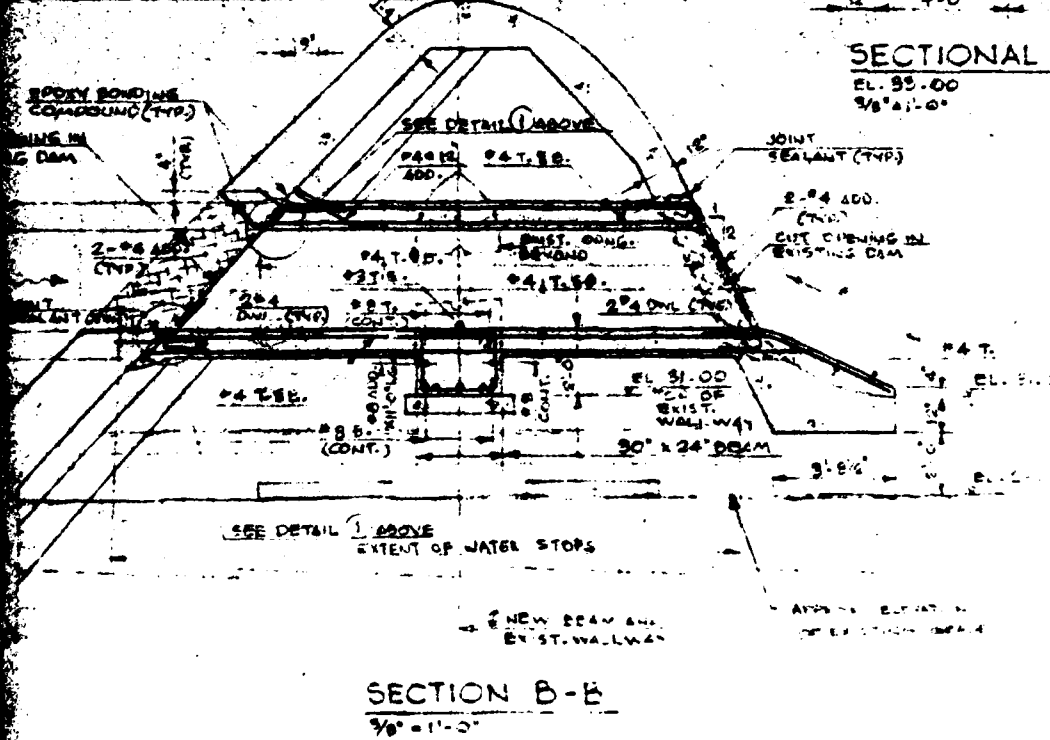
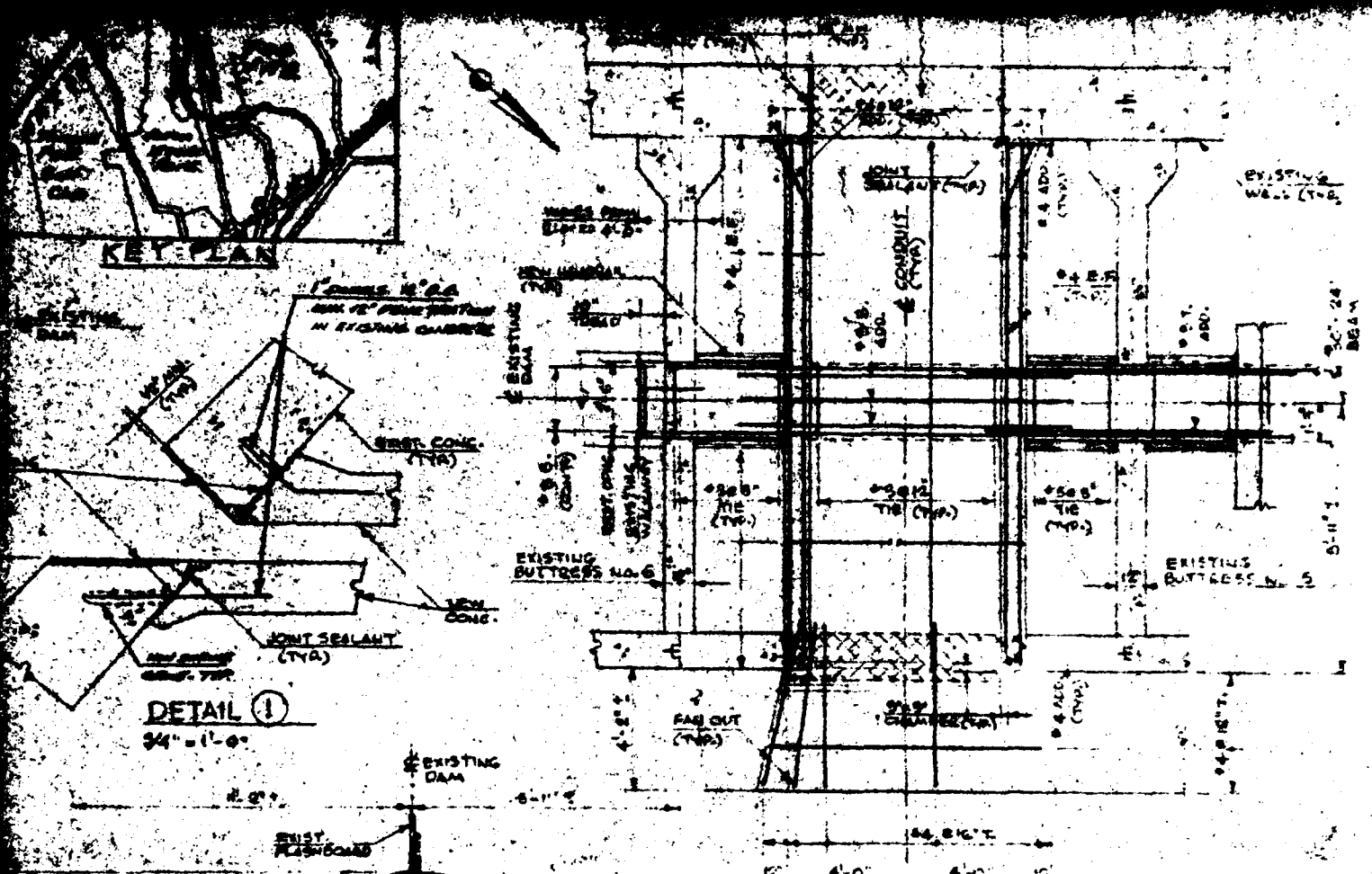
EDWARD M. MCCABE
DIRECTOR OF ENGINEERING RECOMMENDED

FRANK T. KEARNEY
1ST DEPUTY COMMISSIONER

James J. ...
ENGINEER

DESIGNED	DATE	BY
DRAWN	DATE	BY
CHECKED	DATE	BY
SECT. CHIEF	DATE	BY
PROJ. ENGR.	DATE	BY
BY	DATE	ISSUED FOR

HAZEN AND SAW
ENGINEERS
380 LEXINGTON AVE
NEW YORK, N.Y.



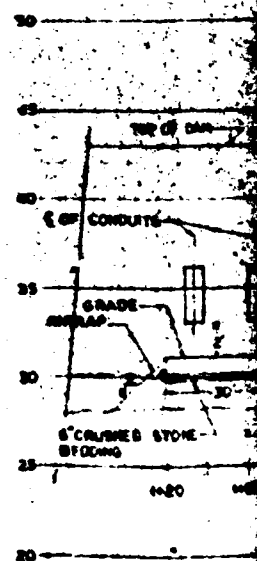
GENERAL NOTES

1. ALL CONCRETE SHALL BE CLASS 2 CONCRETE WITH MINIMUM COMPRESSIVE STRENGTH OF 3000 LBS. PER SQ. IN. (20 MPa) WHEN BUILDING CODE HAVING ELICTION SHALL GOVERN.)
2. REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF ASTM A615 GRADE 60.
3. ALL STEEL SHALL BE 304 OR 316 UNLESS NOTED OTHERWISE (NATIONAL SPECIFICATION TO BE USED).
4. JOINT SEALANT SHALL BE 1/2\"/>

TOWN OF MAMARONECK ARMAND J. GIAMUNIZIO VILLAGE MANAGER		COUNTY OF WESTCHESTER DEPARTMENT OF PLANNING PETER ESCHWEILER COMMISSIONER		WESTCHESTER JOINT WATER WORKS MAMARONECK, N.Y. JOHN & MOCH P.E. MANAGER		Plate 10 DATE 1/28/78 SHEET 1 OF 4 DWG 51-01-C-1-0 RES. NO. 1-2
B. SAWYER SCALE AS SHOWN		COUNTY OF WESTCHESTER DEPARTMENT OF PUBLIC WORKS FRANK C. BOHLANDER COMMISSIONER		MODIFICATIONS OF WESTCHESTER JOINT WATER WORKS DAM CONTRACT NO. 2515 TWIN CONDUIT DETAILS		

WEST 1: 5
HOLB 1: 4

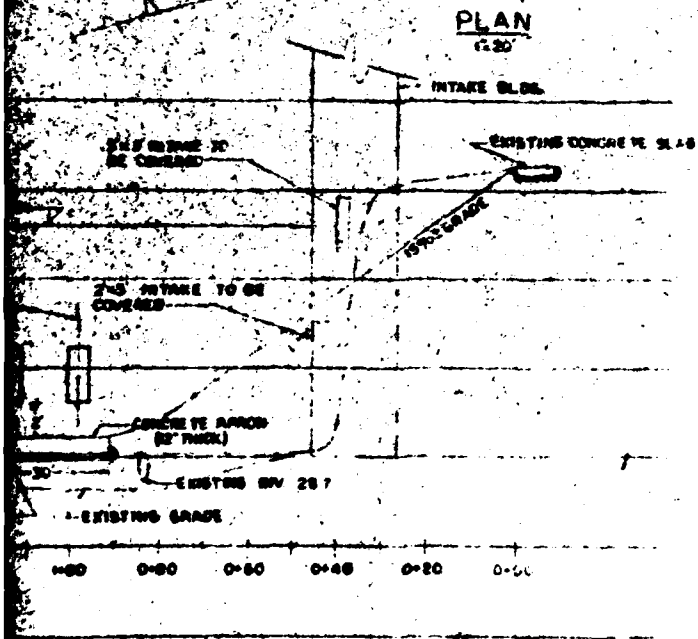
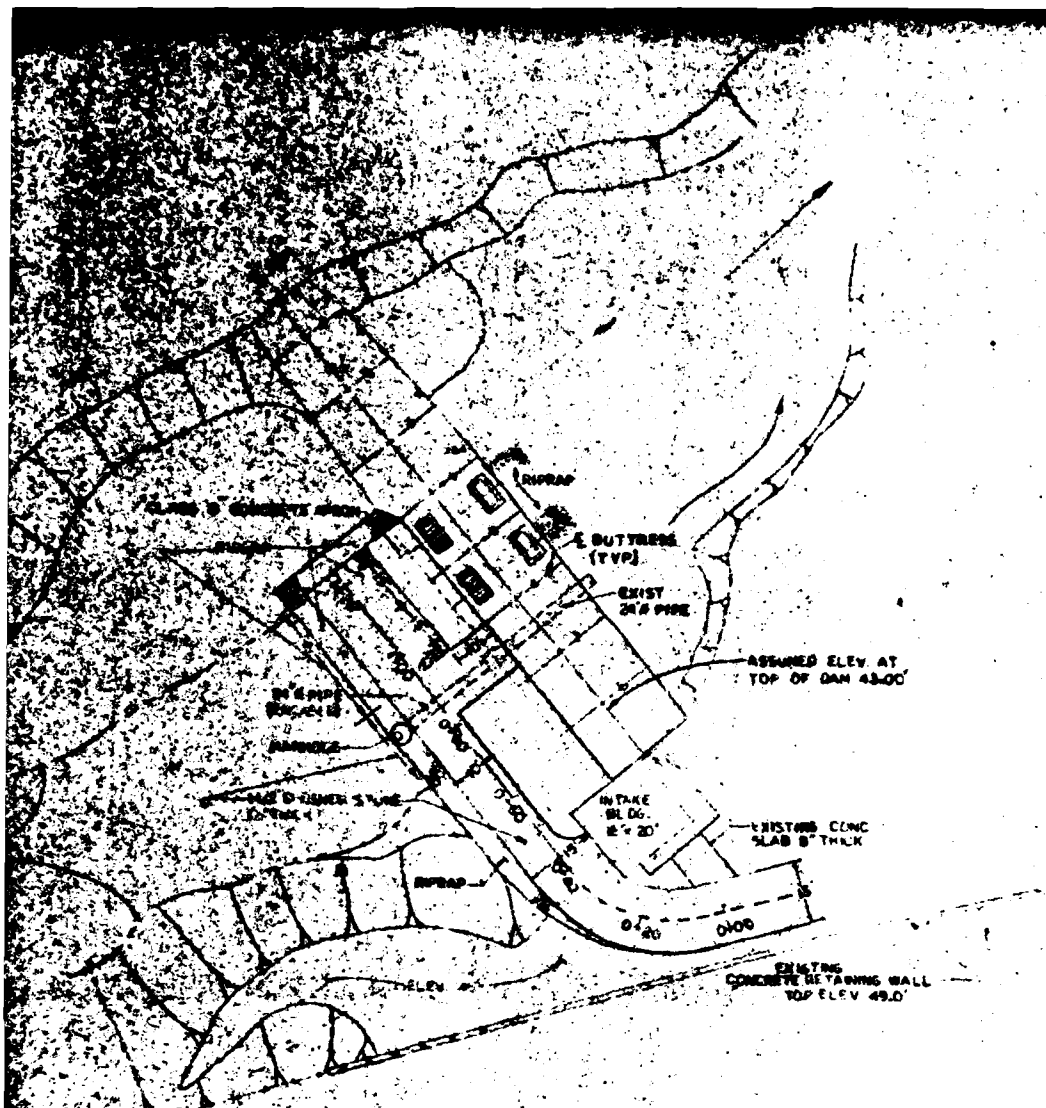
684 - 1.5
→ 682 (1.5)

[illegible]

DESIGNED AP
DRAWN AP
CHECKED _____
SECT CHIEF _____
PROJ ENGR Ted T

HAZEN AND SA
ENGINEERS

200 LEXINGTON AVE.
NEW YORK, N.Y. 10017

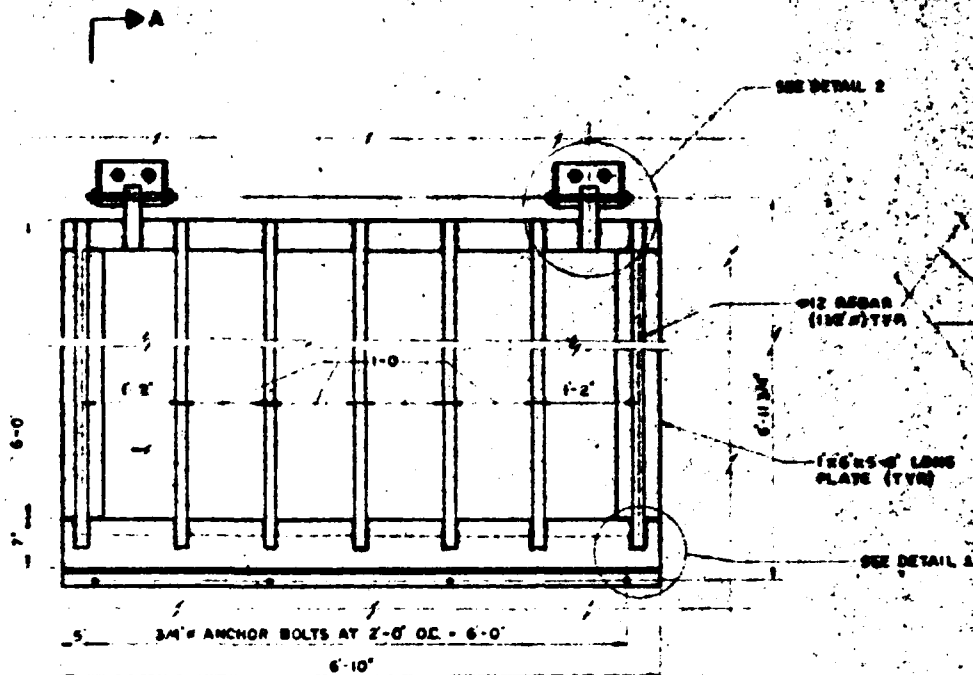


- NOTES: 1. ELEVATIONS BASED ON U.S.G.S. DATUM
2. GATE VALVE ON EXISTING 24" DRAIN PRESENTLY NORMALLY OPEN. TO BE NORMALLY CLOSED AFTER COMPLETION OF TWIN CONDUITS

Plate 19

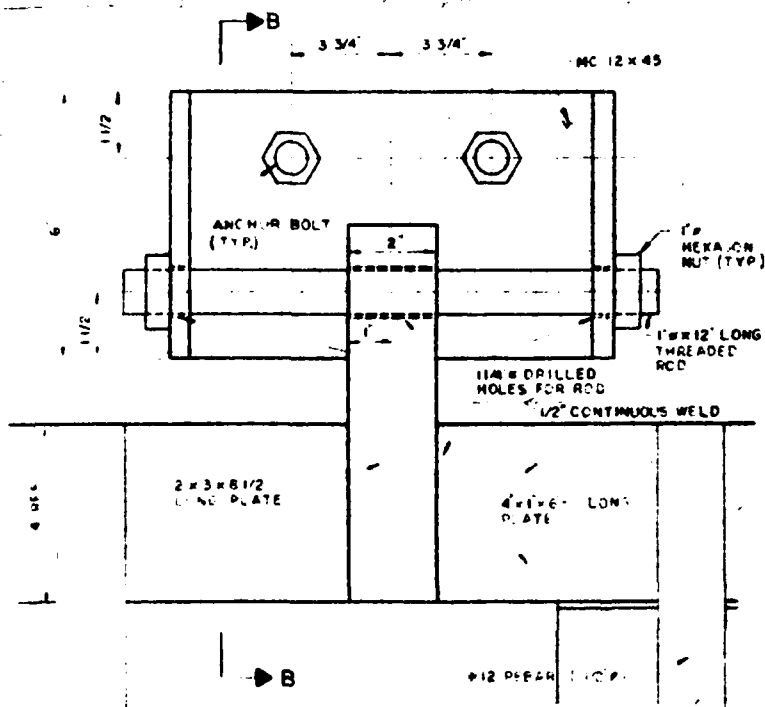
SAWYER 1000 1000 1000	SCALE 1" = 10'	COUNTY OF WESTCHESTER DEPARTMENT OF PUBLIC WORKS FRANK C. BOYLANDER	MODIFICATIONS OF WESTCHESTER JOINT WATER WORKS DAM CONTRACT NO 2315	DATE 1/6/70 SHEET 1 OF 1
--------------------------------	-------------------	---	---	-----------------------------

3'-0" x 6'-4"
CONDUIT
SEE DMC
7721-1



BARSCREEN ASSEMBLY
(1 REQUIRED PER CONDUIT)
SCALE: 1/2"=1'-0"

SECTION A-A
SCALE: 1/2"=1'-0"

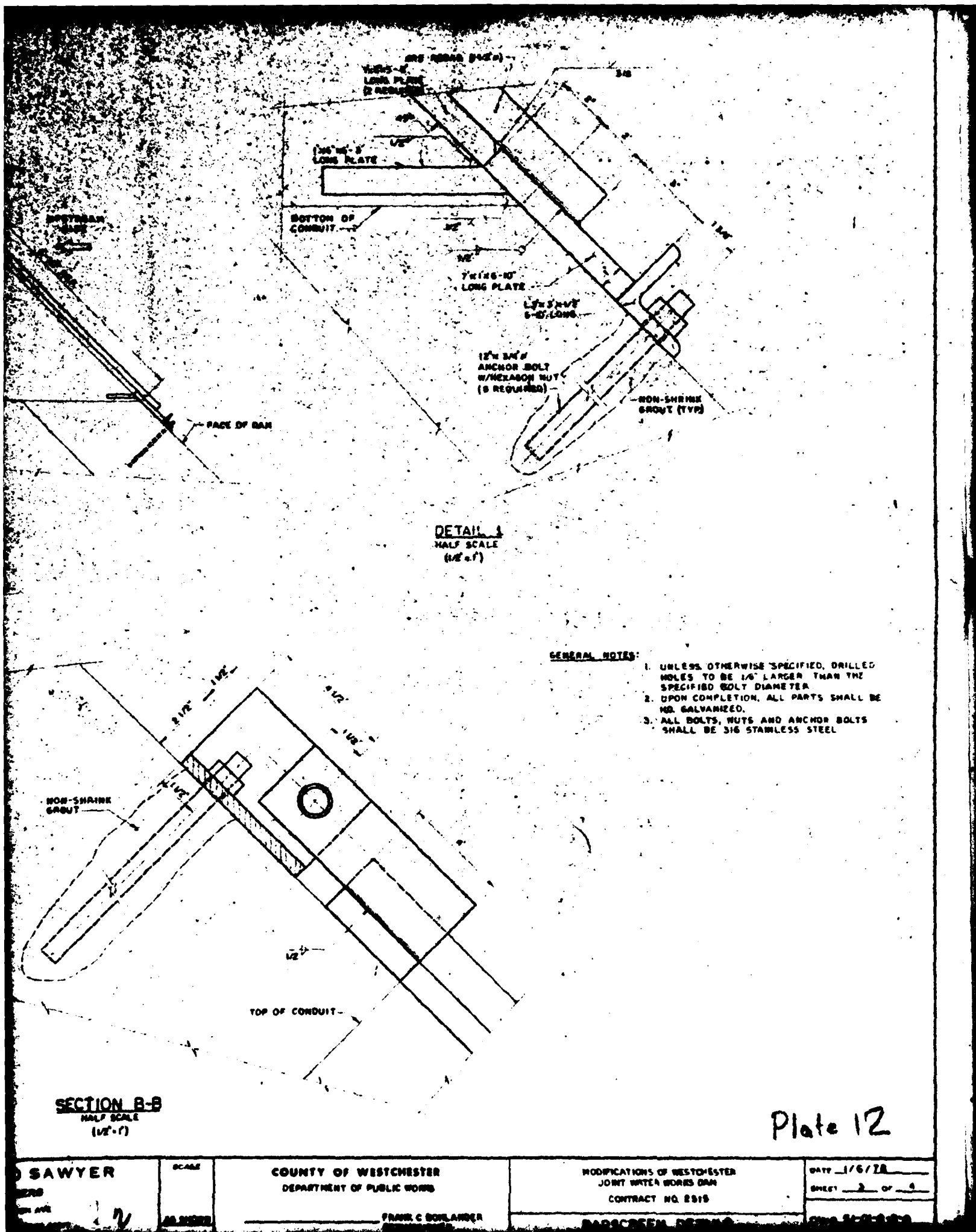


DETAIL 2
HALF SCALE
(1/2"=1')

DESIGNED: *[Signature]*
DRAWN: *[Signature]*
CHECKED: *[Signature]*
SECT CHIEF: *[Signature]*
PROJ. ENGINEER: *[Signature]*



HAZEN AND SAWYER
ENGINEERS
200 LEXINGTON AVE.
NEW YORK, N.Y.



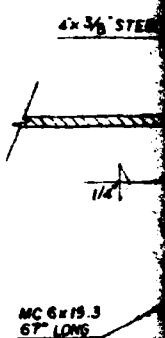
GENERAL NOTES:

1. UNLESS OTHERWISE SPECIFIED, DRILLED HOLES TO BE 1/8" LARGER THAN THE SPECIFIED BOLT DIAMETER.
2. UPON COMPLETION, ALL PARTS SHALL BE HD. GALVANIZED.
3. ALL BOLTS, NUTS AND ANCHOR BOLTS SHALL BE 316 STAINLESS STEEL.

SECTION B-B
HALF SCALE
(1/2" = 1')

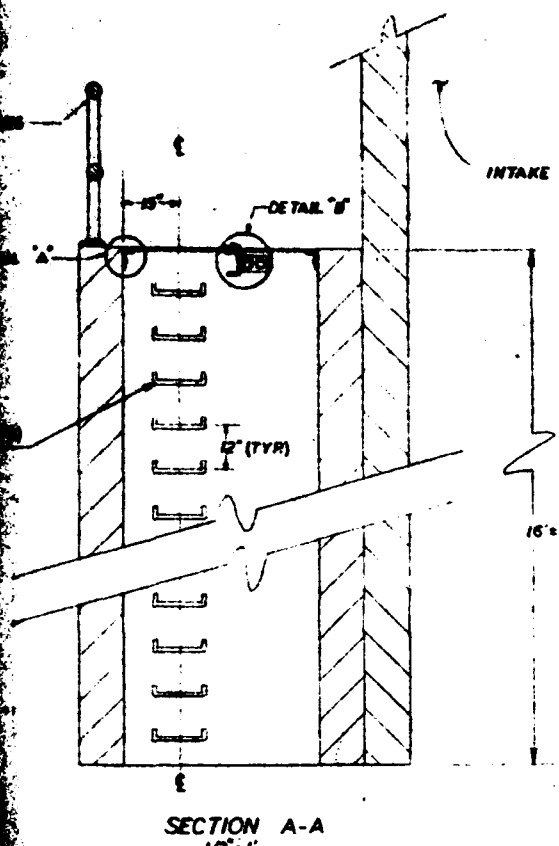
Plate 12

SAWYER 12	SCALE AS SHOWN	COUNTY OF WESTCHESTER DEPARTMENT OF PUBLIC WORKS FRANK C BOULANGER	MODIFICATIONS OF WESTCHESTER JOINT WATER WORKS DAM CONTRACT NO. 2815 BARSCREEN DETAIL	DATE 1/6/78
				SHEET 2 OF 3



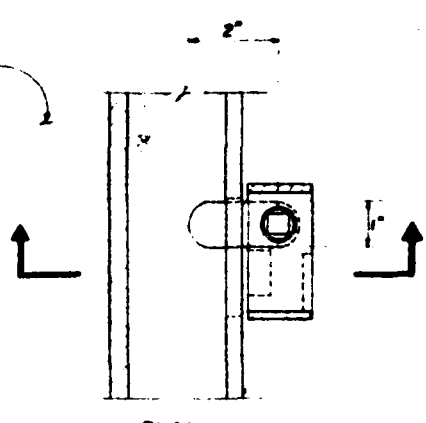
DETAIL "A"
3" = 1'

HAZEN AND SAWYER
ENGINEERS
300 LEXINGTON AVE
NEW YORK, NEW YORK 17

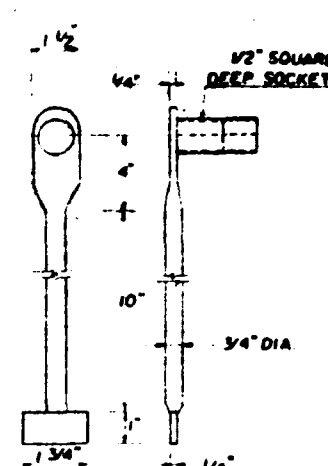


SECTION A-A
1/2" = 1'

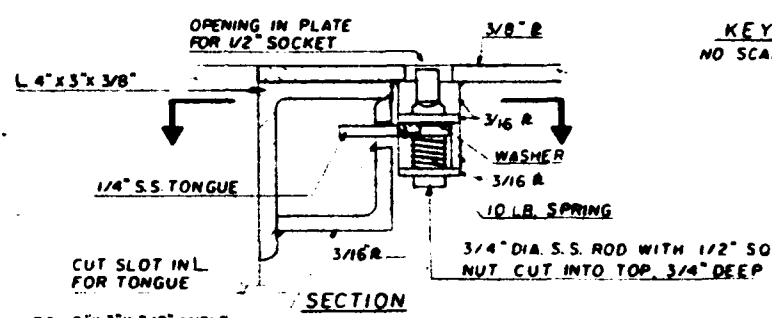
INTAKE CHAMBER BUILDING



PLAN

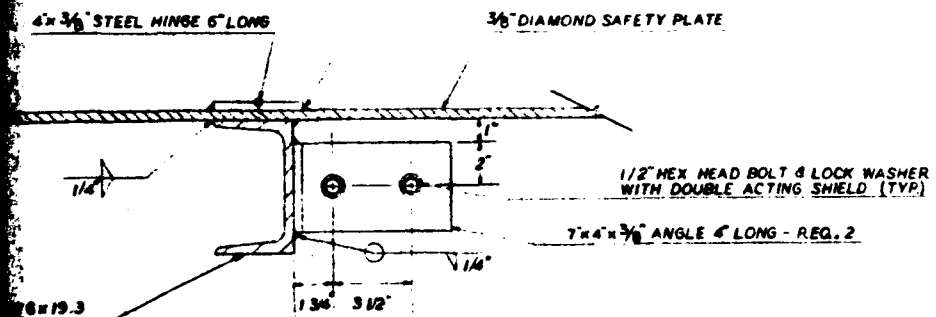


KEY
NO SCALE



SECTION

LATCH DETAILS
HALF SIZE



DETAIL "B"
5" = 1'

GENERAL NOTES

1. ALL EXPOSED STEEL EDGES TO BE CHAMFERED.
2. DIMENSIONS OF OPENING TO BE VERIFIED BY CONTRACTOR BEFORE FABRICATION.
3. UPON FABRICATION, ALL STEEL PARTS SHALL BE H.D. GALVANIZED, U. O. N.
4. ALL BOLTS, NUTS, AND ANCHOR BOLTS SHALL BE 316 STAINLESS STEEL.
5. EXISTING SPIRAL STAIRWAY TO BE REMOVED.

Plate 13

AND SAWYER

SCALE

COUNTY OF WESTCHESTER
DEPARTMENT OF PUBLIC WORKS

MODIFICATIONS OF WESTCHESTER
JOINT WATER WORKS DAM
CONTRACT NO. 2915

DATE 1/8/78

SHEET 4 OF 4

APPROVED

FRANK C. BOHLANDER

HATCHMAN, DETAIL

DWG 2-2-1-4-2

PHOTOGRAPHS

APPENDIX B



PHOTOGRAPH 1. CRACKED CONCRETE
APRON AT EMBANKMENT CREST



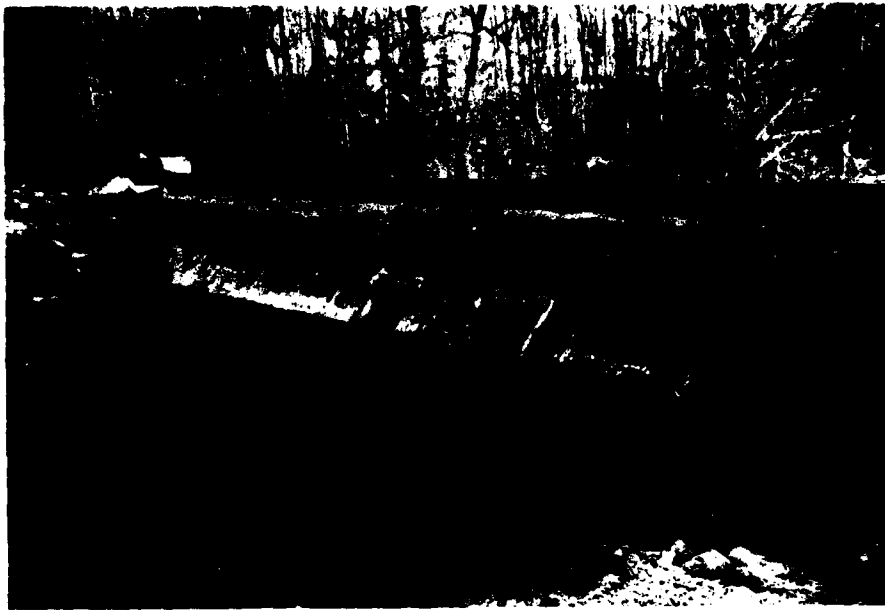
PHOTOGRAPH 2. UPSTREAM VIEW OF EMBANKMENT



PHOTOGRAPH 3. GATE LIFTING
MACHINERY LOCATED INSIDE
GATEHOUSE (NO LONGER
OPERATED)



PHOTOGRAPH 4. CONDITION OF REINFORCED CONCRETE SLAB
(DOWNSTREAM FACE) AND CONCRETE ENCASING
RESERVOIR DRAIN AT DISCHARGE POINT



PHOTOGRAPH 5. CONDITION OF CONCRETE
SLAB (DOWNSTREAM FACE)



PHOTOGRAPH 6. CONDITION OF WATER PASSAGE CONDUITS



PHOTOGRAPH 7. CONDITION OF
CONCRETE SIDEWALLS AND
LOCATION OF SEEPAGE AT
LEFT ABUTMENT



PHOTOGRAPH 8. GAP BETWEEN SILL AND FOUNDATION AT LEFT
ABUTMENT OF BUTTRESS DAM



PHOTOGRAPH 9. VIEW OF DOWNSTREAM SLOPE OF EMBANKMENT

VISUAL INSPECTION CHECKLIST

APPENDIX C

VISUAL INSPECTION CHECKLIST

1) Basic Data

a. General

Name of Dam Mamaroneck Reservoir Dam

Fed. I.D. # NY 00111 DEC Dam No. Unknown

River Basin Mamaroneck River

Location: Town Mamaroneck County Westchester

Stream Name Mamaroneck River

Tributary of Unknown

Latitude (N) 40°-58.1' Longitude (W) 73°-44.4'

Type of Dam Ambursen (Buttress) with Earth Embankment

Hazard Category High

Date(s) of Inspection 02 April 81

Weather Conditions Sunny 60°F

Reservoir Level at Time of Inspection 3 inches above invert of conduit (E1.33)

b. Inspection Personnel Mr Anthony Delcimascolo and Mr Al D. Bernardo

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

Mr. Joe Morgan

Westchester Joint Waterworks

1625 Mamaroneck Ave

Mamaroneck, NY 10543

d. History:

Date Constructed 1928 Date(s) Reconstructed 1978

Designer Alexander Potter

Constructed By Unknown

Owner Town of Mamaroneck

2) Embankment

a. Characteristics

- (1) Embankment Material Earth
- (2) Cutoff Type Concrete Core Wall
- (3) Impervious Core Not Applicable
- (4) Internal Drainage System None
- (5) Miscellaneous A concrete apron exists along the top of the embankment.

b. Crest

- (1) Vertical Alignment Good
- (2) Horizontal Alignment Good
- (3) Surface Cracks Some cracking in the concrete crest apron exists
- (4) Miscellaneous None

c. Upstream Slope

- (1) Slope (Estimate) (V:H) Approximately 1:2 (same as drawings)
- (2) Undesirable Growth or Debris, Animal Burrows None
- (3) Sloughing, Subsidence or Depressions None observed

(4) Slope Protection Stone placed along upstream slope of embankment

(5) Surface Cracks or Movement at Toe There is no downstream slope to the dam; the d/s portion consists of nearly level fill material.

d. Downstream Slope

(1) Slope (Estimate - V:H) See (5) above (Gently sloping downstream slope)

(2) Undesirable Growth or Debris, Animal Burrows None

(3) Sloughing, Subsidence or Depressions Not Applicable

(4) Surface Cracks or Movement at Toe Not Applicable since there is actually no downstream toe of the embankment.

(5) Seepage Not Applicable

(6) External Drainage System (Ditches, Trenches; Blanket) Not Applicable

(7) Condition Around Outlet Structure Appears to be in good condition

(8) Seepage Beyond Toe Not Applicable

e. Abutments - Embankment Contact

At right embankment there exists a vertical concrete retaining wall for Mamaroneck Avenue. The left contact is the buttress dam

(1) Erosion at Contact None

(2) Seepage Along Contact None

3) Drainage System

a. Description of System None

b. Condition of System Not Applicable

c. Discharge from Drainage System Not Applicable

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

5) Reservoir

- a. Slopes The reservoir slope consist of low, ^{very} gently rolling hills. The slopes appear stable. The area is very developed.
- b. Sedimentation There was no evidence of sedimentation problems in the reservoir area
- c. Unusual Conditions Which Affect Dam None

6) Area Downstream of Dam

- a. Downstream Hazard (No. of Homes, Highways, etc.) Large number of homes and local roadways are located downstream
- b. Seepage, Unusual Growth None observed. Area d/s of dam is a small ^{housing} development; wooded.
- c. Evidence of Movement Beyond Toe of Dam None was observed
- d. Condition of Downstream Channel Good with little to no debris. The channel is relatively deep. A small bridge exists about 1000' d/s of the dam

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

The overflow section is the Ambursen Dam. The Dam has been breached with two box culverts since its ^{initial} construction. The invert elevation of the water passageways is E133. The concrete decks (u/s & d/s) are supported by the concrete

a. General Buttresses which are located 15 feet on center.

Mamaroneck Dam is a run-of-the-river Ambursen dam, with an adjoining earth embankment. (See sheets 7 and 8 for description)

- b. Condition of Service Spillway See sheets 7 and 8

c. Condition of Auxiliary Spillway Not Applicable

d. Condition of Discharge Conveyance Channel

See (6) on Sheet (5)

8) Reservoir Drain/Outlet

Type: Pipe ☒ Conduit ☐ Other ☐

Material: Concrete ☐ Metal Cast Iron ^{or Steel} Other ☐

Size: 24" ϕ Length ☐

Invert Elevations: Entrance 25 ft Exit $\approx$ 25 ft (Horizontal Pipe)

Physical Condition (Describe): Unobservable ☒

Material: Unknown, although appears good at discharge location

Joints: Unobservable Alignment Unknown

Structural Integrity: Unknown

Hydraulic Capability: Water was flowing through the pipe at the time of this inspection

Means of Control: Gate ☐ Valve ☒ Uncontrolled ☐

Operation: Operable ☐ Inoperable ☐ Other Unknown

Present Condition (Describe): The gate valve appears as though it has not been maintained for some time

9) Structural

- a. Concrete Surfaces Concrete appears to be in good to excellent condition at the inner and outer concrete deck surfaces. The concrete haunches at the inner side of the upstream slab at each buttress. The buttress concrete is in good condition as well as the water conduit concrete surfaces.
- b. Structural Cracking None was observed along the outer and inner deck surfaces, concrete haunch, culvert, sill or elsewhere along the dam.
- c. Movement - Horizontal & Vertical Alignment (Settlement) No movement observed. The vertical and horizontal alignment of the crest appear good.
- d. Junctions with Abutments or Embankments Appear to be good, except at left abutment where minor leakage through the foundation was observed.
- e. Drains - Foundation, Joint, Face None
- f. Water Passages, Conduits, Sluices Two box culverts were constructed ^{invert} at El 33 at the approximate center of the dam circa 1978. These structures have metal bar grills to catch debris, etc., at their inlets.
- g. Seepage or Leakage Near the left abutment there appears to be some seepage through the foundation bedrock. The seepage could not be measured. No other seepage was observed in the vicinity of the dam.

- h. Joints - Construction, etc. Good Condition. There appears to be only little deterioration or spalling of concrete along horizontal and vertical construction lift lines
- i. Foundation Bedrock comprised of massive and hard schist and is in good condition as observed at the left abutment. The rock does not appear to be erodible. Discontinuities were observed extending parallel and perpendicular to the dam
- j. Abutments Left Abutment consist of sound rock as described above. The right abutment is the embankment previously described.
- k. Control Gates The original plans show a sluice gate structure at the left abutment. Apparently this structure was never constructed.
- l. Approach & Outlet Channels Not Applicable
- m. Energy Dissipators (Plunge Pool, etc.) None
- n. Intake Structures Gatehouse and valves are no longer operational. Were previously used to regulate the flow of water to a treatment plant that was located approx 200' d/s. Neither the plant nor the gatehouse (and control facilities) are operational
- o. Stability The dam appears to be very stable.
- p. Miscellaneous Flashboards exist along the top of the buttress dam. The flashboards appear to be in good condition. They are ≈ 2.5 high and consist of wooden planks supported by vertical metal posts

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

a. Description and Condition The gatehouse is located at the crest of the embankment adjacent to the overflow section. The gatehouse "houses" the gate machinery which was used to regulate flows to the downstream water treatment facilities. The gatehouse and facilities are no longer operational. The condition of the exterior concrete surfaces of the gatehouse is fair good. The gate operators are also in good condition

HYDROLOGIC DATA AND COMPUTATIONS

APPENDIX D

CHECK LIST FOR DAMS
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

1

AREA-CAPACITY DATA:

	<u>Elevation (ft.)</u>	<u>Surface Area (acres)</u>	<u>Storage Capacity (acre-ft.)</u>
1) Top of Dam	<u>44</u>	<u>49 ±</u>	<u>320</u>
2) Design High Water (Max. Design Pool)	<u>Unknown</u>	<u>Unknown</u>	<u>Unknown</u>
3) Auxiliary Spillway Crest	<u>Not Applicable</u>	<u>Not Applicable</u>	<u>Not Applicable</u>
4) Pool Level with Flashboards	<u>42.5</u>	<u>43 ±</u>	<u>240 (assumed)</u>
5) Service Spillway Crest	<u>40</u>	<u>33</u>	<u>107</u>

DISCHARGES

	<u>Volume (cfs)</u>
1) Average Daily	<u>UNKNOWN</u>
2) Spillway @ Maximum High Water (TOP OF DAM)	<u>4240</u>
3) Spillway @ Design High Water	<u>Unknown</u>
4) Spillway @ Auxiliary Spillway Crest Elevation	<u>Not Applicable</u>
5) Low Level Outlet w/ W.L. @ EL 44	<u>Unknown</u>
6) Total (of all facilities) @ Maximum High Water	<u>4800</u>
7) Maximum Known Flood @ USGS Gauge 9.26/75.	<u>3700</u>
8) At Time of Inspection	<u>UNKNOWN</u>
9) Water Conduit Passages (Maximum Pool)	<u>560 cfs</u>

CREST:

ELEVATION: 40 (w/o flashboards)Type: Ambursen Dam with Earth EmbankmentWidth: Length: 180± feetSpillover (Ambursen) Concrete Buttress DamLocation Left-side of Project

SPILLWAY:

SERVICE

CONDUITS

~~ADDITIONAL~~40

Elevation

EL 33

Type

Rectangular Openings130

Width

6+ feet

Type of Control

✓

Uncontrolled

✓

Controlled:

Not Applicable (NA)

Type

(Flashboards; gate)(NA)

Number

(NA)

Size/Length

Invert Material

Anticipated Length
of operating service(NA)

Chute Length

(NA)Height Between Spillway Crest
& Approach Channel Invert
(Weir Flow)

HYDROMETEROLOGICAL GAGES:

Type : None

Location: Not Applicable (N.A.)

Records:

Date - N.A.

Max. Reading - N.A.

FLOOD WATER CONTROL SYSTEM:

Warning System: N.A.

Method of Controlled Releases (mechanisms):

24" reservoir drain and gate valve

DRAINAGE AREA: 15.2 square miles

DRAINAGE BASIN RUNOFF CHARACTERISTICS:

Land Use - Type: Sub-urban development with woodlands & parks

Terrain - Relief: Gently sloping

Surface - Soil: Glacial Till and Fill

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

unknown

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:

Unknown

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

Location: Unknown

Elevation: Unknown

Reservoir:

Length @ Maximum Pool 0.1 (Miles)

Length of Shoreline (@ Spillway Crest) 2.5± (Miles)

TAMS

Job No. 1579-025

Project MAHARONECK DAM INVESTIGATION

Subject HYDROLOGIC/HYDRAULIC COMPUTATION

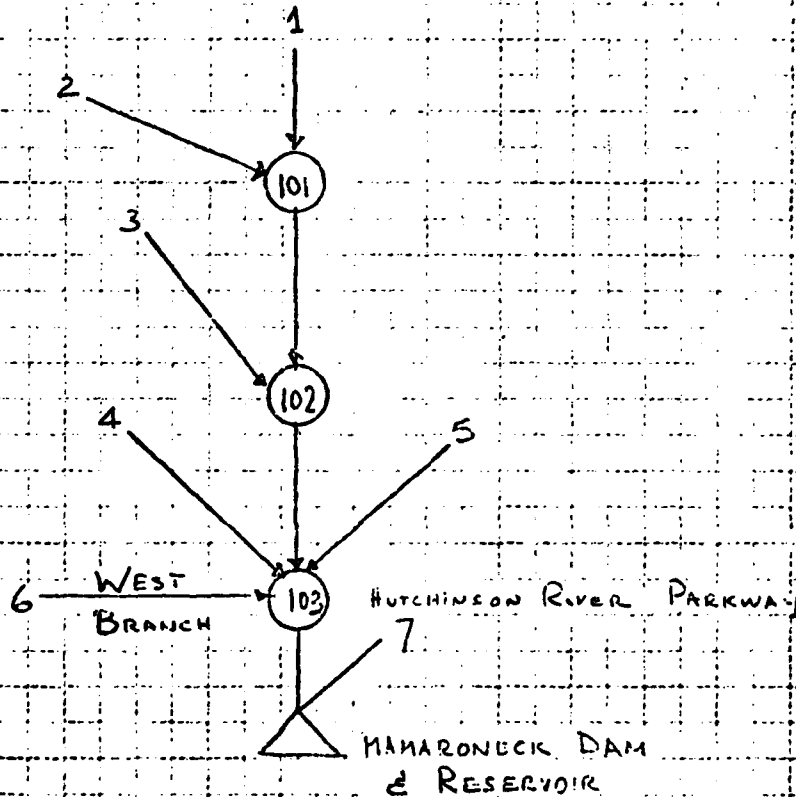
Sheet 1 of 57

Date APRIL 8, 81

By D.L.C.

Ch'k. by _____

NODAL NETWORK



TAMS

Job No. 1579-08

Project MAMARONECK DAM PHASE 1 INSPECTION

Subject HYDROLOGIC / HYDRAULIC COMPUTATIONS

Sheet 2 of 57

Date APRIL 8 1981

By D.L.C

Ch'k. by _____

FROM Lower HUDSON RIVER BASIN Hydrologic Flood Routing Model

SUB-AREA	AREA	C _P	T _P
1	2.89	0.63	3.4
2	2.50	0.61	2.7
3	2.33	0.64	4.7
4	1.62	0.63	3.0
5	1.36	0.63	2.0
6	2.77	0.89	3.6
* 7	1.77	0.69	2.5

Σ 15.24 sqm.

FROM HYDROMET # 33

ALL SEASON 200 SQ MILE 24 Hour PMP ~ 22.5"

Duration % of Index for Zone 6 (Lat 40° 56')

6 109

12 120

24 128

48 140

Basin Losses

INITIAL

- 2.0 inch

CONSTANT

- 0.1 in/hour

TAMS

Job No. 1579 - 08

Sheet 3 of 57

Project MAMARONECK DAM INVESTIGATION

Date April 8, 81

Subject HYDROLOGIC / HYDRAULIC COMPUTATIONS

By D.L.C.

Ch'k. by _____

LOW LEVEL OUTLETS.

AREA $2(6.3 \times 30) = 2 \times 19.9 = 37.8 \text{ sq. ft.}$

E FL 34.5 MSL

For HEC 1 DB.

COQL = 0.6

CAREA = 37.8

EXPL = 0.5

FLEV = 34.5

FLOW OVER DAM/SPILLWAY CREST (RUN OF RIVER DAM.)

CREST LENGTH = 130.0'

EL	H	C	Q
40	0	0	0
41	1	3.45	450
42	2	3.82	1400
44	4	4.08	4240
46	6	4.13	7890
50	10	4.13	17000

DAM OVERTOPPING

TOP OF ABUTMENTS & FILL ON

RIGHT BANK

TOPEL = 44.0

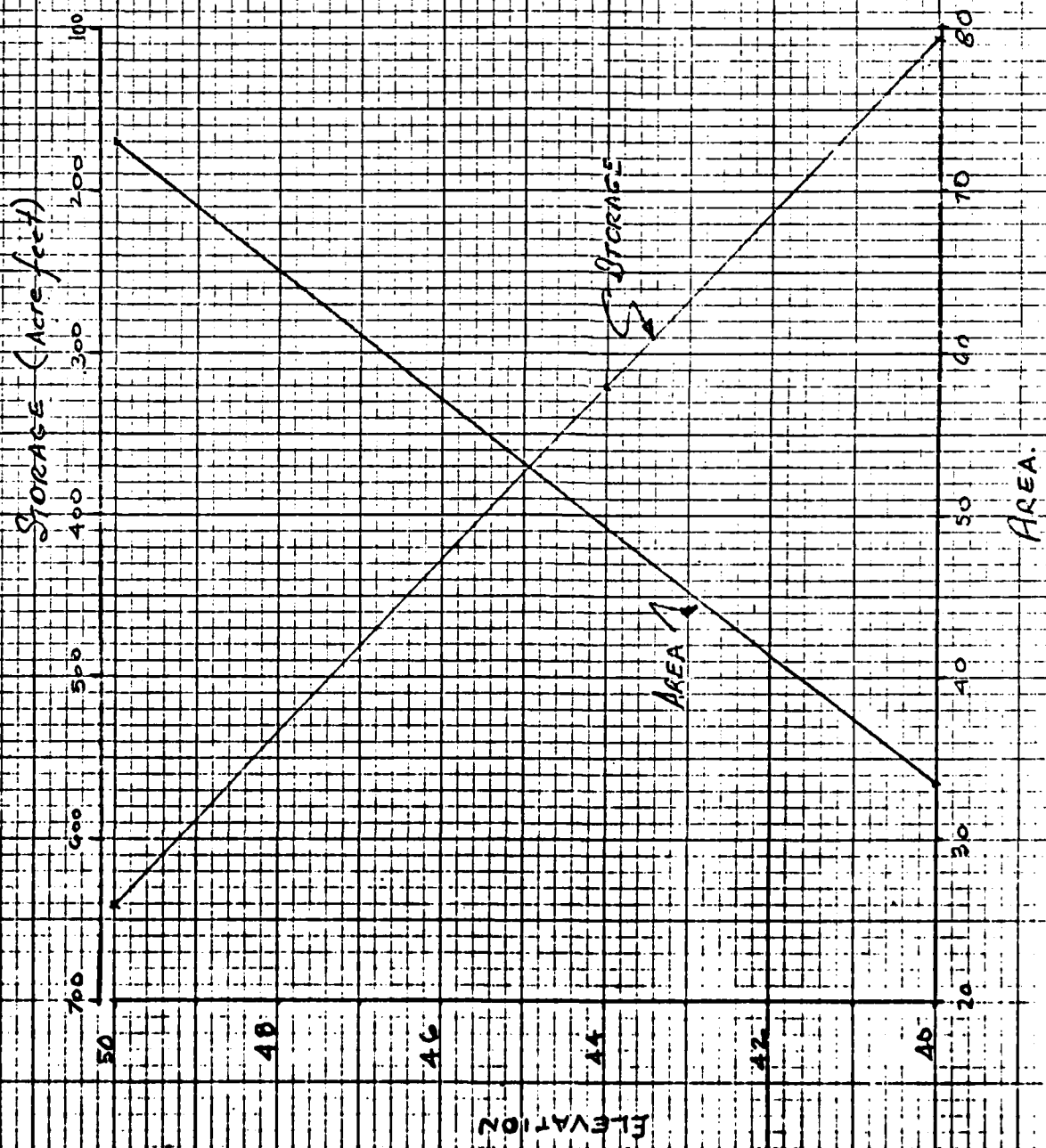
COQD = 3.09

EXPD = 1.5

DAMWID = 35.0'

MAMARONECK
RESERVOIR

Sheet # of 57



TAMS

Job No. 1579-08

Project MAMARONECK DAM INVESTIGATION

Subject HYDROLOGIC/HYDRAULIC COMPUTATIONS

Sheet 5 of 57

Date APRIL 8, '81

By D. L. C

Ch'k. by _____

LAKE AREA = 0.365 m^2 = 33.5 acres @ EL 40'

50' CONTOUR = 0.795 m^2 = 73 acres

EL	ΔH	AREA	MEAN AREA	ΔVol	STORAGE
33					
40		33.5			107
	10		53.25	532.5	
50		73.0			640

BOTTOM OF DAM EL 27 Slope = $\frac{3}{800} = 0.0038$

CROSS SECTION 800 FT Down stream of Dam (At Bridge)

	DISTANCE	ELEVATION	
①	0	50	
②	220	40	PMF depth 14.8'
③	360	30	$\frac{1}{2}$ PMF depth 11.5'
④	365	24	
⑤	415	24	
⑥	420	30	
⑦	600	40	
⑧	730	50	

MAPARONECK DAM INVESTIGATION
HEC-10E PMF ANALYSIS
APRIL 1981 TAMS 1579-OE

Sheet 6 of 57

31	K1	10 SUB-BASIN (S) RUNOFF						
32	K	1	1.36	15.24			1	
33	P	22.5	109	120	140			
34	V	2	0.63			2	0.1	0.2
35	X	-0.5	-0.05					
36	X	-0.5	-0.05					
37	K	2	1.6					
38	K1	11 COMBINE RUNOFF FROM 5 WITH 2 COMBINED HYDROGRAPHS						
39	K	0						
40	K	3						
41	K1	12 WEST BRANCH RUNOFF						
42	P	1	2.77	15.24	140		1	
43	P	22.5	109	120	140			
44	V	2	0.89			2	0.1	0.3
45	X	-0.5	-0.05					
46	X	-0.5	-0.05					
47	K	2	1.6					
48	K1	13 COMBINE WEST BRANCH FLOW WITH UPPER BASIN FLOW						
49	K	0						
50	K	3						
51	K1	14 INLEW FROM AREA ADJACENT TO RESERVOIR						
52	P	1	1.77	15.24	140		1	
53	P	22.5	109	120	140			
54	V	2	0.89			2	0.1	0.1
55	X	-0.5	-0.05					
56	X	-0.5	-0.05					
57	K	2	1.6					
58	K1	15 COMBINE ADJACENT AREA FLOW WITH RIVER FLOW AT RESERVOIR						
59	K	0						
60	K	3						
61	K1	16 ROUTE THROUGH MAMARONECK RESERVOIR						
62	P	1	1.77	15.24	140			
63	P	22.5	109	120	140			
64	V	2	0.89			2	0.1	0.1
65	X	-0.5	-0.05					
66	X	-0.5	-0.05					
67	K	2	1.6					
68	K1	17 CHANNEL ROUTE AT STATION 8+00 (ROAD CROSSING)						
69	K	0						
70	K	3						
71	K1							
72	P	22.5	109	120	140			
73	V	2	0.89			2	0.1	0.1
74	X	-0.5	-0.05					
75	X	-0.5	-0.05					
76	K	2	1.6					
77	K1	15 COMBINE ADJACENT AREA FLOW WITH RIVER FLOW AT RESERVOIR						
78	K	0						
79	K	3						
80	K1	16 ROUTE THROUGH MAMARONECK RESERVOIR						
81	P	1	1.77	15.24	140			
82	P	22.5	109	120	140			
83	V	2	0.89			2	0.1	0.1
84	X	-0.5	-0.05					
85	X	-0.5	-0.05					
86	K	2	1.6					
87	K1	15 COMBINE ADJACENT AREA FLOW WITH RIVER FLOW AT RESERVOIR						
88	K	0						
89	K	3						
90	K1	16 ROUTE THROUGH MAMARONECK RESERVOIR						
91	P	1	1.77	15.24	140			
92	P	22.5	109	120	140			
93	V	2	0.89			2	0.1	0.1
94	X	-0.5	-0.05					
95	X	-0.5	-0.05					
96	K	2	1.6					
97	K1	15 COMBINE ADJACENT AREA FLOW WITH RIVER FLOW AT RESERVOIR						
98	K	0						
99	K	3						
100	K1	16 ROUTE THROUGH MAMARONECK RESERVOIR						
101	P	1	1.77	15.24	140			
102	P	22.5	109	120	140			
103	V	2	0.89			2	0.1	0.1
104	X	-0.5	-0.05					
105	X	-0.5	-0.05					
106	K	2	1.6					
107	K1	15 COMBINE ADJACENT AREA FLOW WITH RIVER FLOW AT RESERVOIR						
108	K	0						
109	K	3						
110	K1	16 ROUTE THROUGH MAMARONECK RESERVOIR						
111	P	1	1.77	15.24	140			
112	P	22.5	109	120	140			
113	V	2	0.89			2	0.1	0.1
114	X	-0.5	-0.05					
115	X	-0.5	-0.05					
116	K	2	1.6					
117	K1	15 COMBINE ADJACENT AREA FLOW WITH RIVER FLOW AT RESERVOIR						
118	K	0						
119	K	3						
120	K1	16 ROUTE THROUGH MAMARONECK RESERVOIR						
121	P	1	1.77	15.24	140			
122	P	22.5	109	120	140			
123	V	2	0.89			2	0.1	0.1
124	X	-0.5	-0.05					
125	X	-0.5	-0.05					
126	K	2	1.6					
127	K1	15 COMBINE ADJACENT AREA FLOW WITH RIVER FLOW AT RESERVOIR						
128	K	0						
129	K	3						
130	K1	16 ROUTE THROUGH MAMARONECK RESERVOIR						
131	P	1	1.77	15.24	140			
132	P	22.5	109	120	140			
133	V	2	0.89			2	0.1	0.1
134	X	-0.5	-0.05					
135	X	-0.5	-0.05					
136	K	2	1.6					
137	K1	15 COMBINE ADJACENT AREA FLOW WITH RIVER FLOW AT RESERVOIR						
138	K	0						
139	K	3						
140	K1	16 ROUTE THROUGH MAMARONECK RESERVOIR						
141	P	1	1.77	15.24	140			
142	P	22.5	109	120	140			
143	V	2	0.89			2	0.1	0.1
144	X	-0.5	-0.05					
145	X	-0.5	-0.05					
146	K	2	1.6					
147	K1	15 COMBINE ADJACENT AREA FLOW WITH RIVER FLOW AT RESERVOIR						
148	K	0						
149	K	3						
150	K1	16 ROUTE THROUGH MAMARONECK RESERVOIR						
151	P	1	1.77	15.24	140			
152	P	22.5	109	120	140			
153	V	2	0.89			2	0.1	0.1
154	X	-0.5	-0.05					
155	X	-0.5	-0.05					
156	K	2	1.6					
157	K1	15 COMBINE ADJACENT AREA FLOW WITH RIVER FLOW AT RESERVOIR						
158	K	0						
159	K	3						
160	K1	16 ROUTE THROUGH MAMARONECK RESERVOIR						
161	P	1	1.77	15.24	140			
162	P	22.5	109	120	140			
163	V	2	0.89			2	0.1	0.1
164	X	-0.5	-0.05					
165	X	-0.5	-0.05					
166	K	2	1.6					
167	K1	15 COMBINE ADJACENT AREA FLOW WITH RIVER FLOW AT RESERVOIR						
168	K	0						
169	K	3						
170	K1	16 ROUTE THROUGH MAMARONECK RESERVOIR						
171	P	1	1.77	15.24	140			
172	P	22.5	109	120	140			
173	V	2	0.89			2	0.1	0.1
174	X	-0.5	-0.05					
175	X	-0.5	-0.05					
176	K	2	1.6					
177	K1	15 COMBINE ADJACENT AREA FLOW WITH RIVER FLOW AT RESERVOIR						
178	K	0						
179	K	3						
180	K1	16 ROUTE THROUGH MAMARONECK RESERVOIR						
181	P	1	1.77	15.24	140			
182	P	22.5	109	120	140			
183	V	2	0.89			2	0.1	0.1
184	X	-0.5	-0.05					
185	X	-0.5	-0.05					
186	K	2	1.6					
187	K1	15 COMBINE ADJACENT AREA FLOW WITH RIVER FLOW AT RESERVOIR						
188	K	0						
189	K	3						
190	K1	16 ROUTE THROUGH MAMARONECK RESERVOIR						
191	P	1	1.77	15.24	140			
192	P	22.5	109	120	140			
193	V	2	0.89			2	0.1	0.1
194	X	-0.5	-0.05					
195	X	-0.5	-0.05					
196	K	2	1.6					
197	K1	15 COMBINE ADJACENT AREA FLOW WITH RIVER FLOW AT RESERVOIR						
198	K	0						
199	K	3						
200	K1	16 ROUTE THROUGH MAMARONECK RESERVOIR						
201	P	1	1.77	15.24	140			
202	P	22.5	109	120	140			
203	V	2	0.89			2	0.1	0.1
204	X	-0.5	-0.05					
205	X	-0.5	-0.05					
206	K	2	1.6					
207	K1	15 COMBINE ADJACENT AREA FLOW WITH RIVER FLOW AT RESERVOIR						
208	K	0						
209	K	3						
210	K1	16 ROUTE THROUGH MAMARONECK RESERVOIR						
211	P	1	1.77	15.24	140			
212	P	22.5	109	120	140			
213	V	2	0.89			2	0.1	0.1
214	X	-0.5	-0.05					
215	X	-0.5	-0.05					
216	K	2	1.6					
217	K1	15 COMBINE ADJACENT AREA FLOW WITH RIVER FLOW AT RESERVOIR						
218	K	0						
219	K	3						
220	K1	16 ROUTE THROUGH MAMARONECK RESERVOIR						
221	P	1	1.77	15.24	140			
222	P	22.5	109	120	140			
223	V	2	0.89			2	0.1	0.1
224	X	-0.5	-0.05					
225	X	-0.5	-0.05					
226	K	2	1.6					
227	K1	15 COMBINE ADJACENT AREA FLOW WITH RIVER FLOW AT RESERVOIR						
228	K	0						
229	K	3						
230	K1	16 ROUTE THROUGH MAMARONECK RESERVOIR						
231	P	1	1.77	15.24	140			
232	P	22.5	109	120	140			
233	V	2	0.89			2	0.1	0.1
234	X	-0.5	-0.05					
235	X	-0.5	-0.05					
236	K	2	1.6					
237	K1	15 COMBINE ADJACENT AREA FLOW WITH RIVER FLOW AT RESERVOIR						
238	K	0						
239	K	3						
240	K1	16 ROUTE THROUGH MAMARONECK RESERVOIR						
241	P	1	1.77	15.24	140			
242	P	22.5	109	120	140			
243	V	2	0.89			2	0.1	0.1
244	X	-0.5	-0.05					
245	X	-0.5	-0.05					
246	K	2	1.6					
247	K1	15 COMBINE ADJACENT AREA FLOW WITH RIVER FLOW AT RESERVOIR						
248	K	0						
249	K	3						
250	K1	16 ROUTE THROUGH MAMARONE						

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 HYDROGRAPH PACKAGE (NEC-1)
 JULY 1978
 MODIFICATION 21 APR 80

0.0 101 11/03/03
 100 100 11/26/81

MAHARONECK DAM INVESTIGATION
 NEC-1DB-PYE ANALYSIS
 APRIL 1981 TANS 1579-OR

JOB SPECIFICATION									
NO	NHR	NMIN	1DAY	1HR	1MIN	METRC	IPLT	IPRT	INSTAN
100	0	30	0	0	0	0	0	0	0
			JOPER	5	0	0	0	0	0
			LROPT	0	0	0	0	0	0
			TRACE	0	0	0	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED

RTIO= 1.00 75 .50 .25
 NPLAN= 1 RTIO= 4 LRTIO= 1

SUB-AREA RUNOFF COMPUTATION

1 SUB-BASIN RUNOFF (1)

ISTAR	1COMP	IECON	ITAPE	JPLY	JPRY	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

INHYG	IUNG	TARFA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	2.60	0.00	15.24	0.00	0.000	0	1	0

PRECIP DATA

SPFC	PMS	R6	R12	R24	R48	R72	R96
0.00	22.50	109.00	120.00	128.00	140.00	0.00	0.00

TESPC COMPUTED BY THE PROGRAM IS .516

LOSS DATA

LROPI	STRKR	DLTKR	RTIOL	EPAIN	STKRS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	1.00	1.00	2.00	.10	0.00	.01

UNIT HYDROGRAPH DATA

TP= 3.40 CP= .53 VTA= 0

RECESSION DATA

STRIO= .50 GRCSN= .05 RTIO= 1.60
 APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP / EF TC= 7.75 AND P= 6.17 INTERVALS

UNIT HYDROGRAPH 37 END-OF-PERIOD ORDINATES, LAG= 3.43 HOURS, CPA= .66 VOL= 1.00

12.	67.	134.	209.	277.	340.	391.	256.
217.	185.	157.	134.	114.	97.	70.	59.

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0 11

MO. DA	HR. MM	PERIOD	RAIN	EXCS	LOSS	COMP 0	END-OF-PERIOD FLOW	MO. DA	HR. MM	PERIOD	RAIN	EXCS	LOSS	COMP 0
1.01	1.30	1	.00	.00	.00	1	1.02	1.02	1.30	51	.05	.00	.05	7
1.01	1.03	2	.00	.00	.00	1	1.02	1.02	2.00	52	.05	.00	.05	6
1.01	1.30	3	.00	.00	.00	1	1.02	1.02	2.30	53	.05	.00	.05	5
1.01	2.00	4	.00	.00	.00	1	1.02	1.02	3.00	54	.05	.00	.05	5
1.01	2.30	5	.00	.00	.00	1	1.02	1.02	3.30	55	.05	.00	.05	4
1.01	3.00	6	.00	.00	.00	1	1.02	1.02	4.00	56	.05	.00	.05	4
1.01	3.30	7	.00	.00	.00	1	1.02	1.02	4.30	57	.05	.00	.05	4
1.01	4.00	8	.00	.00	.00	1	1.02	1.02	5.00	58	.05	.00	.05	3
1.01	4.30	9	.00	.00	.00	1	1.02	1.02	5.30	59	.05	.00	.05	3
1.01	5.00	10	.00	.00	.00	1	1.02	1.02	6.00	60	.05	.00	.05	3
1.01	5.30	11	.00	.00	.00	1	1.02	1.02	6.30	61	.17	.12	.05	5
1.01	6.00	12	.00	.00	.00	1	1.02	1.02	7.00	62	.17	.12	.05	13
1.01	6.30	13	.02	.00	.02	1	1.02	1.02	7.30	63	.17	.12	.05	28
1.01	7.00	14	.02	.00	.02	1	1.02	1.02	8.00	64	.17	.12	.05	53
1.01	7.30	15	.02	.00	.02	1	1.02	1.02	8.30	65	.17	.12	.05	86
1.01	8.00	16	.02	.00	.02	1	1.02	1.02	9.00	66	.17	.12	.05	124
1.01	8.30	17	.02	.00	.02	1	1.02	1.02	9.30	67	.17	.12	.05	165
1.01	9.00	18	.02	.00	.02	1	1.02	1.02	10.00	68	.17	.12	.05	205
1.01	9.30	19	.02	.00	.02	1	1.02	1.02	10.30	69	.17	.12	.05	241
1.01	10.00	20	.02	.00	.02	1	1.02	1.02	11.00	70	.17	.12	.05	271
1.01	10.30	21	.02	.00	.02	1	1.02	1.02	11.30	71	.17	.12	.05	296
1.01	11.00	22	.02	.00	.02	1	1.02	1.02	12.00	72	.17	.12	.05	318
1.01	11.30	23	.02	.00	.02	1	1.02	1.02	12.30	73	1.00	.95	.05	352
1.01	12.00	24	.02	.00	.02	1	1.02	1.02	13.00	74	1.20	1.15	.05	423
1.01	12.30	25	.02	.00	.02	1	1.02	1.02	13.30	75	1.20	1.15	.05	552
1.01	13.00	26	.09	.00	.09	1	1.02	1.02	14.00	76	1.20	1.15	.05	749
1.01	13.30	27	.11	.00	.11	1	1.02	1.02	14.30	77	1.50	1.45	.05	1022
1.01	14.00	28	.11	.00	.11	1	1.02	1.02	15.00	78	1.50	1.45	.05	1363
1.01	14.30	29	.14	.00	.14	1	1.02	1.02	15.30	79	1.92	1.77	.05	1762
1.01	15.00	30	.14	.00	.14	2	1.02	1.02	16.00	80	5.77	5.72	.05	2271
1.01	15.30	31	.17	.00	.17	2	1.02	1.02	16.30	81	1.40	1.35	.05	2908
1.01	16.00	32	.54	.01	.54	3	1.02	1.02	17.00	82	1.40	1.35	.05	3563
1.01	16.30	33	.13	.00	.13	3	1.02	1.02	17.30	83	1.10	1.05	.05	4263
1.01	17.00	34	.13	.00	.13	4	1.02	1.02	18.00	84	1.10	1.05	.05	4844
1.01	17.30	35	.10	.01	.10	5	1.02	1.02	18.30	85	.07	.02	.05	5240
1.01	18.00	36	.10	.03	.05	6	1.02	1.02	19.00	86	.07	.02	.05	5397
1.01	18.30	37	.51	.00	.51	10	1.02	1.02	19.30	87	.07	.02	.05	5281
1.01	19.00	38	.01	.00	.01	14	1.02	1.02	20.00	88	.07	.02	.05	4920
1.01	19.30	39	.01	.00	.01	18	1.02	1.02	20.30	89	.07	.02	.05	4434
1.01	20.00	40	.01	.00	.01	22	1.02	1.02	21.00	90	.07	.02	.05	3916
1.01	20.30	41	.01	.00	.01	26	1.02	1.02	21.30	91	.07	.02	.05	3399
1.01	21.00	42	.01	.00	.01	25	1.02	1.02	22.00	92	.07	.02	.05	2915
1.01	21.30	43	.01	.00	.01	23	1.02	1.02	22.30	93	.07	.02	.05	2491
1.01	22.00	44	.01	.00	.01	21	1.02	1.02	23.00	94	.07	.02	.05	2131
1.01	22.30	45	.01	.00	.01	19	1.02	1.02	23.30	95	.07	.02	.05	1825
1.01	23.00	46	.01	.00	.01	15	1.03	1.03	0.00	96	.07	.02	.05	1564
1.01	23.30	47	.01	.00	.01	13	1.03	1.03	.30	97	0.00	0.00	0.00	1343
1.02	0.00	48	.01	.00	.01	11	1.03	1.03	1.00	98	0.00	0.00	0.00	1153
1.02	.30	49	.05	.00	.05	9	1.03	1.03	1.30	99	0.00	0.00	0.00	989
1.02	1.00	50	.05	.00	.05	8	1.07	1.07	2.00	100	0.00	0.00	0.00	848

SUM 25.55 21.17 4.49 74052.
(652.3) (538.3) (114.3) (2097.77)

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0 0.00 0.40 1.00 2.00 3.00 4.00 5.00 6.00 7.00 8.00 9.00 10.00 11.00 12.00

UNIT HYDROGRAPH DATA

TP= 2.70 CP= .61 VTA= 9

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SUDER CP AND TP ARE 1C= 6.22 AND P= 5.24 INTERVALS

UNIT HYDROGRAPH 32 END-OF-PERIOD ORIGINATES, LAG= 2.69 HOURS, CP= .61 VOL= 1.00

24. 185. 277. 362. 335. 279. 231. 190.
157. 130. 89. 73. 50. 41. 28. 28.
23. 19. 13. 11. 9. 7. 5. 4.
3.

END-OF-PERIOD FLOW

MO.DA	MR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	MR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	1.30	1	.00	.00	.00	1	1.02	1.30	51	.05	.00	.05	28.
1.01	1.30	2	.00	.00	.00	1	1.02	2.00	52	.05	.00	.05	23.
1.01	1.30	3	.00	.00	.00	1	1.02	2.30	53	.05	.00	.05	20.
1.01	2.00	4	.00	.00	.00	1	1.02	3.00	54	.05	.00	.05	16.
1.01	2.30	5	.00	.00	.00	1	1.02	3.30	55	.05	.00	.05	14.
1.01	3.00	6	.00	.00	.00	1	1.02	4.00	56	.05	.00	.05	12.
1.01	3.30	7	.00	.00	.00	1	1.02	4.30	57	.05	.00	.05	10.
1.01	4.00	8	.00	.00	.00	1	1.02	5.00	58	.05	.00	.05	9.
1.01	4.30	9	.00	.00	.00	1	1.02	5.30	59	.05	.00	.05	7.
1.01	5.00	10	.00	.00	.00	1	1.02	6.00	60	.05	.00	.05	6.
1.01	5.30	11	.00	.00	.00	1	1.02	6.30	61	.17	.12	.35	9.
1.01	6.00	12	.00	.00	.00	1	1.02	7.00	62	.17	.12	.35	19.
1.01	6.30	13	.02	.00	.02	1	1.02	7.30	63	.17	.12	.35	40.
1.01	7.00	14	.02	.00	.02	1	1.02	8.00	64	.17	.12	.35	71.
1.01	7.30	15	.02	.00	.02	1	1.02	8.30	65	.17	.12	.35	111.
1.01	8.00	16	.02	.00	.02	1	1.02	9.00	66	.17	.12	.35	154.
1.01	8.30	17	.02	.00	.02	1	1.02	9.30	67	.17	.12	.35	193.
1.01	9.00	18	.02	.00	.02	1	1.02	10.00	68	.17	.12	.35	226.
1.01	9.30	19	.02	.00	.02	1	1.02	10.30	69	.17	.12	.35	253.
1.01	10.00	20	.02	.00	.02	1	1.02	11.00	70	.17	.12	.35	276.
1.01	10.30	21	.02	.00	.02	1	1.02	11.30	71	.17	.12	.35	294.
1.01	11.00	22	.02	.00	.02	1	1.02	12.00	72	.17	.12	.35	310.
1.01	11.30	23	.02	.00	.02	1	1.02	12.30	73	.17	.12	.35	343.
1.01	12.00	24	.02	.00	.02	1	1.02	13.00	74	.17	.12	.35	432.
1.01	12.30	25	.09	.00	.09	1	1.02	13.30	75	1.20	1.15	.05	559.
1.01	13.00	26	.00	.00	.00	1	1.02	14.00	76	1.20	1.15	.05	555.
1.01	13.30	27	.11	.00	.11	1	1.02	14.30	77	1.50	1.45	.05	1189.
1.01	14.00	28	.11	.00	.11	1	1.02	15.00	78	1.50	1.45	.05	1560.
1.01	14.30	29	.14	.00	.14	2	1.02	15.30	79	1.92	1.77	.05	1994.
1.01	15.00	30	.14	.00	.14	2	1.02	16.00	80	5.77	5.72	.05	2317.
1.01	15.30	31	.17	.05	.05	4	1.02	16.30	81	1.40	1.35	.05	3192.
1.01	16.00	32	.34	.49	.05	22	1.02	17.00	82	1.40	1.35	.05	3234.
1.01	16.30	33	.33	.38	.05	65	1.02	17.30	83	1.10	1.05	.05	4599.
1.01	17.00	34	.13	.06	.05	124	1.02	18.00	84	1.10	1.05	.05	5060.
1.01	17.30	35	.10	.05	.05	189	1.02	18.30	85	.07	.02	.05	5222.
1.01	18.00	36	.10	.05	.05	242	1.02	19.00	86	.07	.02	.05	5022.
1.01	18.30	37	.01	.00	.01	272	1.02	19.30	87	.07	.02	.05	4572.
1.01	19.00	38	.01	.00	.01	273	1.02	20.00	88	.07	.02	.05	4572.
1.01	19.30	39	.01	.00	.01	245	1.02	20.30	89	.07	.02	.05	3670.
1.01	20.00	40	.01	.00	.01	247	1.02	21.00	90	.07	.02	.05	2317.
1.01	20.30	41	.01	.00	.01	196	1.02	21.30	91	.07	.02	.05	2424.
1.01	21.00	42	.01	.00	.01	155	1.02	22.00	92	.07	.02	.05	2315.

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1.01	21.30	43	.01	.00	.01	128	1.02	22.30	93	.07	.02	.05	1677
1.01	22.00	44	.01	.00	.01	106	1.02	23.00	94	.07	.02	.05	1397
1.01	22.50	45	.01	.00	.01	98	1.02	23.50	95	.07	.02	.05	1167
1.01	23.00	46	.01	.00	.01	77	1.03	0.00	96	.37	.02	.05	977
1.01	23.30	47	.01	.00	.01	60	1.03	.30	97	0.30	0.00	0.00	819
1.02	0.00	48	.01	.00	.01	49	1.03	1.00	98	0.30	0.00	0.00	687
1.02	0.30	49	.02	.00	.05	41	1.03	1.30	99	0.30	0.00	0.00	575
1.02	1.00	50	.05	.00	.05	34	1.03	2.00	100	0.30	0.00	0.00	480
SUM										25.05	21.94	3.71	68462
										(652.) (557.) (94.) (938.63)			

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
5222	3897	1366	522	68220
148	110	39	19	1932
	14.50	20.34	21.15	21.15
	368.28	516.51	537.30	537.30
	1932	2710	2819	2819
	2363	3343	3477	3477

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1													
1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1
184	65	124	189	242	272	270	246	217	246	217	246	217	246
28	23	23	16	12	10	9	41	34	41	34	41	34	41
5	19	43	71	111	154	226	253	276	253	276	253	276	253
204	310	343	332	309	253	1580	1994	2517	1994	2517	1994	2517	1994
319	3936	4509	5067	5222	5022	4038	3470	2917	3470	2917	3470	2917	3470
2424	2015	1677	1197	1167	977	687	575	480	575	480	575	480	575
PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME									
5222	3897	1366	522	68220									
148	110	39	19	1932									
	14.50	20.34	21.15	21.15									
	368.28	516.51	537.30	537.30									
	1932	2710	2819	2819									
	2363	3343	3477	3477									

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
5222	3897	1366	522	68220
148	110	39	19	1932
	14.50	20.34	21.15	21.15
	368.28	516.51	537.30	537.30
	1932	2710	2819	2819
	2363	3343	3477	3477

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2													
1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1
139	17	49	93	141	181	204	135	163	135	163	135	163	135
21	16	15	12	10	9	7	37	25	37	25	37	25	37
6	32	32	32	23	115	145	169	207	169	207	169	207	169
221	232	259	324	449	641	992	1185	1496	1185	1496	1185	1496	1185
2399	2950	3443	3795	3916	3767	3420	3029	2188	3420	3029	2188	2188	2188
1215	1511	1254	1048	875	732	614	515	431	515	431	515	431	515
PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME									
5916	2922	1125	512	51165									
111	83	29	16	1440									
	10.97	15.25	15.87	15.87									

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
5916	2922	1125	512	51165
111	83	29	16	1440
	10.97	15.25	15.87	15.87

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T

276.21	347.39	602.92	402.98
1449.	2032.	2114.	2114.
1718.	2507.	2507.	2508.

NO
AC-FT
THOUS CU M

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 3									
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
11.	32.	62.	94.	121.	136.	135.	123.	128.	128.
93.	78.	64.	44.	36.	30.	25.	20.	17.	17.
14.	12.	9.	7.	6.	5.	4.	4.	3.	3.
4.	3.	2.	1.	1.	1.	1.	1.	1.	1.
147.	155.	172.	216.	330.	427.	595.	790.	997.	1259.
1594.	1967.	2300.	2811.	2511.	2286.	2019.	1735.	1458.	1458.
1212.	1007.	836.	699.	583.	481.	343.	288.	240.	240.

PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME									
CFS	2611.	1948.	683.	341.	341.	341.	341.	341.	341.
CMS	74.	55.	19.	10.	10.	10.	10.	10.	10.
INCHES	74.	55.	19.	10.	10.	10.	10.	10.	10.
AC-FT	184.14	258.26	268.65	268.65	268.65	268.65	268.65	268.65	268.65
THOUS CU M	1192.	1071.	1739.	1739.	1739.	1739.	1739.	1739.	1739.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 4									
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
46.	39.	32.	27.	22.	18.	15.	12.	8.	8.
7.	6.	5.	4.	3.	3.	2.	2.	2.	2.
2.	5.	10.	15.	28.	38.	45.	56.	69.	69.
74.	77.	86.	108.	150.	214.	297.	395.	499.	629.
806.	983.	1150.	1265.	1305.	1256.	1143.	1010.	868.	729.
608.	504.	419.	349.	292.	244.	205.	172.	144.	120.

PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME									
CFS	1305.	974.	342.	171.	171.	171.	171.	171.	171.
CMS	37.	28.	10.	5.	5.	5.	5.	5.	5.
INCHES	37.	28.	10.	5.	5.	5.	5.	5.	5.
AC-FT	92.07	129.13	136.33	136.33	136.33	136.33	136.33	136.33	136.33
THOUS CU M	596.	836.	869.	869.	869.	869.	869.	869.	869.

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COMBINE HYDROGRAPHS

3 COMBINE 2 HYDROGRAPHS AT NOOF 101

1STAG 1 ICGP 2 IECCY 0 ITAPE 0 JPLT 0 JORT INAME ISTAGE 1AUTO 0

[illegible][illegible][illegible]

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74.	42.	51.	43.	36.	30.	26.	22.	19.	14.
11.	1.	-9.	-11.	-1.	29.	40.	148.	224.	300.
372.	437.	473.	466.	444.	455.	550.	775.	1155.	1576.
2073.	2833.	3609.	5265.	6745.	8282.	9476.	10165.	10314.	9993.
9355.	8466.	7509.	6556.	5667.	4867.	4164.	3556.	3034.	2588.

PEAK									
CFS	10314.	8135.	7735.	1341.	TOTAL VOLUME				
CMS	292.	230.	77.	38.					
INCHES	14.04	18.28	19.28	19.28					
AC-FT	356.59	479.61	489.70	489.70					
THOUS CU YD	4034.	5425.	5539.	5539.					
	4975.	6692.	6533.	6533.					

STATION 2, PLAN 1, RTIO 2

OUTFLOW									
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
201.	197.	185.	168.	148.	129.	110.	93.	79.	56.
55.	46.	32.	27.	23.	19.	16.	12.	14.	12.
2.	1.	-7.	-8.	-1.	22.	60.	111.	168.	225.
279.	328.	355.	349.	333.	341.	413.	582.	866.	1182.
2152.	2152.	2932.	3949.	5389.	6211.	7107.	7624.	7735.	7495.
7601.	6350.	5632.	4917.	4250.	3650.	3125.	2667.	2276.	1941.

PEAK									
CFS	7735.	6101.	2051.	1705.	TOTAL VOLUME				
CMS	219.	173.	58.	28.					
INCHES	10.53	14.16	14.46	14.46					
AC-FT	267.44	359.71	367.28	367.28					
THOUS CU YD	3725.	5019.	5125.	5125.					

STATION 2, PLAN 1, RTIO 3

OUTFLOW									
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
0.	-4.	-10.	-11.	-0.	22.	53.	87.	115.	130.
134.	131.	123.	112.	90.	73.	62.	52.	44.	44.
27.	31.	26.	22.	14.	13.	11.	9.	8.	8.
3.	1.	-6.	-6.	-0.	15.	40.	74.	112.	150.
166.	219.	30.	233.	222.	227.	275.	388.	577.	788.
1035.	1416.	1954.	2632.	3293.	4141.	4738.	5082.	5157.	4997.
4668.	4233.	3754.	3278.	2833.	2434.	2082.	1778.	1517.	1294.

PEAK									
CFS	5157.	4067.	1368.	470.	TOTAL VOLUME				
CMS	146.	115.	39.	10.					
INCHES	7.02	9.44	9.64	9.64					
AC-FT	178.29	239.61	244.85	244.85					
	2017.	2713.	2770.	2770.					

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3496.

[illegible]

1000

5 SUP-BAS IN (3) RUNOFF

ISTAQ	ICOMP	IECEN	ITYPE	JPLY	JPRY	INAME	ISTAGE	AUTO
2	0	0	0	0	0	1	0	0

ISAME	LOCAL
1	0

111

R96
0.30

TRNSPC COMPUTED BY THE PROGRAM IS .614

RTI	ALSMX	RTIHP
010	0.00	.02

UNIT HYDROGRAPH DATA

VTAN = 0

RECESSION DATA

05 RTIOR= 1.60

10.71 AND R= 8.24 INTERVALS

UNIT HYDROGRAPH SU END-OF-PERIOD ORDINATES, LAG= 4.68 HOURS, CP= .64 VOL= 1.30

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0														
NO. DA	HR. PM	PERIOD	RAIN	EXCS	LOSS	COMP Q	END-OF-PERIOD FLOW			PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	7.30	1	.00	.00	.00	1.	1.02	1.30	174.	99.	194.	.00	.05	9.
1.01	1.00	2	.00	.00	.00	1.	1.02	2.00	174.	99.	194.	.00	.05	9.
1.01	1.30	3	.00	.00	.00	1.	1.02	2.30	174.	99.	194.	.00	.05	9.
1.01	2.00	4	.00	.00	.00	1.	1.02	3.00	174.	99.	194.	.00	.05	9.
1.01	2.30	5	.00	.00	.00	1.	1.02	3.30	174.	99.	194.	.00	.05	9.
1.01	3.00	6	.00	.00	.00	1.	1.02	4.00	174.	99.	194.	.00	.05	9.
1.01	3.30	7	.00	.00	.00	1.	1.02	4.30	174.	99.	194.	.00	.05	9.
1.01	4.00	8	.00	.00	.00	1.	1.02	5.00	174.	99.	194.	.00	.05	9.
1.01	4.30	9	.00	.00	.00	1.	1.02	5.30	174.	99.	194.	.00	.05	9.
1.01	5.00	10	.00	.00	.00	1.	1.02	6.00	174.	99.	194.	.00	.05	9.
1.01	5.30	11	.00	.00	.00	1.	1.02	6.30	174.	99.	194.	.00	.05	9.
1.01	6.00	12	.00	.00	.00	1.	1.02	7.00	174.	99.	194.	.00	.05	9.
1.01	6.30	13	.02	.00	.02	1.	1.02	7.30	174.	99.	194.	.00	.05	9.
1.01	7.00	14	.02	.00	.02	1.	1.02	8.00	174.	99.	194.	.00	.05	9.
1.01	7.30	15	.02	.00	.02	1.	1.02	8.30	174.	99.	194.	.00	.05	9.
1.01	8.00	16	.02	.00	.02	1.	1.02	9.00	174.	99.	194.	.00	.05	9.
1.01	8.30	17	.02	.00	.02	1.	1.02	9.30	174.	99.	194.	.00	.05	9.
1.01	9.00	18	.02	.00	.02	1.	1.02	10.00	174.	99.	194.	.00	.05	9.
1.01	9.30	19	.02	.00	.02	1.	1.02	10.30	174.	99.	194.	.00	.05	9.
1.01	10.00	20	.02	.00	.02	1.	1.02	11.00	174.	99.	194.	.00	.05	9.
1.01	10.30	21	.02	.00	.02	1.	1.02	11.30	174.	99.	194.	.00	.05	9.
1.01	11.00	22	.02	.00	.02	1.	1.02	12.00	174.	99.	194.	.00	.05	9.
1.01	11.30	23	.02	.00	.02	1.	1.02	12.30	174.	99.	194.	.00	.05	9.
1.01	12.00	24	.02	.00	.02	1.	1.02	13.00	174.	99.	194.	.00	.05	9.
1.01	12.30	25	.05	.00	.05	1.	1.02	13.30	174.	99.	194.	.00	.05	9.
1.01	13.00	26	.09	.00	.09	1.	1.02	14.00	174.	99.	194.	.00	.05	9.
1.01	13.30	27	.11	.00	.11	1.	1.02	14.30	174.	99.	194.	.00	.05	9.
1.01	14.00	28	.11	.00	.11	1.	1.02	15.00	174.	99.	194.	.00	.05	9.
1.01	14.30	29	.14	.00	.14	2.	1.02	15.30	174.	99.	194.	.00	.05	9.
1.01	15.00	30	.14	.00	.14	2.	1.02	16.00	174.	99.	194.	.00	.05	9.
1.01	15.30	31	.17	.00	.17	2.	1.02	16.30	174.	99.	194.	.00	.05	9.
1.01	16.00	32	.34	.01	.35	3.	1.02	17.00	174.	99.	194.	.00	.05	9.
1.01	16.30	33	.13	.00	.13	3.	1.02	17.30	174.	99.	194.	.00	.05	9.
1.01	17.00	34	.13	.00	.13	3.	1.02	18.00	174.	99.	194.	.00	.05	9.
1.01	17.30	35	.10	.01	.10	3.	1.02	18.30	174.	99.	194.	.00	.05	9.
1.01	18.00	36	.10	.01	.10	3.	1.02	19.00	174.	99.	194.	.00	.05	9.
1.01	18.30	37	.01	.00	.01	8.	1.02	19.30	174.	99.	194.	.00	.05	9.
1.01	19.00	38	.01	.00	.01	10.	1.02	20.00	174.	99.	194.	.00	.05	9.
1.01	19.30	39	.01	.00	.01	12.	1.02	20.30	174.	99.	194.	.00	.05	9.
1.01	20.00	40	.01	.00	.01	14.	1.02	21.00	174.	99.	194.	.00	.05	9.
1.01	20.30	41	.01	.00	.01	16.	1.02	21.30	174.	99.	194.	.00	.05	9.
1.01	21.00	42	.01	.00	.01	17.	1.02	22.00	174.	99.	194.	.00	.05	9.
1.01	21.30	43	.01	.00	.01	18.	1.02	22.30	174.	99.	194.	.00	.05	9.
1.01	22.00	44	.01	.00	.01	18.	1.02	23.00	174.	99.	194.	.00	.05	9.
1.01	22.30	45	.01	.00	.01	18.	1.02	23.30	174.	99.	194.	.00	.05	9.
1.01	23.00	46	.01	.00	.01	18.	1.02	24.00	174.	99.	194.	.00	.05	9.
1.01	23.30	47	.01	.00	.01	18.	1.02	24.30	174.	99.	194.	.00	.05	9.
1.01	24.00	48	.01	.00	.01	18.	1.02	25.00	174.	99.	194.	.00	.05	9.
1.01	24.30	49	.01	.00	.01	18.	1.02	25.30	174.	99.	194.	.00	.05	9.
1.01	25.00	50	.01	.00	.01	18.	1.02	26.00	174.	99.	194.	.00	.05	9.
1.01	25.30	51	.01	.00	.01	18.	1.02	26.30	174.	99.	194.	.00	.05	9.
1.01	26.00	52	.01	.00	.01	18.	1.02	27.00	174.	99.	194.	.00	.05	9.
1.01	26.30	53	.01	.00	.01	18.	1.02	27.30	174.	99.	194.	.00	.05	9.
1.01	27.00	54	.01	.00	.01	18.	1.02	28.00	174.	99.	194.	.00	.05	9.
1.01	27.30	55	.01	.00	.01	18.	1.02	28.30	174.	99.	194.	.00	.05	9.
1.01	28.00	56	.01	.00	.01	18.	1.02	29.00	174.	99.	194.	.00	.05	9.
1.01	28.30	57	.01	.00	.01	18.	1.02	29.30	174.	99.	194.	.00	.05	9.
1.01	29.00	58	.01	.00	.01	18.	1.02	30.00	174.	99.	194.	.00	.05	9.
1.01	29.30	59	.01	.00	.01	18.	1.02	30.30	174.	99.	194.	.00	.05	9.
1.01	30.00	60	.01	.00	.01	18.	1.02	31.00	174.	99.	194.	.00	.05	9.
1.01	30.30	61	.01	.00	.01	18.	1.02	31.30	174.	99.	194.	.00	.05	9.
1.01	31.00	62	.01	.00	.01	18.	1.02	32.00	174.	99.	194.	.00	.05	9.
1.01	31.30	63	.01	.00	.01	18.	1.02	32.30	174.	99.	194.	.00	.05	9.
1.01	32.00	64	.01	.00	.01	18.	1.02	33.00	174.	99.	194.	.00	.05	9.
1.01	32.30	65	.01	.00	.01	18.	1.02	33.30	174.	99.	194.	.00	.05	9.
1.01	33.00	66	.01	.00	.01	18.	1.02	34.00	174.	99.	194.	.00	.05	9.
1.01	33.30	67	.01	.00	.01	18.	1.02	34.30	174.	99.	194.	.00	.05	9.
1.01	34.00	68	.01	.00	.01	18.	1.02	35.00	174.	99.	194.	.00	.05	9.
1.01	34.30	69	.01	.00	.01	18.	1.02	35.30	174.	99.	194.	.00	.05	9.
1.01	35.00	70	.01	.00	.01	18.	1.02	36.00	174.	99.	194.	.00	.05	9.
1.01	35.30	71	.01	.00	.01	18.	1.02	36.30	174.	99.	194.	.00	.05	9.
1.01	36.00	72	.01	.00	.01	18.	1.02	37.00	174.	99.	194.	.00	.05	9.
1.01	36.30	73	.01	.00	.01	18.	1.02	37.30	174.	99.	194.	.00	.05	9.
1.01	37.00	74	.01	.00	.01	18.	1.02	38.00	174.	99.	194.	.00	.05	9.
1.01	37.30	75	.01	.00	.01	18.	1.02	38.30	174.	99.	194.	.00	.05	9.
1.01	38.00	76	.01	.00	.01	18.	1.02	39.00	174.	99.	194.	.00	.05	9.
1.01	38.30	77	.01	.00	.01	18.	1.02	39.30	174.	99.	194.	.00	.05	9.
1.01	39.00	78	.01	.00	.01	18.	1.02	40.00	174.	99.	194.	.00	.05	9.
1.01	39.30	79	.01	.00	.01	18.	1.02	40.30	174.	99.	194.	.00	.05	9.
1.01	40.00	80	.01	.00	.01	18.	1.02	41.00	174.	99.	194.	.00	.05	9.
1.01	40.30	81	.01	.00	.01	18.	1.02	41.30	174.	99.	194.	.00	.05	9.
1.01	41.00	82	.01	.00	.01	18.	1.02	42.00	174.	99.	194.	.00	.05	9.
1.01	41.30	83	.01	.00	.01	18.	1.02	42.30	174.	99.	194.	.00	.05	9.
1.01	42.00	84	.01	.00	.01	18.	1.02	43.00	174.	99.	194.	.00	.05	9.
1.01	42.30	85	.01	.00	.01	18.	1.02	43.30	174.	99.	194.	.00	.05	9.
1.01	43.00	86	.01	.00	.01	18.	1.02	44.00	174.	99.	194.	.00	.05	9.
1.01	43.30	87	.01	.00	.01	18.	1.02	44.30	174.	99.	194.	.00	.05	9.
1.01	44.00	88	.01	.00	.01	18.	1.02	45.00	174.	99.	194.	.00	.05	9.
1.01	44.30	89	.01	.00	.01	18.	1.02	45.30	174.	99.	194.	.00	.05	9.
1.01	45.00	90	.01	.00	.01	18.	1.02	46.00	174.	99.	194.	.00	.05	9.
1.01	45.30	91	.01	.00	.01	18.	1.02	46.30	174.	99.	194.	.00	.05	9.
1.01	46.00	92	.01	.00	.01	18.	1.02	47.00	174.	99.	194.	.00	.05	9.
1.01	46.30	93	.01	.00	.01	18.	1.02	47.30	174.	99.	194.	.00	.05	9.
1.01	47.00	94	.01	.00	.01	18.	1.02	48.00	174.	99.	194.	.00	.05	9.
1.01	47.30	95	.01	.00	.01	18.	1.02	48.30	174.	99.	194.	.00	.05	9.
1.01	48.00	96	.01	.00	.01	18.	1.02	49.00	174.	99.	194.	.00	.05	9.
1.01	48.30	97	.01	.00	.01	18.	1.02	49.30	174.	99.	194.	.00	.05	9.
1.01	49.00	98	.01	.00	.01	18.	1.02	50.00	174.	99.	194.	.00	.05	9.
1.01	49.30	99	.01	.00	.01	18.	1.02	50.30	174.	99.	194.	.00	.05	9.
1.01	50.00	100	.01	.00	.01	18.	1.02	51.00	174.	99.	194.	.00	.05	9.

Sheet 20 of 57

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
SUR	63.53	212.6	343.3	619.43
	(532.)	(539.)	(175.)	(1546.07)

MM	304.14	456.19	456.41
AC-FT	1497.	2221.	2232.
THOUS CU F	1936.	2740.	2753.

[illegible]

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3537.	2995.	1120.	540.	5400.
CMS	100.	85.	32.	15.	1529.
INCHES		11.97	17.88	17.97	17.97
"M		304.14	454.19	456.41	456.41
AC-FT		1487.	2221.	2232.	2232.
THOUS CU M		1934.	2740.	2753.	2753.

[illegible]

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2633	2245	340	405	40507
CFS	75	64	24	11	1147
INCHES		8.98	13.41	13.48	13.48
MM		228.10	342.65	342.31	342.31
AL-FT		1115	1666	1674	1674
THOUS CU M		1376	2053	2065	2065

HYDROGRAPH AT STA						2 FOR PLAT. 1, RTIO 3					
1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

Sheet 21 of 57

Sheet 21 of 57

[illegible]

		HYDROGRAPH AT STA										2 FOR PLAN 1, RTID 4											
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
43.	43.	54.	64.	78.	100.	130.	169.	217.	282.	370.	484.	630.	817.	1050.	1350.	1720.	2170.	2700.	3300.	4000.	4800.	5700.	6700.
366.	366.	551.	652.	746.	831.	917.	1000.	1080.	1150.	1220.	1290.	1360.	1430.	1500.	1570.	1640.	1710.	1780.	1850.	1920.	1990.	2060.	2130.
751.	751.	655.	588.	524.	466.	415.	369.	329.	290.	250.	210.	170.	130.	90.	50.	10.	0.	0.	0.	0.	0.	0.	0.
		PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME																	
		284.	750.	260.	135.	13502.																	
		25.	21.	8.	4.	382.																	
		INCHES		CM		4.49																	
		MM		MM		114.10																	
		AC-FT		AC-FT		558.																	
		THOUS CU Y		THOUS CU Y		688.																	

AD-A107 407

TIPPETIS-ABBETT-MCCARTHY-STRATTON NEW YORK

F/G 13/13

NATIONAL DAM SAFETY PROGRAM. MAMARONECK RESERVOIR DAM (INVENTOR--ETC(U)

AUG 81 E O'BRIEN

DACW51-81-C-0008

UNCLASSIFIED

NL

2 of 2

AD-A
107 407

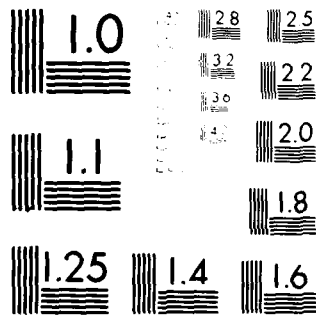
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DATE

FILED

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DTIC



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

INCHES	13.38	16.53	16.79	16.79
MM	339.86	419.79	426.49	426.49
AC-FT	5506.	6801.	6910.	6910.
THOUS CU M	6792.	8389.	8523.	8523.

STATION 3, PLAN 1, RTIO 2												
OUTFLOW												
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
119.	159.	185.	201.	205.	208.	208.	208.	208.	208.	208.	208.	208.
115.	102.	87.	74.	63.	53.	45.	38.	33.	28.	24.	20.	16.
23.	23.	18.	9.	-1.	-11.	-14.	-2.	27.	74.	552.	9152.	5033.
125.	205.	284.	363.	417.	434.	421.	402.	418.	577.	7999.	9152.	5033.
769.	1307.	1345.	1868.	2666.	3716.	5075.	6577.	7999.	9152.	9152.	9152.	5033.
9802.	10201.	10094.	9641.	8973.	8177.	7534.	6503.	5720.	4909.	4152.	3403.	2653.
TOTAL VOLUME												
CFS	10201.	8328.	7572.	1254.	1254.	1254.	1254.	1254.	1254.	1254.	1254.	1254.
CMS	236.	73.	56.	351.	351.	351.	351.	351.	351.	351.	351.	351.
INCHES	10.54	12.40	12.59	12.59	12.59	12.59	12.59	12.59	12.59	12.59	12.59	12.59
AC-FT	254.90	314.84	319.87	319.87	319.87	319.87	319.87	319.87	319.87	319.87	319.87	319.87
THOUS CU M	4130.	5101.	5182.	5182.	5182.	5182.	5182.	5182.	5182.	5182.	5182.	5182.
THOUS CU M	5094.	6292.	6392.	6392.	6392.	6392.	6392.	6392.	6392.	6392.	6392.	6392.

STATION 3, PLAN 1, RTIO 3												
OUTFLOW												
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
79.	106.	124.	134.	137.	133.	125.	115.	103.	90.	77.	64.	51.
79.	68.	58.	49.	42.	35.	30.	26.	22.	19.	16.	13.	10.
17.	15.	12.	6.	-1.	-7.	-9.	-2.	269.	388.	532.	6101.	3335.
90.	137.	193.	242.	278.	289.	280.	265.	279.	358.	4384.	5332.	3335.
513.	671.	857.	1243.	1764.	2479.	3381.	4384.	5332.	6101.	6101.	6101.	3335.
6601.	6801.	6723.	6428.	5982.	5451.	4982.	4335.	3813.	3335.	3335.	3335.	3335.
TOTAL VOLUME												
CFS	6601.	5552.	1714.	836.	836.	836.	836.	836.	836.	836.	836.	836.
CMS	293.	157.	49.	24.	24.	24.	24.	24.	24.	24.	24.	24.
INCHES	6.69	8.26	8.40	8.40	8.40	8.40	8.40	8.40	8.40	8.40	8.40	8.40
AC-FT	162.93	209.90	213.25	213.25	213.25	213.25	213.25	213.25	213.25	213.25	213.25	213.25
THOUS CU M	2753.	3401.	3455.	3455.	3455.	3455.	3455.	3455.	3455.	3455.	3455.	3455.
THOUS CU M	3396.	4165.	4262.	4262.	4262.	4262.	4262.	4262.	4262.	4262.	4262.	4262.

STATION 3, PLAN 1, RTIO 4												
OUTFLOW												
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.

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[illegible]

SUB-AREA RUNOFF COMPUTATION

8 SUB-BASIN (7) RUNOFF

ISZB	IOMP	IECN	ITAP	JPLY	JPRY	INAME	ISTAGE	IAUTO
3	0	0	0	0	0	1	0	0

HYDROGRAPH DATA									
INYDC	IUNGS	TAREA	SNAP	TRSDA	TRSPC	RAZZO	ISNDW	ISANE	LOCAL
1	1	1.62	0.00	15.24	0.00	0.000	0	1	0

PRECIP DATA									
SPFE	PMS	R6	R12	R24	R48	R72	R96		
0.00	22.50	109.00	120.00	122.00	140.00	0.00	0.00		

TRSDC COMPUTED BY THE PROGRAM IS -674

W140 5507

LOOPT	STICK	DIURN	RTIOL	ERAIN	STARS	RTIOK	SINTL	CHSTL	ALSMX	RTIMP
0	3.00	0.00	1.00	0.00	0.00	1.00	2.00	.10	0.00	.02

UNIT HYDROGRAPH DATA

TP= 3.00 CP= .63 NTA= 0

RECESSION DATA

RECESSION DATA									
APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SUTHER CP AND TP ARE TC = 6.05 PUD R = 5.33 INTERVALS									
UNIT HYDROGRAPH		32 END-OF-PERIOD ORIGINATES, LAG =		2.99 HOURS, CP =		.63 VOL = 1.00			
16.	52.	132.	150.	199.	222.	153.	160.	133.	
110.	91.	75.	62.	52.	43.	35.	29.	20.	
17.	14.	11.	9.	8.	7.	5.	4.	4.	
3.	2.								

END-OF-PERIOD FLOW

PRD-OF-PERIOD FLOW												
Y2-DA	HR-YY	PERIOD	RAIN	EXCS	LOSS	COMP 0	HP-YY	PERIOD	RAIN	EXCS	LOSS	COMP 3
1-01	30	1	.00	.00	.03	1.	1.02	1.30	.51	.05	.05	4.

C 10

1.01	1.00	2	0.00	0.00	0.00	1	1.02	2.00	52	0.05	0.00	0.05	3
1.01	1.30	3	0.00	0.00	0.00	1	1.02	2.30	53	0.05	0.00	0.05	3
1.01	2.00	4	0.00	0.00	0.00	1	1.02	3.00	54	0.05	0.00	0.05	3
1.01	2.30	5	0.00	0.00	0.00	1	1.02	3.30	55	0.05	0.00	0.05	3
1.01	3.00	6	0.00	0.00	0.00	1	1.02	4.00	56	0.05	0.00	0.05	3
1.01	3.30	7	0.00	0.00	0.00	1	1.02	4.30	57	0.05	0.00	0.05	2
1.01	4.00	8	0.00	0.00	0.00	1	1.02	5.00	58	0.05	0.00	0.05	2
1.01	4.30	9	0.00	0.00	0.00	1	1.02	5.30	59	0.05	0.00	0.05	2
1.01	5.00	10	0.00	0.00	0.00	1	1.02	6.00	60	0.05	0.00	0.05	2
1.01	5.30	11	0.00	0.00	0.00	1	1.02	6.30	61	0.05	0.00	0.05	2
1.01	6.00	12	0.00	0.00	0.00	1	1.02	7.00	62	0.05	0.00	0.05	10
1.01	6.30	13	0.00	0.00	0.00	1	1.02	7.30	63	0.05	0.00	0.05	22
1.01	7.00	14	0.00	0.00	0.00	1	1.02	8.00	64	0.05	0.00	0.05	40
1.01	7.30	15	0.00	0.00	0.00	1	1.02	8.30	65	0.05	0.00	0.05	64
1.01	8.00	16	0.00	0.00	0.00	1	1.02	9.00	66	0.05	0.00	0.05	90
1.01	8.30	17	0.00	0.00	0.00	1	1.02	9.30	67	0.05	0.00	0.05	116
1.01	9.00	18	0.00	0.00	0.00	1	1.02	10.00	68	0.05	0.00	0.05	138
1.01	9.30	19	0.00	0.00	0.00	1	1.02	10.30	69	0.05	0.00	0.05	157
1.01	10.00	20	0.00	0.00	0.00	1	1.02	11.00	70	0.05	0.00	0.05	173
1.01	10.30	21	0.00	0.00	0.00	1	1.02	11.30	71	0.05	0.00	0.05	186
1.01	11.00	22	0.00	0.00	0.00	1	1.02	12.00	72	0.05	0.00	0.05	197
1.01	11.30	23	0.00	0.00	0.00	1	1.02	12.30	73	0.05	0.00	0.05	217
1.01	12.00	24	0.00	0.00	0.00	1	1.02	13.00	74	0.05	0.00	0.05	268
1.01	12.30	25	0.00	0.00	0.00	1	1.02	13.30	75	0.05	0.00	0.05	361
1.01	13.00	26	0.00	0.00	0.00	1	1.02	14.00	76	0.05	0.00	0.05	506
1.01	13.30	27	0.00	0.00	0.00	1	1.02	14.30	77	0.05	0.00	0.05	700
1.01	14.00	28	0.00	0.00	0.00	1	1.02	15.00	78	0.05	0.00	0.05	934
1.01	14.30	29	0.00	0.00	0.00	2	1.02	15.30	79	0.05	0.00	0.05	1194
1.01	15.00	30	0.00	0.00	0.00	3	1.02	16.00	80	0.05	0.00	0.05	1520
1.01	15.30	31	0.00	0.00	0.00	3	1.02	16.30	81	0.05	0.00	0.05	1934
1.01	16.00	32	0.00	0.00	0.00	3	1.02	17.00	82	0.05	0.00	0.05	2378
1.01	16.30	33	0.00	0.00	0.00	4	1.02	17.30	83	0.05	0.00	0.05	2797
1.01	17.00	34	0.00	0.00	0.00	5	1.02	18.00	84	0.05	0.00	0.05	3120
1.01	17.30	35	0.00	0.00	0.00	5	1.02	18.30	85	0.05	0.00	0.05	3256
1.01	18.00	36	0.00	0.00	0.00	7	1.02	19.00	86	0.05	0.00	0.05	3257
1.01	18.30	37	0.00	0.00	0.00	10	1.02	19.30	87	0.05	0.00	0.05	3039
1.01	19.00	38	0.00	0.00	0.00	13	1.02	20.00	88	0.05	0.00	0.05	2719
1.01	19.30	39	0.00	0.00	0.00	15	1.02	20.30	89	0.05	0.00	0.05	2371
1.01	20.00	40	0.00	0.00	0.00	17	1.02	21.00	90	0.05	0.00	0.05	2021
1.01	20.30	41	0.00	0.00	0.00	18	1.02	21.30	91	0.05	0.00	0.05	1654
1.01	21.00	42	0.00	0.00	0.00	17	1.02	22.00	92	0.05	0.00	0.05	1412
1.01	21.30	43	0.00	0.00	0.00	15	1.02	22.30	93	0.05	0.00	0.05	1178
1.01	22.00	44	0.00	0.00	0.00	12	1.02	23.00	94	0.05	0.00	0.05	985
1.01	22.30	45	0.00	0.00	0.00	10	1.02	23.30	95	0.05	0.00	0.05	824
1.01	23.00	46	0.00	0.00	0.00	9	1.03	0.00	96	0.00	0.00	0.00	691
1.01	23.30	47	0.00	0.00	0.00	7	1.03	1.00	97	0.00	0.00	0.00	561
1.02	0.00	48	0.00	0.00	0.00	6	1.03	1.00	98	0.00	0.00	0.00	488
1.02	0.30	49	0.05	0.00	0.05	5	1.03	1.30	99	0.00	0.00	0.00	410
1.02	1.00	50	0.05	0.00	0.05	4	1.03	2.00	100	0.00	0.00	0.00	344

SUM 25.65 21.22 4.43 42071.
(652.) (539.) (113.) (1205.31)

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
3286.	2507.	981.	425.	42492.
93.	71.	25.	12.	1203.
	14.39	20.23	20.33	20.33
	365.63	513.85	515.46	516.46
	1243.	1747.	1756.	1756.
	1533.	2155.	2166.	2166.

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AC-FT	6213.	8548.	8666.
THOUS CU M	7664.	10544.	10689.

SUM OF 2 HYDROGRAPHS AT			
3.	3.	3.	3.
3.	3.	3.	3.
2.	3.	3.	3.
4.	3.	3.	3.
132.	171.	210.	233.
121.	104.	59.	76.
24.	31.	35.	40.
275.	353.	448.	564.
2219.	3443.	4208.	5110.
11173.	10968.	10380.	9591.

SUM OF 2 HYDROGRAPHS AT			
3.	3.	3.	3.
3.	3.	3.	3.
2.	3.	3.	3.
4.	3.	3.	3.
132.	171.	210.	233.
121.	104.	59.	76.
24.	31.	35.	40.
275.	353.	448.	564.
2219.	3443.	4208.	5110.
11173.	10968.	10380.	9591.

SUM OF 2 HYDROGRAPHS AT			
3.	3.	3.	3.
3.	3.	3.	3.
2.	3.	3.	3.
4.	3.	3.	3.
132.	171.	210.	233.
121.	104.	59.	76.
24.	31.	35.	40.
275.	353.	448.	564.
2219.	3443.	4208.	5110.
11173.	10968.	10380.	9591.

SUM OF 2 HYDROGRAPHS AT			
3.	3.	3.	3.
3.	3.	3.	3.
2.	3.	3.	3.
4.	3.	3.	3.
132.	171.	210.	233.
121.	104.	59.	76.
24.	31.	35.	40.
275.	353.	448.	564.
2219.	3443.	4208.	5110.
11173.	10968.	10380.	9591.

SUM OF 2 HYDROGRAPHS AT			
3.	3.	3.	3.
3.	3.	3.	3.
2.	3.	3.	3.
4.	3.	3.	3.
132.	171.	210.	233.
121.	104.	59.	76.
24.	31.	35.	40.
275.	353.	448.	564.
2219.	3443.	4208.	5110.
11173.	10968.	10380.	9591.

Sheet 30 of 57

92.	118.	149.	188.	229.	271.	315.	367.	438.	504.
740.	930.	1148.	1403.	1703.	2054.	2451.	2872.	3259.	3556.
3724.	3753.	3656.	3460.	3197.	2898.	2590.	2290.	2009.	1753.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3753.	3132.	1077.	524.	52428.
CMS	106.	89.	31.	13.	1483.
INCHES		3.12	4.29	4.35	
M		79.24	109.03	113.52	
AC-FT		1553.	2137.	2166.	
THOUS CU M		1916.	2636.	2672.	

SUB-AREA RUNOFF COMPUTATION

10 SUB-EASIN (5) RUNOFF

ISTAG	ICOMP	IECON	ITAPE	JPLY	JPRY	INAME	ISTAGE	IAUTO
3	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IMY6	IUNG	TAREA	SWAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	1.36	0.00	15.24	0.00	0.000	0	1	0

PRECIP DATA

SPEE	PMS	R6	R12	R24	R48	R72	R96
0.00	22.50	109.00	120.00	128.00	140.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .514

LOSS DATA

LROPT	STRR	OLTRP	RTIOL	ERRIN	STRRS	RTIOK	STRTL	CNSTL	ALSHR	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	2.00	.10	0.00	.02

UNIT HYDROGRAPH DATA

TP= 2.00 CP= .63 NTA= 0

RECESSION DATA

STRG= -.50 ORCSH= -.05 RTIOR= 1.60
APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 4.79 AND N= 3.57 INTERVALS

UNIT HYDROGRAPH 21 END-OF-PERIOD COORDINATES, LAG= 1.98 HOURS, CP= .63 VOL= 1.00

31.	109.	204.	270.	273.	224.	166.	123.	91.	68.
50.	37.	28.	21.	15.	11.	5.	6.	5.	3.

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP R
1-01	1-51	1	.00	.00	.00	1.	1-02	1-30	51	.05	.00	.05	1.
1-01	1-52	2	.00	.00	.00	1.	1-02	2-00	52	.05	.00	.05	1.
1-01	1-53	3	.00	.00	.00	1.	1-02	2-30	53	.05	.00	.05	1.
1-01	2-00	4	.00	.00	.00	1.	1-02	3-00	54	.05	.00	.05	2.
1-01	2-30	5	.00	.00	.00	1.	1-02	3-30	55	.05	.00	.05	2.
1-01	3-00	6	.00	.00	.00	1.	1-02	4-00	56	.05	.00	.05	2.
1-01	3-30	7	.00	.00	.00	1.	1-02	4-30	57	.05	.00	.05	2.

12

1.01	4.00	8	.00	.00	.00	.00	1	1.02	5.00	58	.05	.00	.05	2
1.01	4.30	9	.00	.00	.00	.00	1	1.02	5.30	59	.05	.00	.05	2
1.01	5.00	10	.00	.00	.00	.00	1	1.02	6.00	60	.05	.00	.05	2
1.01	5.30	11	.00	.00	.00	.00	1	1.02	6.30	61	.17	.12	.05	5
1.01	6.00	12	.00	.00	.00	.00	1	1.02	7.00	62	.17	.12	.05	18
1.01	6.30	13	.02	.00	.02	.02	1	1.02	7.30	63	.17	.12	.05	42
1.01	7.00	14	.02	.00	.02	.02	1	1.02	8.00	64	.17	.12	.05	74
1.01	7.30	15	.02	.00	.02	.02	1	1.02	8.30	65	.17	.12	.05	106
1.01	8.00	16	.02	.00	.02	.02	1	1.02	9.00	66	.17	.12	.05	133
1.01	8.30	17	.02	.00	.02	.02	1	1.02	9.30	67	.17	.12	.05	152
1.01	9.00	18	.02	.00	.02	.02	1	1.02	10.00	68	.17	.12	.05	167
1.01	9.30	19	.02	.00	.02	.02	1	1.02	10.30	69	.17	.12	.05	178
1.01	10.00	20	.02	.00	.02	.02	1	1.02	11.00	70	.17	.12	.05	196
1.01	10.30	21	.02	.00	.02	.02	1	1.02	11.30	71	.17	.12	.05	192
1.01	11.00	22	.02	.00	.02	.02	1	1.02	12.00	72	.17	.12	.05	196
1.01	11.30	23	.02	.00	.02	.02	1	1.02	12.30	73	1.00	.95	.05	225
1.01	12.00	24	.02	.00	.02	.02	1	1.02	13.00	74	1.20	.95	.05	318
1.01	12.30	25	.09	.00	.09	.09	1	1.02	13.30	75	1.20	1.15	.05	495
1.01	13.00	26	.09	.00	.09	.09	1	1.02	14.00	76	1.20	1.15	.05	742
1.01	13.30	27	.11	.00	.11	.11	1	1.02	14.30	77	1.50	1.45	.05	1020
1.01	14.00	28	.11	.00	.11	.11	2	1.02	15.00	78	1.50	1.45	.05	1293
1.01	14.30	29	.14	.00	.14	.14	2	1.02	15.30	79	1.52	1.77	.05	1558
1.01	15.00	30	.14	.00	.14	.14	3	1.02	16.00	80	5.77	5.72	.05	1942
1.01	15.30	31	.17	.00	.17	.17	3	1.02	16.30	81	1.40	1.35	.05	2496
1.01	16.00	32	.34	.01	.34	.34	4	1.02	17.00	82	1.40	1.35	.05	3359
1.01	16.30	33	.13	.00	.13	.13	5	1.02	17.30	83	1.10	1.05	.05	3422
1.01	17.00	34	.13	.00	.13	.13	6	1.02	18.00	84	1.10	1.05	.05	3444
1.01	17.30	35	.10	.01	.09	.09	7	1.02	18.30	85	.37	.02	.05	3157
1.01	18.00	36	.10	.05	.05	.05	9	1.02	19.00	86	.37	.02	.05	2725
1.01	18.30	37	.01	.00	.01	.01	13	1.02	19.30	87	.37	.02	.05	2257
1.01	19.00	38	.01	.00	.01	.01	15	1.02	20.00	88	.37	.02	.05	1782
1.01	19.30	39	.01	.00	.01	.01	20	1.02	20.30	89	.07	.02	.05	1353
1.01	20.00	40	.01	.00	.01	.01	19	1.02	21.00	90	.07	.02	.05	1015
1.01	20.30	41	.01	.00	.01	.01	16	1.02	21.30	91	.37	.02	.05	764
1.01	21.00	42	.01	.00	.01	.01	12	1.02	22.00	92	.37	.02	.05	572
1.01	21.30	43	.01	.00	.01	.01	9	1.02	22.30	93	.37	.02	.05	439
1.01	22.00	44	.01	.00	.01	.01	7	1.02	23.00	94	.07	.02	.05	335
1.01	22.30	45	.01	.00	.01	.01	5	1.02	23.30	95	.07	.02	.05	257
1.01	23.00	46	.01	.00	.01	.01	4	1.03	0.00	96	.07	.02	.05	200
1.01	23.30	47	.01	.00	.01	.01	3	1.03	.30	97	0.30	0.00	0.30	169
1.02	0.00	48	.01	.00	.01	.01	2	1.03	1.00	98	0.30	0.00	0.30	162
1.02	.30	49	.05	.00	.05	.05	2	1.03	1.30	99	0.30	0.00	0.30	154
1.02	1.00	50	.05	.05	.05	.05	1	1.03	2.00	100	0.30	0.00	0.30	147
SUM										25.55	21.22	4.43	37174	
										(652.1) (539.1) (313.1) (3052.65)				

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CCS	3444	2353	769	371	37082
CHS	98	67	22	11	1050
INCHFS		16.16	21.03	21.14	21.14
HA		410.47	534.79	536.95	536.95
AC-IT		1172	1525	1533	1533
THOUS CU M		1445	1881	1890	1890

HYDROGRAPH AT STA. 3 FOR PLAY 1, RTIO. 1

1:	1:	1:	1:	1:	1:
1:	1:	1:	1:	1:	1:

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COMBINE HYDROGRAPHS

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11 COMBINE RUNOFF FROM 5 WITH 2 COMBINED HYDROGRAPHS
      JSTAQ  ICOMP  ICECON  ITAPE  JPLT  JPRT  INAME  ISTAGE  IAUTO
      3      2      0      0      0      0      1      0      0

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[illegible]

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1560.	1357.	5078.	2468.	246798.
CFS	443.	144.	70.	6989.	
INCHES	351.	17.88	17.88	17.88	
MM	11.70	454.15	454.15	454.15	
AC-FT	297.15	10198.	10198.	10198.	
THOUS CU M	8231.	12475.	12475.	12475.	12579.

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CHS 111. 93. 36. 17. 1747.
INCHES 2.92 4.42 4.67 4.67
MM 74.29 112.14 113.54 113.54
AC-FT 1668. 2518. 2550. 2550.
THOUS CU M 2058. 3106. 3145. 3145.

SUB-AREA RUNOFF COMPUTATION

12 WEST BRANCH RUNOFF

ISTAQ ICOMP IECON ITAPE JPLT JPRY INAME ISTAGE IAUOTO
3 0 0 0 0 0 1 0 0

HYDROGRAPH DATA

INVC IUNG TAREA SNAP TRSDA TRSPC RATIO ISHOW ISAME LOCAL
1 2.77 0.00 15.24 0.00 0.000 0 1 0

PRECIP DATA

SPEE PHS R4 R12 R24 R48 R72 R96
0.00 22.50 109.00 120.00 128.00 140.00 0.00 0.00

TRSPC COMPUTED BY THE PROGRAM IS .614

LOSS DATA

LROPT STYKR OLTR RTIOL ERAIN STKRS RTICK STRTL CNSTL ALSMX RTIMP
1 0.00 0.00 1.00 0.00 0.00 1.00 2.00 .10 0.00 .03

UNIT HYDROGRAPH DATA

TP= 3.60 CP= .89 NTA= 0

RECESSION DATA

STRAT= .50 SPCSN= .05 RTIDR= 1.60

CLARK DID NOT CONVERGE TO GIVEN SNYDER COEFFICIENTS

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC=12.97 AND R= .60 INTERVALS

UNIT HYDROGRAPH 16 END-OF-PERIOD ORIGINATES, LAG= 3.56 HOURS, CP= .78 VOL= 1.00
139. 274. 362. 393. 367. 329.
229. 149. 57.

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	1.30	1	.00	.00	.00	1.	1.02	1.30	51	.25	.03	.35	2.
1.01	1.30	2	.00	.00	.00	1.	1.02	2.00	52	.05	.00	.05	2.
1.01	1.30	3	.00	.00	.00	1.	1.02	2.30	53	.05	.00	.05	2.
1.01	2.00	4	.00	.00	.00	1.	1.02	3.00	54	.05	.00	.05	3.
1.01	2.30	5	.00	.00	.00	1.	1.02	3.30	55	.05	.00	.05	3.
1.01	3.00	6	.00	.00	.00	1.	1.02	4.00	56	.05	.00	.05	4.
1.01	3.30	7	.00	.00	.00	1.	1.02	4.30	57	.05	.00	.05	4.
1.01	4.00	8	.00	.00	.00	1.	1.02	5.00	58	.35	.20	.35	4.
1.01	4.30	9	.00	.00	.00	1.	1.02	5.30	59	.35	.03	.35	5.
1.01	5.00	10	.00	.00	.00	1.	1.02	6.00	60	.35	.30	.35	5.
1.01	5.30	11	.00	.00	.00	1.	1.02	6.30	61	.17	.12	.05	11.
1.01	6.00	12	.00	.00	.00	1.	1.02	7.00	62	.17	.12	.05	27.
1.01	6.30	13	.02	.00	.02	1.	1.02	7.30	63	.17	.12	.05	53.

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[illegible]

COMBINE HYDROGRAPHS

13 COMBINE WEST BRANCH FLOW WITH UPPER BASIN FLOW									
	ISTAQ	IComp	IECON	ITAPE	JPLI	JPPT	INAME	ISTAGE	AUTO
	3	2	0	0	0	0	1	0	0
SUN OF 2 HYDROGRAPHS AT	3	PLAN 1	RTIO 1						
6.	6.	6.	6.	6.	6.	6.	6.	6.	6.
6.	5.	5.	5.	5.	5.	5.	6.	6.	6.
16.	6.	6.	6.	7.	8.	9.	11.	13.	15.
22.	25.	24.	8.	-1.	9.	40.	96.	155.	198.
164.	304.	316.	312.	298.	276.	247.	215.	198.	186.
142.	122.	105.	91.	79.	68.	60.	52.	46.	40.
141.	212.	291.	291.	373.	462.	561.	673.	779.	896.
933.	1068.	1279.	2182.	2852.	3629.	4509.	5525.	7126.	9368.
9276.	11399.	13286.	18450.	24829.	32830.	42830.	55234.	71234.	93684.
18996.	18022.	16008.	15062.	12102.	10823.	9402.	8459.	7417.	6417.

SUM OF 2 HYDROGRAPHS AT

	SUR. OF 2 HYDROGRAPHS AT		3 PLAN 1		RYD 2	
5.	5.	5.	5.	5.	5.	4.
4.	4.	4.	4.	4.	4.	4.
4.	4.	4.	4.	4.	4.	4.
4.	4.	4.	4.	4.	4.	4.
12.	16.	23.	18.	5.	6.	10.
171.	206.	225.	237.	234.	207.	124.
						165.
						161.

123.	106.	92.	79.	68.	59.	51.	45.	39.	35.
40.	65.	106.	159.	219.	280.	344.	421.	503.	599.
706.	801.	959.	1237.	1536.	2130.	2722.	3382.	4144.	5344.
6958.	8549.	9963.	11133.	12667.	12643.	13503.	14048.	14425.	14526.
16245.	13516.	12453.	11297.	10198.	9076.	8117.	7201.	6344.	5563.

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	14326.	6991.	2622.	262194.
CMS	411.	141.	60.	6854.
INCHES	8.87	13.79	13.94	13.94
MM	225.31	350.19	354.03	354.03
AC-FT	6359.	9900.	10308.	10308.
THOUS CU M	7856.	12211.	12345.	12345.

SUM OF 2 HYDROGRAPHS AT										
3			3			3			PLAY 1 RTID 3	
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
12.	12.	12.	12.	12.	12.	12.	12.	12.	12.	12.
114.	138.	152.	158.	156.	169.	169.	138.	124.	108.	94.
82.	71.	61.	53.	45.	39.	34.	30.	26.	23.	23.
27.	43.	71.	106.	146.	187.	231.	281.	337.	399.	399.
466.	534.	643.	825.	1091.	1426.	1815.	2254.	2763.	3563.	3563.
4639.	5699.	6642.	7422.	8045.	8562.	9002.	9365.	9617.	9684.	9684.
9495.	2071.	8303.	7531.	6799.	6051.	5412.	4801.	4229.	3708.	3708.

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	9864.	8563.	3327.	1515.
CMS	274.	242.	94.	4572.
INCHES	5.91	9.19	9.29	9.29
MM	150.21	233.46	235.02	235.02
AC-FT	4245.	6600.	6572.	6572.
THOUS CU M	5238.	8141.	8210.	8210.

SUM OF 2 HYDROGRAPHS AT										3	PLAN 1	RTID 4																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4842.	4282.	1664.	80731.
CMS	137.	121.	57.	2286.
INCHES	2.96	4.60	4.65	4.65
MM	75.10	116.73	119.01	119.01
AC-FT	2123.	3303.	3336.	3336.
THOUS CU M	2819.	4070.	4115.	4115.

Sheet no of 57

***** SUB-AREA RUNOFF COMPUTATION *****

SUB-AREA RUNOFF COMPUTATION

14 INFLOW FROM AREA ADJACENT TO RESERVOIR

ISTAQ 3 ICOMP 0 ILECON 0 ITAPE 0 JPLT 0 JPRY 0 INAME ISTAGE IAUTO 0

HYDROGRAPH DATA

INHYG IUNG TAREA SNAP TRSDA TRSPC RATIO ISNOW ISAME LOCAL

PRECIP DATA

SPFE 0.00 PMS 22.50 R6 109.00 R72 120.00 R24 140.00 R72 R96

TRSPC COMPUTED BY THE PROGRAM IS .814

LOSS DATA

LRDPT STKR DLTKR RTIOL ERRAIN STRKS RTICK STRTL CHSTL ALSMT RTIMP

UNIT HYDROGRAPH DATA

TP= 2.50 CP= .69 NTA= 0

RECESSION DATA

SIRTO= -.50 ORCSN= -.05 RTIOR= 1.60

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 5.99 AND R= 3.61 INTERVALS

UNIT HYDROGRAPH 23 END-OF-PERIOD ORIGINATES, LAG= 2.48 HOURS, CP= .69 VOL= 1.00

27. 96. 195. 257. 314. 313. 263. 199. 151. 114.
86. 65. 49. 37. 28. 21. 16. 12. 9. 7.
5. 4. 3.

END-OF-PERIOD FLOW

MO.DA HR.MN PERIOD RAIN EXCS LOSS COMP D

1.01	1.30	1	1.02	1.30	51	.35	.00	.05	2.
1.01	1.30	2	1.02	2.00	52	.05	.00	.05	1.
1.01	2.30	3	1.02	2.30	53	.05	.00	.05	1.
1.01	2.30	4	1.02	3.00	54	.05	.00	.05	1.
1.01	3.00	5	1.02	3.30	55	.05	.00	.05	1.
1.01	3.30	6	1.02	4.00	56	.05	.00	.05	1.
1.01	4.00	7	1.02	4.30	57	.05	.00	.05	1.
1.01	4.30	8	1.02	5.00	58	.05	.00	.05	1.
1.01	5.00	9	1.02	5.30	59	.05	.00	.05	1.
1.01	5.30	10	1.02	6.00	60	.05	.00	.05	1.
1.01	6.00	11	1.02	6.30	61	.17	.12	.05	1.
1.01	6.30	12	1.02	7.00	62	.17	.12	.05	16.
1.01	7.00	13	1.02	7.30	63	.17	.12	.05	37.
1.01	7.30	14	1.02	8.00	64	.17	.12	.05	69.
1.01	8.00	15	1.02	8.30	65	.17	.12	.05	106.
1.01	8.30	16	1.02	9.00	66	.17	.12	.05	143.
1.01	9.00	17	1.02	9.30	67	.17	.12	.05	174.
1.01	9.30	18	1.02	10.00	68	.17	.12	.05	197.
1.01	9.30	19	1.02	10.30	69	.17	.12	.05	215.

Sheet 41 of 57

INCHES	15.84	20.87	20.96	20.96
RM	402.23	520.19	532.40	532.40
AC-FT	1494.	1969.	1978.	1978.
TN0US CU M	1843.	2429.	2439.	2439.

HYDROGRAPH AT STA 3 FOR PLAN 1, RTIO 2									
1.	1.	1.	1.	1.	1.	1.	1.	1.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1.	2.	3.	3.	5.	8.	12.	15.	16.	1.
13.	10.	7.	6.	4.	3.	2.	2.	2.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
12.	28.	52.	79.	107.	130.	148.	161.	171.	1.
179.	185.	205.	249.	391.	573.	804.	1061.	1321.	1655.
2100.	2370.	2953.	3170.	3147.	2874.	2469.	2049.	1639.	1271.
971.	745.	574.	444.	346.	270.	212.	167.	153.	146.

CFS	3170.	2250.	745.	359.	TOTAL VOLUME
CMS	90.	54.	21.	10.	35894.
INCHES	11.88	15.66	15.72	15.72	1016.
MM	301.67	397.65	399.30	399.30	1572
AC-FT	1121.	1477.	1483.	1483.	399.30
TN0US CU M	1382.	1822	1830.	1830.	1483.

HYDROGRAPH AT STA 3 FOR PLAN 1, RTIO 4									
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1.	1.	2.	3.	5.	8.	10.	11.	11.	1.
10.	8.	5.	4.	3.	2.	2.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
2.	19.	34.	53.	71.	87.	99.	108.	114.	1.
119.	123.	179.	261.	382.	536.	707.	881.	1103.	1.
1400.	1713.	1972.	2114.	2098.	1916.	1646.	1366.	1033.	847.
642.	497.	382.	296.	231.	180.	141.	102.	97.	97.

CFS	2114.	1537.	496.	239.	TOTAL VOLUME
CMS	60.	43.	14.	7.	23930.
INCHES	7.52	10.44	10.44	10.44	678.
MM	201.12	265.10	266.20	266.20	1048
AC-FT	747.	985.	989.	989.	266.20
TN0US CU M	921.	1215.	1220.	1220.	989.

HYDROGRAPH AT STA 3 FOR PLAN 1, RTIO 4									
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1.	1.	1.	1.	2.	3.	4.	5.	5.	1.
5.	4.	3.	2.	1.	1.	1.	1.	1.	1.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1.	9.	17.	26.	36.	43.	49.	54.	57.	37.
60.	62.	69.	90.	130.	191.	265.	354.	440.	552.

Sheet 43 of 57

700.	857.	986.	1057.	1049.	958.	923.	693.	546.	426.
324.	248.	191.	148.	115.	90.	71.	56.	51.	49.
PEAK									
CFS									
1057.									
CFS									
30.									
INCHES									
3.96									
AC-FT									
100.56									
THOUS CU M									
461.									
610.									

COMBINE HYDROGRAPHS									
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15 COMBINE ADJACENT AREA FLOW WITH RIVER FLOW AT RESERVOIR									
ISTAG ICOMP IECON ITAPE JPLT JPRY INAME ISTATE IAUO									
3 2 0 0 0 0 0 1 0 0									

SUM OF 2 HYDROGRAPHS AT									
3 PLAY 1 RTIO 1									
7.	7.	7.	7.	7.	7.	7.	7.	7.	6.
6.	6.	6.	6.	6.	6.	6.	6.	6.	6.
7.	7.	7.	7.	7.	7.	7.	7.	7.	15.
18.	27.	34.	27.	12.	5.	10.	55.	115.	187.
248.	292.	377.	325.	320.	304.	280.	251.	219.	190.
166.	143.	124.	107.	92.	20.	59.	61.	53.	47.
56.	102.	179.	281.	397.	516.	636.	758.	889.	1027.
1771.	1314.	1554.	2005.	2703.	3616.	4701.	5924.	7287.	9332.
12078.	18825.	17229.	19072.	20285.	20556.	21296.	21462.	21419.	21032.
20226.	19015.	17371.	15634.	14059.	12462.	11106.	9824.	8662.	7611.

PEAK									
CFS									
21462.									
CFS									
608.									
INCHES									
11.94									
AC-FT									
303.22									
THOUS CU M									
11562.									

SUM OF 2 HYDROGRAPHS AT									
3 PLAY 1 RTIO 2									
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
16.	20.	25.	20.	9.	4.	14.	41.	86.	140.
186.	219.	238.	244.	240.	228.	210.	188.	164.	143.
126.	107.	93.	80.	69.	60.	52.	46.	40.	36.
23.	76.	136.	211.	298.	387.	477.	569.	666.	771.
959.	1119.	1422.	14304.	15213.	15717.	15972.	16054.	15797.	15737.
15216.	14262.	13029.	11741.	10544.	9446.	8310.	7360.	6497.	5738.

Sheet 44 of 57

		PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS		16097.	16668.	5236.	2791.	278086.
CMS		456.	415.	162.	79.	7875.
INCHES			8.94	14.00	14.15	14.15
MM			227.41	355.70	359.29	359.29
AC-FT			7274.	11377.	11491.	11491.
THOUS CU M			9972.	14033.	14174.	14174.

		SUM OF 2 HYDROGRAPHS AT												3	PLAN 1	RTIO 3
4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
124.	146.	159.	163.	160.	152.	140.	128.	109.	95.	27.	24.	30.	379.	444.	514.	
63.	72.	62.	53.	48.	40.	35.	30.	27.	24.	30.	379.	444.	514.	4656.	10531.	
29.	51.	49.	140.	1351.	1807.	2351.	2562.	3643.	4656.	10709.	10531.	4331.	5856.			
566.	657.	777.	1004.	1351.	1807.	2351.	2562.	3643.	4656.	10709.	10531.	4331.	5856.			
4339.	7413.	8614.	9536.	10142.	10476.	10648.	10731.	10709.	10531.	4331.	5856.					
10143.	9508.	8698.	7827.	7029.	6231.	5553.	4912.									

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	10731.	9779.	3824.	1954.	195392.
CMS	304.	277.	108.	52.	5250.
INCHES		5.97	9.34	9.43	
MM		151.61	237.14	239.52	
AC-FT		4849.	7584.	7661.	
THOUS CU M		5981.	9355.	9450.	

		SUM OF 2 HYDROGRAPHS AT												3	PLAN 1	RTIO 4
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
5.	7.	8.	7.	3.	1.	5.	18.	29.	47.	3.	4.	4.	4.	4.	4.	4.
62.	73.	79.	81.	80.	76.	70.	63.	55.	48.	13.	12.	12.	12.	12.	12.	12.
41.	35.	31.	27.	23.	20.	17.	15.	13.	12.	12.	12.	12.	12.	12.	12.	12.
14.	25.	45.	70.	99.	129.	159.	190.	222.	257.	1822.	2333.	2333.	2333.	2333.	2333.	2333.
293.	329.	398.	502.	676.	904.	1175.	1481.	1822.	2333.	5353.	5266.	5266.	5266.	5266.	5266.	5266.
3020.	3706.	4307.	4768.	5071.	5239.	5374.	5361.	5353.	5266.	2166.	1903.	1903.	1903.	1903.	1903.	1903.
5071.	4756.	4343.	3914.	3515.	3115.	2777.	2456.	2166.	1903.							

		PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS		5366.	4889.	1912.	927.	92696.
CMS		152.	138.	54.	26.	2625.
INCHES			2.98	4.67	4.72	
MM			75.80	118.57	119.76	
AC-FT			2425.	3792.	3830.	
THOUS CU M			2991.	4678.	4725.	

Sheet 45 of 57

16 ROUTE THROUGH MAMORNECK RESERVOIR

16 ROUTE THROUGH MAMORNECK RESERVOIR

ISTAG	ICOMP	IECON	ITYPE	JPLY	JPRY	INAME	ISTAGE	IAUTO
4	1	0	0	0	0	1	0	0

	LOSS	CLOSS	AVG	IRIS	ISAME	IOPT	IPMP	LSTR
	0.0	0.000	0.00	1	1	0	0	0

STPS	WSTDL	LAG	ANSKK	X	YSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	107.	-1

STAGE	40.00	42.30	44.00	46.00	50.00
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PLW	0.00	450.00	1402.00	4240.00	7890.00
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CAPACITY=	85.	107.	640.
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ELEVATION=	33.	40.	50.
1			
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50			

CREL	SPWD	COQV	EXPM	ELEV	COOL	CAREA	EXPL
40.0	0.0	0.0	0.0	34.5	.6	37.8	.5

DAM DATA	
TOPEL	COOD EXP
44.0	3.1 1.

STATION 6, PLAN 1, RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1.	6.	6.	6.	6.	6.	6.	6.	6.	6.
6.	6.	6.	6.	6.	6.	7.	7.	7.	7.
6.	6.	6.	6.	6.	6.	7.	7.	7.	7.
16.	12.	15.	17.	18.	16.	16.	16.	30.	49.
76.	107.	139.	169.	193.	213.	225.	231.	232.	228.
220.	209.	197.	184.	170.	157.	144.	137.	119.	108.
99.	96.	103.	126.	158.	206.	265.	335.	413.	568.
719.	882.	1054.	1257.	1503.	1746.	3851.	4693.	5970.	7480.
9625.	12246.	14803.	17235.	19015.	20196.	23847.	21392.	21279.	21279.
20836.	25938.	31662.	37099.	42486.	48496.	124419.	110493.	9825.	8591.

STORAGE

[illegible]

STAGE

[illegible]

88-46-457-

~~SECRET~~

PEAK OUTFLOW IS 16035. AT TIME 44.50 HOURS

PEAK	16035.	6-HOUR	5547.	72-HOUR	2582.	TOTAL VOLUME	268156.
CFS	454.	14548.	157.	76.			
CMS		412.	13.54	13.64			
INCHES		8.88	344.03	345.45			
PM		225.55	11003.	11081.			
AC-FT		7214.	13572.	13569.			
THOUS CU M		8895.					

STATION 4, PLAN 1, RATIO 3

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW		2.		3.		4.		5.		6.		7.		8.		9.		10.		11.		12.		13.		14.		15.		16.		17.		18.		19.		20.		21.		22.		23.		24.		25.		26.		27.		28.		29.		30.		31.		32.		33.		34.		35.		36.		37.		38.		39.		40.		41.		42.		43.		44.		45.		46.		47.		48.		49.		50.		51.		52.		53.		54.		55.		56.		57.		58.		59.		60.		61.		62.		63.		64.		65.		66.		67.		68.		69.		70.		71.		72.		73.		74.		75.		76.		77.		78.		79.		80.		81.		82.		83.		84.		85.		86.		87.		88.		89.		90.		91.		92.		93.		94.		95.		96.		97.		98.		99.		100.		101.		102.		103.		104.		105.		106.		107.		108.		109.		110.		111.		112.		113.		114.		115.		116.		117.		118.		119.		120.		121.		122.		123.		124.		125.		126.		127.		128.		129.		130.		131.		132.		133.		134.		135.		136.		137.		138.		139.		140.		141.		142.		143.		144.		145.		146.		147.		148.		149.		150.		151.		152.		153.		154.		155.		156.		157.		158.		159.		160.		161.		162.		163.		164.		165.		166.		167.		168.		169.		170.		171.		172.		173.		174.		175.		176.		177.		178.		179.		180.		181.		182.		183.		184.		185.		186.		187.		188.		189.		190.		191.		192.		193.		194.		195.		196.		197.		198.		199.		200.		201.		202.		203.		204.		205.		206.		207.		208.		209.		210.		211.		212.		213.		214.		215.		216.		217.		218.		219.		220.		221.		222.		223.		224.		225.		226.		227.		228.		229.		230.		231.		232.		233.		234.		235.		236.		237.		238.		239.		240.		241.		242.		243.		244.		245.		246.		247.		248.		249.		250.		251.		252.		253.		254.		255.		256.		257.		258.		259.		260.		261.		262.		263.		264.		265.		266.		267.		268.		269.		270.		271.		272.		273.		274.		275.		276.		277.		278.		279.		280.		281.		282.		283.		284.		285.		286.		287.		288.		289.		290.		291.		292.		293.		294.		295.		296.		297.		298.		299.		300.		301.		302.		303.		304.		305.		306.		307.		308.		309.		310.		311.		312.		313.		314.		315.		316.		317.		318.		319.		320.		321.		322.		323.		324.		325.		326.		327.		328.		329.		330.		331.		332.		333.		334.		335.		336.		337.		338.		339.		340.		341.		342.		343.		344.		345.		346.		347.		348.		349.		350.		351.		352.		353.		354.		355.		356.		357.		358.		359.		360.		361.		362.		363.		364.		365.		366.		367.		368.		369.		370.		371.		372.		373.		374.		375.		376.		377.		378.		379.		380.		381.		382.		383.		384.		385.		386.		387.		388.		389.		390.		391.		392.		393.		394.		395.		396.		397.		398.		399.		400.		401.		402.		403.		404.		405.		406.		407.		408.		409.		410.		411.		412.		413.		414.		415.		416.		417.		418.		419.		420.		421.		422.		423.		424.		425.		426.		427.		428.		429.		430.		431.		432.		433.		434.		435.		436.		437.		438.		439.		440.		441.		442.		443.		444.		445.		446.		447.		448.		449.		450.		451.		452.		453.		454.		455.		456.		457.		458.		459.		460.		461.		462.		463.		464.		465.		466.		467.		468.		469.		470.		471.		472.		473.		474.		475.		476.		477.		478.		479.		480.		481.		482.		483.		484.		485.		486.		487.		488.		489.		490.		491.		492.		493.		494.		495.		496.		497.		498.		499.		500.		501.		502.		503.		504.		505.		506.		507.		508.		509.		510.		511.		512.		513.		514.		515.		516.		517.		518.		519.		520.		521.		522.		523.		524.		525.		526.		527.		528.		529.		530.		531.		532.		533.		534.		535.		536.		537.		538.		539.		540.		541.		542.		543.		544.		545.		546.		547.		548.		549.		550.		551.		552.		553.		554.		555.		556.		557.		558.		559.		560.		561.		562.		563.		564.		565.		566.		567.		568.		569.		570.		571.		572.		573.		574.		575.		576.		577.		578.		579.		580.		581.		582.		583.		584.		585.		586.		587.		588.		589.		590.		591.		592.		593.		594.		595.		596.		597.		598.		599.		600.		601.		602.		603.		604.		605.		606.		607.		608.		609.		610.		611.		612.		613.		614.		615.		616.		617.		618.		619.		620.		621.		622.		623.		624.		625.		626.		627.		628.		629.		630.		631.		632.		633.		634.		635.		636.		637.		638.		639.		640.		641.		642.		643.		644.		645.		646.		647.		648.		649.		650.		651.		652.		653.		654.		655.		656.		657.		658.		659.		660.		661.		662.		663.		664.		665.		666.		667.		668.		669.		670.		671.		672.		673.		674.		675.		676.		677.		678.		679.		680.		681.		682.		683.		684.		685.		686.		687.		688.		689.		690.		691.		692.		693.		694.		695.		696.		697.		698.		699.		700.		701.		702.		703.		704.		705.		706.		707.		708.		709.		710.		711.		712.		713.		714.		715.		716.		717.		718.		719.		720.		721.		722.		723.		724.		725.		726.		727.		728.		729.		730.		731.		732.		733.		734.		735.		736.		737.		738.		739.		740.		741.		742.		743.		744.		745.		746.		747.		748.		749.		750.		751.		752.		753.		754.		755.		756.		757.		758.		759.		760.		761.		762.		763.		764.		765.		766.		767.		768.		769.		770.		771.		772.		773.		774.		775.		776.		777.		778.		779.		780.		781.		782.		783.		784.		785.		786.		787.		788.		789.		790.		791.		792.		793.		794.		795.		796.		797.		798.		799.		800.		801.		802.		803.		804.		805.		806.		807.		808.		809.		810.		811.		812.		813.		814.		815.		816.		817.		818.		819.		820.		821.		822.		823.		824.		825.		826.		827.		828.		829.		830.		831.		832.		833.		834.		835.		836.		837.		838.		839.		840.		841.		842.		843.		844.		845.		846.		847.		848.		849.		850.		851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17 CHANNEL ROUTE AT STATION 8+00 (ROAD CROSSING)

ISTAG	ICOMP	IECON	ITYPE	JPLY	JPRY	INAME	ISTAGE	IAUTO
17	1	0	0	0	0	1	0	0

[illegible]

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1:STPS      NSTDL      LAG      AFSK      0.00
          1          0

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NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLWTH	SEL
.0350	.0350	.0350	24.3	53.0	830.	.00380

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

	06-90	07-90	08-90	09-90	10-90	11-90	12-90	01-91	02-91	03-91	04-91	05-91	06-91	07-91	08-91	09-91	10-91	11-91	12-91	01-92	02-92	03-92	04-92	05-92	06-92	07-92	08-92	09-92	10-92	11-92	12-92	01-93	02-93	03-93	04-93	05-93	06-93	07-93	08-93	09-93	10-93	11-93	12-93	01-94	02-94	03-94	04-94	05-94	06-94	07-94	08-94	09-94	10-94	11-94	12-94	01-95	02-95	03-95	04-95	05-95	06-95	07-95	08-95	09-95	10-95	11-95	12-95	01-96	02-96	03-96	04-96	05-96	06-96	07-96	08-96	09-96	10-96	11-96	12-96	01-97	02-97	03-97	04-97	05-97	06-97	07-97	08-97	09-97	10-97	11-97	12-97	01-98	02-98	03-98	04-98	05-98	06-98	07-98	08-98	09-98	10-98	11-98	12-98	01-99	02-99	03-99	04-99	05-99	06-99	07-99	08-99	09-99	10-99	11-99	12-99	01-00	02-00	03-00	04-00	05-00	06-00	07-00	08-00	09-00	10-00	11-00	12-00	01-01	02-01	03-01	04-01	05-01	06-01	07-01	08-01	09-01	10-01	11-01	12-01	01-02	02-02	03-02	04-02	05-02	06-02	07-02	08-02	09-02	10-02	11-02	12-02	01-03	02-03	03-03	04-03	05-03	06-03	07-03	08-03	09-03	10-03	11-03	12-03	01-04	02-04	03-04	04-04	05-04	06-04	07-04	08-04	09-04	10-04	11-04	12-04	01-05	02-05	03-05	04-05	05-05	06-05	07-05	08-05	09-05	10-05	11-05	12-05	01-06	02-06	03-06	04-06	05-06	06-06	07-06	08-06	09-06	10-06	11-06	12-06	01-07	02-07	03-07	04-07	05-07	06-07	07-07	08-07	09-07	10-07	11-07	12-07	01-08	02-08	03-08	04-08	05-08	06-08	07-08	08-08	09-08	10-08	11-08	12-08	01-09	02-09	03-09	04-09	05-09	06-09	07-09	08-09	09-09	10-09	11-09	12-09	01-10	02-10	03-10	04-10	05-10	06-10	07-10	08-10	09-10	10-10	11-10	12-10	01-11	02-11	03-11	04-11	05-11	06-11	07-11	08-11	09-11	10-11	11-11	12-11	01-12	02-12	03-12	04-12	05-12	06-12	07-12	08-12	09-12	10-12	11-12	12-12	01-13	02-13	03-13	04-13	05-13	06-13	07-13	08-13	09-13	10-13	11-13	12-13	01-14	02-14	03-14	04-14	05-14	06-14	07-14	08-14	09-14	10-14	11-14	12-14	01-15	02-15	03-15	04-15	05-15	06-15	07-15	08-15	09-15	10-15	11-15	12-15	01-16	02-16	03-16	04-16	05-16	06-16	07-16	08-16	09-16	10-16	11-16	12-16	01-17	02-17	03-17	04-17	05-17	06-17	07-17	08-17	09-17	10-17	11-17	12-17	01-18	02-18	03-18	04-18	05-18	06-18	07-18	08-18	09-18	10-18	11-18	12-18	01-19	02-19	03-19	04-19	05-19	06-19	07-19	08-19	09-19	10-19	11-19	12-19	01-20	02-20	03-20	04-20	05-20	06-20	07-20	08-20	09-20	10-20	11-20	12-20	01-21	02-21	03-21	04-21	05-21	06-21	07-21	08-21	09-21	10-21	11-21	12-21	01-22	02-22	03-22	04-22	05-22	06-22	07-22	08-22	09-22	10-22	11-22	12-22	01-23	02-23	03-23	04-23	05-23	06-23	07-23	08-23	09-23	10-23	11-23	12-23	01-24	02-24	03-24	04-24	05-24
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STORAGE	0.00	1.29	2.63	4.03	5.46	7.20	9.93	13.77	18.70	24.74
	31.84	40.12	49.66	60.04	71.49	85.01	99.41	115.08	132.02	150.23

OUTFLOW	0.00	219.49	692.34	1355.29	2182.91	3239.94	4652.89	6632.55	9253.25	12692.64
	16998.13	22269.90	28322.06	36037.40	4773.67	54975.87	66703.06	80362.76	95130.59	112000.13

STAGE	24.00	25.37	26.74	28.11	29.47	30.84	32.21	33.58	34.95	36.32
	37.68	39.05	40.42	41.79	43.16	44.53	45.89	47.26	48.63	50.00

Flow	0.00	219.49	692.54	1355.29	2162.91	3239.94	4482.89	6652.55	9293.25	12692.66
1999.13	22269.90	20577.90	18977.90	16907.40	14773.67	12475.87	100708.06	80362.76	65130.59	512300.13

STATION 17, PLAN 1, RTIO 1

OUTFLOW

2. 2. 3. 4. 5. 5. 6.

6. 6. 6. 6. 6. 6. 6.

[illegible]

10.	12.	15.	17.	18.	17.	16.	14.	28.	46.
22	6.3	1.77	6.47	6.88	2.25	2.27	2.27	2.25	2.25

72	103	135	164	190	210	224	231	232	228
220	211	103	106	122	150	175	177	175	110

220.	197.	186.	172.	159.	145.	135.	121.	110.
100.	96.	102.	120.	199.	241.	329.	408.	534.

106.	90.	102.	123.	122.	199.	281.	324.	408.	336.
702.	876.	1043.	1268.	1853.	2000.	3902.	4848.	5916.	7397.

9517.	1213J.	14803.	17149.	18964.	20157.	20869.	21238.	21393.	21296.
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20556.	19997.	16723.	17157.	15554.	13065.	12479.	11124.	9876.	8760.
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	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	

STOR

[illegible]

1. The first part of the document is a list of names and their corresponding page numbers. The names are listed in a single column, and the page numbers are listed in a single column to the right of the names. The names are: John Doe, Jane Doe, and John Doe. The page numbers are: 1, 2, and 3.

[illegible]

100

Sheet 50 of 57

10. In a case where the defendant is a minor, the court shall consider the best interests of the child.

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

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS			
				RATIO 1	RATIO 2	RATIO 3	RATIO 4
				1.00	.75	.50	.25
HYDROGRAPH AT	1	2.89	1	5397.	4048.	2699.	1349.
	(	7.49)	(	152.83)	114.63)	76.42)	38.21)
HYDROGRAPH AT	1	2.50	1	5222.	3916.	2611.	1305.
	(	6.47)	(	147.87)	110.90)	73.93)	36.97)
2 COMBINED	1	5.39	1	10462.	7847.	5231.	2616.
	(	13.96)	(	296.25)	222.19)	148.15)	74.06)
ROUTED TO	2	5.39	1	10316.	7735.	5157.	2578.
	(	13.96)	(	292.05)	219.04)	146.02)	73.01)
HYDROGRAPH AT	2	2.33	1	3537.	2653.	1769.	884.
	(	6.03)	(	100.17)	75.13)	50.06)	25.04)
2 COMBINED	2	7.72	1	13831.	10373.	6916.	3458.
	(	19.99)	(	391.66)	293.74)	195.83)	97.71)
ROUTED TO	3	7.72	1	13601.	10231.	6701.	3400.
	(	19.99)	(	385.16)	288.26)	192.57)	96.29)
HYDROGRAPH AT	3	1.62	1	3286.	2464.	1643.	821.
	(	4.20)	(	93.06)	69.78)	46.52)	23.26)
2 COMBINED	3	9.34	1	15016.	11250.	7507.	3753.
	(	24.19)	(	425.16)	315.85)	212.57)	106.28)
HYDROGRAPH AT	3	1.36	1	3446.	2593.	1722.	861.
	(	3.52)	(	97.53)	73.15)	48.77)	24.38)
2 COMBINED	3	10.70	1	15663.	11745.	7830.	3915.
	(	27.71)	(	433.45)	332.59)	221.73)	110.86)
HYDROGRAPH AT	3	2.77	1	6196.	4638.	3052.	1546.
	(	7.17)	(	175.10)	131.33)	87.55)	43.78)
2 COMBINED	3	13.47	1	19358.	14526.	9884.	4842.
	(	34.89)	(	548.46)	411.33)	274.22)	137.11)
HYDROGRAPH AT	3	1.77	1	4227.	3170.	2114.	1057.
	(	4.56)	(	119.73)	89.78)	59.85)	29.93)
2 COMBINED	3	15.24	1	24462.	18097.	10731.	5366.
	(	39.47)	(	637.76)	455.80)	303.87)	151.93)
ROUTED TO	4	15.24	1	21392.	16035.	10680.	5330.
	(	39.47)	(	605.75)	454.35)	302.41)	150.94)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 INITIAL VALUE SPILLWAY CREST TOP OF DAM
 ELEVATION 40.00 107. 44.00
 STORAGE 107. 323.
 OUTFLOW 0. 1403.

RATIO OF PMF	MAXIMUM RESERVOIR W.S. ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	58.35	14.35	1085.	21392.	13.00	44.50	0.00
.75	54.75	10.75	893.	16035.	12.50	44.50	0.00
.50	50.91	6.91	688.	12650.	11.50	44.50	0.00
.25	46.63	2.68	463.	5330.	10.00	44.50	0.00

PLAN 1 STATION 17

RATIO	MAXIMUM FLOW/CFS	MAXIMUM STAGE, FT	TIME HOURS
1.00	21393.	38.8	44.50
.75	16032.	37.4	44.50
.50	10678.	35.5	44.50
.25	5325.	32.7	44.50

STABILITY ANALYSIS

APPENDIX E

TAMS

Job No. 1579-08

Project Mamaronock Reservoir Dam

Subject Stability Analysis: Phase I Inspection

Sheet 1 of 18

Date 01 May 81

By A.O

Ch'k. by _____

LOADING CONDITIONS

<u>Case</u>	<u>Description</u>
<u>I</u>	<u>Normal Loading</u> - Lake level at top of flashboards (EL 42.5)
<u>II</u>	<u>Normal Loading</u> - Lake level at top of spillway crest (EL 40) with an additional <u>Ice Loading</u> of 5 Kips/L.F. at 0.5 feet below crest
<u>III</u>	<u>Unusual Loading</u> - Lake level at $\frac{1}{2}$ PMF (EL 50.091) & Tailwater depth of 12.5 feet
<u>IV</u>	<u>Extreme Loading</u> - Lake Level at Full PMF (EL 58.035) & Tailwater depth of 15 feet

STABILITY AND OVERTURNING CRITERIA

<u>Case</u>	<u>Location of Resultant</u>	<u>Friction Factor of Safety</u>
<u>I</u>	middle third	3.0
<u>II</u>	middle third	3.0
<u>III</u>	middle third	3.0
<u>IV</u>	middle third	3.0

TAMS

Job No. 1579-08

Project Mamaroneck Reservoir Dam

Subject Stability Analysis: Phase I Inspection

Sheet 2 of 18

Date 01 May 81

By A.D.

Ch'k. by _____

Assumptions and Notes

- (1) For all loading cases: $\gamma_{\text{concrete}} = 150 \text{ #/ft}^3$
 $\phi(\text{base}) = 45^\circ$ {rock fdn.}
 $C(\text{base}) = 1 \text{ ksf}$

- (2) The assumed configuration is as shown in Figure 1 (page 3)

- (3) For Cases III and IV — half the weight of water above the spillway crest at the upstream side was assumed to be an additional dead water weight load.

- (4) Flashboards would not withstand $\frac{1}{2}$ PMF and Full PMF loadings

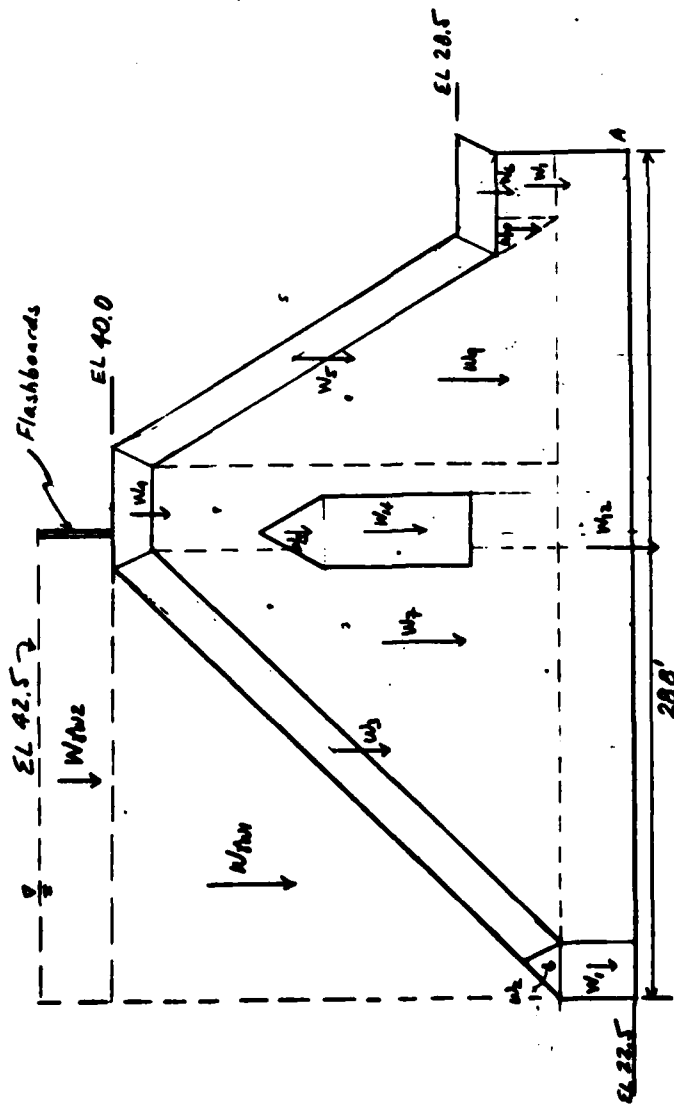
- (5) The stability of a typical buttress was examined. The loads on each buttress were computed for a 15 ft length, i.e., the spacing between buttresses.

Also, since there is a gap between the downstream slab (at its bottom) and the underlying foundation, tailwater would enter thereby putting pressure on the inner concrete surfaces

- (6) The weight of the haunches was excluded from this analysis.

- (7) The Shear Friction Factor of Safety computed for all Cases analyzed did not include passive pressures. For Cases I & II this was of no consequence since the S.F.F.S. values (computed) were greater than 2.0. For Cases III and IV, the water surface above the dam was approx. 13 & 18 feet, respectively. Under these large discharges, the condition of the rock would be unknown; therefore passive pressures were not used in the analysis.

- (8) Stability Analysis & Criteria in accordance with recommended guidelines of Corps of Engineers.



ASSUMED TYPICAL SECTION

SCALE: 1/4 inch = 1 foot

Figure 1

WEIGHT COMPUTATIONS

	K/CF	K
$W_1 = 0.150 \times 1.9 \times 2.5 = 0.7125 \times 15' = 10.7 \text{ K}$		
$W_2 = 0.150 \times 0.5 \times 1.9 \times 1.3 = 0.1875 \times 15' = 2.8 \text{ K}$		
$W_3 = 0.150 \times 1.4 \times 19.2 = 4.03 \times 15' = 60.5 \text{ K}$		
$W_4 = 0.150 \times 1.3 \times 3.5 = 0.6075 \times 15' = 9.1 \text{ K}$		
$W_5 = 0.150 \times 1.3 \times 13.5 = 2.6325 \times 15' = 39.5 \text{ K}$		
$W_6 = 0.150 \times 1.3 \times 3.5 = 0.6075 \times 15' = 9.1 \text{ K}$		
$W_7 = 0.150 \times 0.5 \times 13.5 \times 13.7 = 13.97 \times 15' = 209.6 \text{ K}$		
$W_8 = 0.150 \times 13.7 \times 2.9 = 5.96 \times 15' = 89.4 \text{ K}$		
$W_9 = 0.150 \times 0.5 \times 0.4 \times 13.6 = 0.51 \times 15' = 7.7 \text{ K}$		
$W_{10} = 0.150 \times 0.5 \times 1.3 \times 2.0 = 0.20 \times 15' = 3.0 \text{ K}$		
$W_{11} = 0.150 \times 2.0 \times 2.2 = 0.66 \times 15' = 9.9 \text{ K}$		
$W_{12} = 0.150 \times 26.9 \times 2.5 = 10.09 \times 15' = 151.4 \text{ K}$		
$W_{13} = 0.150 \times 0.5 \times 2.5 \times 2.2 = 0.41 \times 15' = 6.2 \text{ K}$		
$W_{14} = 0.150 \times 4.9 \times 2.5 = 1.84 \times 15' = 27.6 \text{ K}$		

TAMS

Job No. 1579-08

Project Manaroneck Reservoir Dam

Subject Stability Analysis : Phase I Inspection

Sheet 4 of 18

Date 01 May 81

By A.D.

Ch'k. by J.P.

CENTER OF GRAVITY COMPUTATIONS FOR CONCRETE BUTTRESS

SUMMARY OF WEIGHTS AND

MOMENT ARMS FOR BUTTRESS

SECTION AND COMPUTATION OF MOMENTS

<u>Designation</u>	<u>Weight (Kips)</u>	<u>Moment Arm From Pt. A (ft)</u>	<u>Moment (K-ft)</u>
W_7	13.9 ↓	$13.5 + \frac{1}{3}(13.5) = 18.0$	250.2 ↗
W_8	5.96 ↓	$10.6 + \frac{1}{2}(2.9) = 12.05$	71.8 ↗
W_9	8.87 ↓	$2.2 + \frac{2}{3}(8.4) = 7.80$	66.8 ↗
W_{10}	0.20 ↓	$2.2 + \frac{2}{3}(1.3) = 3.07$	0.6 ↗
W_{11}	0.66 ↓	$\frac{1}{2}(2.2) = 1.1$	0.7 ↗
W_{12}	10.09	$\frac{1}{2}(26.9) = 13.45$	135.7 ↗
- W_{13}	- 0.41 ↓	$11.6 + \frac{1}{2}(2.5) = 12.9$	- 5.3 ↗
- W_{14}	- 1.84 ↓	12.9	- 23.7 ↗
TOTAL	37.13 ↓		496.8 ↗

$$\bar{x}_{c.o.g.} = \frac{496.8 \uparrow}{37.13 \downarrow} \frac{\text{K-ft}}{\text{ft}}$$

$$\bar{x}_{c.o.g.} = 13.38 \text{ feet}$$

$\bar{y}_{c.o.g.}$ not required for this analysis

TAMS

Job No. 1579-08

Project Mamaroneck Reservoir Dam

Subject Stability Analysis : PHASE I Inspection

Sheet 5 of 18

Date 01 May 81

By A.D.

Ch'k. by _____

SUMMARY OF WEIGHTS AND MOMENT ARMS FOR CONCRETE DECKS AND COMPUTATION OF MOMENTS

Designation	Weight (Kip)	Moment Arm From Pt. A (ft)	Moment (K-ft)
W_1	10.7 ↓	$26.9 + \frac{1.9}{2} = 27.85'$	298.0 ↑
W_2	2.8 ↓	$26.9 + \frac{1.9}{2} = 27.85'$	78.0 ↑
W_3	60.5 ↓	20.3 *	1,228.2 ↑
W_4	10.2 ↓	12.05 (same as W_3)	122.9 ↑
W_5	39.5 ↓	6.9 *	272.6 ↑
W_6	10.2 ↓	1.4 *	14.3 ↑
TOTAL	133.9		2014 ↑

$$\sum W_i \downarrow = 133.9 + 37.13 = 171^K \downarrow \quad \sum W_i = 2014 + 496.8 = 2510.8^K \uparrow$$

* The moment arm was computed from drawing diagonals, the arm being the distance from pt. A to their intersection.

DEAD WATER WEIGHT COMPUTATIONS

$$W_{dW1} \downarrow = 0.5 \times 14.8 \times 15 \times 0.0624 = 6.93^K/LF \times 15' = 104.0^K \downarrow$$

$$W_{dW2} \downarrow = 15.8 \times 2.5 \times 0.0624 = 2.46^K/LF \times 15' = 36.9^K \downarrow$$

$$M_{dW1}^{\leftarrow} \text{ (about A)} = 104.0 \times \left\{ 14 + 9.87 \right\} = 2482.5^K\text{-ft} \uparrow$$

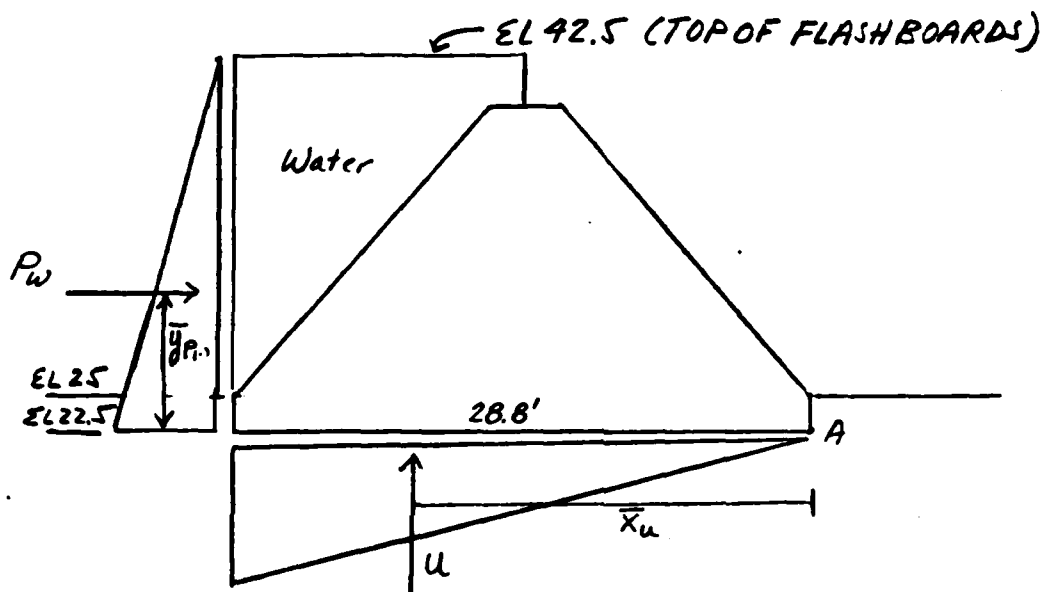
$$M_{dW2}^{\leftarrow} \text{ (about A)} = 36.9 \times \left\{ 13 + \frac{15.8}{2} \right\} = 771.2^K\text{-ft} \uparrow$$

TAMS

Job No. 1579-08
 Project Mamaroneck Reservoir Dam
 Subject Stability Analysis: Phase I Inspection

Sheet 6 of 18
 Date 01 May 81
 By A.D.
 Ch'k. by _____

CASE I - NORMAL POOL WITH FLASHBOARDS



$$\vec{P}_w = \frac{1}{2} \times 0.0624 \times (42.5 - 22.5)^2 = 12.5 \text{ K/ft} \times 15' = 187.5 \text{ K} \rightarrow$$

$$\vec{P}_w = 187.5 \text{ K} \times \frac{1}{3} (42.5 - 22.5) = 1250 \text{ K-ft} \downarrow$$

$$U \uparrow = \frac{1}{2} \times 0.0624 \times (42.5 - 25) \times 28.8 = 15.7 \text{ K} \times 2.0' = 31.4 \text{ K} \uparrow$$

(note: base width of footing is 2.0 ft)

$$\vec{U} = 31.4 \left\{ \frac{2}{3} (28.8) \right\} = 602.9 \text{ K-ft} \downarrow$$

$$\Sigma F_H = \vec{P}_w = 187.5 \text{ K} \rightarrow$$

$$\Sigma F_V = \Sigma W_i \downarrow + W_{fw1} \downarrow + W_{fw2} \downarrow - U \uparrow = 280.5 \text{ K} \downarrow$$

$$\Sigma M_{\text{resulting}} = \Sigma W_i \leftarrow + \vec{M}_{fw1} + \vec{M}_{fw2} = 5764.5 \text{ K-ft} \uparrow$$

TAMS

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 Date 01 May 81
 By A.D.
 Ch'k. by _____

$$\Sigma M_{opposing} = \vec{P}_w + \vec{U}_w = 1853 \downarrow \text{ kip-ft}$$

Location of Resultant

$$\bar{X}_{resultant} = \frac{(M_1 - M_0)}{\Sigma F_v} - \frac{B}{3} = \frac{5764.5 - 1853}{280.5} - \frac{28.2}{3}$$

$$\bar{X}_{res} = +4.43 \text{ (inside middle third)}$$

Shear

Friction Factor of Safety ($\tan \phi = 1$)

$$S.F.F.S. = \frac{\Sigma F_v \tan \phi + c(L)B}{\Sigma F_H} \quad \text{where } L = 28.8 \text{ ft.}$$

$$\{ B = 15 \text{ ft.}$$

$$= \frac{280.5 \tan 45 + 1(28.8)(15)}{187.5}$$

$$= 3.8 > 3.0 \text{ (okay)}$$

(See note 7 on pg 2/18 for explanation of passive pressures not used in analysis)

TAMS

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Project Mamaroneck Reservoir Dam

Subject Stability Analysis: Phase I Inspection

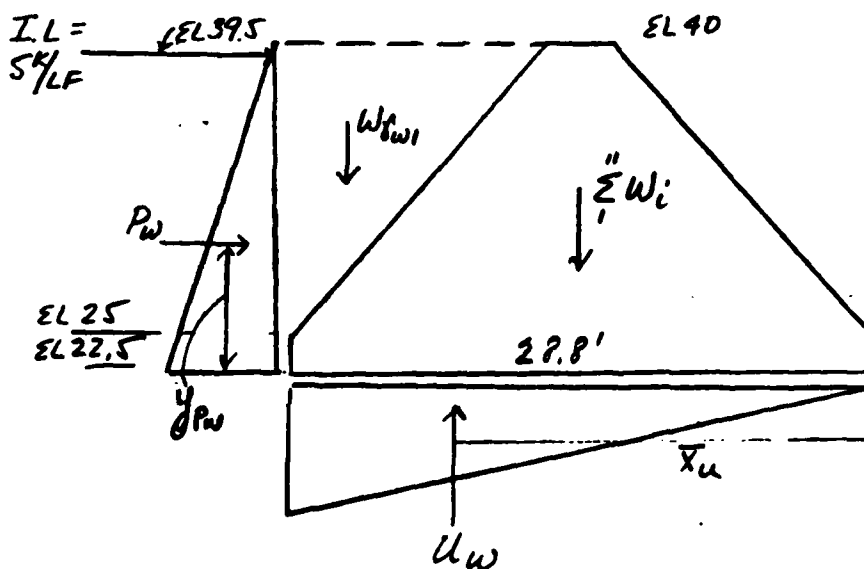
Sheet 8 of 18

Date 01 May 81

By A.D.

Ch'k. by _____

CASE II : NORMAL POOL WITH ICE LOAD



$$\vec{P}_w = \frac{1}{2} \times 0.0624 \times (40 - 22.5)^2 = 9.55 \text{ K/LF} \times 15' = 143.3 \text{ K} \rightarrow$$

$$\vec{P}_w = 143.3 \times \left\{ \frac{1}{3} (40 - 22.5) \right\} = 836 \text{ K-ft} \downarrow$$

$$U_w = \frac{1}{2} \times 0.0624 \times (40 - 25) \times 28.8 = 13.48 \text{ K/LF} \times 2' = 27 \text{ K} \uparrow$$

$$\vec{U}_w = 27 \times \frac{2}{3} (28.8) = 518.4 \text{ K-ft} \downarrow$$

$$\vec{I.L.} = 5 \text{ K/LF} \times 15' = 75 \text{ K} \rightarrow$$

$$\vec{I.L.} = 75 \text{ K} \times (39.5 - 25) = 1087.5 \text{ K-ft} \downarrow$$

$$\Sigma F_H : \vec{P}_w + \vec{I.L.} = 218.3 \text{ K} \rightarrow$$

$$\Sigma F_V : \Sigma W_i \downarrow + W_w \downarrow - U_w \uparrow = 248 \text{ K} \uparrow$$

$$\Sigma M_r : \Sigma W_i + \vec{M}_{W_i} = 4993.3 \text{ K-ft} \uparrow$$

$$\Sigma M_o : \vec{P}_w + \vec{U}_w + \vec{I.L.} = 2441.9 \text{ K-ft} \downarrow$$

TAMS

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Project Mamaroneck River Dam

Subject Stability Analysis: Phase I Inspection

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Date 01 May 81

By AD

Ch'k. by _____

Location of Resultant

$$\bar{x}_{\text{result}} = \frac{\sum M_r - M_o}{\sum F_v} - \frac{B}{3} = \frac{4993 - 2442}{248} - \frac{28.8}{3}$$

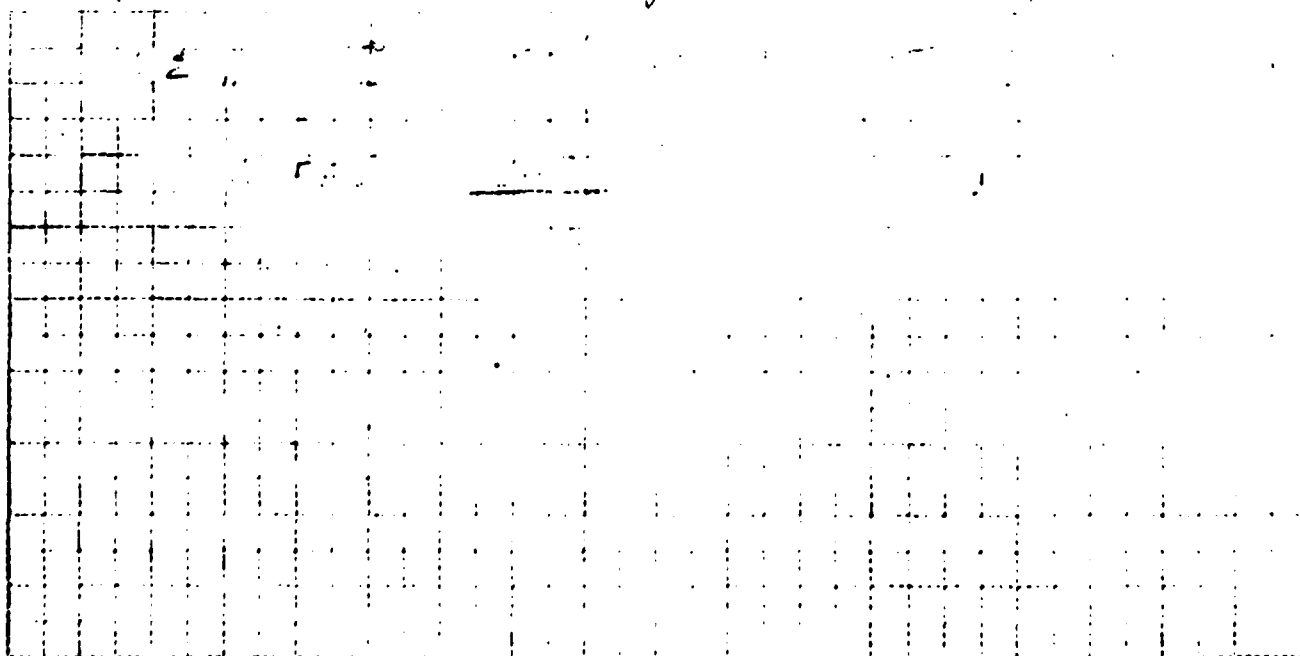
$$x_{\text{result}} = 0.69 \text{ feet (inside middle third)}$$

Shear Friction Factor of Safety ($\tan \phi = 1$)

$$S.F.F.S. = \frac{\sum F_v \tan \phi + CL(\phi)}{\sum F_h} = \frac{248 + 1(28.8)(15)}{218.3}$$

$$S.F.F.S. = 3.11 > 3.0 \quad (\text{Okay})$$

(See pg 2/18 for explanation of passive pressures not used in analysis)

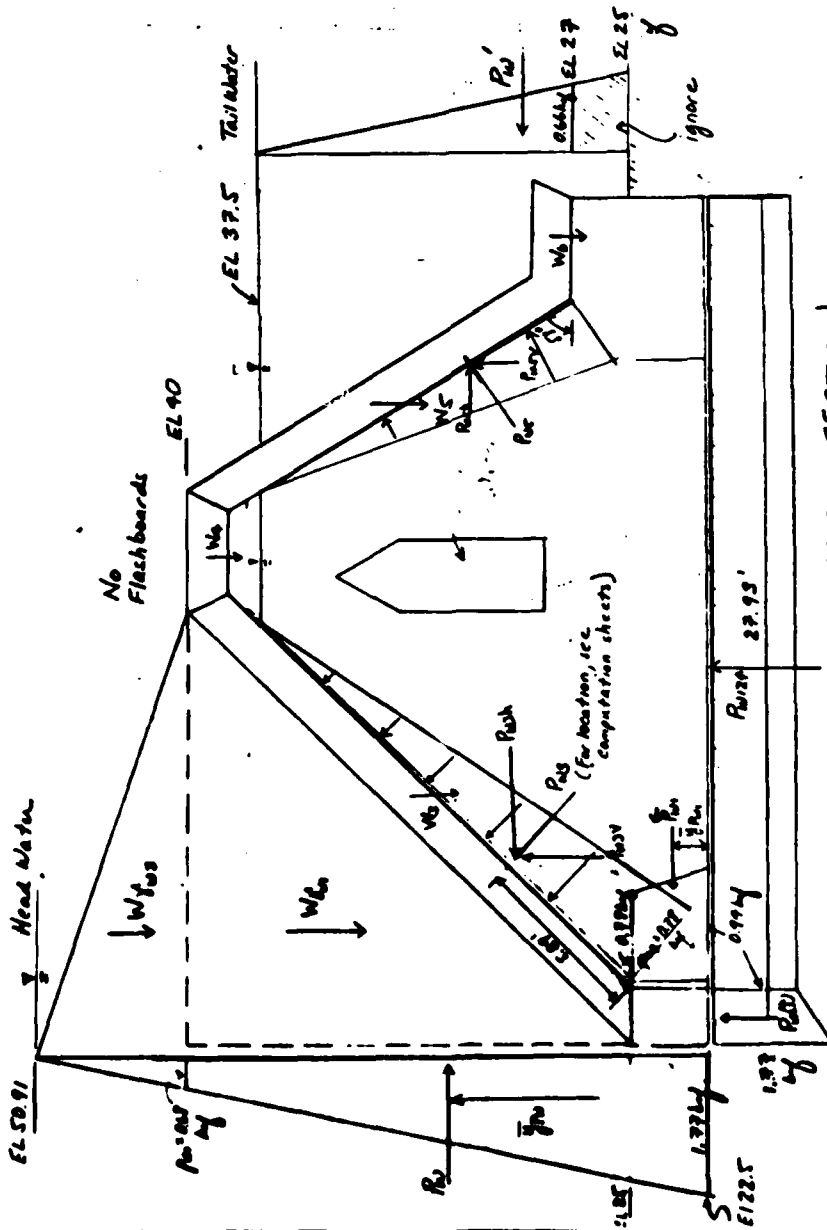


EL 50.91 Head Water

No Flashboards

EL 40

EL 37.5 Tailwater



ASSUMED TYPICAL SECTION

SCALE 1/4" = 1 ft

0 2 4 6 8 10 feet

CASE III : UNUSUAL LOADING (1/2 PMF)

Compute Upstream Water Force

$$P_{w1} = \frac{1}{2} (50.91 - 40) = 0.68 \text{ ksf}$$

$$P_{w2} = \frac{1}{2} (50.91 - 22.5) = 1.77 \text{ ksf}$$

$$P_{w3} = 1.15 \text{ ksf} \times (40 - 22.5) \times 15' = 301 \text{ k}$$

Compute Downstream Water Force

$$P_{w4} = \frac{1}{2} (37.5 - 22) = 0.66 \text{ ksf}$$

$$P_{w5} = \frac{1}{2} \times 0.66 \times (37.5 - 22) = 0.6 \times 15' = 9 \text{ k}$$

Compute Water Force Along Inner Slab of W1

$$P_{w6} = \frac{1}{2} (37.5 - 25) = 0.71 \text{ ksf}$$

$$P_{w7} = \frac{1}{2} \times 0.71 \times (37.5 - 25) = 14' = 16.5 \text{ k}$$

Since Upstream Slope = 45°

$$P_{w8} = P_{w9} = 0.707 \times 16.5 = 68.2 \text{ k} \leftarrow \text{Push}$$

Compute Water Force Along Side of W1

$$P_{w10} = \left\{ \frac{0.71 + 0.94}{2} \right\} \times 2.5 \times 14' = 30.1 \text{ k}$$

Compute Water Force At Base of W1

$$P_{w11} = \frac{1.73 + 0.94}{2} \times 19' \times 15' = 326 \text{ k}$$

Compute Water Force Along Inner Surface of W2

$$P_{w12} = \frac{1}{2} \times 0.66 \times \frac{37.5 - 22}{2} \times 14' = 57.2 \text{ k}$$

$$P_{w13} = 57.2 \text{ k} \times 0.89 = 50.9 \text{ k} \leftarrow \text{Push}$$

TAMS

Job No. 1579-08

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Project Mamaronock Reservoir Dam

Date 02 May 81

Subject Stability Analysis: Phase I Inspection

By AD

Ch'k. by _____

Compute Moment Arm For Each Water Force (About Pt. A)

$$\vec{P}_w : \bar{y}_{pw} = \frac{0.68 \frac{(17.5)^2}{2} + \frac{1}{2} (1.77 - 0.68) \frac{(17.5)^2}{3}}{0.68(17.5) + \frac{1}{2} (1.77 - 0.68)(17.5)}$$

$$\bar{y}_{pw} = 7.45 \text{ feet}$$

$$\vec{P}_w' : \bar{y}_{pw} = 2 + \frac{1}{3} (37.5 - 27) = 5.5 \text{ feet}$$

$$\vec{P}_{ws} : r = \frac{37.5 - 25}{\sin 45} = 17.68$$

$$x \text{ along u/s } (45^\circ) = \frac{17.68}{3} = 5.89'$$

$$\text{Graphically } \bar{x}_{pwsv} = 22.6'$$

$$\bar{y}_{pwsh} = 6.7'$$

$$\vec{P}_{w1} : \bar{y}_{pw1} = \frac{0.78 \frac{(2.5)^2}{2} + 0.5 \frac{(2.5)^2}{3} (0.94 - 0.78)}{0.78(2.5) + 0.5(2.5)(0.94 - 0.78)}$$

$$\bar{y}_{pw1} = 1.21 \text{ feet}$$

$$\vec{P}_{w1} : \bar{x} = 26.9 + \frac{0.94 \frac{(1.9)^2}{2} + \frac{1}{2} (1.9)(1.62 - .94) \frac{2}{3} (1.9)}{0.94(1.9) + \frac{1}{2} (1.9)(1.62 - 0.94)}$$

$$\bar{x} = 26.9 + 1.03$$

$$\bar{x}_{pw} = 27.93 \text{ feet.}$$

TAMS

Job No. 1579-08

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Project Mamarrueh Barrage Dam

Date 04 May 81

Subject Stability Analysis: Phase I Inspection

By AD

Ch'k. by _____

Compute:

$$P_{WS} \rightarrow : r = \frac{37.5 - 27}{\sin 58^\circ} = 12.38 \text{ feet}$$

$$x \text{ along } d/s (58^\circ) = \frac{12.38}{3} = 4.13 \text{ feet}$$

$$\bar{x}_{PWSV} = 5.7 \text{ feet}$$

$$y_{PWSH} = 7.9 \text{ feet}$$

Compute Additional Dead Water Weight

$$W_{PWS} = 0.5(50.91 - 40) \times 14.8 \times 0.0624 \times 15' = 75.6 \text{ K}\downarrow$$

$$M_{PWS} = 75.6 \times \{14 + 9.87\} = 1804.6$$

Compute Uplift at base of Buttress ftg (Consider only 1' width)

$$P_{W12} \uparrow = \{28.8 - 1.9\} \times 0.0624 \times \{37.5 - 22.5\} \times 1' = 25.2 \text{ K}\uparrow$$

$$\bar{x}_{B2\uparrow} = \frac{\{28.8 - 1.9\}}{2} = 13.45'$$

$$\vec{P}_W : 301.9 \times 7.45 = 2249.2 \downarrow \text{ K-ft}$$

$$\vec{P}_V : 31.2 \times 4.17 = 130.1 \uparrow \text{ K-ft}$$

$$\vec{P}_{SH} : 68.2 \times 6.7 = 456.9 \uparrow \text{ K-ft}$$

$$\vec{P}_{SV} : 68.2 \times 22.6 = 1541.3 \downarrow \text{ K-ft}$$

$$\vec{P}_{W1} : 30.1 \times 1.21 = 36.4 \uparrow \text{ K-ft}$$

$$\vec{P}_{W1} : 36.5 \times 27.93 = 1019.7 \downarrow \text{ K-ft}$$

$$\vec{P}_{WSH} : 30.3 \times 7.9 = 239.4 \downarrow \text{ K-ft}$$

$$\vec{P}_{WSV} : 48.5 \times 5.7 = 276.5 \downarrow \text{ K-ft}$$

$$M_{PWS} : \text{(From above)} \quad 1804.6 \uparrow \text{ K-ft}$$

$$\vec{P}_{W12\uparrow} : 25.2 \times 13.45 = 338.9 \downarrow \text{ K-ft}$$

$$\sum M_r (P + W_{PWS}) = 2428 \text{ K-ft} \uparrow$$

$$\sum M_o (P) = 5665 \text{ K-ft}$$

TAMS

Job No. 1579-08

Project Mamooned Reservoir Dam

Subject Stability Analysis: Phase I

Sheet 13 of 18

Date 04 May 81

By A.D

Ch'k. by _____

Total Forces and Moments

$$\Sigma F_H: \vec{P}_w - \vec{P}_{w1} - \vec{P}_{w3h} - \vec{P}_w + \vec{P}_{wsh} = 202.7 \text{ K} \rightarrow$$

$$\Sigma F_V: \Sigma W_i \downarrow + W_{w1} \downarrow - P_{w3v} \uparrow - P_{wsv} \uparrow - P_{w1} \uparrow + W_{w2} - P_{w2} \uparrow = 172.2 \text{ K}$$

$$\Sigma M_r: \Sigma \vec{W}_i + \Sigma \vec{M}_r(P + M_{w3}) + \vec{M} W_{w1} = 7421.3 \text{ K-ft}$$

$$\Sigma M_o: \Sigma \vec{M}_o(P) = 5665 \text{ K-ft}$$

Location of Resultant:

$$x_{\text{result}} = \frac{7421.3 - 5665}{172.2} = \frac{28.8}{3}$$

$$x_{\text{result}} = 0.60 \text{ feet (inside middle third)}$$

Friction Factor of Safety ($\tan \phi = 1$)

$$F.F.S. = \frac{\Sigma F_v \tan \phi}{\Sigma F_H} = \frac{172.2}{202.7}$$

$$F.S. = 0.85 < 1.25 \text{ (No Good)}$$

Since this value is low for Ambursen type dams, let's assume

that the uplift forces, $P_{w1} \uparrow$, $P_{w3} \uparrow$, $P_{wsh} \uparrow$, $P_{w1} \uparrow$, $P_{w2} \uparrow$, are also 60% of the tailwater depth. Therefore, we multiply $(0.6H)^2$ or 0.36 to the previous computed values, i.e.

$$\Sigma F_H: \vec{P}_w - \vec{P}_{w1} - 0.36(\vec{P}_{w3h} - \vec{P}_{wsh} + \vec{P}_{w1}) = 246.2$$

$$\Sigma F_V: \Sigma W_i \downarrow + W_{w1} \downarrow + W_{w3} - 0.36(P_{w3v} \uparrow + P_{wsv} \uparrow + P_{w1} \uparrow + P_{w2} \uparrow) = 286.4$$

$$\therefore S.F.F.S. = \frac{\Sigma F_v \tan \phi + C.B.}{\Sigma F_H} = \frac{286.4 + (28.8 \times 15)}{246.2} = 2.9 < 3.0, \text{ (No Good)}$$

See pg 2/3 for explanation of passive pressures not used in analysis.

CASE IV: (PMF)

Compute P_W - Force

$$P_W = \left\{ \frac{1.15 + 2.23}{2} \right\} (17.5) \times 15' = 449.5 \text{ k}$$

$$\bar{X}_{P_W} = \frac{1.15(17.5)^2}{2} + \frac{1(2.23 - 1.15)(17.5)^2}{3}$$

$$1.15(17.5) + \frac{1}{2}(2.23 - 1.15)(17.5)$$

$$\bar{X}_{P_W} = 5.92 \text{ ft} \quad \bar{P}_W = 2622.6 \text{ k-ft}$$

Compute P'_W - Force

$$P'_W = \frac{1}{2}(13)^2 0.0624 \times 15' \times 0.6 = 47.5 \text{ k}$$

$$\bar{X}_{P'_W} = 2 + \frac{1}{2}(13) = 6.5 \text{ ft}$$

$$\bar{P}'_W = 205.7 \text{ k-ft}$$

Compute P_{W3}

$$P_{W3} = \left\{ \frac{0.08 + 0.91}{2} \right\} \left(\frac{500 - 25}{100} \right) \times 19' = 150.6 \text{ k}$$

$$P_{W3} h = P_{W3} r = 150.6 \times 0.707 = 106.5 \text{ k-ft}$$

where P_{W3} acts from base of force at EL 25

$$r = \frac{0.08 \sqrt{(19.4)^2} + 45(99 - 98)(19.4)^2}{3}$$

$$r = \frac{0.08(19.4) + 0.5(99 - 98)(19.4)}{3} = 6.97$$

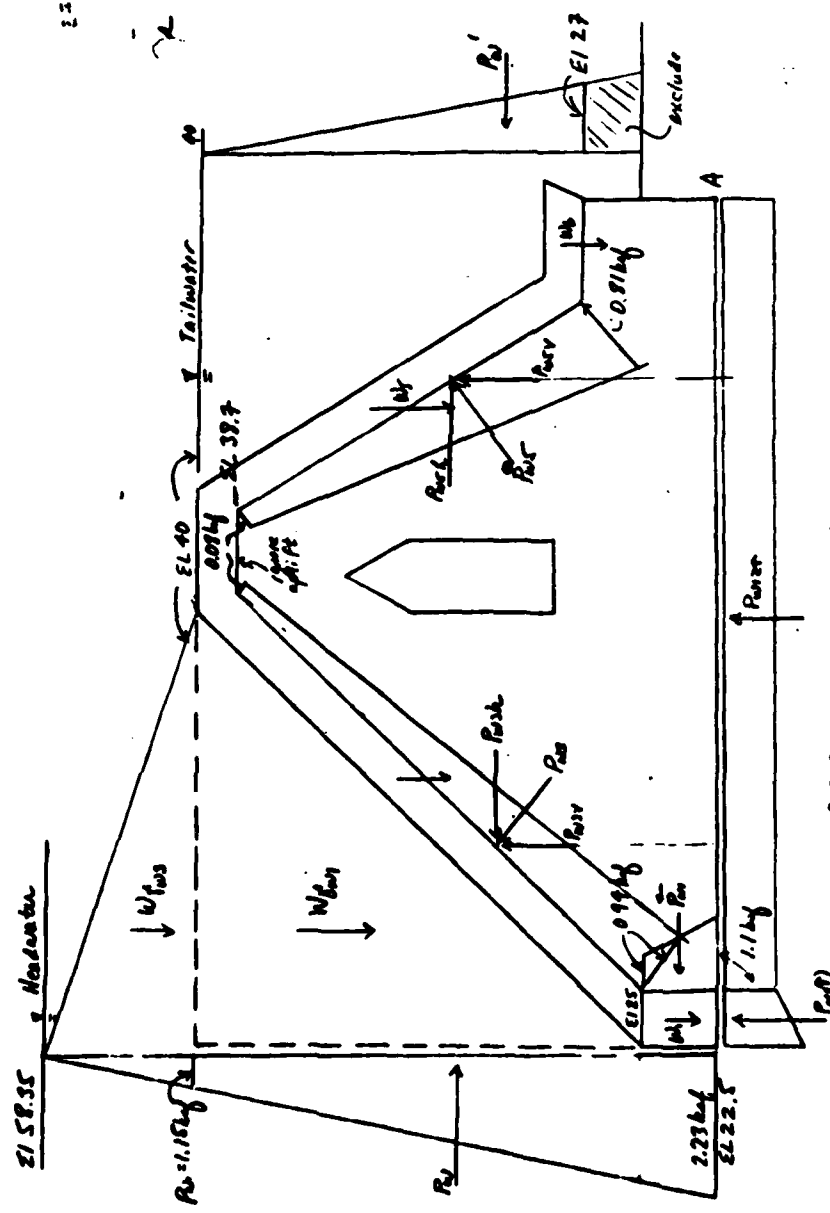
Scale $\frac{1}{4}'' = 1 \text{ ft}$



Graphically

$$\bar{X}_{P_{W3}} = 20.9 \text{ feet}$$

$$\bar{X}_{P_{W3}} = 7.4 \text{ feet}$$



ASSUMED TYPICAL SECTION

TAMS

Job No. 1579-08

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Project Mamaronck Reservoir Dam

Date 4 May 81

Subject Stability Analysis

By A.D.

Ch'k. by _____

Compute $\bar{P}_{w1}$

$$\bar{P}_{w1} = \frac{(1.1 + 0.94)}{2} \times 2.5 \times 14 = \frac{35.7}{2.57} K \leftarrow$$

$$\bar{x}_{P_{w1}} = \frac{0.94 \left(\frac{2.5}{2} \right)^2 + \frac{1}{2} (1.1 - 0.94) \left(\frac{2.5}{3} \right)^2}{0.94(2.5) + \frac{1}{2} (1.1 - 0.94)(2.5)}$$

$$\bar{x}_{P_{w1}} = 1.26 \text{ feet} \Rightarrow \bar{P}_{w1} = \frac{45}{45} K\text{-ft} \uparrow$$

Compute $P_{w2}(\uparrow)$

$$P_{w1}(\uparrow) = \left\{ \frac{2.23 + 1.1}{2} \right\} \times 1.9' \times 15' = 47.45 K \uparrow$$

$$\bar{x}_{P_{w1}} = \frac{1.1 \left(\frac{1.9}{2} \right)^2 + \frac{1}{2} (2.23 - 1.1) \left(\frac{1.9}{3} \right)^2}{1.1(1.9) + \frac{1}{2} (2.23 - 1.1)(1.9)}$$

$$\bar{x}_{P_{w1}} = \frac{27.74}{27.74} \text{ feet} \Rightarrow \bar{P}_{w1}(\uparrow) = 39.9 K\text{-ft} \downarrow$$

Compute P_{w12} (Uplift at base of buttress for 1' width only)

$$P_{w12} = 1.1 \times 1' \times \{28.8 - 1.9\} = 29.6 K \uparrow$$

$$\bar{x}_{w12} = \frac{28.8 - 1.9}{2} = 13.45 \text{ ft.}$$

TAMS

Job No. 1579-08

Sheet 17 of 18

Project Mamaroneck Reservoir Dam

Date 04 May 81

Subject Stability Analysis : Phase I

By AD

Ch'k. by _____

Computation of Moments (about A)

For Water Forces

$$\begin{array}{rcll} \vec{P}_W : & K & ft & \\ & 443 & \times 5.92 & = 2662.6 \text{ K-ft} \downarrow \end{array}$$

$$\begin{array}{rcll} \overleftarrow{P}_W' & & & \\ & 47.5 & \times 6.33 & = 300.7 \text{ K-ft} \uparrow \end{array}$$

$$\begin{array}{rcll} \vec{P}_{W3V} & & & \\ & 106.5 & \times 20.9 & = 2225.9 \text{ K-ft} \downarrow \end{array}$$

$$\begin{array}{rcll} \overleftarrow{P}_{W3H} & & & \\ & 106.5 & \times 7.4 & = 788.1 \text{ K-ft} \uparrow \end{array}$$

$$\begin{array}{rcll} \vec{P}_{W5V} & & & \\ & 72.9 & \times 6.1 & = 444.7 \text{ K-ft} \downarrow \end{array}$$

$$\begin{array}{rcll} \vec{P}_{W5H} & & & \\ & 45.6 & \times 8.8 & = 401.3 \text{ K-ft} \downarrow \end{array}$$

$$\begin{array}{rcll} \overleftarrow{P}_{W1} & & & \\ & 35.7 & \times 1.26 & = 45 \text{ K-ft} \uparrow \end{array}$$

$$\begin{array}{rcll} \vec{P}_{W1} & & & \\ & 47.45 & \times 27.74 & = 1316.3 \text{ K-ft} \downarrow \end{array}$$

$$\begin{array}{rcll} \overleftarrow{W}_{W3} & & & \\ & 127.1 & \times 23.87 & = 3034 \text{ K-ft} \uparrow \end{array}$$

$$\begin{array}{rcll} \vec{P}_{W12} & & & \\ & 29.6 & \times 13.45 & = 398.1 \text{ K-ft} \downarrow \end{array}$$

$$\overleftarrow{EM}_A(P_W) = 4160 \text{ K-ft} \uparrow$$

$$\overrightarrow{EM}_A(P_f) = 7449 \text{ K-ft} \downarrow$$

TAMS

Job No. 1579-08

Project Mamaroneck Dam

Subject Stability Analysis

Sheet 18 of 18

Date 04 May 81

By A. D.

Ch'k. by _____

Total Forces and Moments

$$\Sigma F_H: \vec{P}_w - \vec{P}_{w1} - \vec{P}_{wsh} - \vec{P}'_w + \vec{P}_{wsh} = 298.9 \text{ K} \rightarrow$$

$$\Sigma F_V = \sum W_i \downarrow + W_{w1} \downarrow + W_{w3} \downarrow - P_{w3v} \uparrow - P_{w1v} \uparrow - P_{w1} \uparrow - P_{w12} \uparrow = 145.6 \text{ K} \uparrow$$

$$\Sigma M_r: \sum \hat{W}_i + \Sigma M(P + M_{w1}) + M_{w3} = 9161 \text{ K-ft} \uparrow$$

$$\Sigma M_o: \Sigma M_o(P) = 7449 \text{ K-ft} \downarrow$$

Location of Resultant

$$x_{\text{result}} = \frac{\Sigma M_r - \Sigma M_o}{F_v} - \frac{B}{4} = \frac{9161 - 7449}{145.6} - \frac{28.2}{3}$$

$$x_{\text{result}} = 2.16 \text{ ft (inside middle third)}$$

Friction Factor of Safety ($\tan \phi = 1$)

$$F.F.S. = \frac{F_v}{F_H} = \frac{145.6}{298.9} = 0.49 < 1.1 \text{ (No Good)}$$

For the following analysis, see note on bottom of pg 13.

For PMF Case

$$\Sigma F_H: \vec{P}_w - \vec{P}'_w - 0.36(\vec{P}_{wsh} + \vec{P}_{w1} - \vec{P}_{wsh}) = 360.7 \text{ K} \rightarrow$$

$$\Sigma F_V: \sum W_i \downarrow + W_{w1} \downarrow + W_{w3} \downarrow - 0.36(P_{w3v} + P_{w1v} + P_{w1} + P_{w12}) = 255.7 \text{ K} \uparrow$$

$$\therefore S.F.F.S. = \frac{255.7 + 1(298.9 \times 15)}{360.7} = 1.90 < 3.0 \text{ (No Good)}$$

(See pg 2/18 for explanation of passive pressures not used in analysis)

REFERENCES

APPENDIX F

REFERENCES

1. "Flood Hydrograph Package (HEC-1) Users Manual for Dam Safety Investigations", U.S. Army Corps of Engineers, Hydrologic Engineering Center, September 1979.
2. "Seasonal Variation of the Probable Maximum Precipitation, East of the 105th Meridian for Areas from 10 to 1,000 Square Miles, and Durations of 6, 12, 24 and 48 Hours", Hydro-meteorological Report No. 33. Weather Bureau, U.S. Department of Commerce, April 1956.
3. "Lower Hudson River Basin Hydrologic Flood Routing Model", Water Resources Engineers, Inc. for the Department of the Army, COE, New York District, January 1977.
4. "Recommended Guidelines for Safety Inspection of Dams", Department of the Army, Office of the Chief of Engineers, Appendix D.
5. "Water Resources Data for New York", Vol. I, U.S. Geological Survey Water-Data Report NY-79-1, 1979.
6. "New England Upland Section", Internal Report, Civil Engineering Department, Purdue University, West Lafayette, Indiana, August 1977.
7. Geologic Map of New York, The University of the State of New York, The State Education Department, Map and Chart Series No. 5, Albany, New York, 1962.

OTHER DATA

APPENDIX G

DEC DAM INSPECTION REPORT

22

RB

60

CTY

30

YR. AP.

400866

DAM NO. 233

04/18/72

INS. DATE

352

USE

4

TYPE

AS BUILT INSPECTION

1

Location of Spillway and outlet

1

Elevations

1

Size of Spillway and outlet

1

Geometry of Non-overflow section

1

GENERAL CONDITION OF NON-OVERFLOW SECTION

1

Settlement

2

Cracks

1

Deflections

1

Joints

2

Surface of Concrete

1

Leakage

1

Undermining

1

Settlement of Embankment

1

Crest of Dam

1

Downstream Slope

1

Upstream Slope

1

Toe of Slope

1

GENERAL CONDITION OF SPILLWAY AND OUTLET WORKS

2

Auxiliary Spillway

2

Service or Concrete Spillway

1

Stilling Basin

2

Joints

2

Surface of Concrete

2

Spillway Toe

2

Mechanical Equipment

1

Plunge Pool

2

Drain

1

Maintenance

2

Hazard Class

3

Evaluation

4

Inspector

COMMENTS:

Re-constr proposed in '78



FOR DEPARTMENT USE ONLY

APPLICATION NO.

366-99-0071

DAM NO.

233-866

WATERSHED

Long Island

APPLICATION FOR PERMIT

FOR THE CONSTRUCTION, RECONSTRUCTION OR REPAIR OF A DAM OR OTHER IMPOUNDMENT STRUCTURE

Read instructions on reverse side of last sheet before completing this application. PLEASE TYPE OR PRINT CLEARLY IN INK

PROJECT DESCRIPTION

1. LOCATION ON U.S. GEOLOGICAL SURVEY MAP Name of Map Hamaroneck Latitude 41° 58' 05" Longitude 73° 44' 20"			2. PROPOSED USE FOR IMPOUNDED WATER Existing dam-utilize for flood control	3. STATE THE HEIGHT ABOVE SPILLCREST OF THE LOWEST PART OF THE IMMEDIATE UPSTREAM ADJOINING PROPERTY OR PROPERTIES N/A Feet
4. IS THIS PROPOSED POND OR LAKE PART OF A PUBLIC WATER SUPPLY? ☐ Yes ☒ No If not, where is nearest downstream public water supply intake?			5. SIZE OF AREA DRAINING INTO POND OR LAKE (Acres or Square Miles) 24.5 sq. miles	HEIGHT OF DAM ABOVE STREAM BED 115 Feet

6. THE DRAINAGE AREA IS COMPOSED OF: (Total - 100%)
 _____ % Forest _____ % Cropland _____ % Pasture _____ % Other _____ % Swamp **100** % Suburban Lands _____ % Urban Land.

TYPE OF SPILLWAY ☐ Service Spillway - Auxiliary Spillway Combination ☐ Single Spillway ☒ Pipe Riser ONLY ☒ Other single spillway with new openings		8. DESIGNER'S ESTIMATE OF CLASS OF HAZARD (As described in "Guidelines for Small Earth Dam Designs") ☐ Class "A" ☐ Class see report Class "C" NOTE: Provide descriptive information on character of downstream area.
---	--	--

9a. SPILLWAY INFLOW DESIGN FLOOD N/A through dam Frequency _____ Flood Peak _____ cfs Runoff Volume _____ in.	9b. SERVICE SPILLWAY INFLOW DESIGN FLOOD N/A Frequency _____ Flood Peak _____ cfs Runoff Volume _____ in.
---	---

10. THE SINGLE SPILLWAY OR AUXILIARY SPILLWAY IS COMPOSED OF:
☐ Vegetated Earth ☒ Concrete ☐ Timber ☐ Rock-filled Crib ☐ Masonry ☐ Other _____

11. MAXIMUM VELOCITY WITHIN THE SINGLE OR AUXILIARY SPILLWAY N/A f/s	12. SINGLE OR AUXILIARY SPILLWAY DISCHARGE AT DESIGN HIGH WATER N/A cfs	13. TYPE OF ENERGY DISSIPATER PROVIDED ON SINGLE SPILLWAY ☐ Hydraulic Jump Basin ☐ Drop Structure ☒ Other see plans
---	--	---

14. POND OR LAKE WILL BE DRAINED BY MEANS OF **conduits in dam** WATER WILL BE SUPPLIED TO RIPARIAN OWNERS DOWNSTREAM BY MEANS OF **N/A**

15. AREA-CAPACITY DATA Answer 1, 2 and 3, OR 1, 2, 4, 5		ELEVATION, Referred to Assumed Benchmark 43	SURFACE AREA 40 Acres	VOLUME STORED 241 Acre-Feet	16. TYPE OF ENERGY DISSIPATER AT OUTLET OF CONDUIT: ☐ Impact Basin ☐ Hydraulic Jump Basin ☒ Plunge Pool ☐ Other _____
1. Top of Dam	N/A Feet				IS PIPE RISER PROVIDED WITH AN ANTI-VORTEX DEVICE? ☐ Yes ☐ No N/A
2. Design High Water	N/A Feet				
3. Single Spillway Crest	N/A Feet				
4. Auxiliary Spillway Crest	N/A Feet				
5. Service Spillway Crest	N/A Feet				

17. DRAWDOWN TIMES: Answer 1 and 2, OR 1, 3 and 4		3. Can the Service Spillway evacuate 75% of the storage between the auxiliary spillway and the Service Spillway crest within seven days? ☐ Yes ☒ No
1. Has provision been made to evacuate 90% of the storage below the lowest spillway crest within fourteen days? ☒ Yes ☐ No	2. Can the single spillway evacuate 75% of the storage between the maximum design high water and the spillway crest within 48 hours? ☒ Yes ☐ No	4. Can the Service Spillway and the Auxiliary Spillway in combination evacuate the storage between the design high water and the auxiliary spillway crest within 12 hours? ☐ Yes ☒ No

18. SOIL DATA - State the character of the bed and banks in respect to natural types of soil materials, hardness, perviousness, water bearing, effect of exposure to air and water, uniformity, etc.
N/A

If an earth dam, describe the material to be used in the embankment.

What is the source of embankment fill material(s)?

Are there porous seams or fissures beneath the foundation of the proposed dam? ☐ Yes ☒ No N/A		Method used to obtain the above soil data N/A ☐ Soil Borings ☐ Test Pits	
DESIGN ENGINEER Name of Agency or Individual Hazen and Sawyer P.E. License No. of Individual _____		20. CONSTRUCTION ENGINEER Name of Agency or Individual West. Co. Dept of Public Works P.E. License No. of Individual _____	
Address 10 Lexington Avenue, NYC 10017		Address County Office Building, White Plains, NY 10601	
Title _____	Telephone No. 212-986-0033	Title _____	Telephone No. 914-662-2537

- ☒ **Article 15 (STREAM PROTECTION) Environmental Conservation Law**
- ☒ For the construction, reconstruction or repair of a DAM or other impoundment structure.
- ☐ For the construction, reconstruction or repair of any permanent DOCK, pier or wharf; and any dock, pier or wharf, built on open work supports, which has a top surface area of more than 200 square feet.
- ☐ For the disturbance of a STREAM BED or excavation in or fill of navigable waters.
- ☐ **Article 24 (FRESHWATER WETLANDS) Environmental Conservation Law**
- ☐ **Article 25 (TIDAL WETLANDS) Environmental Conservation Law**

Read instructions on reverse side of last sheet before completing this application. PLEASE TYPE OR PRINT CLEARLY IN INK.

1. NAME AND ADDRESS OF APPLICANT		TELEPHONE NO.
First	M.I.	Last
Westchester County Department of Public Works		914-682-2537
Street Address		
Westchester County Office Building		
Post Office	State	Zip Code
White Plains	New York	10601
2. NAME AND ADDRESS OF OWNER (If different from Applicant)		
First	M.I.	Last
Westchester Joint Water Works		
Street Address		
1625 Mamaroneck Avenue		
Post Office	State	Zip Code
Mamaroneck	New York	10543
3. AGENCY SUBMITTING APPLICATION		
Westchester County Department of Public Works		
PROJECT DATA		
4. LOCATION OF WETLAND OR ADJACENT AREA, STREAM, OR BODY OF WATER		
Body of Water	Town	County
Mamaroneck River	Village of Mamaroneck Town of Harrison	Westchester
Locate by giving distance and direction from a commonly accepted and identifiable landmark or body of water or U.S.G.S. coordinates.		
5. SIZE OF WORK SECTION	6. SPECIFIC LOCATION	7. WILL PROJECT UTILIZE STATE OWNED LANDS?
see plans/eng. report	Westchester Joint Water Works Dam (WJWW)	☐ Yes ☒ No
8. TYPE AND EXTENT OF WORK (Feet of new channel; yards of material to be removed, draining, dredging, filling, etc.)		
Construction of conduits in existing WJWW Dam for flood control purposes. See reports, plans and specifications for details		
9. DOES PROJECT COMPLY WITH		
A. Use Guidelines (If any)		B. Development Restrictions (If any)
N/A		N/A
PURPOSE (Hardship)		
Flood control with maximum benefit downstream in the Village of Mamaroneck by reducing flood peaks of 1, 2 and 3-year storms		
11. IF A DAM OR OBSTRUCTION, INDICATE (existing dam)		12. PROPOSED STARTING DATE
Height +15	Size of Pond 241 acre-feet	2/1/78
13. APPROXIMATE COMPLETION DATE		5/1/78
NAME AND ADDRESS OF TWO OFFICIAL NEWSPAPERS IN LOCALITY WHERE PROPOSED ACTIVITY IS LOCATED		
The Daily Item 33 New Broad Street Port Chester, NY		The Daily Times 126 Librarie Avenue Mamaroneck, NY
15. CERTIFICATION		
I hereby affirm under penalty of perjury that information provided on this form and all attachments submitted herewith is true to the best of my knowledge and belief. False statements made herein are punishable as a Class A misdemeanor pursuant to Section 210.45 of the Penal Law. As a condition to the issuance of a permit, the applicant accepts full legal responsibility for all damage, direct or indirect, of whatever nature, and by whomever suffered, arising out of the project described herein and agrees to indemnify and save harmless the State from suits, actions, damages and costs of every name and description resulting from the said project.		
DATE		SIGNATURE

WESTCHESTER JOINT WATER WORKS

Serving the Village of Mamaroneck, The Towns of Mamaroneck and Harrison

1685 MAMARONECK AVENUE • 898-3500

MAMARONECK, N. Y. 10543

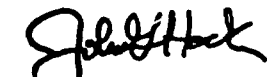
January 5, 1978

Mr. George Danskin
New York State Department
of Environmental Conservation
21 South Putt Corners Road
New Paltz, New York 12561

Dear Mr. Danskin:

This letter authorizes Frank C. Bohlander, Commissioner of Public Works, Westchester County, to make application on behalf of the Westchester Joint Water Works for permission to construct a conduit in the existing dam for flood control purposes.

Very truly yours,



JOHN G. HOCK, P.E.
Manager

JGH:h

CC: Mr. Frank C. Bohlander, Commissioner
Public Works, Westchester County

S. Zeccolo

February 1, 1978

Would you please review this within the area of your interest and let me have any comments or criticisms you care to make.

Encl.

SJZ:scs

S. Zeccolo

G. Koch

Review of proposed modification to Westchester Water Works

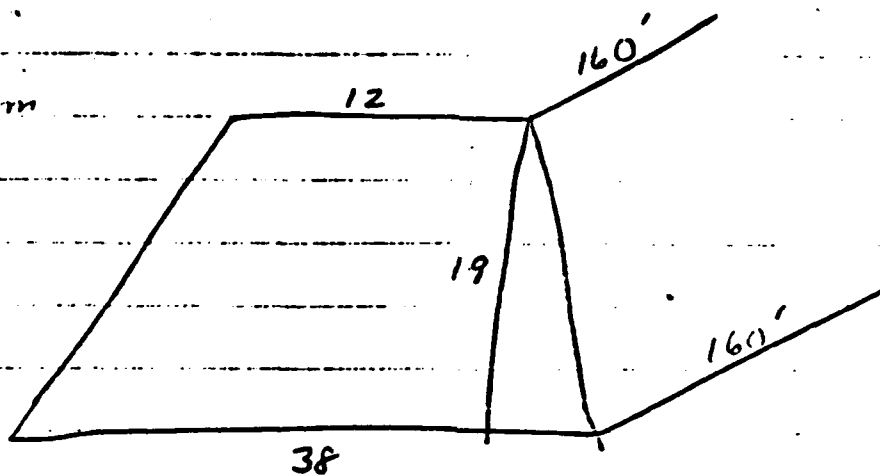
Dam Appl. #360-99-0071 Dam 233-866 Long Island

February 27, 1978

I have reviewed the plans and design report for the proposed modifications to the dam. The purpose of this project is to reduce the peak outflows for storms with a return frequency of less than 3 years. Since the proposed modification will increase the spillway capacity, I have no objection to the project.

GK/jb

Volume of Dam



$$V = \frac{(28)(19)(160)}{54} = 1576 \text{ cu yd}$$

Impounding Capacity

G.G. Mill

÷ 43560

151 acre ft

STATE OF NEW YORK


 DEPARTMENT OF PUBLIC WORKS
 DIVISION OF ENGINEERING

ALBANY

Received Mar. 20, 1930Dam No. 233-866Disposition App. Mar. 24, 1930Watershed Long I. d.

Foundation inspected _____

Structure inspected _____

 Application for the Construction ~~or Reconstruction~~ of a Dam

Application is hereby made to the Superintendent of Public Works, Albany, N. Y., in compliance with the provisions of Section 948 of the Conservation Law (see last page of this application) for the approval of specifications and detailed drawings, marked Westchester Joint Water Works No. 1
Alexander Potter and Robert H. Stevens, Associate Engineers,
 herewith submitted for the { construction
 reconstruction } of a dam herein described. All provisions of law will be complied with in the erection of the proposed dam. It is intended to complete the work covered by the application about August 1, 1930.
 (Date)

1. The dam will be on Mamaroneck River flowing into Long Island Sound in the town of Mamaroneck, County of Westchester and on the site of the present dam 500 ft. above Winfield Ave., Mamaroneck, N.Y.
(Give exact distance and direction from a well-known bridge, dam, village main cross-roads or mouth of a stream)
2. Location of dam is shown on the Oyster Bay quadrangle of the U.S.C.
 United States Geological Survey.
3. The name of the owner is Westchester Joint Water Works No. 1
4. The address of the owner is 284 Mamaroneck Ave., Mamaroneck, N. Y.
5. The dam will be used for water supply storage
6. Will any part of the dam be built upon or its pond flood any State lands? No.
7. The watershed above the proposed dam is 14.46 square miles.
8. The proposed dam will create a pond area at the spillcrest elevation of 18 acres and will impound 6,600,000 cubic feet of water.

9. The maximum height of the proposed dam above the bed of the stream is 19 feet inches.

10. The lowest part of the natural shore of the pond is 6 feet vertically above the spillcrest, and everywhere else the shore will be at least 4 feet above the spillcrest.

11. State if any damage to life or to any buildings, roads or other property could be caused by any possible failure of the proposed dam. Winfield Avenue road and bridge would be washed away.

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

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

Rock outcrop covered with clay.

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

Rock outcrop covered with clay.

15. State the character of the bed and the banks in respect to the hardness, perviousness, water bearing, effect of exposure to air and to water, uniformity, etc. The bottom of the stream indicates a granite formation, and the shores are formed by rock outcrops. The rock formation does not indicate disintegration by exposure.

16. Are there any porous seams or fissures beneath the foundation of the proposed dam? No drillings were taken but provisions have been made to grout all seams.

17. WASTES. The spillway of the above proposed dam will be 150 feet long in the clear; the waters will be held at the right end by an earth embankment, the top of which will be 4 feet above the spillcrest, and have a top width of 20 feet; and at the left end by a rock ledge the top of which will be 8 feet above the spillcrest, and have a top width of 50 feet.

18. The spillway is designed to safely discharge 2,515 cubic feet per second.

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

The spillway section has been designed to take care of a run-off of 250 c.f.s. per square mile of drainage area.

20. What is the maximum height of flash boards which will be used on this dam? 2 ft.

21. APRON. Below the proposed dam there will be an apron built of concrete feet long across the stream, 130 feet wide and 1 foot thick.

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

SECTION 948 OF THE CONSERVATION LAW

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

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

Westchester Social Water Works No. 1
Owner.

By Augustus V. Haine, authorized agent of owner.

Address of signer 284 Mamaroneck Av.
Mamaroneck, N.Y.

Date March 14, 1930

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

STATE OF NEW YORK
CONSERVATION COMMISSION
ALBANY

DAM REPORT

June 9th, 1915
(Date)

CONSERVATION COMMISSION,

DIVISION OF INLAND WATERS.

GENTLEMEN:

I have the honor to make the following report in relation to the structure known as the Old Mamaroneck Natunmks Dam Dam.

This dam is situated upon the Mamaroneck River
(Give name of stream)
in the Town of Mamaroneck Westchester County,
about one mile from the Village of Mamaroneck
(State distance)
The distance up stream from the dam, to the Mamaroneck Ave Bridge
(Up or down) (Give name of nearest rap or fall, or site of or of a bridge)
is about one fourth mile
(State distance)

The dam is now owned by New York Interurban Water Co.
(Give name and address of owner)
and was built in or about the year 1900, and was extensively repaired or reconstructed during the year 1914.

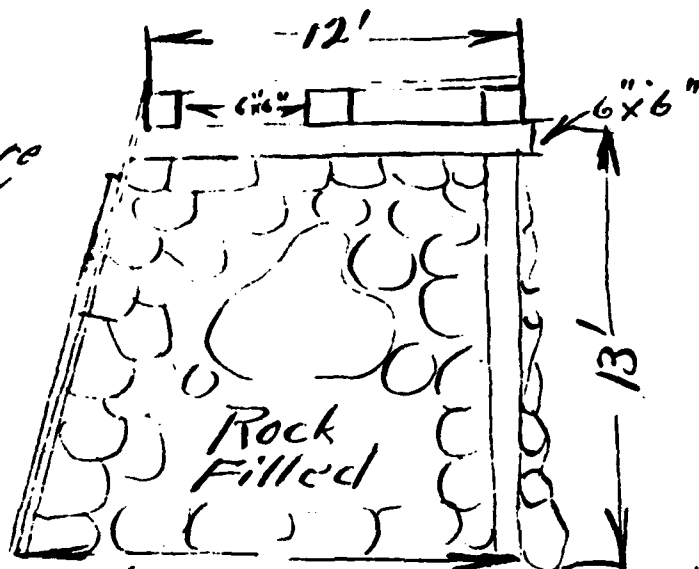
As it now stands, the spillway portion of this dam is built of 2' x 8" plank
(State whether of masonry, concrete or timber)
and the other portions are built of Earth and Rocks and Timber
(State whether of masonry, concrete, masonry or timber with or without rock fill)

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

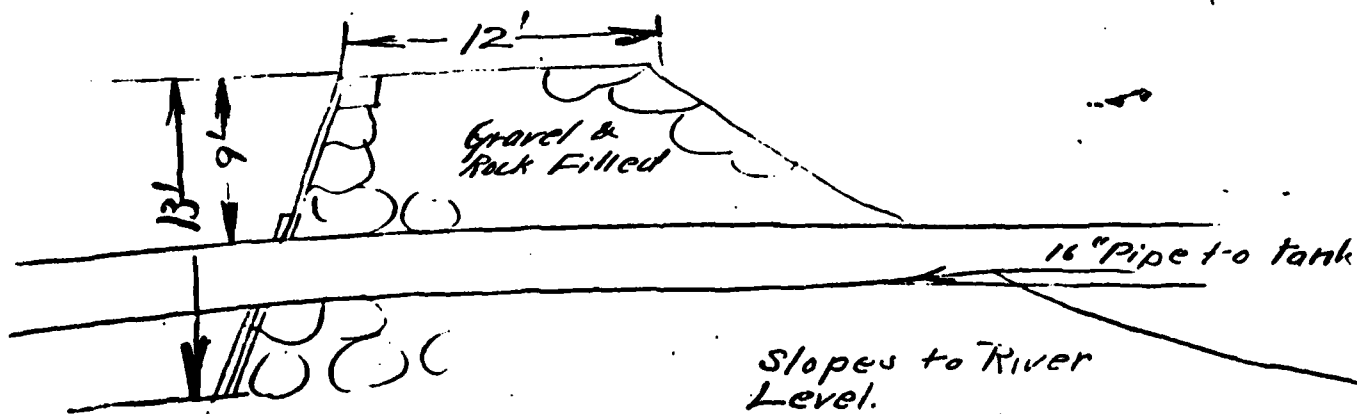
(In the space below, make one sketch showing the dam, and a second sketch showing the same the greatest height of the dam above the stream bed, its thickness at the top, and thickness at the bottom, as nearly as you can learn.)

the form and dimensions of a cross section through the spillway or waste-weir of this dam. Show particularly information for a cross section through the other portion of the dam. Show particularly dam bed, its thickness at the top, and thickness at the bottom, as nearly as you can learn.)

Face Plank are
1 1/2" Thick and
Double below
water line.



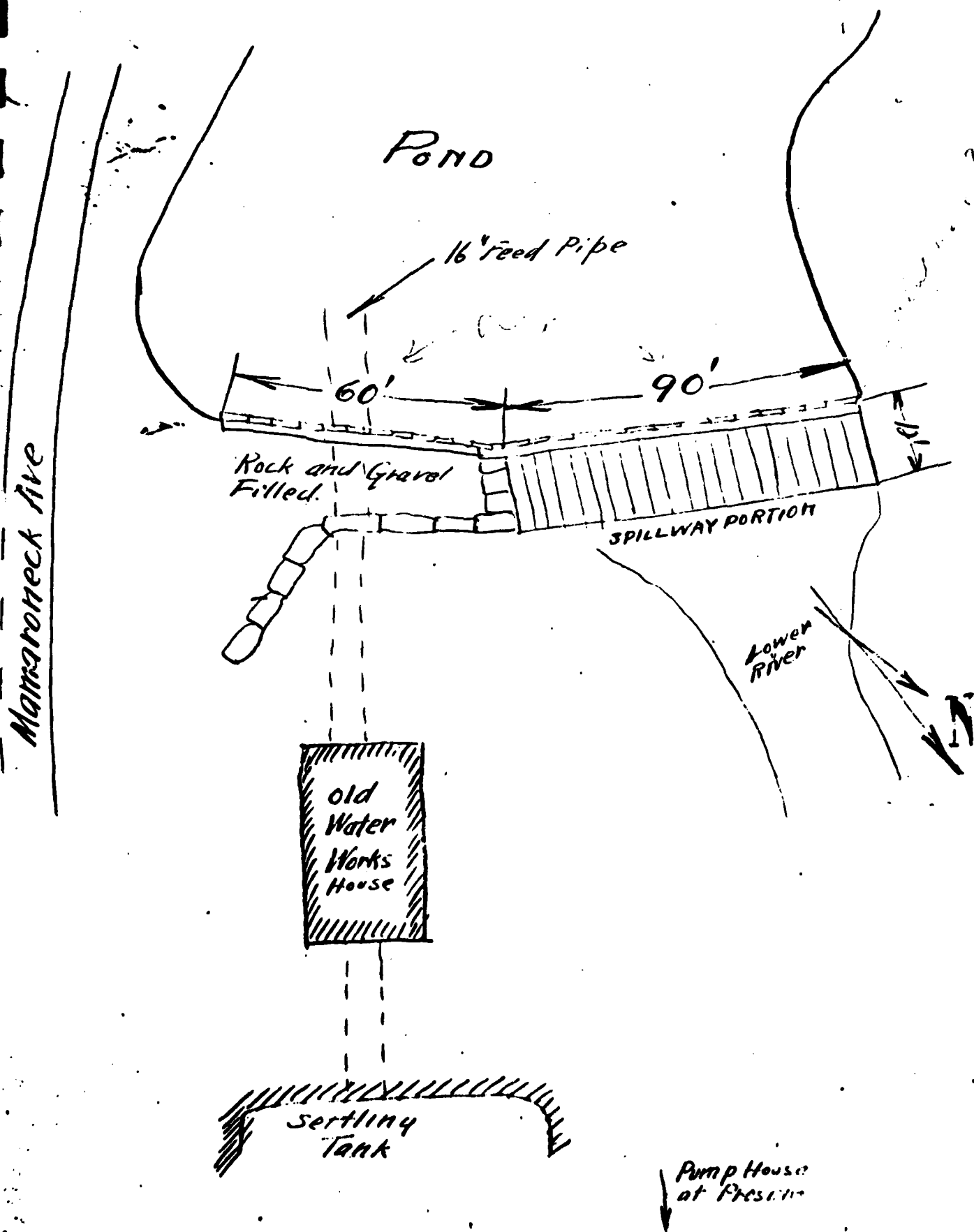
Bottom is width resulting
from a slope of 1' in 9" Bed?



Slopes to River
Level.

All in good condition as it was
repaired last year. Sections all $\perp$ to
River.

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



The total length of this dam is 160 feet. The spillway or waste-weir portion, is about 90 feet long, and the crest of the spillway is about Three feet below the top of the dam.

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

16" pipe to settling basin

At the time of this inspection the water level above the dam was 0 ft. .5 in.

~~below~~
above the crest of the spillway.

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

This dam seems in good condition throughout as it was almost entirely rebuilt last year.

Reported by

L. O. Seymour
(Signature)

Wilcox, N. Y.
(Address - Street and number, P. O. Box or R. F. D., route)

(Name of place)

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

STATE OF NEW YORK
CONSERVATION COMMISSION
ALBANY

DAM REPORT

Feb 13th, 1913
(Date)

CONSERVATION COMMISSION,

DIVISION OF INLAND WATERS.

GENTLEMEN:

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

This dam is situated upon the Mamaronock River
(Give name of stream)
in the Town of Mamaronock, Westchester County,
about 1/2 mile from the Village or City of Mamaronock
(State distance)

The distance up stream from the dam, to the Bridges crossing the river
(Up or down) (Give name of nearest important stream or of a bridge)
is about 750 feet
(State distance)

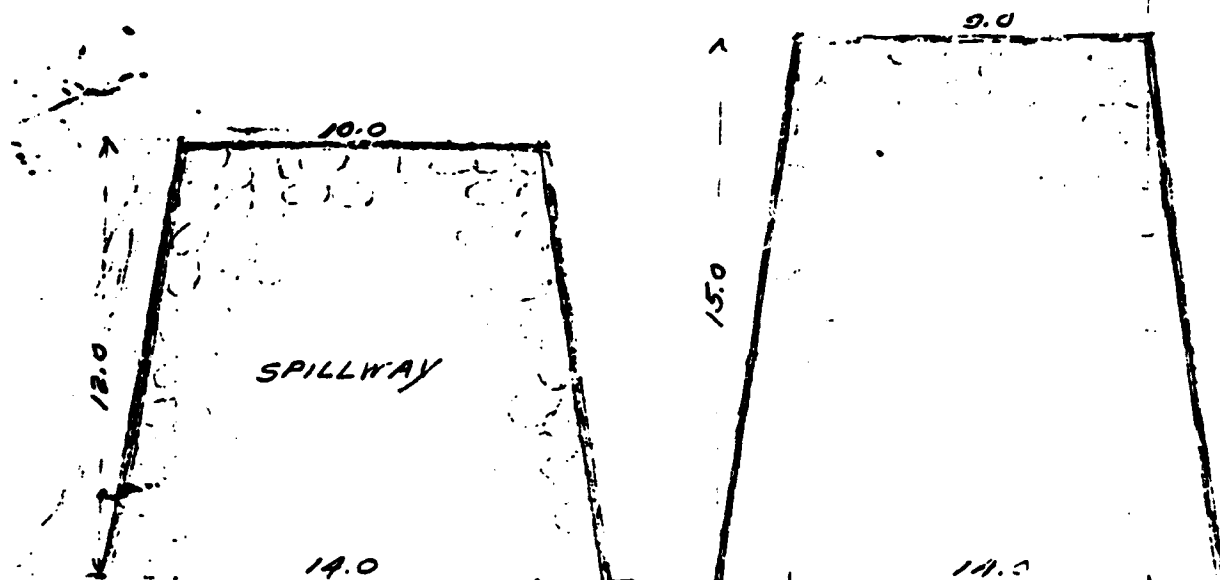
The dam is now owned by Suburban Water Co
(Give name if full)
over 100 years ago
and was built in or about the year _____, and was extensively repaired or reconstructed during the year 1912.

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

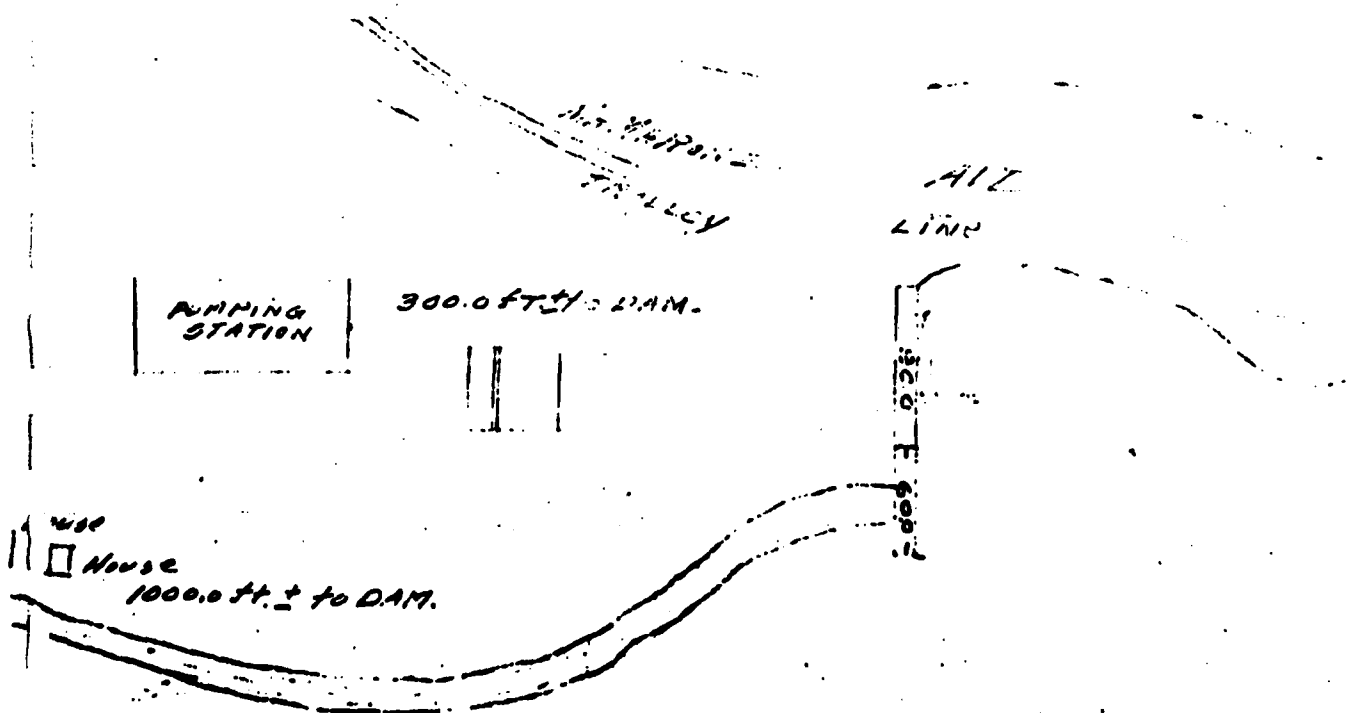
As nearly as I can learn, the character of the foundation bed under the spillway portion of the dam is Rock and under the remaining portions such foundation bed is Rock.

201 Mamaronock River

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



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



The total length of this dam is 150 feet feet. The spillway or waste-weir portion, is about 90 foot feet long, and the crest of the spillway is about 3 feet below the top of the dam.

The number, size and location of discharge pipes, waste pipes or gates which may be used for drawing off the water from behind the dam, are as follows: 2 10 inch

pipes 50 feet from road end of dam

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

The dam is in poor condition and has always
been so. But the risk of the spillway does away
with any danger of the dam being carried
away.

EEF

Reported by

Benjamin M. Bailey
(Signature)

White Plains R.F.D. Route 1

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

(Name of place)

(SEE OTHER SIDE)

DATE
FILME