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NATIONAL DAM SAFETY REPORT. ROBERT STREET DAM (NJ-00371), RARIT--ETC(U)
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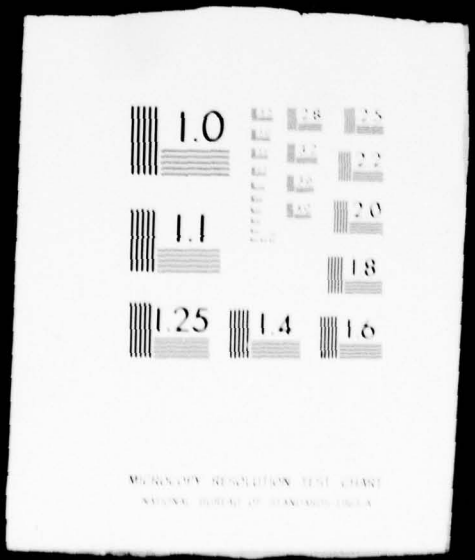

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ROBERT STREET DAM

NJ 00371

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

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DEPARTMENT OF THE ARMY
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April, 1979

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18. SUPPLEMENTARY NOTES

Copies are obtainable from National Technical Information Service, Springfield, Virginia, 22151.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Dams	Structural Analysis	Robert Street Dam , N.J.
Embankments	Safety	
Riprap	Visual Inspection	
Spillway	National Dam Safety Act Report	

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.

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IN REPLY REFER TO

NAPEN-D

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, New Jersey 08621

2 MAY 1979

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Robert Street Dam in Somerset County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Robert Street Dam, initially listed as a high hazard potential structure but reduced to a low hazard potential structure as a result of this inspection, is judged to be in good overall condition. However, the spillway is considered inadequate, as 12 percent of the 100 year design flood would overtop the dam. The low hazard potential classification means that in the event of failure of the dam, no loss of life and only minimal economic loss is expected. For the same reasons no further studies or increase of spillway capacity are recommended. To assure the continued functioning of the dam and its impoundment, the following remedial actions could be undertaken by the owner:

a. Riprap or other suitable slope protection should be placed on the river bank immediately up and downstream from the wing walls.

b. The wing wall tie to the existing overbank abutments should be studied and modified to prevent failure of the earth embankment adjacent to the wing walls.

c. If water is to continue to be routed through the Dead River, the deflection boom should be rehabilitated and the adjacent breach through the bank repaired.

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NAPEN-D
Honorable Brendan T. Byrne

d. Trees along the shore tilted steeply towards the reservoir should be removed as soon as possible.

e. A program of annual inspection and timely maintenance of the dam and appurtenant structures should be initiated.

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congresswoman Millicent Fenwick of the Fifth District. Under the provisions of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a resonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Safety Program will be the implementation of the recomendations made as a result of the inspection. We accordingly request that we be advised of proposed action taken by the State to implement our recommendations.

Sincerely,

James G. Ton

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

1 Incl
As stated

Copies furnished:
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Division of Water Resources
N. J. Dept of Environmental Protection
P. O. Box CN029
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ROBERT STREET DAM (NJ00371)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 5 and 21 December 1978 by Jenny Engineering Inc. under contract to the State of New Jersey. The state, under agreement with the U. S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

Robert Street Dam, initially listed as a high hazard potential structure but reduced to a low hazard potential structure as a result of this inspection, is judged to be in good overall condition. However, the spillway is considered inadequate, as 12 percent of the 100 year design flood would overtop the dam. The low hazard potential classification means that in the event of failure of the dam, no loss of life and only minimal economic loss is expected. For the same reasons no further studies or increase of spillway capacity are recommended. To assure the continued functioning of the dam and its impoundment, the following remedial actions could be undertaken by the owner:

a. Riprap or other suitable slope protection should be placed on the river bank immediately up and downstream from the wing walls.

b. The wing wall tie to the existing overbank abutments should be studied and modified to prevent failure of the earth embankment adjacent to the wing walls.

c. If water is to continue to be routed through the Dead River, the deflection boom should be rehabilitated and the adjacent breach through the bank repaired.

d. Trees along the shore tilted steeply towards the reservoir should be removed as soon as possible.

e. A program of annual inspection and timely maintenance of the dam and appurtenant structures should be initiated.

APPROVED: James G. Ton

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

DATE: 2 May 1979

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Robert Street Dam Federal I.D. No. NJ 00371 New Jersey I.D. No. 570
State Located:	New Jersey
County Located:	Somerset
Stream:	Raritan River
Dates of Inspection:	December 5 and 21, 1978

Brief Assessment of General Condition of Dam

The dam appears to be in good overall condition for its intended use based on visual inspection and review of available information. Erosion at the up and downstream end of wing walls was observed with incipient failure cracks at the upstream end of the left wing wall. There is a continuing problem of erosion of the earth abutments up and downstream of the wing walls.

The spillway is inadequate, as 12% of the Spillway Design Flood would overtop the dam, however this has an insignificant effect on the potential hazard to loss of life or property damage downstream. Therefore, the dam warrants a low potential hazard classification.

An upstream diversion structure into Dead River is blocked with sediments and debris and is inoperable. Water presently enters the Dead River via a breach adjacent to an abutment of the deflection boom.

Recommendations and the urgency of their implementation are as follows:

1. Riprap or other suitable slope protection should be placed on the river bank immediately up and downstream from the wing walls as soon as possible.

2. The wing wall tie to existing overbank abutments needs study and modification to prevent failure of earth embankment adjacent to the wing walls.

3. If water is to continue to be routed through the Dead River, the deflection boom should be rehabilitated and the adjacent breach through the bank repaired. After completion of this work, a regular program of inspection and maintenance should be initiated.

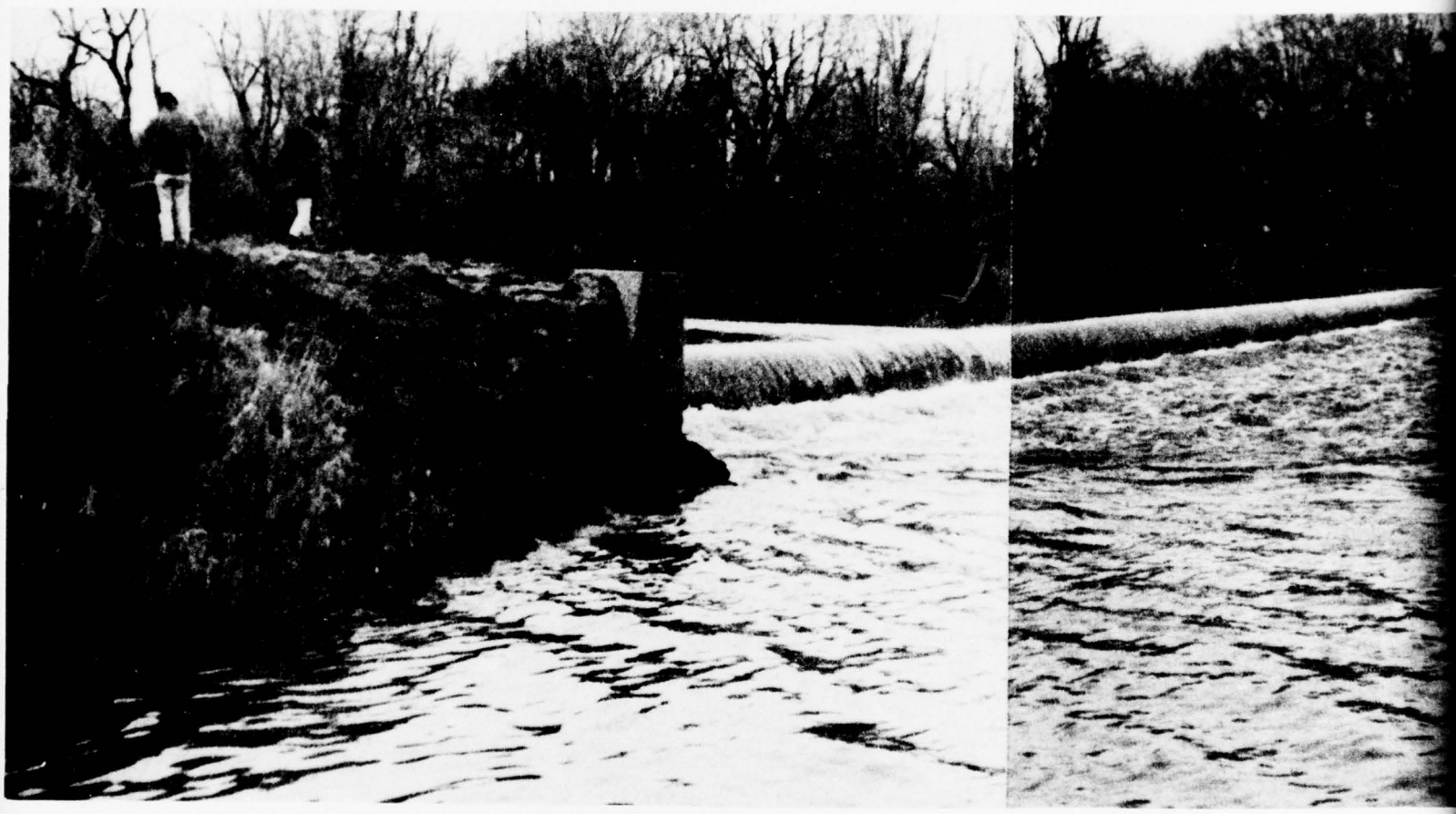
4. Trees along the shore tilting steeply towards the reservoir should be removed as soon as possible.

5. A program of annual inspection and timely maintenance of the dam should be initiated in the near future.

Frank L. Panuzio

Frank L. Panuzio, P.E.
Project Manager

Robert J. Jenny, P.E.
Project Director
New Jersey License No. 9878



ROBERT STREET DAM

View of dam from right abutment looking upstream
(Dec. 5, 1978)

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ent looking upstream.
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TABLE OF CONTENTS

		Page
BRIEF ASSESSMENT OF GENERAL CONDITION OF DAM		i
OVERVIEW PHOTOGRAPH OF DAM		
PREFACE		iii
SECTION 1	PROJECT INFORMATION	
	1.1 General	1
	1.2 Description of Project	1
	1.3 Pertinent Data	4
SECTION 2	ENGINEERING DATA	
	2.1 Design	6
	2.2 Construction	8
	2.3 Operations	8
	2.4 Evaluation	9
SECTION 3	VISUAL INSPECTION	
	3.1 Findings	10
SECTION 4	OPERATION PROCEDURES	
	4.1 Procedures	13
	4.2 Maintenance of Dam	13
	4.3 Maintenance of Operating Facilities	13
	4.4 Description of Warning System	13
	4.5 Evaluation of Operational Adequacy	13
SECTION 5	HYDRAULIC/HYDROLOGIC	
	5.1 Evaluation of Features	14
SECTION 6	STRUCTURAL STABILITY	
	6.1 Evaluation of Structural	18
	Stability	19

TABLE OF CONTENTS

(Continued)

		Page
SECTION 7	ASSESSMENT/REMEDIAL MEASURES	
7.1	Dam Assessment	20
7.2	Remedial Measures	20

PLATES

1. Vicinity Map
2. General Plan
3. Walls and Bar List
4. Wall Details and Miscellaneous Details
5. Dead River Deflection Boom
6. General Plan Based on Visual Inspection

APPENDICES

APPENDIX A - Check List - Visual Observations

Check List - Engineering, Construction Maintenance Data

APPPENDIX B - Photographs

1. Crest of Dam
2. Downstream Left Abutment of Dam
3. View of Dead River deflection boom
4. View of Reservoir
5. Downstream Channel

APPENDIX C - Regional Geology - Piedmont Lowlands

APPENDIX D - Hydrologic and Hydraulic Computations

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D. C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. 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 continued care and inspection can there be any chance that unsafe conditions be detected.

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. The test flood provides a measure of relative spillway capacity and serves as an aide 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

ROBERT STREET DAM
Federal I.D. No. NJ 00371
New Jersey I.D. No. 570

SECTION 1: PROJECT INFORMATION

1.1 General

a. Authority

The National Dam Inspection Act, Public Law 92-367, 1972, provides for the National Inventory and Inspection Program by the U. S. Army Corps of Engineers. This report has been prepared in accordance with this authority, through contract between the State of New Jersey and Jenny-Leedshill Engineers. The State of New Jersey has also entered into an agreement with the U. S. Army Engineer District, Philadelphia, to have this work performed.

b. Purpose of Inspection

The purpose of this inspection was to evaluate the general structural integrity and hydraulic adequacy of the dam, and to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project

a. Description of Dam and Appurtenances

Robert Street Dam is a weir extending entirely across the Raritan River and tied to concrete wing walls parallel to the river banks. The as built plans of the reconstructed dam indicate that the original dam was a concrete gravity structure with a concrete apron extending approximately 8 feet downstream from the toe of the dam. The present

dam is a steel sheet pile, stone fill and reinforced concrete structure which includes the original dam. An 8 inch thick reinforced concrete slab covers the entire crest of the dam and is connected to a concrete ogee section on the downstream face of the dam. Stone fill, a minimum of one foot thick, was placed beneath the ogee spillway and stone fill, 2 feet thick, extends 15 feet upstream and downstream from the dam. Reinforced concrete wing walls tie the structure into both abutments of the dam and a concrete coating has been placed on top of the embankments adjacent to the wing walls. Steel sheet piling was installed along the upstream sections of the wing wall foundations to rock.

Robert Street Dam raises the level of the Raritan River so that water flows into an old meander called Dead River, the entrance of which is located on the south bank of the Raritan River approximately 400 feet upstream from the dam. A deflection boom at the inlet to Dead River is blocked by sediments and debris and water from the Raritan River now enters the Dead River through a channel eroded through the east (downstream) abutment of the deflection boom.

b. Location

Robert Street Dam is located in northcentral New Jersey across the flood way of the Raritan River approximately 1 mile southwest of the town of Raritan in Somerset County, New Jersey. The regional vicinity plan is presented on Plate 1.

c. Size Classification

The storage capacity of Robert Street Dam is estimated to be 580 acre-feet when the reservoir surface is at the top of the wing walls which is considered the top of dam and the height of the dam is 11.5 feet; therefore, the size classification of the dam is small in accordance with

the U. S. Corps of Engineers' Guidelines for size

The criteria for size classification of dams are set forth in the Corps' Guidelines. A small size dam is one in which the reservoir capacity is greater than or equal to 50 acre-feet and less than 1000 acre feet, and/or the maximum height is greater than or equal to 25 feet and less than 40 feet.

d. Hazard Classification

The dam is contained within the banks of the river channel and its spillway crest elevation is only 4.5 feet below the top of the channel banks. In the event of failure of the dam there would be an insignificant in-increase in the potential hazard to loss of life or property damage in the downstream area. The dam, therefore, has a low hazard potential classification in accordance with the Corps' guidelines.

e. Ownership

The dam is owned by the Somerset County Park Commission, County Administrative Building, P.O. Box 837, Somerville, New Jersey 08876.

f. Purpose of Dam

The original dam was constructed to raise the level of the Raritan River to divert water into the Dead River where it was used for irrigation. The State Report on Dam Application No. 570 filed June 8, 1964 indicates that the purpose of the reconstructed dam is to provide recreational boating for Duke Island Community Park.

g. Design and Construction History

No details are available regarding the design and construction history of the original dam, which was reportedly built by the Duke Estate. The dam was given to the Somerset County Park Commission by the Duke Estate

in about 1962 and the dam was reconstructed and a deflection boom constructed at the inlet to the Dead River during 1964.

h. Normal Operational Procedures

The spillway, is a flat crest ogee weir which extends across the entire width of the Raritan River. The discharge over the spillway is controlled only by the level of the Raritan River upstream from the dam and the relatively small amount of water which flows unregulated into the Dead River.

1.3 Pertinent Data

a. Drainage Area	480 sq. mi.
b. Discharge at Damsite	
· Maximum known flood at damsite	36,100 cfs, Sept. 22, 1938, Station No. 01400500, Raritan River at Manville
· Ungated spillway and Dead River bypass (EL. 44')	8670 cfs.
. SDF (100 yr. freq. EL. 54.0)	75,200 cfs.
c. Elevation (ft. above MSL)	
· Spillway crest	39.5
· Streambed at centerline of dam	32.5 (Approx.)
· Top of Dam	44
d. Reservoir	
· Length of maximum pool (Elev. 44)	10,800 ft.
· Length of recreation pool (Elev. 39.5)	5400 ft.

e.	Storage (acre-feet)	
	. Recreation pool (Elev. 39.5)	230
	. Top of Dam (Elev. 44)	580
f.	Reservoir Surface (acres)	
	. Spillway crest (Elev. 39.5)	57.5
	. Top Dam (Elev. 44)	90
g.	Dam	
	. Type	Stone fill sheet pile cofferdam capped by reinforced concrete
	. Length	259 ft.
	. Height	11.5 ft.
	. Top Width	19.17 ft.
	. Side Slopes - upstream	Vertical
	- downstream	5 ft. ogee section
h.	Spillway	
	. Type	Flat crest ogee
	. Length of weir	256 ft.
	. Crest elevation	39.5 ft.
	. U/S Channel	Stone fill 2 ft. thick, extending 15 ft. U/S from spillway, fillet slope 1V:1.33H
	. D/S Channel	Stone fill 2 ft. thick, extending 15 ft. D/S from spillway
i.	Regulating Outlets	Dead River bypass upstream

SECTION 2: ENGINEERING DATA

2.1 Design

a. Geologic Conditions

This small weir type dam is located totally within the flood plain of the Raritan River as it traverses the southern portion of the Piedmont Lowlands physiographic province. The regional geology of this province is discussed in detail in Appendix C to this report.

The surficial soils of this site are composed wholly of recent alluvium deposited by the river. Silts and fine sands are the primary soil types with higher percentage of organic materials in the swamp areas on both abutments. Coarser soil materials can probably be expected at depth, reflecting the Raritan River history as a major glacial outwash river. This dam is situated south of the Wisconsin Age glacial moraine.

According to available boring logs and geologic information, the Brunswick formation shale underlies this site at depths on the order of 10 to 15 feet. No bedrock exposures were seen or expected in the immediate dam site area.

The dam site lies within Seismic Zone 1 and only minor damage to structures in the area should be expected from distant earthquakes.

b. Design History

There is no available information regarding the design of the original dam, which was reportedly constructed by the Duke Estate. The section of the original dam shown on the plans for reconstruction of the dam indicate that it was designed as a concrete gravity dam with a concrete apron extending downstream from the toe of

the dam to prevent erosion from water spilling over the dam. The crest of the original dam was at elevation 38.75 feet and was cut to elevation 38.3 feet during reconstruction.

In 1964 the dam was reconstructed and a deflection boom installed across the inlet to Dead River. Structural details for the reconstruction of Robert Street Dam and the Dead River deflection boom are shown on Sheets 2 through 5 prepared by Goodkind and O'Dea, Consulting Engineers, included as Plates 2 through 5 of this report. Specifications for the reconstruction of the dam are also available.

Logs of borings numbered 4 through 12 are available and the plan of dam (Plate2) indicates that borings numbered 6 through 10 are in the vicinity of the dam. These borings were used to determine the depth to rock shown on Plates 2 through 4 which was used in the design of the dam.

Steel sheet piling used in the reconstruction of the dam and the foundation of the upstream section of the wing walls was specified to be driven a minimum of 2 feet into the rock stratum underlying the site. Two parallel lines of sheet piling were driven along the upstream and downstream side of the dam and were tied together with 1-inch diameter steel rods.

The stone fill placed in the dam between the rows of steel sheet piling was specified to be placed by hand or dumped by truck, shovel or bucket, with care taken to prevent voids in the fill. All open spaces between the stones in the upper two feet of fill were to be filled with spalls and firmly rammed in place.

A select stone fill topping appproximately 4 inches thick was specified to be placed and compacted on top of the stone fill and immediately beneath the reinforced concrete slab at the crest of the dam. Specifications were also given for concrete mixture, placement

and reinforcement.

2.2 Construction

No information regarding the construction of the original dam is available. Plans and specifications for the reconstruction of the dam, prepared by Goodkind and O'Dea, Consulting Engineers, are available.

The width of the rebuilt dam was originally designed to be 17 feet 6 inches; however, the dam was constructed 19 feet 2 inches wide as a result of field investigations indicating that the existing concrete apron extended further downstream than was initially assumed. Other construction modifications included placement of a 1-foot thick layer of stone fill under the concrete spillway apron and the use of stone fill in place of riprap downstream from spillway (Plate 2).

The as-built penetration of the steel sheet piling used in the main body of the dam are shown on Plate 2.

A total of six monthly progress reports were submitted to the New Jersey Department of Conservation and Economic Development from the engineers during the reconstruction of Robert Street Dam. These reports indicated that the dam was constructed as shown on the plans.

The abutments behind both wing walls were severely eroded during floods resulting from Hurricane Doria in 1971. In 1972 the abutments were refilled and compacted and a rough concrete coating was placed on the surface to prevent future erosion (Plate 6).

2.3 Operations

The dam is controlled only by the stage of the Raritan River upstream from the dam and the amount of water which flows unregulated into the Dead River. Therefore, the reservoir operates without regulation. There are no monitoring devices on the dam.

2.4 Evaluation

a. Availability

Available data on the original dam are limited to delineation of its location on the reconstruction drawings (Plate 2) which also indicate that it was a concrete encased, sheet pile cofferdam.

Detailed drawings, including reinforcement details, and construction specifications are available for the existing dam.

b. Adequacy

The available data are adequate to evaluate the structural stability of the dam. The available hydrologic and hydraulic data were also adequate to perform the evaluation described in Section 5.

c. Validity

Visual inspection of the dam indicates that the dam was constructed generally as shown on the available drawings. The upstream diversion structure blocked by sediment and debris and is no longer operable due to lack of maintenance.

SECTION 3: VISUAL INSPECTION

3.1 Findings

a. General

The visual inspection of Robert Street Dam was made on December 5 and 21, 1978. The water surface at the time of the inspection was approximately 10 inches above the crest of the spillway and water was spilling over the entire length of the spillway; therefore, it was not possible to inspect the main structure of the dam or possible erosion at the downstream end of the spillway.

The visual inspection did not reveal any critical signs of distress in the wing walls, but incipient failure cracks were observed in the bank of the upstream of the left wing wall. The uniform flow of water observed passing over the spillway crest indicated that there was no major distortion of the spillway.

The deflection boom located upstream from the dam has been rendered inoperable due to significant sedimentation and collection of debris. Water was entering the Dead River via a breach adjacent to the east (downstream) abutment of the deflection boom.

Detailed inspection was made of the visible sections of the dam, deflection boom, reservoir area and downstream channel. Descriptions of the findings of these inspections are summarized in the paragraphs which follow. The checklist of visual inspection items is included in Appendix A. Geologic and foundation conditions observed at the time of inspection are noted in greater detail in Section 2.1-a.

b. Dam

The dam, except for the wing walls, was submerged at the time of the inspection, therefore, it was not possible to observe the principal structure. However, the

uniform flow of water over the spillway indicated that there are no major failures or distortions in the spillway (Photo 1).

Concrete wing walls tie to the spillway at the abutments of the dam. Vertical cracks with minor displacement were noted in the north wing wall near the downstream crest of the spillway; however, they do not appear to affect the structural integrity of the wall. There were not signs of significant settlement or misalignment at the wing walls. The foundations of the wing walls were submerged and could not be inspected. Weep holes are present in both wing walls, but no flow through them was observed.

The embankments behind the wing walls have a rough concrete surface, as shown in Plate 6 and Photo 2. There was no noticeable erosion of the embankments behind the wing walls. The embankment surfacing just upstream of the left wing wall shows incipient failure cracks, also the present configuration of the extent of the river bank, upstream and downstream of the wing walls (Plate 6), indicates that the river bank and riprap, as shown in Plate 2, has been eroded downstream of the wing walls.

c. Appurtenant Structures

Spillway and Outlets

The dam is considered to be the spillway and wing walls and is as described above.

There is no additional spillway or outlet works.

Dead River Deflection Boom

The deflection boom placed at the inlet to Dead River is blocked by sediments and debris. A channel has been eroded through the south bank of the Raritan River immediately downstream from the deflection boom through which water flows into the Dead River (Photo 3). The deflection boom was not accessible for close inspection; therefore, the condition of the concrete abutments could

original positions. The upstream section of the deflection boom appears to have been removed.

Reservoir Area

The reservoir area immediately behind the dam is poorly defined because of the small impoundment relative to the large river flow (Photo 4). The water was brownish in color indicating a relatively high sediment load. Some brush was observed caught on the upstream edge of the dam near the south (right) abutment (Photo 1). There appears to be considerable debris potential.

The slopes of the overbank channel are nearly flat and covered with a moderate to heavy growth of trees and brush. Several of the trees along the rim of the overbank channel are leaning towards the water, as shown in Photo 4, apparently due to erosion at the bank. One house and an automobile junk yard were observed on the north (left) bank approximately 1000 feet upstream from the dam.

Downstream Channel

Water flowing over the dam continues in the natural Raritan River channel. The slopes of the downstream overbank channel are very similar to those upstream of the dam, i.e. very gently sloping with a moderate to heavy growth of trees and brush (Photo 5). Only a very few trees at the edge of the overbank were observed leaning towards the river, and very minor debris along the banks was noted.

SECTION 4: OPERATIONAL PROCEDURES

4.1 Procedures

The reservoir level is determined by unregulated discharge over the spillway and flow into the Dead River. There are no procedures for operating the dam or reservoir level.

4.2 Maintenance of the Dam

The dam is maintained by the Somerset County Park Commission. The available data indicate that annual inspections of the dam were performed in 1967, 1968, 1969, 1971, and 1972. At present there is no program of regular inspection or maintenance of the dam.

In 1972, repair of damage resulting from floods during Hurricane Doria in 1971 was performed by the Somerset County Park Commission as discussed in Section 2.3.

4.3 Maintenance of Operating Facilities

There are no operating facilities directly associated with the dam.

The Dead River deflection boom located upstream from the dam has not been maintained and is presently inoperable.

4.4 Description of Warning Systems

There is no warning system at Robert Street Dam.

4.5 Evaluation of Operational Adequacy

The unregulated operation for which Robert Street Dam was designed appears to be adequate. Recommendations to reduce possible damage to the dam and rehabilitate the Dead River deflection boom are discussed in Section 7.

SECTION 5: HYDRAULICS/HYDROLOGY

Evaluation of Features

a. Design Data

Robert Street Dam is a run-of-the-river dam constructed to impound an upstream recreation pool and to bypass flows through an old channel meander for irrigation purposes. The overflow section of the dam is 7 feet high and the storage capacity at the top of the wing walls is 560 acre-feet. In accordance with the Corps', "Recommended Guidelines for Safety Inspection of Dams", the dam is classified as small in size. The structure is contained within the banks of the river channel and its crest elevation is 4.5 feet below the top of the channel banks. In the event of failure or misoperation of the dam there would be no increase in the hazard to potential loss of life or property damage in the downstream area. In accordance with Corps' guidelines, the structure has a low hazard potential classification. The Spillway Design Flood (SDF) for Robert Street Dam has been chosen as the 100-year frequency flood.

The drainage basin area of Robert Street Dam is variously reported in the State files as 480 and 475 square miles. A drainage basin area of 480 square miles was used in this hydrology analysis. The drainage basin is delineated on a U.S.G.S. topographic map and is presented on Plate D-1, Appendix D.

The drainage basin is approximately rectangular in shape, 36 miles long in the northeast-southwest direction and 16 miles wide. Elevations range from about 100 feet mean sea level along the perimiter of the drainage basin to less than 100 feet in the valley floor. U.S.G.S. maps indicate the basin topography

about 100 feet mean sea level along the perimeter of the drainage basin to less than 100 feet in the valley floor. U.S.G.S. maps indicate the basin topography varies from flat farmlands to rolling foothills.

Approximately 30 percent of the drainage basin consists of woods and brushwood. Although there are many small communities in the basin only a minor percentage of the basin area is developed.

Based on topographic and land use characteristics of the basin, an initial infiltration loss of 1.5 inches per hour was used in the hydrology analysis of the dam.

Data available from State files and U.S.G.S. maps indicate there are three major reservoirs in the Robert Street dam drainage basin. These reservoirs are: Lake Solitude, Round Valley Reservoir, and Spruce Run Reservoir. The combined drainage area of these three reservoirs is approximately 120 square miles, or about 25 percent of the Robert Street Dam drainage basin. As instructed by the Corps of Engineers, the effect of these reservoirs on the hydrology at Robert Street Dam is ignored in this analysis.

The hydraulic and hydrologic features of the dam were evaluated using criteria set forth in the Corps of Engineers, "Recommended Guidelines for Safety Inspection of Dams", and additional guidance and criteria provided by the Philadelphia District, Corps of Engineers. The 100-year frequency precipitation was calculated using the U.S. Weather Bureau's Technical Paper No. 40, entitled, "Rainfall Frequency Atlas of the United States for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years."

The SDF was calculated using the Corps' computer program HEC-1, Dam Break Version. In computing the SDF, a 3-hour unit hydrograph, supplied by the Corps, was used.

Using the excess rainfall and the unit hydrograph, the program computed the peak inflow discharges of the 5 percent, 25 percent, 50 percent and 100 percent SDF. These discharges are approximately 3810 cfs, 19050 cfs, 38100 cfs and 76200 cfs, respectively.

The various percent SDF inflow hydrographs were routed through the reservoir using the Modified Puls Method by the HEC-1 program. The peak outflow discharges of the 5 percent, 25 percent, 50 percent and 100 percent SDF were calculated to be approximately 3750 cfs, 18830 cfs, 37800 cfs and 75200 cfs, respectively. A plot of percent SDF versus peak outflow discharge is presented as Plate D-2 in Appendix D.

The stage discharge rating curve used in the flood routings was the combined discharges of flow through the bypass channel, flow over the dam crest and flood plain flow. The stage-discharge for the bypass channel and flood plain flow was developed using the Manning Equation and hydraulic parameter estimated from U.S.G.S. maps and field observations. Flow over the dam crest was assumed to be uniform weir flow. A weir coefficient of 2.6 was reported in the State files for this structure and was used in calculating the stage-discharge relationship. Flows over the dam crest and through the bypass channel can pass approximately 12 percent of the SDF without overtopping the channel banks.

The reservoir stage capacity curve was determined from U.S.G.S. 7.5-minute topographic maps and data obtained from State files. This stage-capacity curve

was extended above the top of dam to include surcharge storage during peak flood discharges.

The stage-storage and the spillway and overtop stage-discharge curves are presented in Appendix D as Plates D-3 and D-4, respectively.

There is no outlet for Robert Street Dam and consequently the reservoir cannot be drained.

b. Experience Data

Records of reservoir levels are not maintained for this site. It is reported that flows in the Raritan River frequently cause the dam to be overtopped.

c. Visual Observations

It was observed that the intake to the bypass channel had been damaged by previous floods. The original intake channel appeared to be plugged by debris and sediment deposits and, just adjacent, a new smaller intake channel was developed by erosion. The capacity of the existing intake channel may limit the capacity of the bypass and, therefore, may result in Robert Street Dam being overtopped at lower discharge in Raritan River.

d. Overtopping Potential

Robert Street Dam limits the capacity of the main channel of Raritan River at the dam site and all floods greater than approximately 12 percent of the SDF, approximately 9000 cfs, will overtop the channel banks.

The existence of Robert Street Dam does not significantly change the downstream flooding characteristics during the SDF. Failure of the dam due to overtopping during the SDF would also not significantly effect downstream flooding. Thus, in accordance with the Corps' guidelines, the spillway should be classified as Inadequate and not Seriously Inadequate.

SECTION 6: STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

The spillway was submerged during inspection and could not be observed. The uniform flow of water over the dam, however, indicates that there are no major failures or distortions of the spillway crest. However, it was not possible to observe erosion at the downstream end of the dam, if any.

Visual inspection indicates that the wing walls are in satisfactory condition. Some minor cracking of the left (north) wing wall was observed but it does not appear to be detrimental to the structural stability of the wall.

The deflection boom at the inlet to Dead River, upstream from the dam, is blocked by debris and sediments and is inoperable.

b. Design and Construction Data

The available design and construction data indicate that the dam is adequately designed for its intended purpose except for the tie into the earth abutments.

c. Operating Records

The dam and reservoir are unregulated. Records of reservoir levels and discharge over the dam are not available. There are no instrumentation or monitoring devices on the dam.

d. Post-Construction Changes

The original dam was essentially totally reconstructed to form the present dam as discussed in Section 2. The embankments adjoining the present dam were severely eroded

in 1971 and consequently refilled and covered with a rough concrete surface in 1972 to repair the damage and resist future erosion.

d. Seismic Stability

Since the area lies within Seismic Zone 1, only minor damage may be expected from distant earthquakes. In general, projects located within Seismic Zone 1 may be assumed to present no hazard from earthquakes, provided static stability conditions are satisfactory and conventional safety margins exist. However, static stability analyses are not presently available.

No active faults are known to exist in the immediate vicinity nor surrounding area of the dam.

SECTION 7: ASSESSMENT, RECOMMENDATIONS, PROPOSED REMEDIAL MEASURES

7.1 Dam Assessment

a. Safety

The Robert Street Dam has an insignificant effect on flooding caused by the Spillway Design Flood (SDF). Therefore, damage or even destruction of the dam would not significantly influence the safety of persons or property downstream from the dam during flooding.

Water was flowing over the spillway and thus it could not be observed during the visual inspection; however, no signs of major distress were apparent. The concrete wing walls appear to be in satisfactory condition based on visual inspection. The embankment just upstream of the left wing wall shows incipient failure cracks.

b. Adequacy of Information

The available information and data are adequate to perform an evaluation of the dam's structural stability.

c. Urgency

The visual inspection revealed no apparent deficiencies that would imperil the short term integrity of the structure. In addition, the dam is considered to be 'low hazard'. Certain recommendations are suggested, however, the most urgent of which should be implemented soon.

d. Necessity for Additional Data/Evaluation

No additional data nor evaluations are considered necessary.

7.2 Remedial Measures

a. Alternatives

The visual inspection of the dam indicates that

erosion of the embankment immediately downstream from the wing walls has occurred since reconstruction of the dam in 1964. If erosion of the embankment continues, the wing walls may be undermined and suffer structural damage due to lack of foundation support. Therefore, it is recommended that riprap or other slope protection should be placed on the embankment downstream from the wing walls as soon as possible. In addition, consideration may also be given to angling the upstream and downstream ends of the wing wall into the bank, similar in configuration to the south wing wall and riprap protection, in order to further reduce potential erosion of the abutment and the embankments.

If water is to continue to be routed through the Dead River, it is recommended that the deflection boom be rehabilitated and the adjacent breach through the bank filled and compacted.

The trees along the rim of the reservoir which are tilting steeply towards the reservoir should be removed soon in order to avoid the accumulation of debris.

b. Operation and Maintenance Procedures

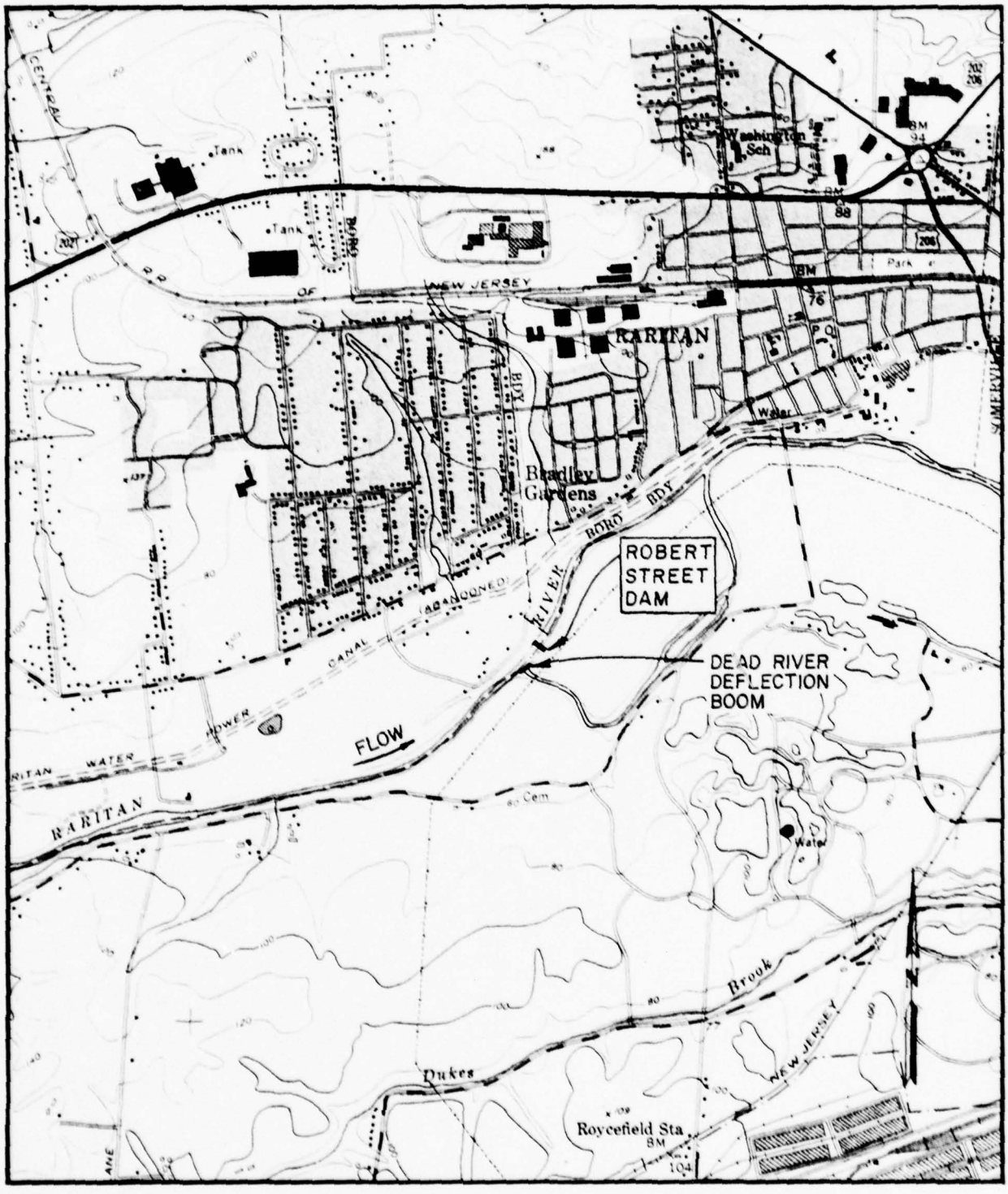
A program of annual inspections of the dam should be initiated by the owners, utilizing the standard visual check list in this report, preferably when the reservoir is sufficiently low to allow inspection of the main body of the dam. In addition, the dam should be inspected following any overtopping of the embankments into the overbank.

A permanent record should be kept of all maintenance and operating events of the dam and reservoir.

If the Dead River deflection boom and inlet are rehabilitated, a regular inspection and maintenance program for this structure should be initiated.

PLATES

PLATE 1



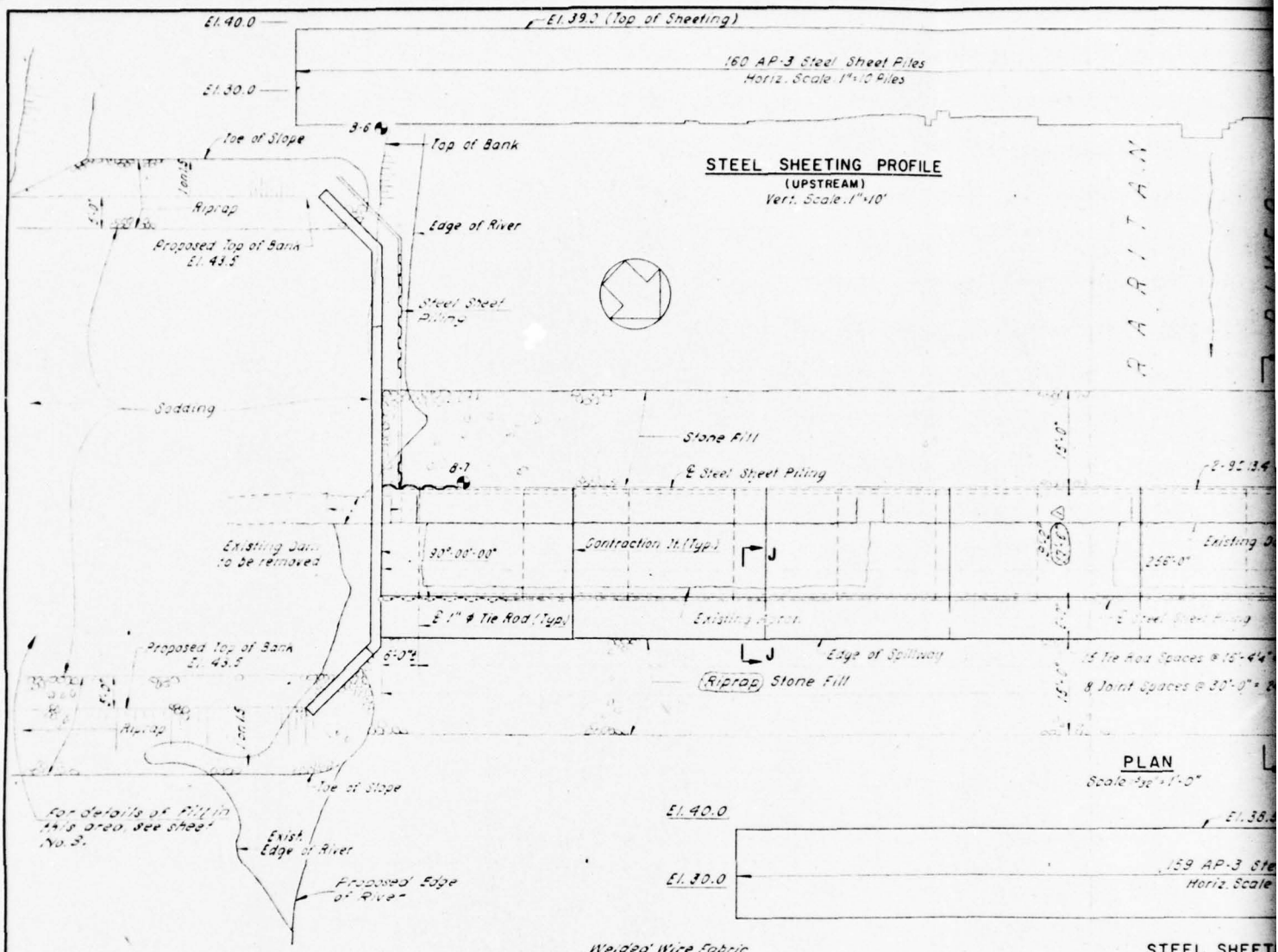
1000 0 1000 2000 3000 4000

SCALE IN FEET

AREA LOCATION

VICINITY MAP

JENNY - LEEDSHILL JANUARY 1979

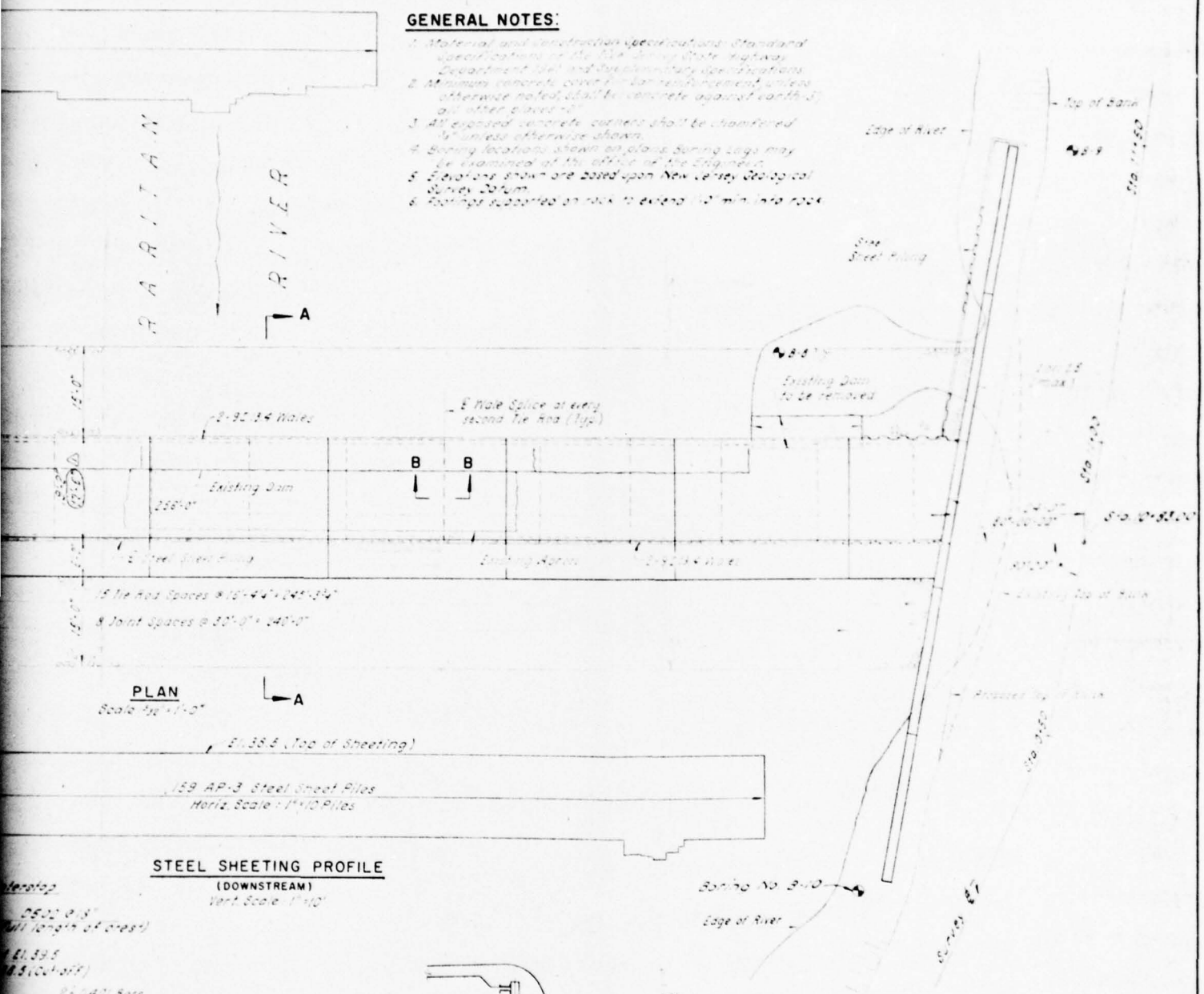


For details of fill in 14"ϕ Steel Pipe, see Sheet No. 3.

MADE BY R.T. Jones, A. Rolph
TRACED BY S. Fumanchew
CHECKED BY A. Pulliam Jr.
IN CHARGE OF S.T. Jones

GENERAL NOTES:

1. Material and construction specifications: Standard specifications of the New Jersey State Highway Department (ref. and supplementary descriptions otherwise noted) shall be complied with.
2. Minimum concrete cover for reinforcement unless otherwise noted, shall be: concrete against earth 3", all other places 2".
3. All exposed concrete corners shall be chamfered ¾" unless otherwise shown.
4. Boring locations shown on plans. Boring logs may be examined at the office of the Engineer.
5. Elevations shown are based upon New Jersey Geodetic Survey Datum.
6. Footings supported on rock to extend 12" min. into rock.



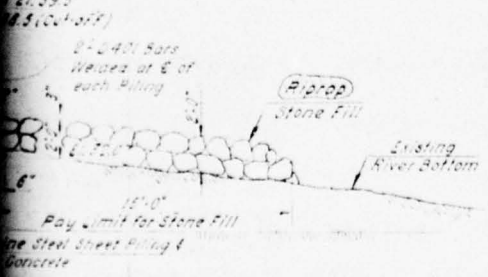
PLAN

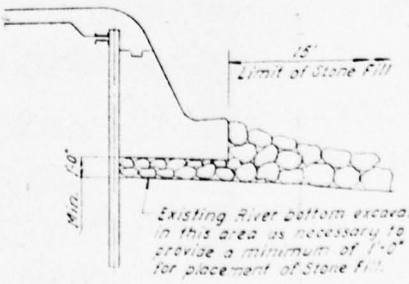
Scale: 1" = 1'-0"

STEEL SHEETING PROFILE

(DOWNSTREAM)

Vert. Scale: 1" = 10'





TYPICAL SPILLWAY SECTION

Scale: ¼" = 1'-0"

References:
1. For joint details in dam see sheet No. 4.
2. For sections B-B and C-C see sheet No. 4.

Note:
As Staked in Field 1965 B.M.T. Station 1000' Upstream from Survey Station 5+80.00 = Elev. 47.9

AS BUILT

SOMERSET COUNTY PARK COMMISSION
DUKE ISLAND COUNTY PARK

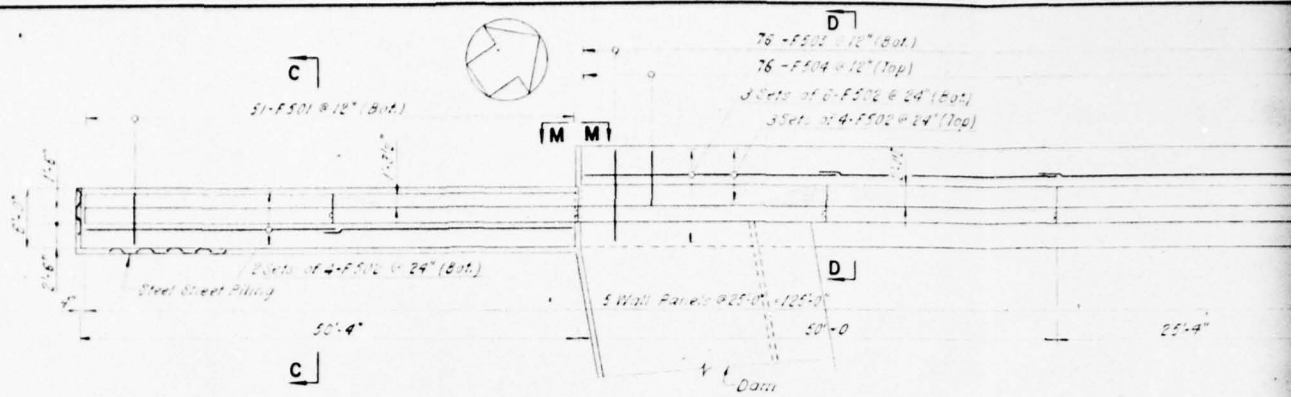
ROBERT STREET DAM

GENERAL PLAN

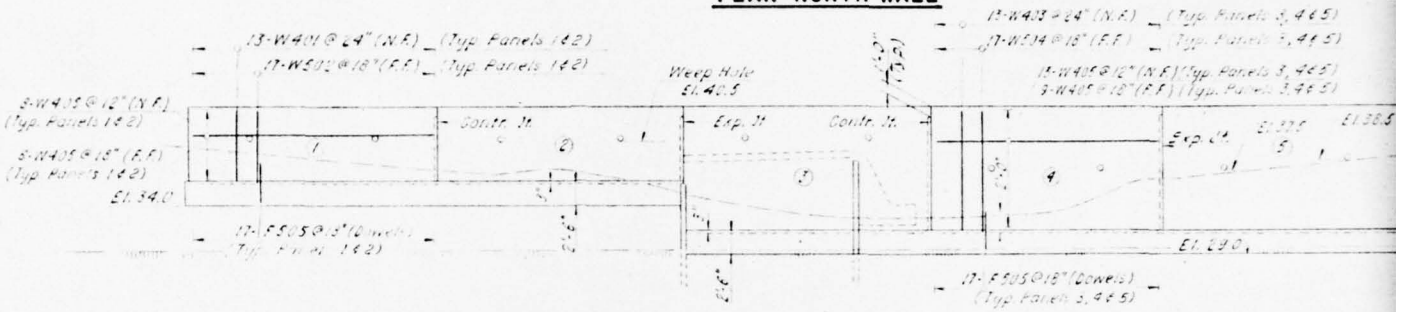
GOODKIND & O'DEA
CONSULTING ENGINEERS
MONTCLAIR, N.J.

NO	REVISION	DATE
	Dam Access	6-65

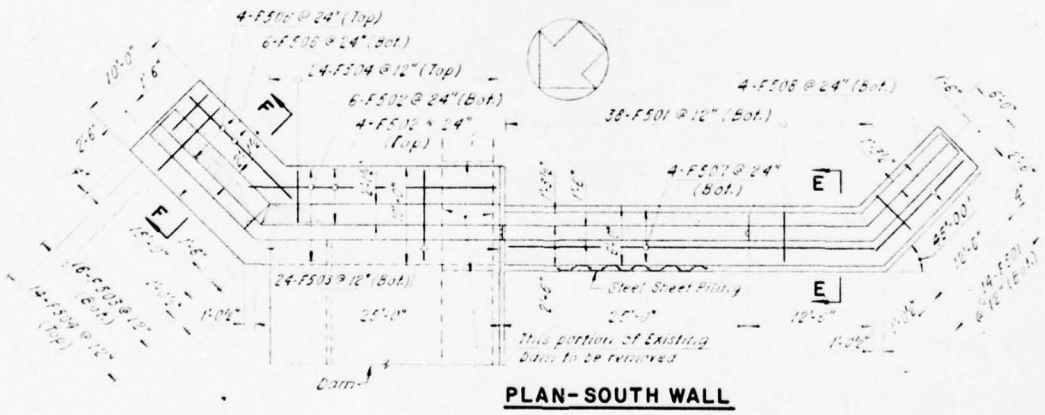
SCALE: As Noted | DATE: [illegible] | SHEET 2 OF 5



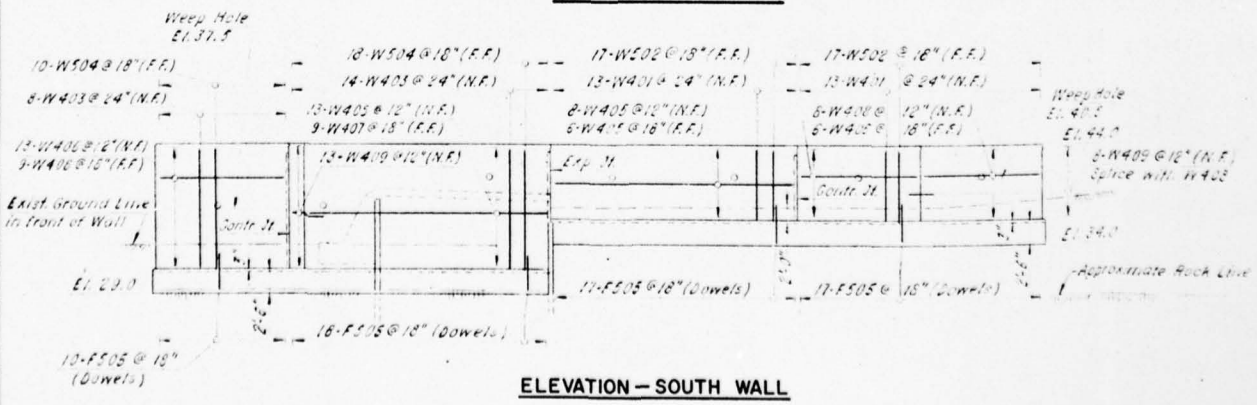
PLAN-NORTH WALL



ELEVATION—NORTH WALL



PLAN-SOUTH WALL



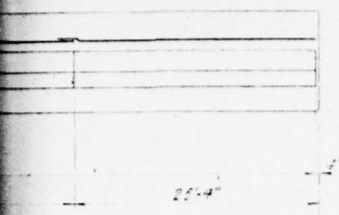
ELEVATION—SOUTH WALL

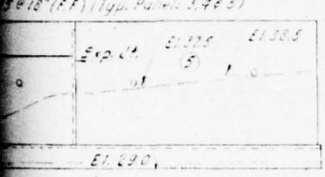
MADE BY A. Kulak
TRACED BY S. Rumsey
CHECKED BY A. Kulak
IN CHARGE OF S. Rumsey

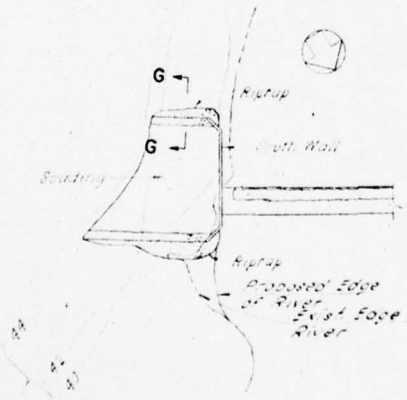
Note:
Place 4" ϕ weep holes in wall panel as shown in elevation. See Section D-D. Cost of weep holes and broken stone to be included in concrete item.

BAR LIST

MARK	SIZE	TYPE	LENGTH	N. WALL	S. WALL	TOTAL	REMARKS
FOOTING							
F3'1"	5	31	5'-0"	51	12	63	
F5'6"	5	31	5'-6"	38	10	48	
F8'3"	5	31	8'-3"	76	40	116	
F8'4"	5	31	8'-4"	76	38	114	
F4'1"	5	31	4'-1"	65	6	71	Dowels
F2'6"	5	31	2'-6"		13	13	
F10'3"	5	31	10'-3"		4	4	
F5'0"	5	31	5'-0"		2	2	
WALLS							
W4'0"	4	31	7'-4"	26	26	52	
W5'6"	5	31	10'-7"	34	34	68	
W4'4"	4	31	12'-4"	34	27	61	
W12'6"	5	31	12'-6"	51	28	79	
W4'7"	4	31	12'-6"	34	27	121	
W4'6"	4	31	12'-7"		34	34	
W4'5"	4	31	6'-10"		9	9	
W4'4"	4	31	10'-5"		18	18	
W4'3"	4	31	5'-8"		21	21	
DAM							
D4'0"	4	31	1'-6"			324	
D5'0"	5	31	6'-3"			120	







PLAN OF FILL AT SOUTH WALL
Scale: 1"=50'

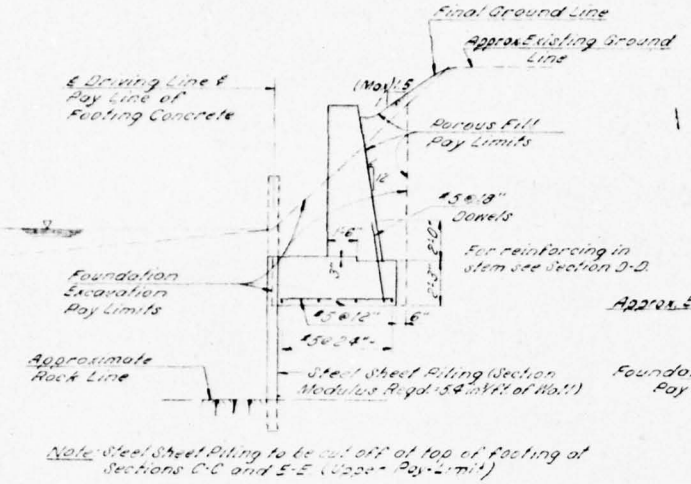
SECTION G-G
Scale: 1/4"=1'-0"

Notes:
1. For sections C-C thru F-F see W.P.A. sheet No. 4.
2. For joint details in walls see sheet No. 3.

AS BUILT

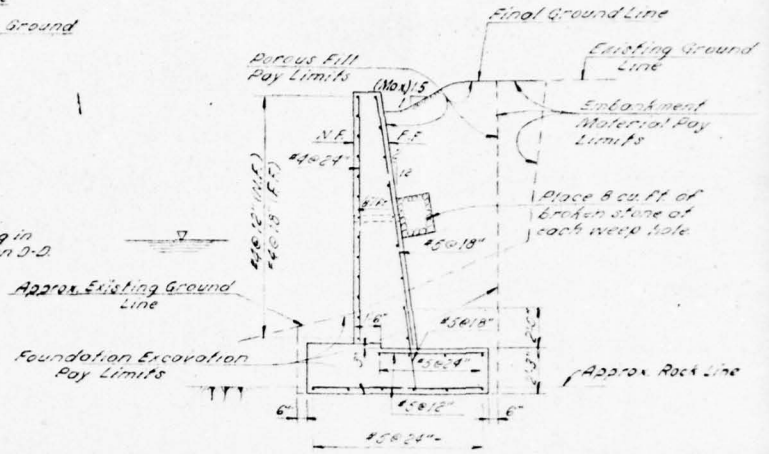
SOMERSET COUNTY PARK COMMISSION DUKE ISLAND COUNTY PARK	
ROBERT STREET DAM WALLS AND BAR LIST	
GOODKIND & O'DEA CONSULTING ENGINEERS	MONTCLAIR, N.J.
SCALE 1/4"=1'-0" per Sheet	DATE [illegible] SHEET 3 OF 5

NO.	REVISION	DATE

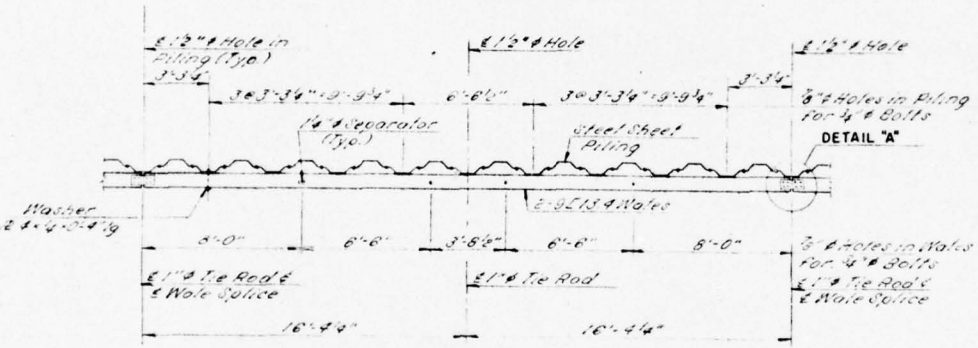


SECTION C-C

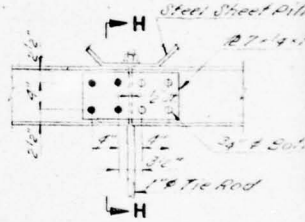
Note: All wall footings to be Class C Concrete. All walls above footings to be Class B Concrete



SECTION D-D

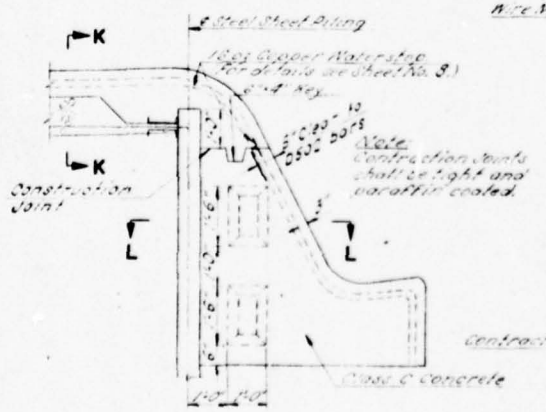


TYPICAL PART PLAN OF WALES



DETAIL "A"

Scale: 1"=1'0"



SECTION J-J

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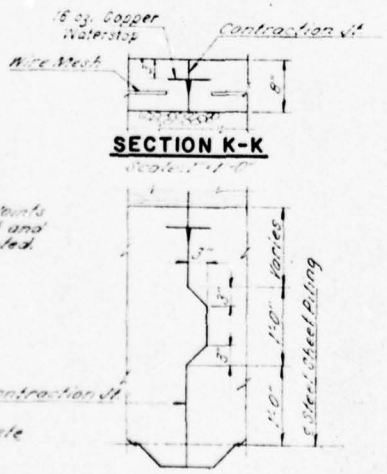
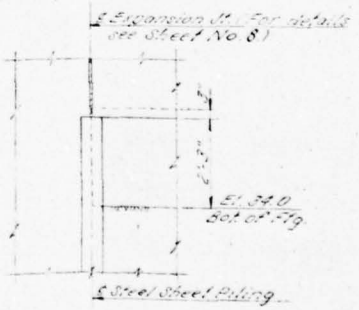


SECTION K-K

Scale: 1"=1'0"

SECTION L-L

Scale: 1"=1'0"

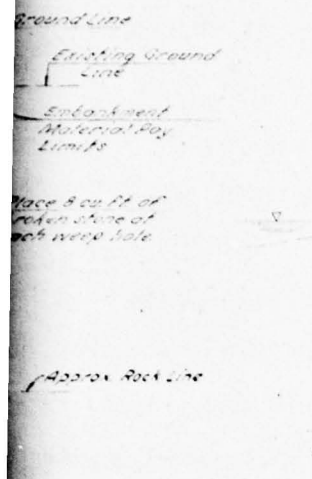


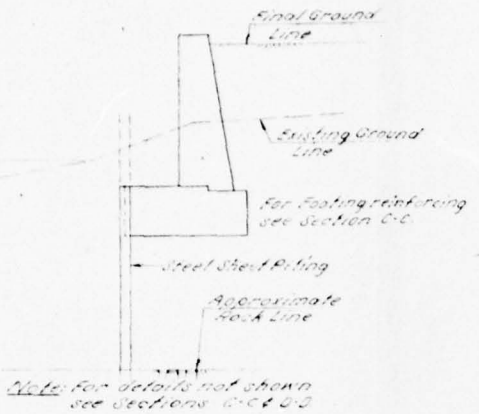
SECTION M-M

Scale: 1"=1'0"

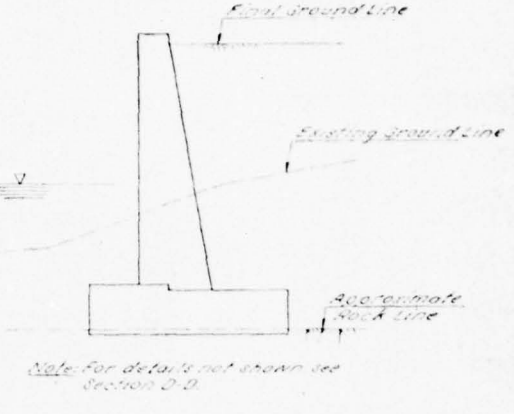
MADE BY A. Wright
TRACED BY J. Roberts
CHECKED BY A. [illegible]
IN CHARGE OF [illegible]

PLATE 4

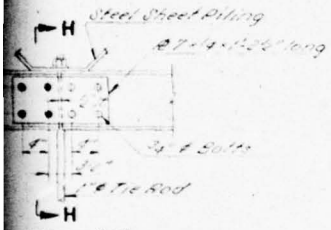




SECTION E-E



SECTION F-F



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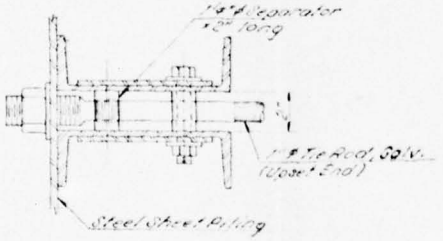
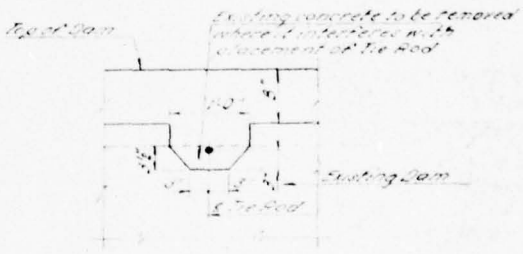


SECTION H-H



SECTION B-B

References

1. For location of Sections A-A thru D-D see Sheet No. 2.
2. For location of Sections C-C thru F-F and M-M, see Sheet No. 3.

AS BUILT

SOMERSET COUNTY PARK COMMISSION
DUKE ISLAND COUNTY PARK

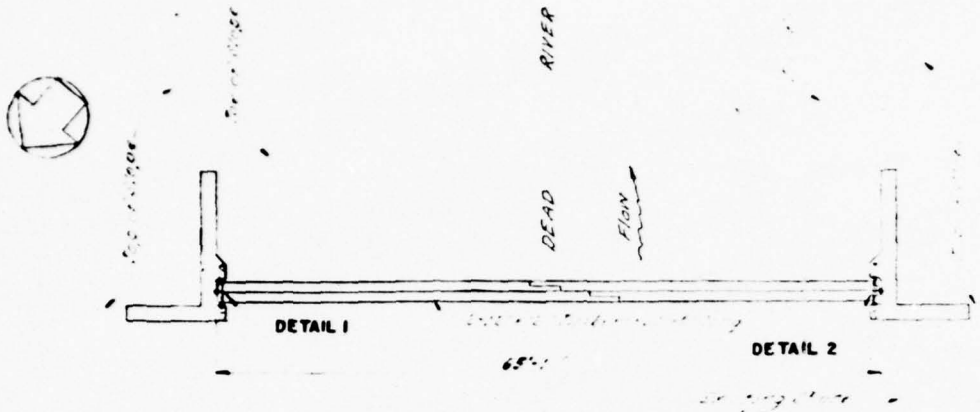
ROBERT STREET DAM

WALL DETAILS & MISCELLANEOUS DETAILS

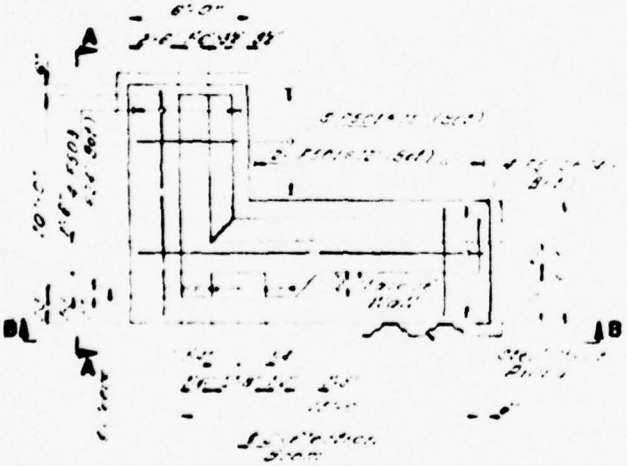
GOODKIND & O'DEA
CONSULTING ENGINEERS
MONTCLAIR, N.J.

NO.	REVISION	DATE

SCALE 1" = 1'-0" | DATE June 9, 1964 | SHEET 4 OF 5

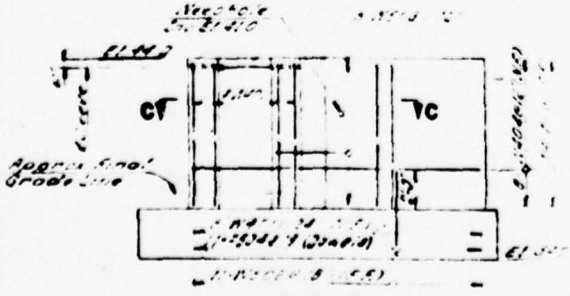


PLAN

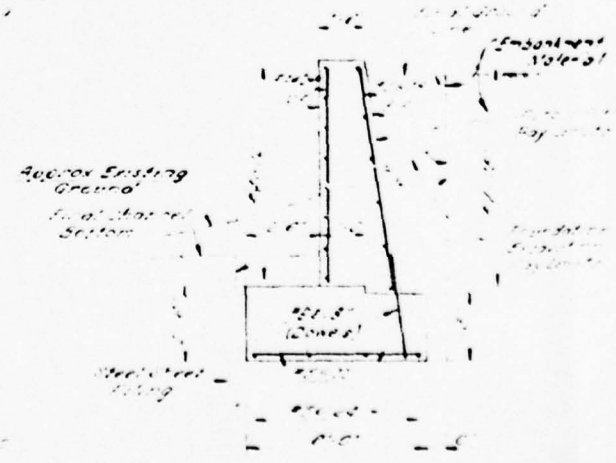


DETAIL PLAN

ELEVATION A-A



ELEVATION B-B



TYPICAL WALL SECTION

Robert St. Dam

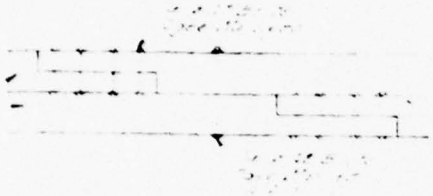
LOC

SPI

SI

DRAWN BY R.T. Cook
TRACED BY J.J. Dobrucki
CHECKED BY A.A. Liggio
IN CHARGE OF E.E. Cook

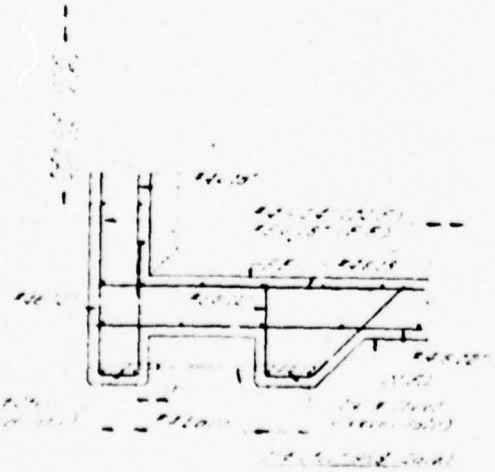
LOCATION PLAN



PLAN

ELEVATION

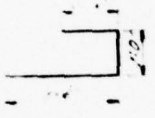
SPLICE DETAIL



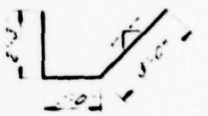
SECTION C-C

BAR LIST

MARK	SIZE	TYPE	LENGTH	TOTAL	REMARKS
FOOTING					
WALLS					



W405



W503

FILE

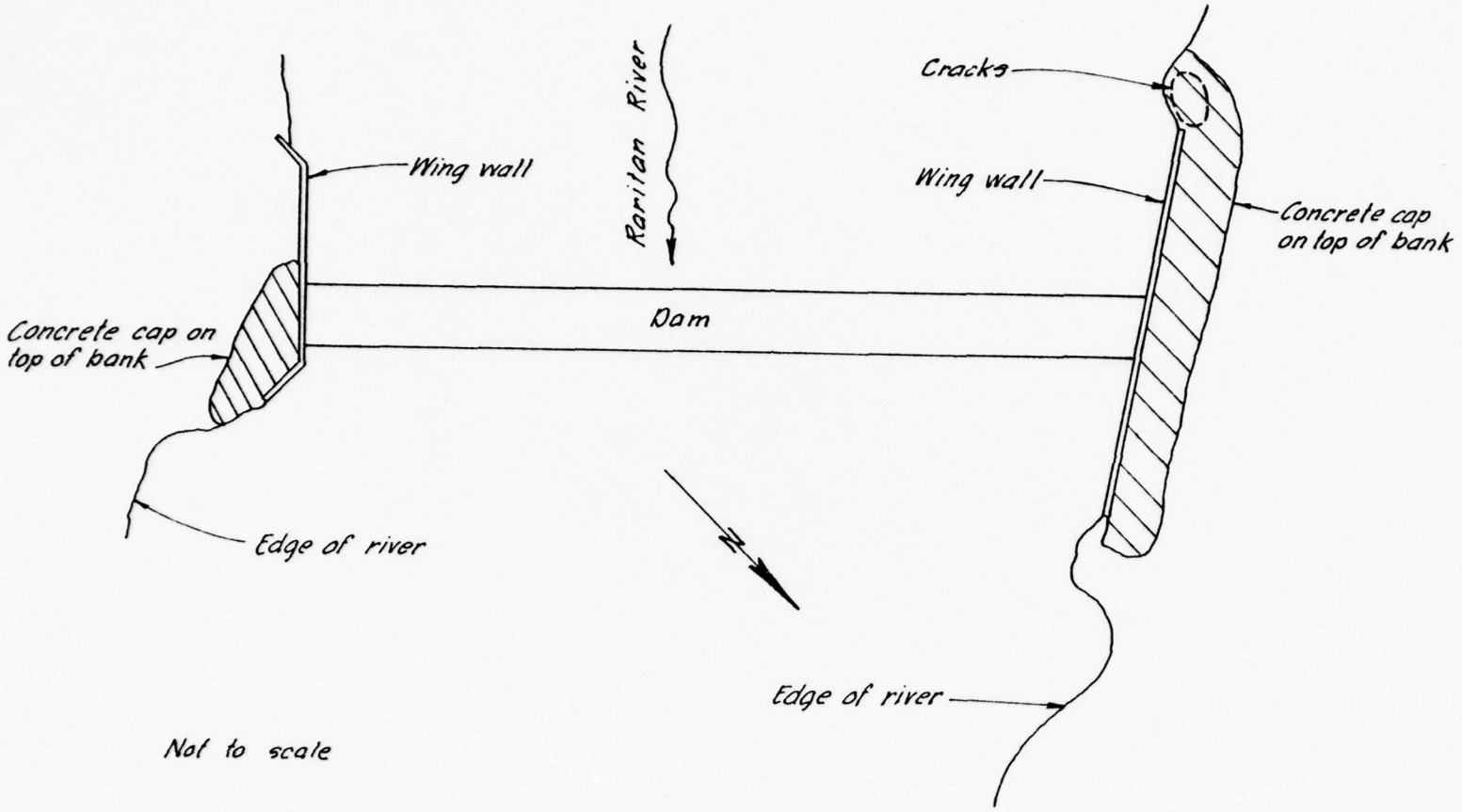
SOMERSET COUNTY PARK COMMISSION
DUKE ISLAND COUNTY PARK

DEAD RIVER DEFLECTION BOOM

GOODKIND & O'DEA
CONSULTING ENGINEERS
MONTCLAIR, N.J.

SCALE: AS NOTED | DATE: June 8 1964 | SHEET 5 OF 9

NO.	REVISIONS	DATE



Not to scale

Note: See Plates 2 thru 4 for dimensions of dam

ROBERT STREET DAM
GENERAL PLAN

Showing configuration of abutments
Based on Dec. 5, 1978 visual field inspection

Jenny / Leedshill

January 1979

PLATE 6

APPENDIX A

CHECK LIST - VISUAL OBSERVATIONS

CHECK LIST - ENGINEERING, CONSTRUCTION
MAINTENANCE DATA

Check List
Visual Inspection
Phase 1

Name Dam Robert Street County Somerset State New Jersey Coordinates Lat. 40°38' 22" N Long. 74° 38'57"W

Date(s) Inspection December 5 & 21, 1978 Weather Partly Cloudy Temperature 43° F.

Pool Elevation at Time of Inspection 40.3ft.M.S.L. Tailwater at Time of Inspection 37.2ft.M.S.L.

Inspection Personnel:

(December 5, 1978)	(December 21, 1978)	(December 21, 1978)
R. C. Gaffin	R.J. Jenny	D.J. Lachel
A. R. Slaughter	F.L. Panuzio	A.R. Slaughter
P. L. Wagner		

Jenny-Leedshill Recorder

Owner Representative (December 5, 1978)
William H. Cunningham, Jr., Somerset County Park Commission

Robert Street

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SEEPAGE OR LEAKAGE	Spillway was submerged during inspection, therefore the dam could not be inspected for possible seepage or leakage.	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	Junction of spillway and wing walls were submerged during inspection and therefore could not be inspected. Wing walls appear to be in satisfactory condition. Fill and concrete surface placed on abutments behind wing walls appear to be in good condition	
DRAINS	Weep holes are present in the concrete wing walls; however, no flow was observed during the inspection.	
WATER PASSAGES	The main length of dam functions as a spillway. Water was approximately 10 inches above the spillway crest during inspection.	
FOUNDATION	Base of dam was submerged during inspection and could not be observed.	

CONCRETE/MASONRY DAMS

Robert Street

VISUAL EXAMINATION OF	OBERSVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	Minor cracks were observed in the concrete wing walls, but they were generally in good condition. No concrete spalling or other deterioration was observed.	The spillway was submerged during inspection and therefore could not be observed. Observations refer only to the visible sections of the concrete wing walls.
STRUCTURAL CRACKING	Vertical cracks were observed in the left (north) wing wall near the downstream crest of the dam, but displacement was minor.	" "
VERTICAL AND HORIZONTAL ALIGNMENT	No significant displacement or distortion of the wing walls was apparent. Uniform flow of water over spillway indicates that dam is aligned vertically and horizontally.	" "
MONOLITH JOINTS	None	" "
CONSTRUCTION JOINTS	Construction and expansion joints in wing walls appear to be in good condition.	" "

EMBANKMENT
(NONE)

Robert Street

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	Not Applicable	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	Not Applicable	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	The embankments adjacent to the wing walls appear to be in generally good condition with the exception of incipient failure cracks noted upstream of the left wing wall.	
VERTICAL AND HORIZONTAL ALINEMENT OF THE CREST	Not Applicable	
RIPRAP FAILURES	Not Applicable	

EMBANKMENT
(NONE)

Robert Street

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
VEGETATION	Not Applicable	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Not Applicable	
ANY NOTICEABLE SEEPAGE	Not Applicable	
STAFF GAGE AND RECORDER	Not Applicable	
DRAINS	Not Applicable	

OUTLET WORKS

Robert Street

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Not Applicable	
INTAKE STRUCTURE	A deflection boom at the inlet to the Dead River is blocked by sediments and debris. Water now enters the Dead River through a channel eroded through the east abutment of the deflection boom. (Photo 3)	Water backed up by Robert Street Dam flows into the Dead River located approx. 400 feet upstream from the dam on the south bank of the Raritan River.
OUTLET STRUCTURE	None	
OUTLET CHANNEL	Water flows through the Dead River which is a natural stream channel (meander) and flows back into the Raritan River approx. 4000 feet downstream from the Robert Street Dam.	
EMERGENCY GATE	None	

UNGATED SPILLWAY

Robert Street

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	The main section of the dam acts as an ungated spillway. Water was spilling uniformly throughout the length of the dam during inspection; therefore, the structure could not be observed.	
APPROACH CHANNEL	" "	
DISCHARGE CHANNEL	" "	
BRIDGE AND PIERS	" "	

GATED SPILLWAY
(NONE)

Robert Street

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	Not Applicable	
APPROACH CHANNEL	Not Applicable	
DISCHARGE CHANNEL	Not Applicable	
BRIDGE AND PIERS	Not Applicable	
GATES AND OPERATION EQUIPMENT	Not Applicable	

INSTRUMENTATION

(NONE)

Robert Street

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	Not Applicable	
OBSERVATION WELLS	Not Applicable	
WEIRS	Not Applicable	
PIEZOMETERS	Not Applicable	
OTHER	Not Applicable	

RESERVOIR

Robert Street

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Very gently sloping and moderate to heavily wooded. Trees along rim of reservoir are tilting towards reservoir and may fall into the reservoir should erosion of their foundation continue.	Trees leaning steeply towards the reservoir should be removed to prevent their falling into the reservoir and restricting flow over the spillway.
SEDIMENTATION	Sediments blocking the Dead River deflection boom and the brown colored reservoir water indicate that there is a high potential for sedimentation; however, no indication of excessive deposition behind the dam was observed. Some debris was observed on right (south) side of dam. (Photo 1)	

DOWNSTREAM CHANNEL

Robert Street

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Natural waterway. Trees along edge of stream are tilting towards stream and may fall into stream should erosion of their foundations continue.	
SLOPES	Low, gently sloping banks. Heavily wooded.	
APPROXIMATE NO. OF HOMES AND POPULATION	None observed immediately downstream.	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

Robert Street

ITEM	REMARKS
PLAN OF DAM	Plan, sections and details of reconstructed dam are shown on sheets 2 thru 5 of 9 prepared by Goodkind and O'Dea, Consulting Engineers, June 9, 1964 (Plates 2 thru 5 of this report).
REGIONAL VICINITY MAP	Dam and vicinity are shown on U. S. Geological Survey, Raritan Quadrangle, Scale 1:24,000 (Plate 1).
CONSTRUCTION HISTORY	No available data regarding original construction. Section of original dam shown on Plate 2 of this report.
TYPICAL SECTIONS OF DAM	See Plan of Dam.
HYDROLOGIC/HYDRAULIC DATA	Report titled "Delineation of Flood Hazard Areas, Raritan River Basin, Flood Hazard Report No. 2, Raritan River." Prepared for State of New Jersey; Department of Environmental Protection, Division of Water Resources, March 1972, by Anderson-Nichols and Company, Inc.
OUTLETS - PLAN - DETAILS -CONSTRAINTS -DISCHARGE RATINGS	Plan and details of deflection boom shown on sheet 5 of 9 prepared by Goodkind and O'Dea Consulting Engineers, June 9, 1964. (Plate 5 of this report)
RAINFALL/RESERVOIR RECORDS	None available.

Robert Street

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
DESIGN REPORTS	Structural details of dam and wing walls are shown on sheets referenced for 'Plan of Dam.' See 'Hydrologic/Hydraulic Data' for hydrologic report.
GEOLOGY REPORTS	None available.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	Extent of flooding determined in report referenced for 'Hydrologic/Hydraulic Data.' Spillway capacity calculated in Report on Dam Application No. 570 filed June 8, 1964 None available None available
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Nine logs for borings Nos. 4 thru 12 to penetrations ranging from 10' to 124', performed by Warren George, Inc., are available. Locations of borings 6 thru 10 are shown on drawings prepared by Goodkind and and O'Dea (Plate 2). None available. None available.
POST-CONSTRUCTION SURVEYS OF DAM	None available.
BORROW SOURCES	Unknown

Robert Street

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
SPILLWAY-PLAN -SECTIONS -DETAILS	See 'Plan of Dam'.
OPERATING EQUIPMENT PLANS & DETAILS	No operating equipment
MONITORING SYSTEMS	None
MODIFICATIONS	Original dam reconstructed in 1964. Specifications prepared by Goodkind and O'Dea and filed with Dam Application No. 570, approved June 25, 1964.
HIGH POOL RECORDS	Flood elevations at dam for August 19, 1955 and September 22, 1938 floods are included in Dam Application No. 570.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	See 'Hydrologic/Hydraulic Data'.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	Erosion of abutments during flooding caused by Hurricane Doria in August 1971. Damage reported in June 21, 1972 inspection report.

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

Robert Street

ITEM	REMARKS
MAINTENANCE OPERATION RECORDS	None available.

APPENDIX B

PHOTOGRAPHS

(Note: All photographs were taken on Dec. 5, 1978)

Photo 1 - View of dam from left (north) abutment

Photo 2 - View of left (north) abutment looking upstream.

Photo 3 - View of Dead River deflection boom looking west.

Photo 4 - View of reservoir from right (south) abutment.

Photo 5 - View looking downstream from left (north) abutment.

APPENDIX C

REGIONAL GEOLOGY - PIEDMONT LOWLANDS

REGIONAL GEOLOGY - PIEDMONT LOWLANDS

Physiography

The Piedmont Lowlands Province of New Jersey lies northwest of a line approximately between Trenton and Perth Amboy and southeast of an approximate line between Milford on the Delaware River and Mahwah near the New York State border. Physiographically, the province is situated between the predominantly Precambrian age New Jersey Highlands Province to the northwest and the typically unconsolidated Creataceous age and younger sediments of the Coastal Plain Province to the southeast. (See Figure C-1).

Bedrock

The Piedmont Lowlands, encompassing about one-fifth of the state, is characterized by northwestward dipping bedrock composed of interbedded red shales, siltstones and sandstones of Triassic and Jurassic age and igneous basalt extrusions (lava flows) and diabase intrusions of Jurassic age. The sedimentary rocks have been eroded to a broad southeastward sloping piedmont plain. The northwest border of the province is a northeast-southwest trending fault zone (Ramapo Fault) which truncates the sedimentary beds. Total vertical displacement on the fault may reach 10,000 feet.

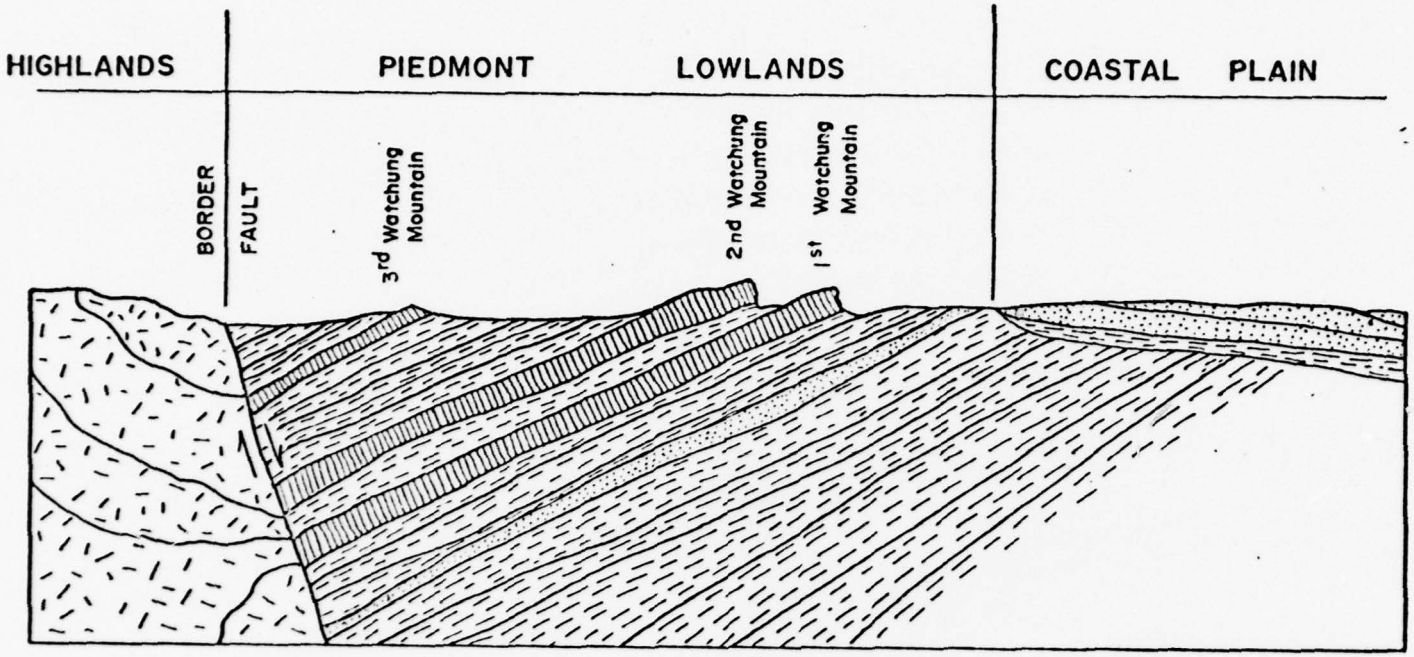
The gently rolling lowland topography of the piedmont lowlands is pierced by long asymetric ridges of hard

and resistant igneous rocks which were intruded into or on top of the sedimentary sequences. With the subsequent erosion of the softer sedimentary rocks, these igneous formations have been left standing, often in bold relief, up to 400 ft. above the surrounding plains. The igneous bodies composed of diabase and basalt form the Palisades along the Hudson River and the three Watchung Mountain ridges of the central Piedmont. The ridges are all steeper on the southeast with gentle dip slopes to the northwest.

Overburden

The Pleistocene Age Wisconsin continental glacier has smoothed and filled approximately the northern half of the province. The terminal moraine of the glacier extends from Perth Amboy to Summit then northwestward to Morris Plains. North of the morainal line the soils characteristically consist of glacial tills overlying the bedrock with scattered overlying stratified outwash deposits. At least three large glacial lakes occupied portions of the area north of the moraine at different periods, resulting in a relatively flat topography composed predominantly of silts and clays.

South of the terminal moraine, most of the overburden consists of alluvial deposits overlying a more highly developed weathered transition zone on top of the bedrock. Some highly weathered tills of pre-Wisconsin glaciation can be found on the top of intervalley ridges. Much of the alluvium is glacial outwash.



SCHEMATIC CROSS-SECTION OF
NEW JERSEY PIEDMONT LOWLANDS
PHYSIOGRAPHIC PROVINCE

JENNY / LEEDSHILL
JANUARY 1979

FIGURE C-1

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

ROBERT ST. DAM

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 480 SQ. MI

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 39.5 (730 AF)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 44.0 (5800 AF)

ELEVATION MAXIMUM DESIGN POOL:

ELEVATION TOP DAM: 44.0

CREST: SPILLWAY

a. Elevation 39.5
b. Type OGEE
c. Width —
d. Length 250
e. Location Spillover INTEG. DAM
f. Number and Type of Gates NONE

OUTLET WORKS: DEAD RIVER DEFLECTION BOOM

a. Type WEIR
b. Location ~400 FT UPSTREAM OF DAM
c. Entrance inverts 37.0
d. Exit inverts 29.5
e. Emergency drawdown facilities NONE

HYDROMETEOROLOGICAL GAGES: NONE

a. Type
b. Location
c. Records

MAXIMUM NON-DAMAGING DISCHARGE: 2470 CFS (elev. 44 feet)

LEEDS, HILL AND JEWETT, INC.

BY RBE DATE 7-03-28 CLIENT NEW JERSEY SHEET NO. OF

CHKD. DATE JOB ROBERT ST. DAM JOB NO. 302-03

SUB-BASIN CHARACTERISTICS

THERE ARE THREE MAJOR LAKES AND RESERVOIRS THAT CONTROL A PORTION OF THE DRAINAGE BASIN OF ROBERT ST. DAM. THEY ARE:

1) LAKE SOLITUDE
2) SPRUCE RUN RESERVOIR
3) ROUND VALLEY RESERVOIR

A GAGE OF THE EFFECT THE RESERVOIRS WILL HAVE ON THE INFLOW HYDROGRAPH TO ROBERT ST. DAM IS TO DETERMINE THE DRAINAGE AREA CONTROLLED BY THESE RESERVOIRS

LENGTH: 26.0 mi
25.5 mi
AVG. 25.75 mi

WIDTH: 4.8 mi
4.4 mi
AVG. 4.6 mi

AREA = 25.75 mi x 4.6 mi
AREA = 118.5 mi² ≈ 120 mi²

% OF BASIN = $\frac{120}{180}$ = 25 %

LEEDS, HILL AND JEWETT, INC.

BY RBE DATE 790103 CLIENT N.J. SHEET NO. OF

CHKD DATE JOB ROBERT ST. DAM JOB NO. 302-03

RAINFALL DURATION CURVE

[1] REF: TECH PAPER No. 40
RAINFALL FREQ ATLAS OF THE UNITED STATES
U.S. DEPT. OF COMMERCE MAY 1961

CENTROID LOCATION LAT. 40°40'
LONG. 74°45'

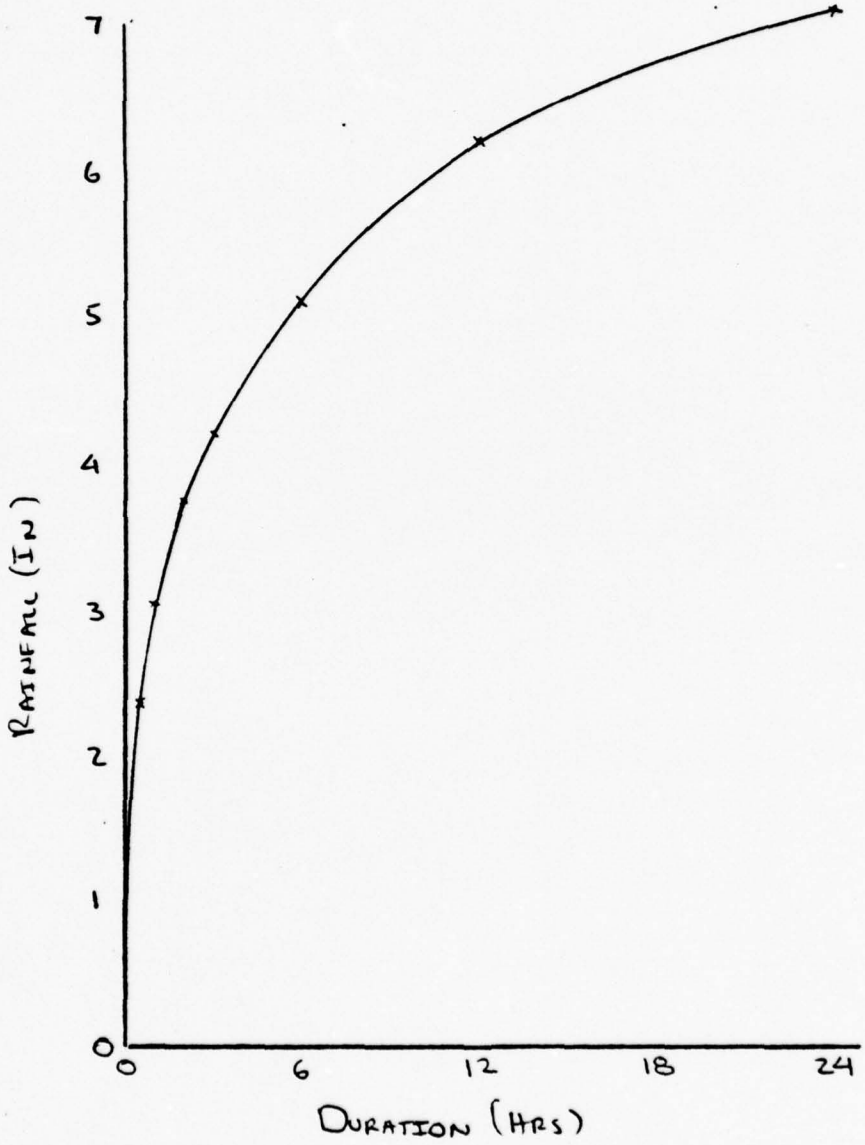
100 YR RAINFALL

DURATION (hr)	RAINFALL[1] (IN)
1/2	2.35
1	3.05
2	3.75
3	4.2
6	5.1
12	6.2
24	7.1

[2] CURVE DEVELOPED FROM ½, 1, 2, 3, 6 12, AND 24 HR VALUES FROM TECH PAPER No. 40

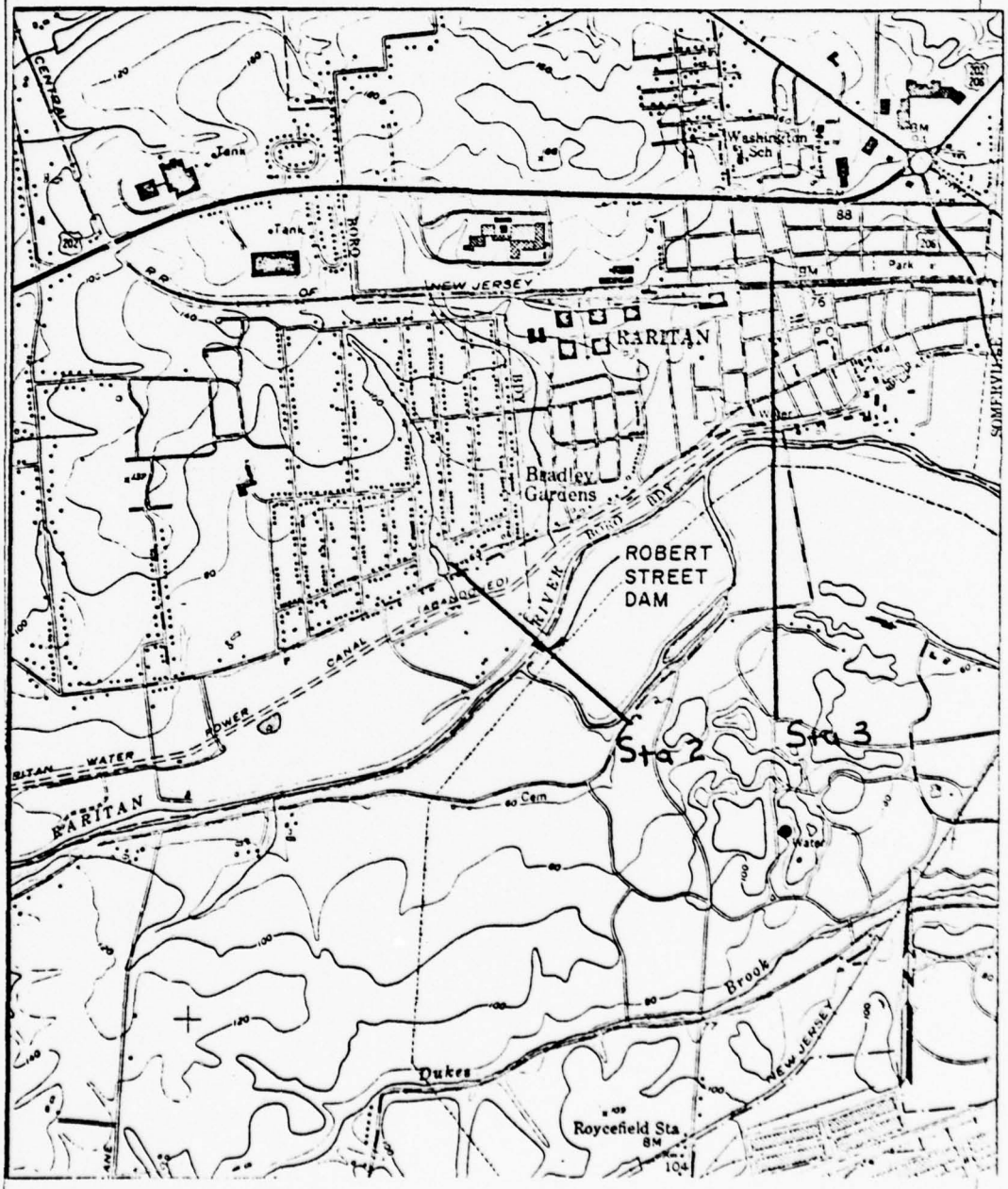
TIME (HRS)	RAINFALL (IN) Σ[2]	Δ	PATTERN USED
3	4.2	4.2	0.2
6	5.1	0.9	0.2
9	5.7	0.6	0.5
12	6.2	0.5	0.9
15	6.5	0.3	4.2
18	6.7	0.2	0.6
21	6.9	0.2	0.3
24	7.1	0.2	0.2

RBF	790103	302-03	2/2



REF 790207	ROBERT ST. DAM	307-03

LOCATION MAP OF CROSS-SECTIONS USED IN ROUTING CALCULATIONS



LEEDS, HILL AND JEWETT, INC.

BY RBF DATE 7/02/12 CLIENT New Jersey SHEET NO. OF

CHKD DATE JOB JOB NO. 202-01

ROBERT ST. DAM

CHANNEL CROSS-SECTIONS [1]

STATION	DISTANCE DOWNSTREAM OF DAM (FT)	MANNINGS LEFT OVER-BANK	MANNINGS MAIN CHANNEL	MANNINGS RIGHT OVER-BANK	CHANNEL INVERT (FT)	MAX ELEV. (FT)	ROCK LENGTH (FT)	ENERGY GRADE LINE SLOPE	X OR Y	X OR Y (FT) 1	2	3	4	5	6	7	8
2 - BELOW DAM																	
3	4800	0.12	0.03	0.12	32	80	4800	.0006	X	0	1600	3700	3700	3450	3450	4700	6700
									Y	80	45	41	32	32	41	60	80
4																	

[1] LOOKING DOWNSTREAM

[2] SEE VENT CHAN SHEET

TABLE 5-6. VALUES OF THE ROUGHNESS COEFFICIENT n *(continued)*

Type of channel and description	Minimum	Normal	Maximum
C. EXCAVATED OR DREDGED			
a. Earth, straight and uniform			
1. Clean, recently completed	0.016	0.018	0.020
2. Clean, after weathering	0.018	0.022	0.025
3. Gravel, uniform section, clean	0.022	0.025	0.030
4. With short grass, few weeds	0.022	0.027	0.033
b. Earth, winding and sluggish			
1. No vegetation	0.023	0.025	0.030
2. Grass, some weeds	0.025	0.030	0.033
3. Dense weeds or aquatic plants in deep channels	0.030	0.035	0.040
4. Earth bottom and rubble sides	0.028	0.030	0.035
5. Stony bottom and weedy banks	0.025	0.035	0.040
6. Cobble bottom and clean sides	0.030	0.040	0.050
c. Dragline-excavated or dredged			
1. No vegetation	0.025	0.028	0.033
2. Light brush on banks	0.035	0.050	0.060
d. Rock cuts			
1. Smooth and uniform	0.025	0.035	0.040
2. Jagged and irregular	0.035	0.040	0.050
e. Channels not maintained, weeds and brush uncut			
1. Dense weeds, high as flow depth	0.050	0.080	0.120
2. Clean bottom, brush on sides	0.040	0.050	0.080
3. Same, highest stage of flow	0.045	0.070	0.110
4. Dense brush, high stage	0.080	0.100	0.140
D. NATURAL STREAMS			
D-1. Minor streams (top width at flood stage <100 ft)			
a. Streams on plain			
STATION 3 1. Clean, straight, full stage, no rifts or deep pools	0.025	(0.030)	0.033
2. Same as above, but more stones and weeds	0.030	0.035	0.040
3. Clean, winding, some pools and shoals	0.033	0.040	0.045
4. Same as above, but some weeds and stones	0.035	0.045	0.050
5. Same as above, lower stages, more ineffective slopes and sections	0.040	0.048	0.055
6. Same as 4, but more stones	0.045	0.050	0.060
7. Sluggish reaches, weedy, deep pools	0.050	0.070	0.080
8. Very weedy reaches, deep pools, or floodways with heavy stand of timber and underbrush	0.075	0.100	0.150

TABLE 5-6. VALUES OF THE ROUGHNESS COEFFICIENT n *(continued)*

Type of channel and description	Minimum	Normal	Maximum
b. Mountain streams, no vegetation in channel, banks usually steep, trees and brush along banks submerged at high stages			
1. Bottom: gravels, cobbles, and few boulders	0.030	0.040	0.050
2. Bottom: cobbles with large boulders	0.040	0.050	0.070
D-2. Flood plains			
a. Pasture, no brush			
1. Short grass	0.025	0.030	0.035
2. High grass	0.030	0.035	0.050
b. Cultivated areas			
1. No crop	0.020	0.030	0.040
2. Mature row crops	0.025	0.035	0.045
3. Mature field crops	0.030	0.040	0.050
c. Brush			
1. Scattered brush, heavy weeds	0.035	0.050	0.070
2. Light brush and trees, in winter	0.035	0.050	0.060
3. Light brush and trees, in summer	0.040	0.060	0.080
4. Medium to dense brush, in winter	0.045	0.070	0.110
5. Medium to dense brush, in summer	0.070	0.100	0.160
d. Trees			
1. Dense willows, summer, straight	0.110	0.150	0.200
2. Cleared land with tree stumps, no sprouts	0.030	0.040	0.050
3. Same as above, but with heavy growth of sprouts	0.050	0.060	0.080
4. Heavy stand of timber, a few down trees, little undergrowth, flood stage below branches	0.080	0.100	0.120
STATION 3 → 5. Same as above, but with flood stage reaching branches	0.100	(0.120)	0.160
D-3. Major streams (top width at flood stage >100 ft). The n value is less than that for minor streams of similar description, because banks offer less effective resistance.			
a. Regular section with no boulders or brush	0.025	.....	0.060
b. Irregular and rough section	0.035	.....	0.100

OPEN-CHANNEL HYDRAULICS

VEN TE CHOW, Ph.D.

Professor of Hydraulic Engineering
University of Illinois

LEEDS, HILL AND JEWETT, INC.

BY RSE DATE 790104 CLIENT N.T. SHEET NO. OF

CHKD. DATE JOB ROBERT ST. DAM JOB NO. 302-03

STAGE DISCHARGE CURVE

SPILLWAY @ El 39.5

$Q = CLH^{1.5}$ $C = 2.6$

$L = 256$

BYPASS CHANNEL

$n = 0.035$

$w = 60$

BOTTOM El. 32.5

SLOPE $= \frac{34-29.5}{8000'}$

SLOPE $= .0006$

CROSS-SECTION

$n = 0.12$

$S = \frac{34-29.5}{6000'}$

$S = 0.0008$

D-1. Minor streams (top width at flood stage <100 ft)					
a. Streams on plain					
1. Clean, straight, full stage, no rifts or deep pools	0.025	0.030	0.033		
2. Same as above, but more stones and weeds	0.030	0.035	0.040		
3. Clean, winding, some pools and shoals	0.033	0.040	0.045		
4. Same as above, but some weeds and stones	0.035	(0.045)	0.050		

VENT: CHOW - OPEN CHANNEL FLOW

d. Trees					
1. Dense willows, summer, straight	0.110	0.150	0.200		
2. Cleared land with tree stumps, no sprouts	0.030	0.040	0.050		
3. Same as above, but with heavy growth of sprouts	0.050	0.060	0.080		
4. Heavy stand of timber, a few down trees, little undergrowth, flood stage below branches	0.080	0.100	0.120		
5. Same as above, but with flood stage reaching branches	0.100	(0.120)	0.160		

$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$

CONTOUR	BYPASS CHANNEL H (FT)	BYPASS CHANNEL Q_1 (CFS)	SPILLWAY H (FT)	SPILLWAY Q_2 (CFS)	OVERTOP SECTION H (FT)	OVERTOP SECTION A (FT^2)	OVERTOP SECTION P (FT)	Q_3 (CFS)	TOTAL Q (CFS)
32.5				0					0
35	2.5	212		0					210
37	4.5	542		0					540
39.5	7.0	1081		0					1080
42	9.5	1770	2.5	2630					4400
44	11.5	2316	4.5	6350	0	0	0	0	8670
45	—	2316	5.5	8535	1	1715	1770	5238	11490
50	—	2316	10.5	22650	6	18440	2452	12990	37956
55	—	2316	15.5	40620	11	35140	3532	43512	86588
60	—	2316	20.5	61780	16	49540	3800	91402	157098

LEEDS, HILL AND JEWETT, INC.

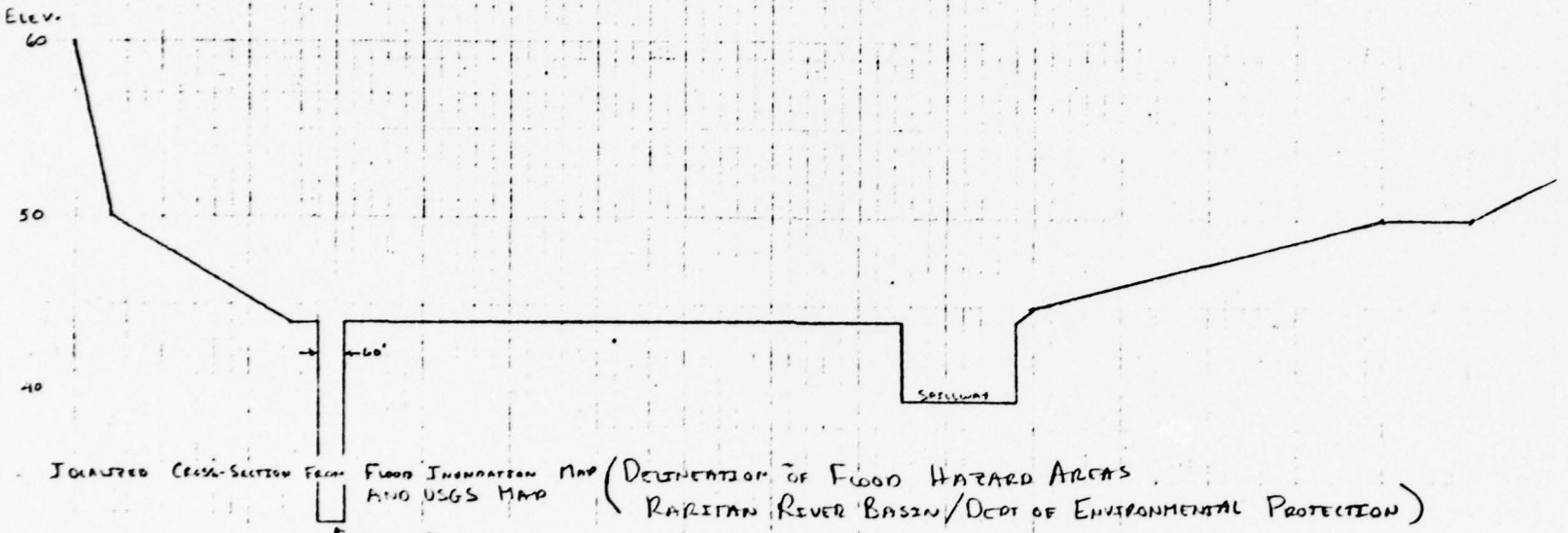
BY EBK DATE 7/6/83 CLIENT NEW JERSEY DAM SAFETY SHEET NO. BY DATE

CHKD DATE JOB ROBERT ST. DAM JOB NO. 382-03 CHKD DATE

SCALE: HORIZ: 200'

VERT: 5'

ROBERT STREET DAM (LOOKING UPSTREAM)



DIGITIZED CROSS-SECTION FROM FLOOD INUNDATION MAP AND USGS MAP (DELINEATION OF FLOOD HAZARD AREAS, RARITAN RIVER BASIN/DEPT OF ENVIRONMENTAL PROTECTION)

BYPASS CHANNEL

SLOPE = 0.7 x SLOPE OF MAIN CHANNEL

SAME ROUGHNESS AS MAIN CHANNEL

(DEPTHS ASSUMED)

D-6

RBE 790328 | ROBERT ST. DAM | NEW JERSEY 302-01 | 1/2

INFLOW HYDROGRAPH

* A 3hr UNIT HYDROGRAPH WAS GIVEN BY CORP OF ENGINEERS. THE RESULTING INFLOW HYDROGRAPH (BELOW) WHEN ROUTED THRUGH THE RESERVOIR GAVE ERRONEOUS RESULTS DUE TO THE LONG TIME INCREMENT. TO PREVENT THIS THE 3hr INFLOW HYDROGRAPH WAS BROKEN DOWN INTO ½ hr INCREMENTS (SEE NEXT PAGE)

INPUT

```
     1 A1   NEW JERSEY DAM SAFETY - ROBERT ST. DAM I.D. NO. 00371
     2 A2   HYDRAULIC-HYDROLOGIC ANALYSIS 302-03
     3 A3   100 YEAR FLOOD
     4      B     36      3       0       0       0       0       0       0       0       0
     5      B1    9
     6      J     1       3
     7      J1  0.25      0.5     1
     8      K     0       1                                               1
     9      K1                                 INFLOW HYDROGRAPH TO RESERVOIR
    10      Q     0      -1      480             480                             1
    11      O     8
    12      O1   0.7     0.2     0.5     0.9     4.2     0.6     0.3     0.2
    13      J                                                      1.5     0.15
    14      U    25
    15      U1    0     1390    3900    7900   17300   13800   14200    9800    7300    5300
    16      U1  4100    3300    2500    2000    1500    1200     800     500     300     200
    17      U1   150     100      50      25       0
    18      X    -1     -.05    2.0
```

3hr UNIT HYDROGRAPH FROM CORP OF ENGINEERS

OUTPUT

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH TO RESERVOIR

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	1	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	-1	480.00	0.00	480.00	0.00	0.600	0	1	0

PRECIP DATA

NP	STORM	DAJ	DAK
8	0.00	0.00	0.00

PRECIP PATTERN

.20	.20	.50	.60	4.20	.60	.30	.20

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.50	.15	0.00	0.00

GIVEN UNIT GRAPH, NUMGO= 25

0.	1390.	3900.	7900.	17300.	13800.	14200.	9800.	7300.	5300.
4100.	3300.	2500.	2000.	1500.	1200.	800.	500.	300.	200.
150.	100.	50.	25.	0.					

UNIT GRAPH TOTALS 102615. CFS OR .99 INCHES OVER THE AREA

RECESSION DATA

STRTQ= -1.00 QRCSN= -.05 RTIOR= 2.00

0 HR.MN	PERIOD	RAIN	EXCS	LOSS	END-OF-PERIOD FLOW COMP Q	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
3.00	1	.20	0.00	.20	448.	9.00	19	0.00	0.00	0.00	6234.
6.00	2	.20	0.00	.20	414.	12.00	20	0.00	0.00	0.00	4969.
9.00	3	.50	0.00	.50	390.	15.00	21	0.00	0.00	0.00	3704.
12.00	4	.90	.15	.75	364.	18.00	22	0.00	0.00	0.00	3441.
15.00	5	4.20	3.75	.45	347.	21.00	23	0.00	0.00	0.00	3203.
18.00	6	.60	.15	.45	3114.	24.00	24	0.00	0.00	0.00	2913.
21.00	7	.30	0.00	.30	10314.	3.00	25	0.00	0.00	0.00	2812.
0.00	8	.20	0.00	.20	33081.	6.00	26	0.00	0.00	0.00	2671.
3.00	9	0.00	0.00	0.00	69117.	9.00	27	0.00	0.00	0.00	2447.
6.00	10	0.00	0.00	0.00	75459.	12.00	28	0.00	0.00	0.00	2283.
9.00	11	0.00	0.00	0.00	57764.	15.00	29	0.00	0.00	0.00	2120.
12.00	12	0.00	0.00	0.00	40144.	18.00	30	0.00	0.00	0.00	1974.
15.00	13	0.00	0.00	0.00	29835.	21.00	31	0.00	0.00	0.00	1859.
18.00	14	0.00	0.00	0.00	21797.	0.00	32	0.00	0.00	0.00	1730.
21.00	15	0.00	0.00	0.00	16439.	3.00	33	0.00	0.00	0.00	1614.
0.00	16	0.00	0.00	0.00	13923.	6.00	34	0.00	0.00	0.00	1506.
3.00	17	0.00	0.00	0.00	10318.	9.00	35	0.00	0.00	0.00	1405.
6.00	18	0.00	0.00	0.00	8238.	12.00	36	0.00	0.00	0.00	1311.
							SUM	7.10	4.09	3.01	440057.
								(100.1)(103.1)(77.)(12715.88)			

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	75469.	66454.	42978.	18112.	448176.
CMS	2137.	1967.	1217.	513.	12691.
INCHES		1.35	3.33	4.21	4.34
MM		34.19	84.62	106.99	110.31
AC-FT		34442.	85241.	107774.	111118.
THOUS CU M		42483.	105144.	132937.	137062.

LEEDS, HILL AND JEWETT, INC.

BY LBE DATE 7/9/07 CLIENT New Jersey SHEET NO. 2 OF 2

CHKD. DATE JOB Robert St Dam - PMF Inflow Hyd JOB NO. 302-03

Time hrs	Q cfs	Time hrs	Q cfs	Time hrs	Q cfs	Time hrs	Q cfs	Time hrs	Q cfs
0	1100	21	17103	42	22401	63	3870	86	2800
	1150		19890		21580		3840		2780
1	1190	22	22680	43	20750	64	3800	87	2760
	1240		25470		19930		3770		2740
2	1290	23	28270	44	19100	65	3730	88	2720
	1335		31060		18270		3700		2700
3	1383	24	33846	45	17499	66	3665	89	2680
	1380		34850		16890		3640		2670
4	1370	25	45850	46	16340	67	3620	90	2650
	1360		51900		15780		3590		2630
5	1350	26	57100	47	15230	68	3570	91	2620
	1340		63400		14670		3540		2600
6	1328	27	69880	48	14118	69	3520	92	2580
	1320		70900		13550		3500		2560
7	1310	28	72000	49	13040	70	3470	93	2545
	1300		73000		12510		3450		2530
8	1290	29	74100	50	11970	71	3430	94	2510
	1280		75180		11430		3400		2490
9	1275	30	76185	51	10893	72	3350	95	2480
	1270		73230		10540		3360		2470
10	1260	31	70300	52	10190	73	3340	96	2449
	1250		67300		9840		3310		2430
11	1240	32	64400	53	9490	74	3290	97	2415
	1230		61400		9140		3270		2400
12	1224	33	58462	54	8794	75	3245	98	2380
	1250		55530		8460		3220		2360
13	1275	34	52600	55	8120	76	3200	99	2346
	1300		49660		7780		3180		2330
14	1330	35	46730	56	7450	77	3160	100	2320
	1360		43800		7110		3130		2300
15	1394	36	40860	57	6771	78	3117	101	2280
	2310		39130		6560		3100		2270
16	3230	37	37400	58	6340	79	3080	102	2243
	4160		35650		6130		3060		2240
17	5080	38	33150	59	5910	80	3030	103	2220
	6000		32220		5700		3010		2210
18	6927	39	30490	60	5485	81	2993	104	2190
	8620		29140		5220		2970		2180
19	10320	40	27820	61	4950	82	2950	105	2169
	12020		26950		4680		2930		2150
20	13710	41	25100	62	4410	83	2910	106	2140
	15400		23750		4140		2890		2120
						84	2874	107	2110
							2850		2090
						85	2840	108	2078
							2820		

① From Computer Run at HEC-1DB using INF UNIT HYDROGRAPH SUPPLIED BY CORPS

② Used Straight line interpolation between HEC-1 Points, see ①

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**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION     JULY 1979
  LAST MODIFICATION  25 SEP 79
**********
    1          A1       NEW JERSEY DAM SAFETY - ROBERT ST. DAM  I.D. NO. 00371
    2          A2       HYDRAULIC-HYDROLOGIC ANALYSIS  302-03
    3          A3       100 YEAR FLOOD
    4          B     217         1        30         0         0         0         0         0         0         0
    5          B1      5
    6          J       1         4         1
    7          J1    0.05      0.25      0.5       1.0
    8          K       0         1
    9          K1                                                                    1
                                        INFLOW HYDROGRAPH TO RESERVOIR
   10          M      -1                  480                 480
   11          M    1100      1150      1190      1240      1290      1335      1383      1380      1370      1360
   12          M    1350      1340      1320      1310      1300      1290      1280      1275      1270      1260
   13          M    1260      1250      1240      1230      1220      1210      1205      1200      1190      1180
   14          M    1174      2310      3230      4160      5090      6000      6927      8020     10320     12220
   15          M   13710     15410     17100     19000     22000     25420     28270     31060     33840     36950
   16          M   45850     51900     57400     63900     69840     73000     72000     73000     74100     75130
   17          M  .74100     73230     70810     67300     64420     61460     58460     55360     52110     49060
   18          M   44730     43000     40160     39130     37400     35640     33950     32220     30490     29140
   19          M   27800     26450     25100     23750     22421     21180     20750     19930     19100     18270
   20          M   17449     16490     16340     15700     15230     14670     14114     13580     13040     12510
   21          M   11970     11430     10490     10540     10190      9840      9490      9140      8794      8460
   22          M    8170      7740      7450      7110      6771      6560      6340      6130      5920      5700
   23          M    5484      5220      4950      4660      4410      4140      3870      3640      3800      3770
   24          M    3730      3700      3665      3640      3620      3590      3570      3540      3523      3500
   25          M    3470      3450      3430      3410      3380      3360      3340      3310      3293      3270
   26          M    3245      3220      3200      3180      3160      3130      3117      3100      3084      3.66
   27          M    3038      3010      2983      2957      2930      2910      2890      2874      2860
   28          M    2840      2820      2800      2780      2760      2740      2720      2700      2686      2670
   29          M    2650      2630      2620      2600      2580      2560      2545      2530      2515      2490
   30          M    2480      2460      2445      2430      2410      2400      2380      2360      2346      2330
   31          M    2320      2300      2280      2270      2253      2240      2220      2210      2190      2180
   32          M    2164      2150      2140      2120      2110      2090      2078
   33          K       1         2                                                   1
   34          K1
   35          T                                                                     1
   36          T1      1                                   1         1
   37          T4    39.5      39.6        42        44        45        47       230        -1
   38          T5       0      1100      6400      8670     11490     20000     37960     86610
   39          T6       0        60       149       230       400       670      1390      2980      5630     13400
   40          T8    32.5        36        38      39.5        42        45        50        55        60        72
   41          T9    39.5
   42          S0      44         4       4.5         0
   43          K       1         3                                                   1
   44          K1       CHANNEL ROUTING -MODIFIED PULS- STATION 2 TO 3
   45          T                                     1         1
   46          T1      1                                                          -1
   47          T5    0.12      0.03      0.12        32        60      4860   6.0CE6
   48          T7       0        80      1600        45      3700        41      3700        32      3950        32
   49          T7    3950        41      4200        60      6700        80
   50          K       99
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**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1979
  LAST MODIFICATION  25 SEP 79
**********

RUN  DATE= 11/19/79
     TIME= 09.37.29.
```

NEW JERSEY DAM SAFETY - ROBERT ST. DAM I.D. NO. 00371
HYDRAULIC-HYDROLOGIC ANALYSIS 302-03
100 YEAR FLOOD -PBE-

JOB SPECIFICATION

NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
217	9	30	0	0	0	0	0	0	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 4 LRTIO= 1

RTIOS= .25 .50 1.00

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH TO RESERVOIR

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISAME	LOCAL
-1	0	480.00	0.00	480.00	0.00	0.000	1	0

INPUT HYDROGRAPH

1100.	1150.	1196.	1240.	1290.	1333.	1383.	1366.	1370.	1366.
1350.	1340.	1326.	1320.	1310.	1360.	1290.	1280.	1275.	1270.
1260.	1250.	1240.	1230.	1224.	1250.	1275.	1310.	1333.	1360.
1384.	2310.	3230.	4100.	5080.	6100.	6927.	8020.	10320.	12620.
15710.	19410.	17103.	14890.	22680.	25470.	28270.	31070.	33960.	36850.
45+50.	51900.	57900.	63700.	69600.	70460.	72600.	73600.	74100.	75130.
76180.	73230.	70300.	67300.	64400.	61460.	58462.	55530.	52602.	49660.
46730.	43800.	40860.	39130.	37400.	35000.	33450.	32220.	30990.	29140.
27420.	26440.	25100.	23750.	224.1.	21980.	20750.	19930.	19110.	18270.
17449.	16490.	15340.	15700.	15230.	14670.	14119.	13590.	13060.	12520.
11470.	11430.	10690.	10090.	10190.	9840.	9490.	9140.	8790.	8440.
8100.	7760.	7450.	7120.	6770.	6560.	6350.	6130.	5910.	5700.
5495.	5290.	5090.	4880.	4810.	4140.	3970.	3840.	3700.	3770.
3730.	3700.	3660.	3640.	3620.	3590.	3570.	3540.	3520.	3500.
3470.	3450.	3430.	3400.	3350.	3360.	3340.	3310.	3290.	3270.
3249.	3227.	3200.	3190.	3160.	3130.	3117.	3100.	3090.	3060.
3030.	3010.	2993.	2970.	2950.	2930.	2910.	2900.	2874.	2860.
2840.	2820.	2800.	2790.	2760.	2740.	2720.	2710.	2690.	2670.
2650.	2630.	2620.	2600.	2570.	2560.	2540.	2530.	2510.	2490.
2460.	2450.	2440.	2430.	2410.	2400.	2380.	2370.	2360.	2330.
2320.	2300.	2280.	2270.	2250.	2240.	2220.	2210.	2190.	2180.
2160.	2150.	2140.	2120.	2110.	2090.	2070.			

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	76195.	71756.	43677.	18098.	2431243.
CMS	2157.	2004.	1237.	529.	80172.
INCHES		1.37	3.39	4.35	4.57
MM		34.83	86.20	111.45	116.14
AC-FT		35548.	86832.	111260.	116994.
THOUS CU M		43278.	106859.	137258.	144319.

D-12

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 4

1160.	1150.	1190.	1240.	1290.	1335.	1383.	1380.	1370.	1360.
1350.	1340.	1320.	1320.	1310.	1300.	1290.	1280.	1270.	1270.
1260.	1250.	1240.	1230.	1220.	1250.	1275.	1300.	1330.	1360.
1394.	2310.	3230.	4160.	5040.	6000.	6727.	8020.	10325.	12620.
13710.	15410.	17103.	19890.	22060.	25470.	28270.	31681.	33846.	34650.
35356.	35230.	35000.	63900.	69300.	70900.	72000.	73000.	74100.	75130.
46730.	43900.	40700.	39130.	37400.	35000.	33900.	32220.	30490.	29140.
27960.	26450.	25100.	23750.	22401.	21580.	20750.	19930.	19160.	18270.
17449.	16890.	16340.	15780.	15230.	14670.	14110.	13540.	13040.	12510.
11970.	11430.	10893.	10340.	10190.	9640.	9090.	9140.	8790.	8440.
8120.	7780.	7450.	7110.	6771.	6560.	6350.	6130.	5910.	5700.
5485.	5270.	4950.	4680.	4410.	4140.	3870.	3840.	3810.	3770.
3730.	3700.	3660.	3640.	3620.	3590.	3570.	3540.	3525.	3510.
3470.	3450.	3430.	3400.	3390.	3360.	3340.	3310.	3290.	3270.
3240.	3220.	3200.	3180.	3160.	3130.	3117.	3100.	3080.	3060.
3030.	3010.	2993.	2970.	2950.	2930.	2910.	2900.	2880.	2860.
2840.	2820.	2800.	2780.	2760.	2740.	2720.	2700.	2680.	2660.
2650.	2630.	2620.	2600.	2580.	2560.	2540.	2520.	2510.	2490.
2480.	2460.	2440.	2430.	2410.	2400.	2380.	2360.	2345.	2330.
2320.	2300.	2280.	2270.	2250.	2240.	2220.	2210.	2190.	2180.
2164.	2150.	2140.	2120.	2110.	2090.	2074.			

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	76195.	76750.	43077.	18698.	2831243.
CMS	2157.	2604.	1237.	529.	80172.
INCHES		1.37	3.39	4.35	4.57
MM		34.93	86.066	110.49	116.14
AC-FT		33086.	86632.	111260.	116994.
THOUS CU M		43278.	106859.	137238.	144309.

D-13

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HYDROGRAPH ROUTING

ROUTED FLOWS THROUGH RESERVOIR

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPNT	INAME	ISTAGE	IAUTO
2	1	0	0	0	0	1	0	0

ROUTING DATA

IRES	ISAME	IOPT	IPMP	LSTR
1	1	0	0	0

NSTPS	NSTOL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	230.	-1

STAGE	39.50	39.60	42.00	44.00	45.00	47.00	50.00	55.00	
FLOW	0.00	1100.00	4400.00	8670.00	11490.00	20000.00	37960.00	86610.00	
CAPACITY=	0.	60.	445.	230.	400.	670.	1390.	2980.	5630.	13400.
ELEVATION=	33.	36.	38.	40.	42.	45.	50.	55.	60.	72.

CREL	SPWID	COOW	EXPW	ELEVL	COOL	CAREA	EXPL
39.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COOD	EXPD	DAMWID
44.0	0.0	1.5	0.

STATION 2, PLAN 1, RATIO 4

ITERATIVE SOLUTION DID NOT CONVERGE 73 1 0.000 5.923E+01 9.927E+03 5.002E+01 4.540E+03

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

1327.	1269.	1196.	1263.	1240.	1283.	1328.	1359.	1369.	1366.
1360.	1351.	1341.	1331.	1322.	1312.	1302.	1292.	1283.	1277.
1276.	1261.	1252.	1242.	1233.	1235.	1251.	1273.	1298.	1326.
1353.	1444.	7304.	3125.	4076.	4960.	5952.	7156.	8674.	10437.
12456.	14697.	17217.	17n24.	20556.	23e07.	26638.	29435.	32224.	34497.
45454.	47639.	49234.	58499.	64356.	65863.	7L602.	71935.	73.69.	74174.
2[2...	74a[7.	73e45.	64e[8.	67.76.	64143.	611Ae.	54244.	55313.	52375.
4[[4e.	44509.	45104.	38672.	37840.	36639.	34953.	33227.	31417.	29643.
2[3[2.	27234.	25806.	24536.	23186.	22.61.	21235.	20408.	1e658.	18926.
1[..6.	17398.	1606[.	1628[..	15583.	15127.	14571.	14124.	13483.	12946.
12411.	11972.	11326.	10[[7.	10468.	10112.	9761.	9436.	9[02.	8726.
8429.	8114.	7786.	7453.	7116.	6820.	6577.	6352.	6134.	5917.
5704.	5473.	5218.	4953.	4685.	4415.	4172.	3985.	3[66.	3927.
3782.	3744.	3706.	3676.	3650.	3624.	3599.	3573.	3544.	3526.
3502.	3478.	3446.	3432.	3[[8.	3386.	3365.	3342.	3317.	3295.
3273.	3246.	3226.	3205.	3184.	3161.	3139.	3121.	3105.	3093.
3081.	3077.	3[86.	3246.	3396.	3122.	3044.	2972.	2944.	2967.
2971.	2947.	2922.	2894.	2764.	2764.	2744.	2724.	2[[4.	2667.
2671.	2653.	2636.	2623.	2603.	2583.	2563.	2549.	2532.	2513.
2497.	2481.	2464.	2446.	2432.	2416.	2401.	2383.	2363.	2349.
2335.	2320.	2312.	2230.	2272.	2257.	2241.	2226.	2211.	2195.
2[72.	2167.	2154.	2146.	2125.	2110.	2[92.			

STORAGE

244.	242.	241.	242.	244.	246.	248.	250.	250.	250.
250.	249.	249.	247.	247.	247.	247.	246.	245.	244.
245.	245.	244.	244.	243.	243.	244.	245.	247.	248.
249.	266.	297.	337.	381.	424.	465.	506.	546.	643.
669.	756.	816.	894.	971.	1050.	1119.	1175.	1232.	1355.
1424.	1515.	1640.	1960.	2131.	2292.	2369.	2420.	2463.	2504.
2545.	2593.	2648.	2844.	2234.	2122.	2009.	1897.	1785.	1672.
1560.	1448.	1347.	1359.	1347.	1359.	1319.	1279.	1239.	1197.
1164.	1132.	1[[4.	1027.	1024.	1064.	952.	928.	905.	921.
944.	970.	890.	831.	812.	793.	776.	756.	737.	719.
701.	693.	685.	669.	637.	626.	615.	604.	593.	582.
570.	557.	543.	529.	516.	502.	492.	482.	473.	466.
459.	445.	434.	423.	412.	401.	389.	379.	375.	372.
369.	368.	366.	364.	363.	362.	36[.	359.	358.	357.
356.	356.	353.	352.	351.	350.	349.	348.	346.	345.
344.	343.	342.	341.	340.	339.	339.	337.	336.	335.
334.	333.	332.	365.	350.	337.	331.	329.	328.	326.
324.	323.	322.	321.	320.	319.	318.	317.	316.	315.
314.	314.	313.	312.	311.	310.	309.	308.	308.	307.
306.	305.	304.	303.	303.	302.	301.	301.	299.	299.
298.	297.	295.	295.	295.	294.	293.	292.	292.	291.
290.	290.	289.	288.	288.	287.	286.			

STAGE

39.8	39.7	39.7	39.7	39.7	39.7	39.8	39.8	39.8	39.8
39.8	39.8	39.8	39.8	39.8	39.8	39.8	39.7	39.7	39.7
39.7	39.7	39.7	39.7	39.7	39.7	39.7	39.7	39.7	39.8
39.8	40.0	40.5	41.1	41.7	42.3	42.7	43.3	44.0	44.7
45.2	45.6	46.0	46.5	47.1	47.6	48.1	47.8	49.0	49.8
50.1	50.4	50.9	51.6	52.3	52.9	53.1	53.2	53.4	53.5
53.6	53.6	53.3	53.0	52.7	52.3	51.9	51.6	51.2	50.9
50.5	50.2	50.0	49.8	50.0	49.5	49.5	49.2	48.9	48.7
48.4	48.2	48.0	47.8	47.5	47.5	47.2	47.1	46.9	46.7
47.6	46.4	46.2	46.1	46.0	45.9	45.7	45.6	45.5	45.3
45.2	45.1	44.9	44.8	44.6	44.5	44.4	44.3	44.1	44.0
43.9	43.7	43.6	43.4	43.3	43.1	43.0	42.9	42.8	42.7
42.6	42.5	42.4	42.3	42.1	42.0	41.8	41.7	41.6	41.6
41.5	41.4	41.5	41.5	41.5	41.4	41.4	41.4	41.4	41.4
41.3	41.3	41.3	41.3	41.3	41.3	41.2	41.2	41.2	41.2
41.2	41.2	41.1	41.1	41.1	41.1	41.1	41.1	41.1	41.0
41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	40.9	40.9
40.9	40.9	40.9	40.8	40.8	40.8	40.8	40.8	40.8	40.8
40.7	40.7	40.7	40.7	40.7	40.7	40.7	40.7	40.6	40.6
40.6	40.6	40.6	40.6	40.6	40.6	40.5	40.5	40.5	40.5
40.5	40.5	40.5	40.5	40.5	40.4	40.4	40.4	40.4	40.4
40.4	40.4	40.4	40.4	40.3	40.3	40.3			

PEAK OUTFLOW IS 75210. AT TIME 30.50 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	75210.	70423.	43697.	18764.	2432289.
CMS	2130.	1994.	1237.	530.	68261.
INCHES		1.36	3.19	4.32	4.57
MM		34.67	80.94	110.91	116.18
AC-FT		34921.	86672.	111319.	117037.
THOUS CU M		43074.	106909.	137310.	144363.

HYDROGRAPH ROUTING

CHANNEL ROUTING -MODIFIED PULS- STATION 2 TO 3

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

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPAP		LSTR
0.0	0.000	0.00	1	1	0	0		0
	NSTPS	NSTOL	LAG	AMSKK	X	TSK	STORA	ISPRAT
	1	0	0	0.000	0.000	0.000	-1.	0

NORMAL DEPTH CHANNEL ROUTING

QMIN	QMAX	QINIT	ELMVI	ELMAX	PLMTH	SEL
.1200	.6300	.1200	32.0	80.0	4800.	.60660

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

0.00	32.00	1400.00	45.00	3700.00	41.00	3700.00	32.00	3950.00	32.00	
3950.00	41.00	4200.00	60.00	6700.00	80.00					

STORAGE	0.00	49.50	139.19	268.79	314.00	739.02	1410.95	2143.87	2910.19	3717.91
	4567.04	5457.57	6422.55	7567.32	8712.15	10037.04	11481.98	13446.99	14732.06	16537.19
OUTFLOW	0.00	1404.37	4405.94	8551.70	13782.36	21499.96	33913.59	50310.25	70239.10	93541.57
	126135.39	149079.74	182003.52	218468.23	259251.41	304328.72	354540.55	409534.38	469754.21	535438.40
STAGE	32.00	34.53	37.05	39.58	42.11	44.63	47.16	49.68	52.21	54.74
	57.26	59.79	62.32	64.84	67.37	69.89	72.42	74.95	77.47	80.00
FLOW	0.00	1404.37	4405.94	8551.70	13782.36	21499.96	33913.59	50310.25	70239.10	93541.57
	126135.39	149079.74	182003.52	218468.23	259251.41	304328.72	354540.55	409534.38	469754.21	535438.40

STATION 3, PLAN 1, RTIO 1

D-5

STATION 3, PLAN 1, RTIO 4

OUTFLOW

1327.	1292.	1236.	1211.	1217.	1243.	1290.	1317.	1345.	1358.
1361.	1358.	1351.	1342.	1333.	1328.	1314.	1304.	1296.	1286.
1279.	1271.	1262.	1253.	1244.	1238.	1241.	1253.	1272.	1295.
1321.	1437.	1965.	2672.	3514.	4436.	5567.	6653.	8044.	9717.
11515.	13209.	14381.	15686.	17597.	20099.	22901.	25714.	28517.	31718.
37348.	43450.	47080.	53098.	58930.	64219.	67382.	70282.	71962.	73169.
74364.	74945.	74644.	72611.	69654.	66766.	63999.	61674.	58547.	55106.
52171.	48933.	47127.	43166.	39463.	36027.	32827.	29613.	26491.	23434.
20470.	29067.	27609.	26334.	24979.	23644.	22579.	21626.	20752.	19952.
19209.	18368.	17690.	17332.	16957.	15882.	15318.	14761.	14210.	13568.
12504.	12134.	11594.	11362.	10653.	10280.	9931.	9582.	9233.	8907.
8581.	8242.	7925.	7648.	7293.	6938.	6573.	6443.	6222.	6005.
5796.	5587.	5322.	5081.	4744.	4525.	4294.	4141.	3945.	3763.
3608.	3765.	3769.	3695.	3605.	3638.	3613.	3588.	3582.	3539.
3506.	3401.	3408.	3445.	3421.	3398.	3377.	3355.	3331.	3304.
3266.	3263.	3239.	3217.	3196.	3174.	3152.	3131.	3113.	3094.
3073.	3049.	3029.	3008.	2986.	3269.	3261.	3076.	2943.	2962.
2931.	2905.	2887.	2866.	2844.	2790.	2755.	2739.	2718.	2697.
2677.	2663.	2649.	2636.	2621.	2599.	2573.	2558.	2541.	2524.
2508.	2490.	2473.	2457.	2441.	2429.	2409.	2393.	2379.	2358.
2343.	2329.	2312.	2295.	2280.	2265.	2250.	2234.	2219.	2204.
2189.	2175.	2161.	2148.	2133.	2119.	2104.			

STOR

66.	64.	61.	60.	60.	62.	63.	65.	67.	67.
67.	67.	67.	66.	66.	65.	65.	65.	64.	64.
63.	63.	62.	62.	62.	61.	61.	62.	63.	64.
65.	70.	82.	99.	118.	140.	159.	177.	202.	232.
259.	309.	369.	439.	524.	622.	736.	876.	1023.	1209.
1573.	1961.	2437.	2991.	2475.	2679.	2823.	2912.	2969.	3012.
3051.	3070.	3042.	2972.	2880.	2777.	2656.	2554.	2441.	2326.
2215.	2109.	2002.	1889.	1662.	1601.	1538.	1467.	1391.	1310.
1230.	1153.	1079.	1004.	930.	859.	798.	745.	698.	654.
611.	568.	529.	494.	462.	430.	399.	368.	338.	310.
292.	281.	270.	264.	251.	244.	237.	230.	224.	216.
209.	204.	198.	193.	187.	182.	177.	173.	170.	166.
162.	159.	155.	150.	146.	141.	136.	132.	129.	127.
125.	124.	123.	123.	122.	121.	121.	121.	122.	119.
119.	118.	117.	117.	116.	116.	115.	115.	114.	114.
113.	113.	112.	112.	111.	111.	110.	110.	109.	109.
108.	108.	107.	106.	114.	113.	104.	106.	106.	105.
104.	103.	103.	102.	102.	101.	101.	100.	100.	100.
99.	99.	98.	98.	98.	97.	97.	96.	95.	95.
95.	95.	95.	94.	94.	93.	93.	92.	92.	92.
91.	91.	91.	90.	90.	90.	89.	89.	88.	88.
88.	87.	87.	87.	86.	86.	86.			

STAGE

34.4	34.3	34.2	34.2	34.2	34.2	34.3	34.4	34.4	34.4
34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.3	34.3	34.3
34.3	34.3	34.3	34.3	34.2	34.2	34.2	34.3	34.3	34.3
34.4	34.6	35.0	35.6	36.3	37.1	37.8	38.4	39.3	40.1
41.0	41.8	42.3	42.7	43.4	44.2	44.9	45.5	46.1	46.7
47.7	48.6	49.3	50.0	50.8	51.4	51.9	52.2	52.4	52.5
52.7	52.7	52.5	52.4	52.1	51.8	51.4	51.0	50.7	50.3
49.9	49.5	49.2	48.8	48.0	47.3	47.6	47.3	47.1	46.8
46.5	46.2	45.9	45.6	45.3	45.1	44.9	44.7	44.4	44.1
43.9	43.6	43.4	43.2	43.0	42.8	42.6	42.4	42.2	42.0
41.8	41.3	41.0	40.8	40.6	40.4	40.2	41.1	39.9	39.7
39.6	39.4	39.2	39.0	38.9	38.8	38.6	38.3	38.2	38.0
37.9	37.8	37.6	37.5	37.3	37.1	37.0	36.8	36.7	36.6
36.5	36.5	36.3	36.3	36.4	36.4	36.4	36.4	36.3	36.3
36.3	36.3	36.3	36.2	36.2	36.2	36.2	36.2	36.1	36.1
36.2	36.1	36.1	36.1	36.0	36.0	36.0	36.0	36.0	35.9
35.9	35.9	35.9	36.0	36.1	36.1	35.9	35.9	35.8	35.8
35.8	35.8	35.7	35.7	35.7	35.7	35.7	35.6	35.6	35.6
35.6	35.6	35.6	35.6	35.5	35.5	35.5	35.5	35.5	35.5
35.5	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.3	35.3
35.3	35.3	35.3	35.3	35.3	35.2	35.2	35.2	35.2	35.2
35.2	35.2	35.2	35.2	35.1	35.1	35.1			

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	74849.	70110.	43651.	16700.	2631863.
CMS	2119.	1985.	1236.	530.	80188.
INCHES		1.36	3.38	4.35	4.57
MM		34.51	85.95	110.51	116.16
AC-FT		34765.	86581.	111318.	117617.
THOUS CU M		42882.	106796.	137308.	144338.

MAXIMUM STORAGE = 3070.

MAXIMUM STAGE IS 52.7

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

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

OPERATION	STATION	AREA	PLAN	RATIO 1 .05	RATIO 2 .25	RATIOS APPLIED TO FLOWS RATIO 3 .50	RATIO 4 1.00
HYDROGRAPH AT	1	480.00	1	3809.	19046.	38093.	76185.
		(1243.19)		(107.847)(	539.331)(	1078.661)(	2157.321)(
ROUTED TO	2	480.00	1	3745.	18836.	37786.	75210.
		(1243.19)		(106.041)(	533.211)(	1069.981)(	2129.701)(
ROUTED TO	3	480.00	1	3741.	18625.	37440.	74849.
		(1243.19)		(105.921)(	527.401)(	1060.361)(	2119.481)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	39.50	39.50	44.00
STORAGE	230.	230.	500.
OUTFLOW	0.	0.	8670.

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
.05	41.52	0.06	368.	3745.	0.00	30.50	0.00
.25	44.73	2.73	918.	18836.	14.00	30.50	0.00
.50	49.97	5.97	1998.	37760.	24.50	30.50	0.00
1.00	53.63	9.63	2545.	75216.	35.00	30.50	0.00

PLAN 1 STATION B

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.05	3741.	36.5	31.00
.25	18625.	43.7	31.00
.50	37446.	47.7	31.00
1.00	74849.	52.7	31.00

Form 15:C-5-57

Dam Application No. 570

Map No. 25-[illegible]

State of New Jersey

Division of Water Policy and Supply

REPORT ON DAM APPLICATION

Application of Somerset County Park Commission

[illegible], 1957 for approval of plans and for a permit to reconstruct the Robert Stout [illegible] Dam across the Raritan River

tributary to Raritan Bay in Bridgewater and Hillsborough Townships

Somerset County, New Jersey, has been examined by

PRINCIPAL FEATURES

Purpose of dam Recreational boating for Duke Island County Park

Type of dam Piling & R.C. [illegible]

Site inspected [illegible]

Foundation material River sand & gravel overlying shale bedrock.

Location: 25.32.7.2.8

Maximum height 7 feet

Drainage area 475 sq. mi.

Length of dam feet

Elevation of low line 39.0

Top width of [illegible] spillway 17.5 feet

Area of lake 57.5 acres

Downstream slope -

Capacity of lake million gallons

Upstream slope -

Type of spillway Ogee

Length of spillway 256'

Design flood flow 33,300 cubic feet per second = 70 sec. ft. per sq. mi.

Head on spillway for design flood flow feet - Entire spillway & dam submerged during major storms

Freeboard - feet

Maximum spillway capacity (dam awash) = 6400 cubic feet per second

= 13.5 sec. ft. per sq. mi.

Outlet other than spillway -

Drawings filed by Goodkind & O'Dea, Montclair, N. J.

PERTINENT INFORMATION

The reconstruction of this dam entails a downstream extension of the existing dam accomplished by the addition of sheet piling, a concrete slab, and spillway. Thus, the existing dam is incorporated as a part of the fill under the slab. The spillway, dam and surrounding low lands will be submerged during major floods. Deflection boom for Dead River is also included in this application although it is actually an encroachment.

HYDROLOGY

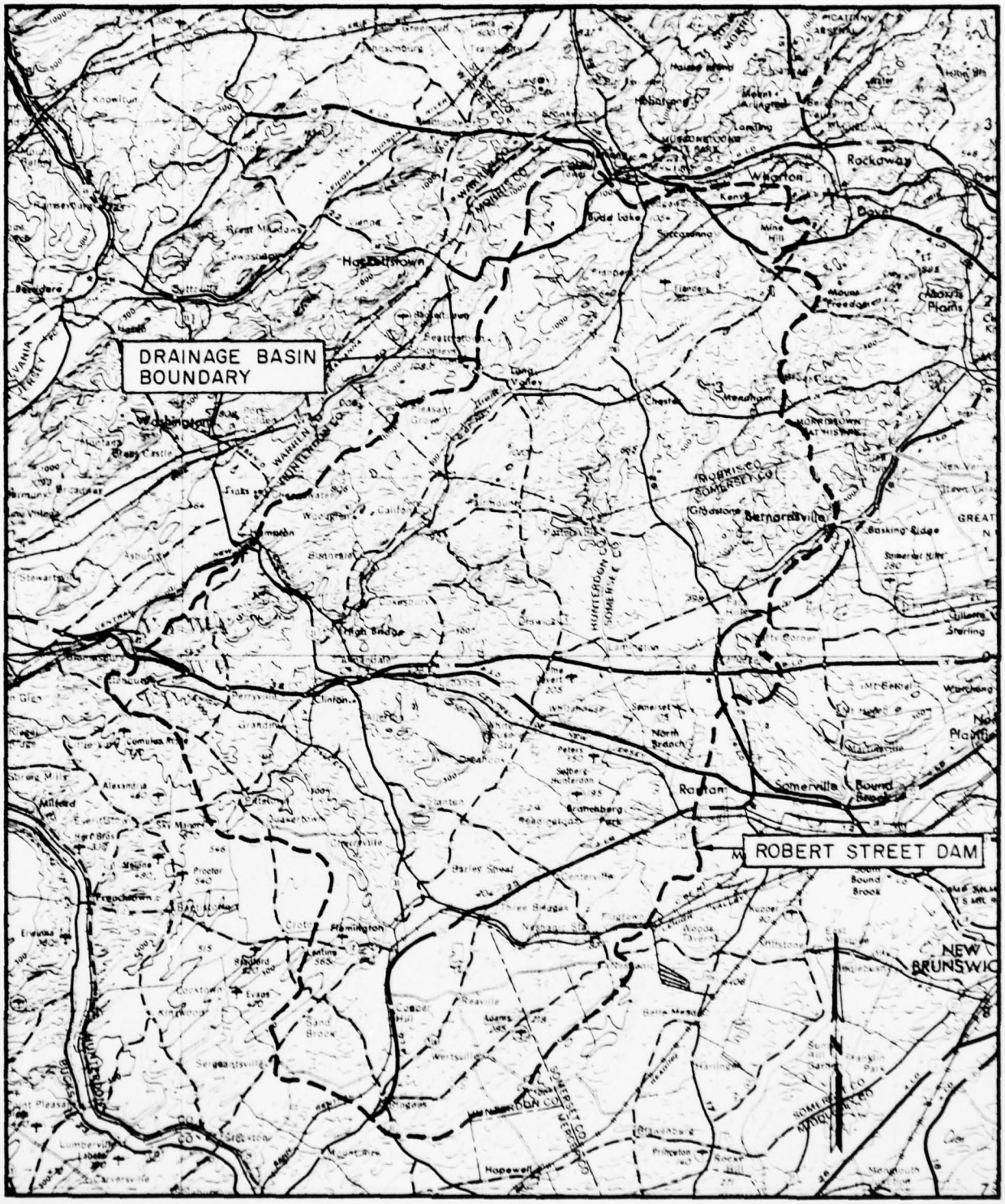
Encroachment applications located downstream used the 1959 flood with a design Q= 36,100 cfs, as was reported in Dam Appl. 515 for the Hamlin Dam 11,000' upstream from this dam. Records show that the floods of August 19, 1959 and September 22, 1938 reached elevations 51.7' and 49.4', respectively, at Robert Street Dam. Using this information a design flood of Q=33,300 cfs was determined for this application.

HYDRAULICS

Determine the capacity of the Robert Street Spillway with a head of 4.5' and length of 255'.

Q= CLH 3/2
Q= 2.63 x 255 x (4.5) 3/2
Q= 6400 cfs.

PLATE D-1



0 1 2 3 4 5 10

SCALE IN MILES

AREA LOCATION

ROBERT STREET DAM

JENNY - LEEDSHILL JANUARY 1979

CLEARPRINT PAPER CO. C-15 10 X 10 DIVISIONS PER INCH 70 X 100 DIVISIONS. PRINTED IN U.S.A. ON CLEARPRINT TECHNICAL PAPER NO. 1018
CLEARPRINT CHARTS

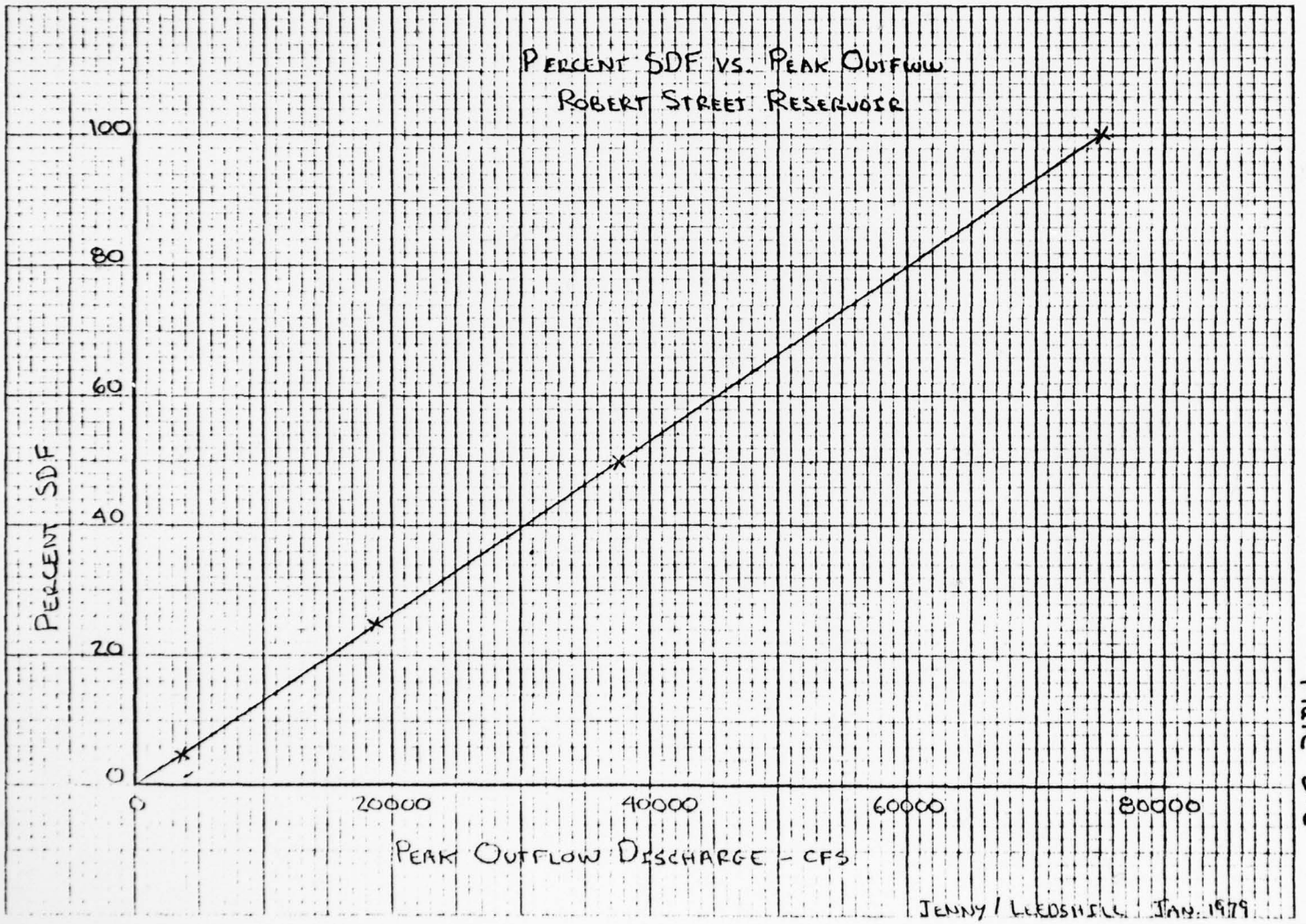


Plate D-2

CLEARPRINT PAPER CO. C-3S 10 X 10 DIVISIONS PER INCH 70 X 100 DIVISIONS PRINTED IN U.S.A. ON CLEARPRINT TECHNICAL PAPER NO. 1018
CLEARPRINT CHARTS

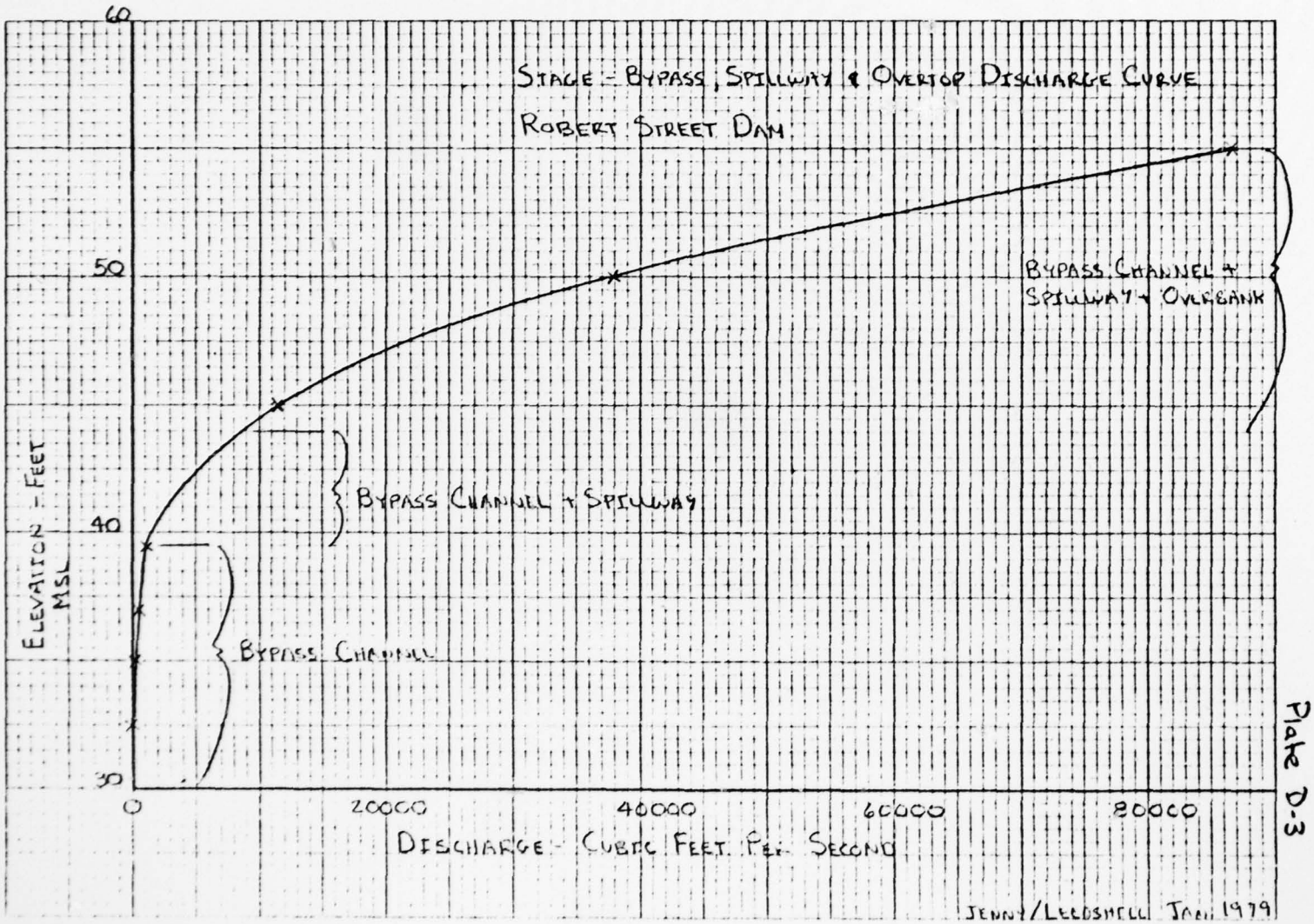


Plate D-3

AD-A068 648 NEW JERSEY STATE DEPT OF ENVIRONMENTAL PROTECTION TRENTON F/G 13/2
NATIONAL DAM SAFETY REPORT. ROBERT STREET DAM (NJ-00371), RARIT--ETC(U)
APR 79 R J JENNY DACW61-78-C-0124

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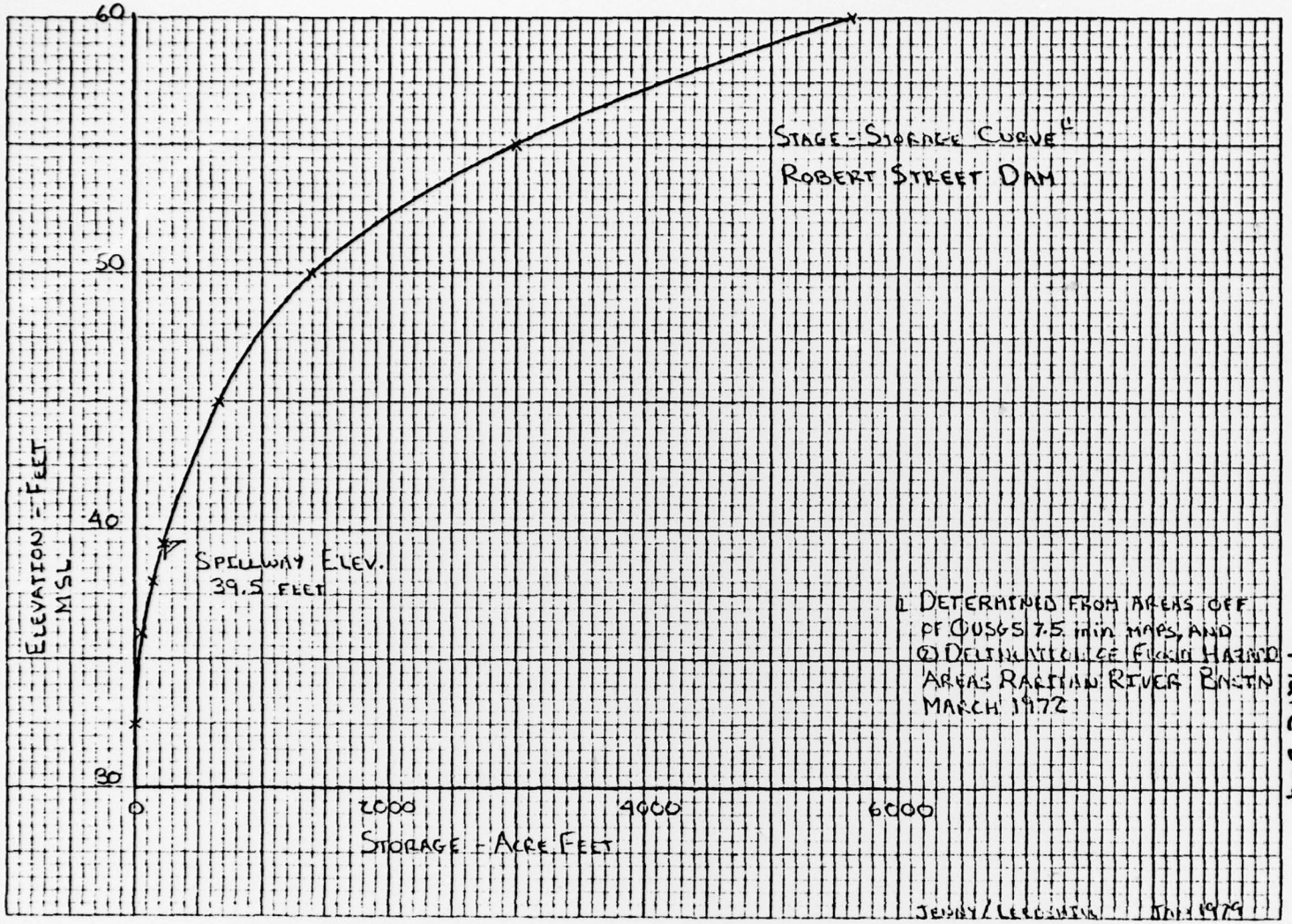
STAGE - STORAGE CURVE[1]
ROBERT STREET DAM
60
50
40
30
ELEVATION - FEET MSL
SPILLWAY ELEV. 39.5 FEET
0
2000
4000
6000
STORAGE - ACRE FEET
[1] DETERMINED FROM AREAS OFF OF USGS 7.5 min MAPS, AND
② DELINEATED BY CE FLOOD HAZARD AREAS RACCIAN RIVER BASIN MARCH 1972
JENNY / LEECHMAN JULY 1979

Plate D-4