

AD-A068 642

NEW JERSEY STATE DEPT OF ENVIRONMENTAL PROTECTION TRENTON F/G 13/2
NATIONAL DAM SAFETY PROGRAM. ASSUNPINK DAM NUMBER 4 (NJ00322), --ETC(U)
APR 79 F K JOLLS

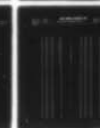
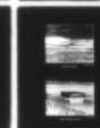
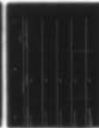
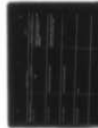
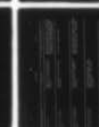
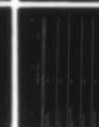
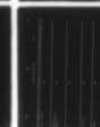
DACW61-78-C-0124

NL

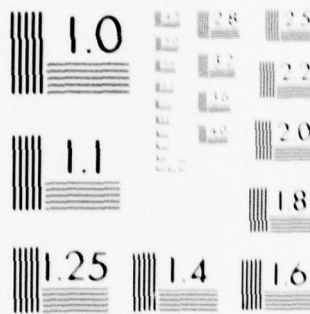
UNCLASSIFIED

| OF |

AD
A068642



END
DATE
FILMED
7-79
DDC



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

AD A068642

DELAWARE RIVER BASIN
ASSUNPINK CREEK
MONMOUTH COUNTY
NEW JERSEY

P.B.S.

LEVEL

ASSUNPINK DAM

NO. 4

NJ 00322

DDC
RECEIVED
MAY 16 1979
C

**PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM**



Approved for public release;
distribution unlimited

DDC FILE COPY

DEPARTMENT OF THE ARMY

Philadelphia District
Corps of Engineers
Philadelphia, Pennsylvania

79 05 14 195
April, 1979

DISCLAIMER NOTICE

**THIS DOCUMENT IS BEST QUALITY
PRACTICABLE. THE COPY FURNISHED
TO DDC CONTAINED A SIGNIFICANT
NUMBER OF PAGES WHICH DO NOT
REPRODUCE LEGIBLY.**

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER NJ00322	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Phase I Inspection Report National Dam Safety Program Assumpink Dam No. 4 Monmouth County, N.J.	5. TYPE OF REPORT & PERIOD COVERED 9 FINAL rept.	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) 10 F. Keith/Jolls P.E.	8. CONTRACT OR GRANT NUMBER(s) 15 DACW61-78-C-0124	
9. PERFORMING ORGANIZATION NAME AND ADDRESS Louis Berger & Assoc. ✓ 100 Halstead St. East Orange, N.J. 07019	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS New Jersey State Dept. of Environmental Protection Trenton	
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Engineer District, Philadelphia Custom House, 2d & Chestnut Streets Philadelphia, Pennsylvania 19106	12. REPORT DATE 11 Apr 1979	13. NUMBER OF PAGES 76
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) 12 79p.	15. SECURITY CLASS. (of this report) Unclassified	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited.		
17. DISTRIBUTION STATEMENT 6 National Dam Safety Program. Assumpink Dam Number 4 (NJ00322), Delaware River Basin, Assumpink Creek, Monmouth County, New Jersey. Phase I Inspection Report.		
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 Safety Drainage Visual Inspection Seepage National Dam Inspection Act Report Structural Analysis Assumpink Dam No. 4, N.J.		
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 ade- quacy. 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.		



IN REPLY REFER TO:
NAPEN-D

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT CORPS OF ENGINEERS
CUSTOM HOUSE - 2 D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

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

9 MAY 1979

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Assunpink Dam No. 4 in Monmouth 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, Assunpink Dam No. 4, 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 and the spillway is considered adequate. 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. The following remedial actions could be undertaken:

- (1) Regrade the eroded crest backslopes and rutted portions of the auxiliary channel and reseed the bare areas.
- (2) Continue to monitor the seepage and backslope drainage system. Records should be maintained of the hydrostatic heads in the standpipes to monitor any abrupt changes and to determine if further corrective measures are required.
- (3) Place additional barriers at various locations to inhibit the illegal vehicular use of the dam surfaces.

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 Congressman Frank Thompson, Jr. of

This document has been approved
for public release and sale; its
distribution is unlimited.

NOTICE

THIS DOCUMENT HAS BEEN REPRODUCED
FROM THE BEST COPY FURNISHED US BY
THE SPONSORING AGENCY. ALTHOUGH IT
IS RECOGNIZED THAT CERTAIN PORTIONS
ARE ILLEGIBLE, IT IS BEING RELEASED
IN THE INTEREST OF MAKING AVAILABLE
AS MUCH INFORMATION AS POSSIBLE.

NAPEN-D

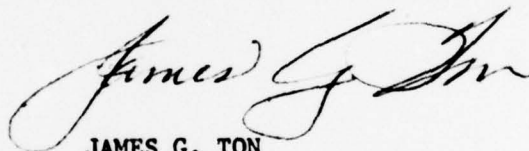
Honorable Brendan T. Byrne

the Fourth 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 reasonable 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 recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,



JAMES G. TON
Colonel, Corps of Engineers
District Engineer

1 Incl
As stated

Copies furnished:

Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N. J. Dept. of Environmental Protection
P. O. Box CN029
Trenton, NJ 08625

John O'Dowd, Acting Chief
Bureau of Flood Plain Management
Division of Water Resources
N. J. Dept. of Environmental Protection
P. O. Box CN029
Trenton, NJ 08625

ACCESS	
NTIS	Section ☒
DDC	Section ☐
NAVJAG	Section ☐
JSI	Section ☐
SY	
DISTRIBUTION AND ADVICE CODES	
SPECIAL	
A	23 CP

ASSUNPINK DAM NO. 4 (NJ00322)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 4 January 1979 by Louis Berger and Associates, 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.

Assunpink Dam No. 4, 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 and the spillway is considered adequate. 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. The following remedial actions could be undertaken:

(1) Regrade the eroded crest backslopes and rutted portions of the auxiliary channel and reseed the bare areas.

(2) Continue to monitor the seepage and backslope drainage system. Records should be maintained of the hydrostatic heads in the standpipes to monitor any abrupt changes and to determine if further corrective measures are required.

(3) Place additional barriers at various locations to inhibit the illegal vehicular use of the dam surfaces.

APPROVED: _____

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

DATE: _____

9 May 1979

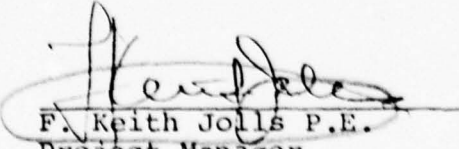
PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam Assunpink Dam No. 4 Fed ID# NJ 00322
NJ ID# 623

State Located New Jersey
County Located Monmouth
Coordinates Lat. 4013.2 - Long. 7431.7
Stream Assunpink Creek
Date of Inspection 4 January 1979

ASSESSMENT OF
GENERAL CONDITIONS

Assunpink Dam No. 4 is in a good overall condition and has sufficient spillway capacity to accommodate the 100-year design flood. It is recommended that its hazard classification be downgraded to low as it is situated within an official Fish and Wildlife Management Area, and overtopping or collapse would not increase the danger of loss of life or downstream property damage. No detrimental findings were uncovered to merit further study. Recommended remedial actions to be undertaken in the future as part of the regular State maintenance program include repair and seeding of the eroded areas of all slopes and the installation of vehicular barriers at the access points around the perimeter of the dam.


F. Keith Jolls P.E.
Project Manager



79 05 14 1979



OVERVIEW OF ASSUNPINK CREEK WATERSHED DAM SITE # 4

JUNE, 1976

TABLE OF CONTENTS

	<u>Page</u>
Assessment of General Conditions	
Overall View of Dam	
Table of Contents	
Preface	
Section 1 - Project Information	1-5
Section 2 - Engineering Data	6-7
Section 3 - Visual Inspection	8-10
Section 4 - Operational Procedures	11
Section 5 - Hydraulic/Hydrologic	12-13
Section 6 - Structural Stability	14-15
Section 7 - Assessment/Recommendations/ Remedial Actions	16-17

FIGURES

Figure 1 - Regional Vicinity Map
Figure 2 - Management Area Overview
Figure 3 - Plan of Dam
Figure 4 - Section Along Centerline of Principal Spillway
Figure 5 - Typical Section
Figure 6 - Riser Details

APPENDIX

Check List - Visual Inspection	
Check List - Engineering Data	
Photographs	
Check List - Hydrologic and Hydraulic Data Computations	A1-A26

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 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 INSPECTION PROGRAM
NAME OF DAM: ASSUNPINK DAM SITE NO. 4 FED #NJ00322
AND NJ ID #623

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

This report is authorized by the Dam Inspection Act, Public Law 92-367, and has been prepared in accordance with Contract FPM-36 between Louis Berger & Associates, Inc. and the State of New Jersey and its Department of Environmental Protection, Division of Water Resources. The State, in turn, is under agreement with the U.S. Army Corps of Engineers, Philadelphia to have this inspection performed.

b. Purpose of Inspection

The purpose of this inspection is to evaluate the structural and hydraulic condition of the Assunpink Dam No. 4 and appurtenant structures, 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

The dam at Assunpink Site No. 4 is a two zone, 2,900 foot long earth structure with an impervious upstream core and cutoff key. The upstream face is protected by riprap between elevations 106 and 113. The principal discharge outlet consists of a drop inlet structure containing a multi-stage reinforced concrete riser, a 60-inch diameter reinforced concrete pipe sluice, and a reinforced concrete impact basin. A trapezoidal auxiliary spillway with a negative approach slope is located just beyond the left abutment. The embankment

has a maximum height of 24 feet (to the crest elevation of 118.7) above the marshland below the toe of the dam. Seepage through the embankment and foundation is controlled by a vertical trench drain with multiple outlets along the downstream toe of the dam. An earth dike on the left abutment prevents high water flows from entering the adjoining valley where Assunpink Dam No. 5 is situated (see Figure 1).

b. Location

The dam is located on the Assunpink Creek in Upper Freehold and Millstone Townships, Monmouth County, and is approximately four and four-tenths of a mile northeast of Allentown and three and four-tenths miles southeast of Windsor. The dam lies generally in a north-south orientation on Assunpink Creek one mile upstream from its confluence with Horse Creek, and is roughly 5 miles northeast of Interchange 7A on the N.J. Turnpike.

c. Size Classification

The dam at Site No. 4 has a maximum height of 24 feet and a maximum storage capacity of 4,300 acre-feet. Accordingly, this dam is in the intermediate size category as defined by the criteria in the Recommended Guidelines for Safety Inspection of Dams (storage between 1,000 and 50,000 acre-feet).

d. Hazard Classification

This dam is part of a fish and game wildlife preserve, and is located in a sparsely inhabited area. While there are several homes located some 9,000 feet downstream in the community of Carsons Mills (just west of the Turnpike), it is unlikely they would be inundated by flood waters resulting from a dam failure. Old York Road and the N.J. Turnpike cross the Assunpink Creek 5,000 feet and 10,000 feet downstream of the dam site respectively, but these crossings are well above flood elevation. Further downstream, Dam No. 6 lies west of the Turnpike, and although presently

dewatered, was designed by the SCS to accommodate a full PMP flood and collapse of all upstream dams. Accordingly, it is recommended that the study dam be downgraded to low hazard category.

e. Ownership

This dam is owned by the State of New Jersey, Department of Environmental Protection, Division of Fish, Game, and Shellfisheries, Trenton, New Jersey.

f. Purpose of Dam

The purpose of the dam is floodwater retention, sediment storage, wildlife management, and recreation.

g. Design and Construction History

The dam was designed in 1972 by the U.S. Soil Conservation Service as part of the Assumpink Creek Watershed floodwater retention program, and constructed under the authority of the Watershed Protection and Flood Prevention Act (PL 566). Construction of the dam was completed in June 1974 by the Farm Harvesting And Flanders Construction Company of Flanders, New Jersey.

h. Normal Operating Procedures

The dam is maintained by personnel of the N.J. Division of Fish and Game, but there are no routine, day-to-day operational procedures. The water level in the lake is regulated during the year at the direction of the Bureau of Fisheries with changes occurring only once or twice a year. These are accomplished by adjusting the gate height in the concrete riser of the drop inlet structure. (See Section 4.)

1.3 PERTINENT DATA

a. Drainage Area

Assumpink Site No. 4 has a drainage area of 6.3 square miles which consists of woodland,

cropland, meadowland, and some rural residential development. The area includes the upstream dams 18 and 19.

- b. Principal spillway capacity at maximum pool elevation - 503 cfs

Auxiliary spillway capacity at maximum pool elevation - 16,250 cfs

Total spillway capacity at maximum pool elevation - 16,750 cfs

- c. Elevation (ft. above MSL)

Top of dam - 118.7

Maximum design pool - 115.6

Full flood control pool (Aux. spillway crest) - 114.2

Recreation pool - 110.0

Streambed at centerline of dam - 94.5₊

- d. Reservoir

Length of maximum pool - 11,400 feet

Length of recreation pool - 8,800 feet

Length of flood control pool - 10,000 feet

- e. Storage (acre-feet)

Recreation pool - 1,158

Flood control pool - 2,450

Top of dam - 4,294

- f. Reservoir Surface (acres)

Top dam - 536

Flood control pool - 385

Recreation pool - 225

- g. Dam

Type - Earth with drop inlet and auxiliary spillway

Length - 2,900 feet

Height - 24.2 feet

Top Width - 15 feet

Side Slopes - 3H:1V

Zoning - 2 zones (see attached plans)

Impervious Core - Inorganic clayey and silty
sand (SM,CL-ML) compacted
to 95% of maximum dry density.

Cutoff - 12-foot wide keyed section with core.

Grout curtain - None

h. Diversion and Regulating Tunnel

None

i. Spillway

Type - Auxiliary channel excavated at left
abutment.

Channel width - 300 feet

Crest elevation - 114.2

Gates - None

U/S Channel - Negatively sloped, vegetated inlet

D/S Channel - Positively sloped, vegetated outlet

j. Regulating Outlets

Principal spillway is a multi-stage, drop inlet
structure with a 60-inch diameter reinforced
concrete outlet pipe.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

Complete details of the initial design report and work plan, hydraulic determinations, structural analyses and subsurface information were available at the Soil Conservation Service offices (in Somerset) together with as-built plans. All design was done in accordance with SCS criteria and was discussed with engineering personnel of their staff who explained in detail the various design and operational features of the dam, particularly the hydraulics of the spillways. The main spillway drop inlet structure is a multi-stage deep-well concrete riser of a standard design developed by the Saint Anthony Falls Hydraulic Laboratory. The impact basin is also of a standard design developed by the SCS.

2.2 CONSTRUCTION

The SCS supervised the construction on lands acquired by the Department of Conservation and Economic Development with Green Acres funds. There have been no major structural modifications since the initial construction.

2.3 OPERATION

As the principal purpose of the dam is to reduce urban flooding in Trenton, as well as to establish a wildlife management and recreational area, the multi-purpose operation appears to function properly under the aegis of the Division of Fish and Game, who regulate the water level seasonally. (See Section 4 for additional operation information).

2.4 EVALUATION

a. Availability

Sufficient engineering data was obtained to assess the structural stability with regard to the embankment zones. The foundation stability was delineated in the various soils reports prepared by the SCS (which analyzed all geotechnical aspects in considerable detail).

Soils at the site consist of stratified sands of the Englishtown Formation which overlie the black stiff clay of the Woodbury Formation. The Englishtown formation contains quartz sand, gravel and clay in thin bedded horizontal strata. Approximately 35 feet of stratified sands and gravel underlie the organic swamp deposits originally found at the dam site. The permeability rates ranged from 1 fpd to 15 fpd in the stratified layers, which precluded the possibility of a watertight foundation or a positive cut-off into the deeper Woodbury clays. A minimal cutoff was employed for the purpose of keying in the dam and an extensive drain system proved to be required to lower the phreatic level.

b. Adequacy

The field inspection and review of the available design plans reveal that the dam is structurally sound and well-built. It is believed that the data available is adequate to render this assessment without recourse to gathering additional information.

c. Validity

The validity of the engineering data available is not challenged and is accepted without recourse to further investigations.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

Visual inspection of Assunpink Dam Site No. 4 was conducted on 4 January 1979. Weather conditions at the time of the inspection were clear and very cold and the embankment was in a frozen condition. The overall appearance of the dam and appurtenant structures was satisfactory. Water level in the lake at the time of the inspection was at normal pool elevation 110.0 and the tailwater was at elevation 94.5. Most of the terrain surrounding the site is wooded or under cultivation. There are several farm houses a few thousand feet to the north and east of the dam site, but all appear to be well above flood elevation. The area to the south of the dam is open and occupied by Assunpink Dam No. 5. The two reservoirs are separated by a dike which was constructed to prevent any interconnection of flows between the two reservoirs.

b. Dam

In general, the dam appeared to be in good satisfactory condition. A fairly continuous grass cover was observed on the embankment slopes and the riprap protection of the upstream face of the dam was uniformly distributed and well placed. The dam crest is badly rutted from vehicle tracks despite the existence of a steel barrier across the crest. The tracks, which are reportedly caused by unauthorized operation of 4-wheel drive vehicles, continue in a southerly direction across the auxiliary spillway where they have created deep erosion gullies on both side walls. In addition to the crest and spillway, tracks were also observed along the downstream toe of the dam as well as on the side slopes. The areas immediately

below the toe on both sides of the discharge channel were utilized as spoil disposal areas during construction and have a naturally high water table. The illegal use of vehicles on this soft, rather spongy ground has resulted in the creation of many deeply incised tracks now filled with water and ice. Additional evidence of the high ground-water table to the right of the impact basin was observed at several locations where small ponds were noted just beyond the toe of the dam. Although there are no seriously eroded areas, the vehicular tracking has done considerable damage and the water and ice in the ruts appear to be from seepage with the soil in the ruts wet and loose down to a depth of six inches. Another deep erosion gully which extends from behind the left wingwall of the impact basin to the crest of the dam appears to have been caused by trail bikes. Erosion behind the right wingwall is considerably less pronounced and of little consequence. Three stand pipes and a manhole are located along the downstream toe of the dam. These are part of the drain system which discharges through the wingwalls of the impact basin. The stand pipe at station 67+00 had water seeping out from under the cap (elev. 108+), suggesting a rather high pressure head on the drain system at this location.

c. Appurtenant Structures

Although the location of the intake structure (22 feet offshore) precluded a close visual inspection, the concrete, grates, and trash racks appeared to be in excellent condition. The wheel to the grate stem was missing, but the representative of the Bureau of Fish and Game advised the inspection team that the wheel is removed to prevent vandalism. The grass cover on the auxiliary spillway appeared in good condition with the exception of the erosion gullies and vehicle tracks. The impact basin also appeared to be in good condition and functioning as designed.

The only deleterious effect noted was the iron oxide staining and some light efflorescence where the conduit emerges from the headwall. The toe drain outlets were submerged and not visible during the inspection.

d. Reservoir

Assunpink Dam Site No. 4 is part of a wildlife maintenance area and, as such, is in a sparsely developed region. The left abutment area is contiguous with the right abutment area of Assunpink Dam Site No. 5 immediately to the south. The reservoir is cleared of trees and stumps and has a well-defined shoreline. It is surrounded by gently sloping wooded areas and cultivated fields. The reservoir severs portions of Sharon-East Branch Road, Clarksburg-Robbinville Road, and Imlaystown-Hightstown Road (all secondary farm roads).

e. Downstream Channel

The flood plain immediately below the dam widens into a wooded marshland for several hundred yards downstream. The slopes of the channel immediately below the impact basin are protected against sloughing by a concrete filled nylon mattress. The channel side slopes are gentle and grass covered as far as the downstream marsh.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

Dam No. 4 functions as an integral part of the overall Assunpink Creek Watershed flood control system, and provides a wildlife and recreational area. Operational procedures are governed by the N.J. Division of Fish and Game, Bureau of Fisheries, who prescribes changes in the lake level periodically during the year. The regulation is performed by their field personnel who manually adjust the gate opening.

4.2 MAINTENANCE OF DAM

The dam is maintained by personnel of the N.J. Division of Fish and Game whose field office is located a short distance upstream. They are responsible for all aspects of the dam's upkeep and safety including grounds keeping, riprap repair, inlet structure operation and repair, impact basin maintenance and routine patrolling. Minor defects are corrected as required, but problems of a more serious nature involving structural aspects are referred to the Soil Conservation Service for additional investigation and remedial action.

4.3 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

No formal warning system exists although personnel of the Division of Fish and Game regularly patrol the dam.

4.4 EVALUATION OF OPERATIONAL ADEQUACY

A formal inspection is performed by engineering personnel of NJDFG and SCS on an annual basis. The operational and maintenance procedures are considered to be adequate and efficiently performed. The design inherently provides flood control (and dam protection) without attendant operational personnel. A warning system is not considered necessary since much of the downstream area is also part of the wildlife preserve.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data

Based on the criteria in the Recommended Guidelines for Safety Inspection of Dams, the 100-year frequency event was selected as the design storm by the inspection team. Precipitation data was obtained from Technical Paper 40 and NOAA Technical Memorandum NWS Hydro - 35. Storage data and time of concentration were obtained from the Soil Conservation Service design calculations and reviewed in the context of the above inspection criteria and the fact that dam sites 18 and 19 are located upstream.

The routed outflows from reservoirs 18 and 19 were included in the inflow to the site 4 reservoir. Sites 18 and 19 lie immediately upstream and lie within the overall drainage basin of site 4. Inflow also included that due to the intermediate area between the upper reservoir and site 4.

The inflow to the reservoir for the selected 100-year storm was computed utilizing the HEC-1 computer program. This gave a peak inflow to the reservoir of 3,170 cfs and routing reduced the peak to 510 cfs. The combined spillways have a maximum discharge capacity of approximately 16,750 cfs before overtopping occurs and can therefore accommodate the design flood. The 60" conduit alone will practically accommodate the entire routed design discharge.

b. Experience Data

The dam was originally designed for a 100-year frequency storm with a time of concentration of 6.8 hours. In the original analysis, annual peak discharges were obtained from USGS records for 1924-58 from gaging data in Trenton, and detailed hydraulic studies were exhaustively performed by the SCS to quantify final design

values against the economical apportionment of the dam. The closed conduit spillway system with a multi-stage drop inlet riser was selected and the auxiliary spillway height established so that the only design flow to ever reach the spillway crest would be if both upstream dams fail.

c. Visual Observations

With the water at low stage at the time of inspection, approximately 5 cfs was flowing out of the 60" outfall. Visual observations confirmed all the aspects and assumptions of the original design.

d. Overtopping Potential

As there are no records of the dam having been overtopped and since the main and auxiliary spillway can easily accommodate the design flood, there is extremely little potential for overtopping. From a design standpoint, the overall hydraulics are very conservative.

e. Drawdown Potential

Drawdown is provided by a 2'x2' gated pond drain at El. 97.5. Assuming no tailwater, it would take approximately 12 days to drawdown the reservoir from the recreation pool elevation.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

In view of the age of the embankment, the well-designed and supervised engineering and continuous maintenance, the dam at Assunpink Site No. 4 is deemed to be in a good overall condition. The upper zones of the riprap show little evidence of subgrade subsidence, and the main embankment crest and adjoining spillway slopes are at true design grade and are marred only by the vehicular rutting. The backslope drainage system in the vicinity of the impact basin appears to be under a continuous but modest head but is functioning satisfactorily. In summary, nothing was visually noted to create or worsen a hazardous condition that could not be readily corrected. The only drainage element not visible for inspection was the lower portions of the intake riser. The spoil areas immediately below the backslopes are saturated, which could be indicative of substantial percolation through the foundation soils.

b. Design and Construction Data

Based upon the review of the SCS studies and contract plans, the dam appears to be well-engineered and reflects a conservative design approach employing conventional analytical techniques. From the observed condition and the hazard classification, it is felt that additional design studies are unnecessary under the purview of PL 92-367.

c. Operating Records

The operational performance has been satisfactory although certain normal remedial repairs and modifications have been required.

d. Post Construction Changes

There have been no major modifications since the initial installation.

e. Seismic Stability

The dam is located in Zone 1 and has negligible potential vulnerability to seismic loadings. Experience indicates that dynamic stability will be adequate if all static conditions and loadings provide sufficient factors of safety.

SECTION 7 - ASSESSMENTS/RECOMMENDATIONS/
REMEDIAL ACTIONS

7.1 DAM ASSESSMENT

a. Safety

Subject to the inherent limitations of the Phase I visual inspection, Assunpink Dam No. 4 is judged to be in a good overall condition. Overtopping of the dam is a very remote possibility and no seriously detrimental conditions were observed. The dam is recommended to be placed in a low hazard category due to location within the officially designated State Fish and Wildlife Management area where there is no downstream development.

b. Adequacy of Information

The information made available by the Soil Conservation Service is deemed to be adequate regarding the evaluation of safe operation and structural stability.

c. Urgency

No immediate urgency is attached to implementing the remedial measures set forth below.

d. Necessity for Further Study

In view of the overall condition of this dam and the fact that it is continually monitored by trained engineering personnel, additional inspections under the purview of P.L. 92-367 are deemed to be unnecessary. The Division of Fish and Game, in conjunction with SCS engineers, maintains an internal system of annual inspections and emergency action plans which basically reflect the requirements mandated therein.

7.2 RECOMMENDATIONS/REMEDIAL MEASURES

a. Recommendations

Under the present Assunpink Creek Fish and Wildlife Management Area maintenance program, it is

recommended that the following be taken under advisement in the future:

- Regrade the eroded crest backslopes and rutted portions of the auxiliary channel and reseed the bare areas.
- Continue to monitor the seepage and back-slope drainage system. Records should be maintained of the hydrostatic heads in the standpipes if monitor any abrupt changes and to determine if further correct measures are required.
- Place additional vehicular barriers at various locations to inhibit the illegal vehicular use of the dam surfaces.

b. O&M Maintenance and Procedures

In view of the assessment contained herein, no additional procedures other than those presently in effect appear to be required.

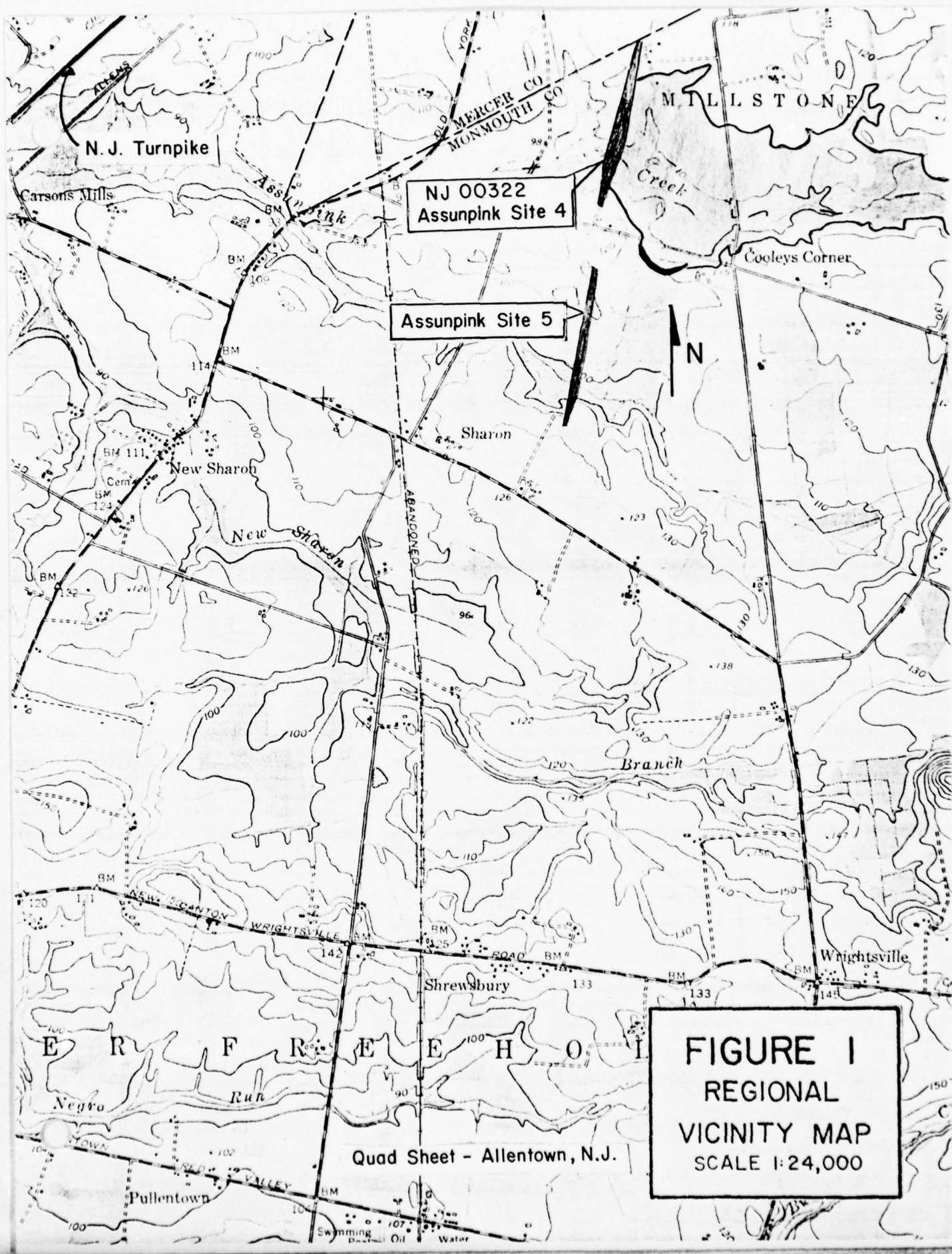


FIGURE I
REGIONAL
VICINITY MAP
SCALE 1:24,000

PROJECT MAP

ASSUNPINK CREEK WATERSHED

MERCER AND MONMOUTH COUNTIES, NEW JERSEY



0 2000' 4000' 6000' 8000'
FEET

- Watershed Boundary
- County Line
- Township Line
- City Limits
- Streams
- Railroads

PROJECT MEASURES

- [Hatched Box] Floodwater retarding structure
- [Hatched Box] Multiple-purpose structure
- [Hatched Box] FW-Fish and Wildlife
- [Hatched Box] R - Recreation

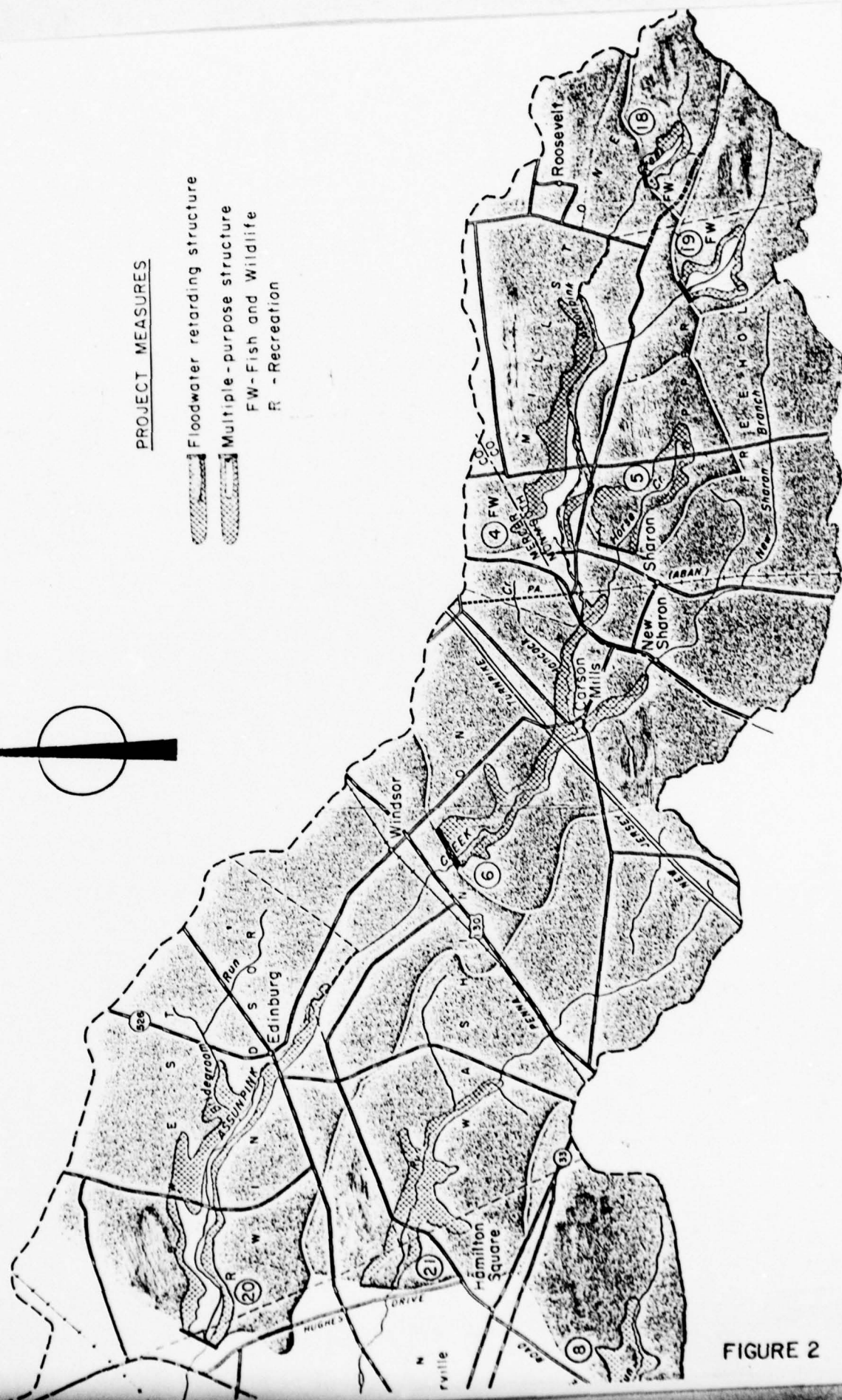
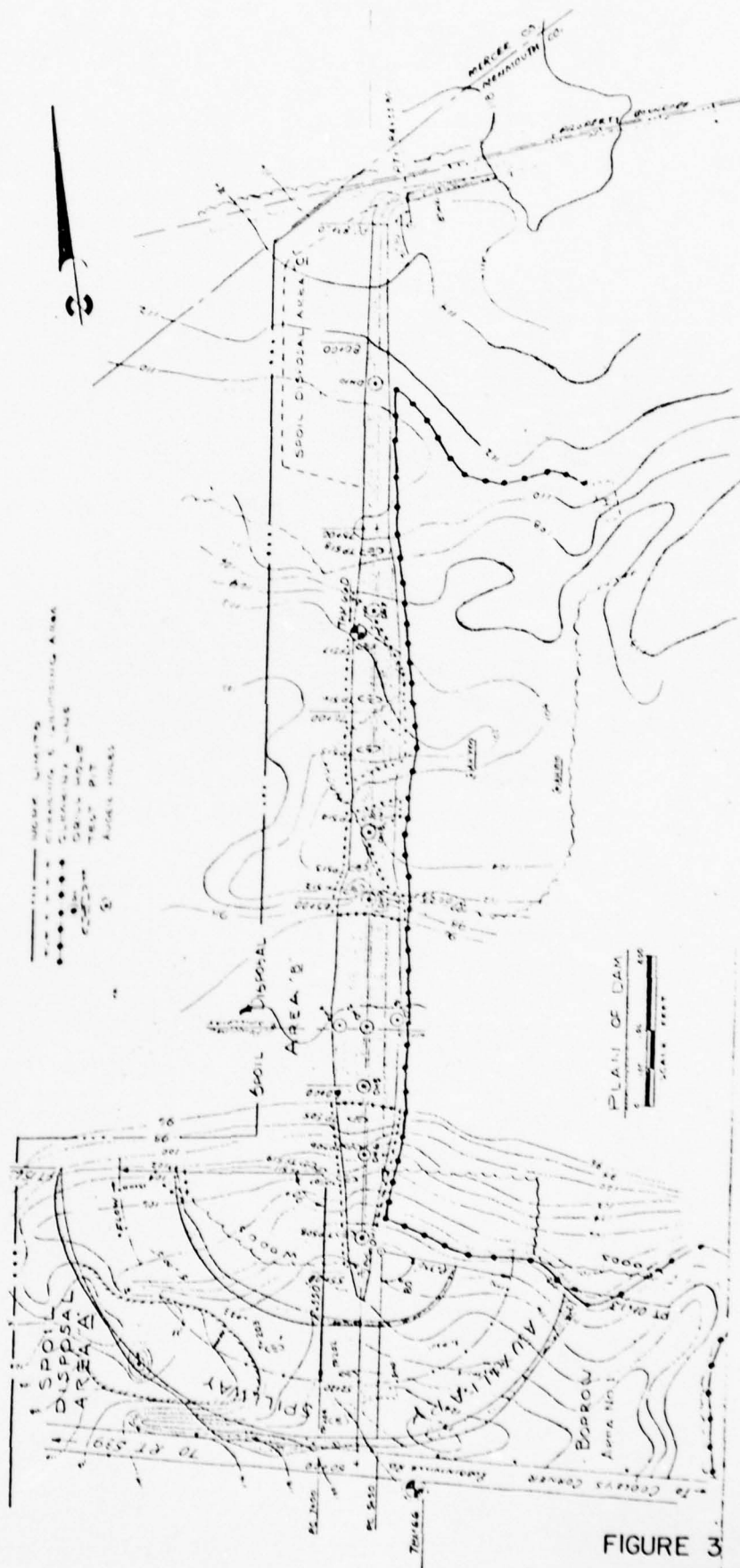


FIGURE 2



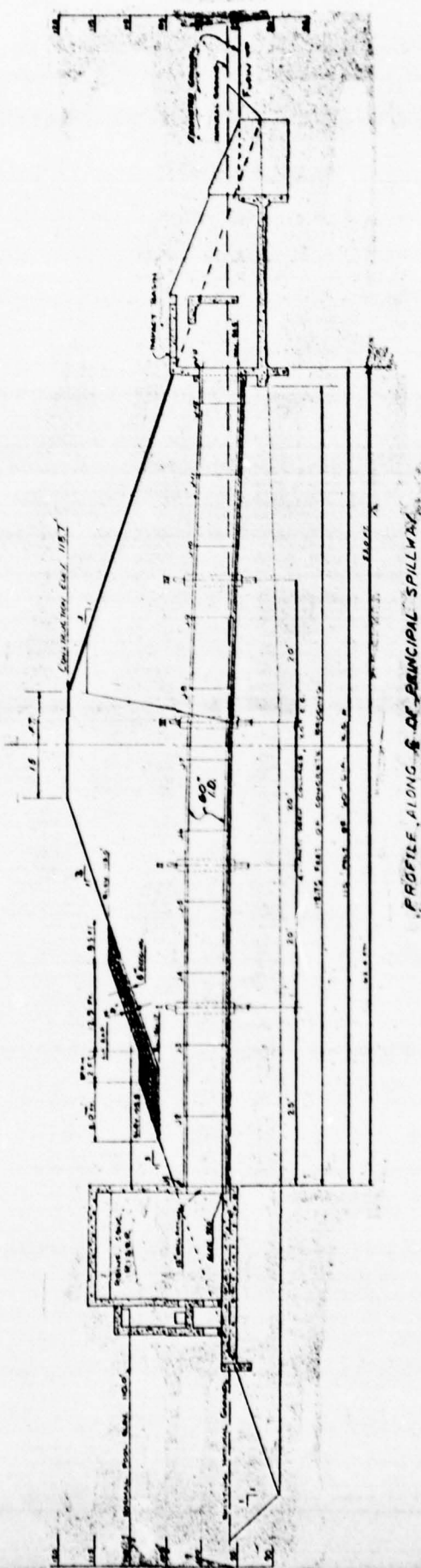


FIGURE 4

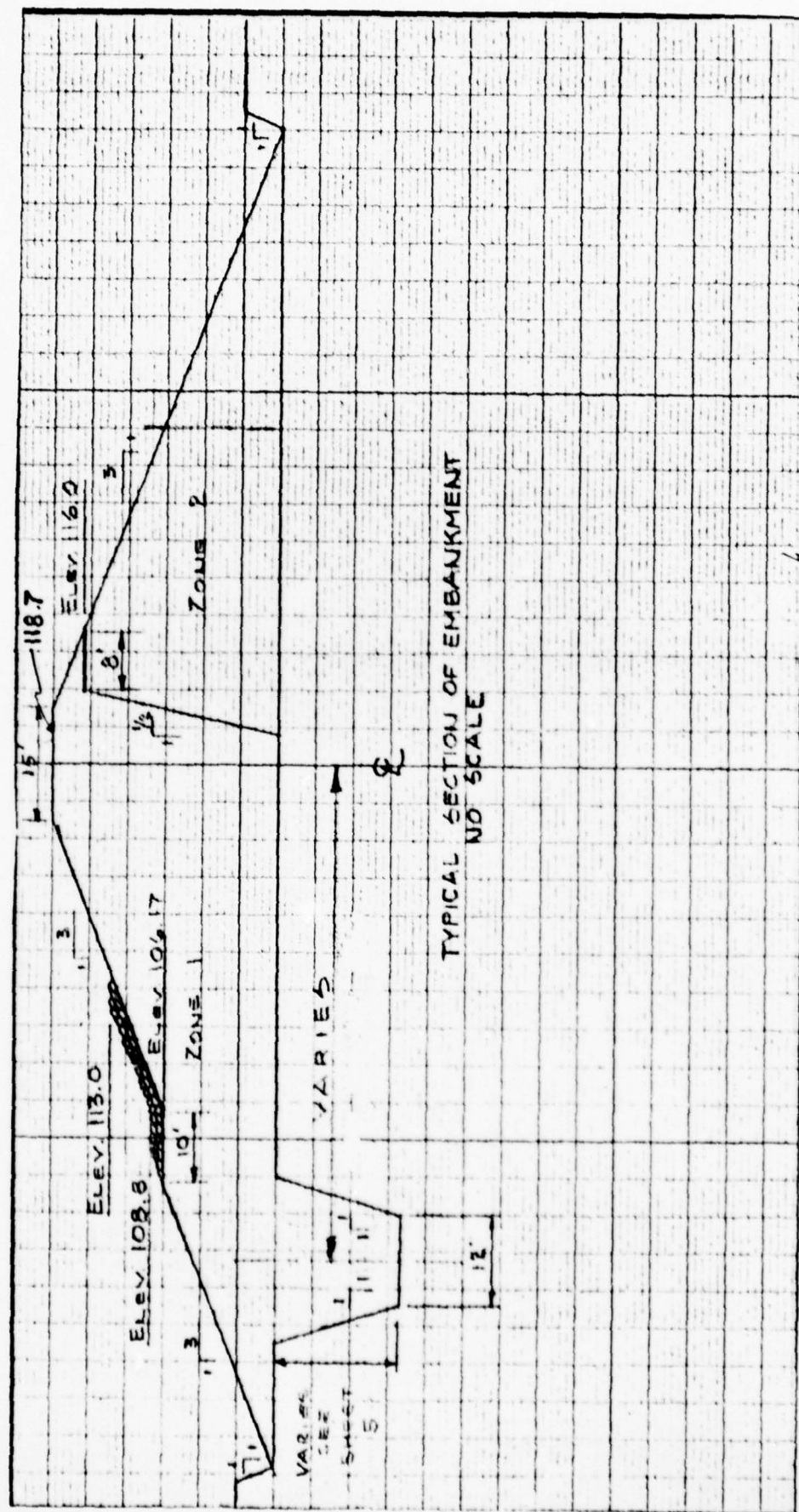
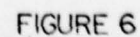


FIGURE 5



ASSUNPINK CREEK WATERSHED PROJECT
MULTIPLE PURPOSE DAM NO 4
UPPER FREEHOLD & MILLSTONE TWPSP
RISER DETAILS
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

	Date	Amount To	Total
James J. A. Thompson	4-72		
J. O. Thompson	4-72		
Total			\$100.00

SHEET 1

Check List
Visual Inspection
Phase 1

Name Dam Assumpink Site 4 Country Monmouth State New Jersey NJDEP

Date(s) Inspection 1/4/79
2/17/79

Weather Sunny Temperature 15° F

Pool Elevation at Time of Inspection 110 M.S.L. Tailwater at Time of Inspection 94.5 M.S.L.

Inspection Personnel:

T. Chapter	F. Schmidt (NJDEP)	K. Jolls
L. Baines	L. Holt (SCS)	
E. Simone		

L. Baines Recorder

Dam No. 00322

CONCRETE/MASONRY DAMS

SHEET 2

VISUAL EXAMINATION OF SEALING OR LEAKAGE	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
	N/A	
STRUCTURE TO ADJUTANT/EXHAUST FUNCTIONS	N/A	
GROUTING	N/A	
WATER PASSAGES	N/A	
FOUNDATION	N/A	

CONCRETE/MASONRY DAMS

SHEET 3

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	N/A	
STRUCTURAL CRACKING	N/A	
VERTICAL AND HORIZONTAL ALIGNMENT	N/A	
MONOLITH JOINTS	N/A	
CONSTRUCTION JOINTS	N/A	

EMBANKMENT

SHEET 4

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	Minor (6" to 8") lateral cracks. Appear to be caused by frost heaving.	Weather conditions prior to inspection was 2-3 days of heavy saturating rain, followed by a rapid temperature drop and continuing freezing conditions.
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	Frost cracks at toe and vehicle tire ruts.	No unusual movement noted.
SLUGHING OR EROSION OF EMBANKMENT AND ADJUTENT SLOPES	Erosion on downstream embankment normal to crest. (Caused by vehicles).	Deep vehicle tracks along toe. However, ground obviously wet, spongy and soft where tracks were made. (See photo).
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Alignment satisfactory. Crest deeply rutted by vehicle tracks despite barrier across crest. (See photo).	
RIPEAP FAILURES	None observed.	

EMBANKMENT

SHEET 5

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
FUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DRAIN	Left embankment abuts right wall of auxiliary spillway. Erosion on walls of spillway caused by vehicles. Right embankment grades smoothly into natural terrain.	Both abutments in satisfactory condition.
ANY NOTICIBLE SEEPAGE	Area along toe between impact basin and right abutment wet. Water in ruts and several small ponds. This area appears to have been spoil area. (See photos).	Area below impact basin and center portion of right embankment originally swamp. Water table still high in reclaimed portion.
STAFF GAGE AND RECORDER	None	
DRAINS	Toe drains discharge into impact basin. Two drains from right embankment. One drain from left embankment.	10" ϕ standpipe at station 67+00 was leaking from top. Elevation of top is 108 M.S.L. May indicate high phreatic surface or considerable ground water pressure in drain field.

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	None observed	Structures relatively new and in good condition.
INTAKE STRUCTURE	Multistage drop inlet box riser. Grating and trash racks on three sides of concrete structure.	Everything in good condition.
OUTLET STRUCTURE	Reinforced concrete impact basin. Surrounded by coarse drain field. 10" toe drains exit through wingwalls.	Light erosion of banks immediately below wingwalls. Protected now by concrete filled fabric material. Light erosion behind retaining and wingwalls.
OUTLET CHANNEL	Channel immediately opens into large flat marsh- land. Discharge spreads out over wide area when flows are high.	
EMERGENCY GATE	None	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	None	Auxiliary spillway consists of wide grassy channel abutting left embankment.
APPROACH CHANNEL	Negatively sloped and grassy.	Erosion across channel and on both walls caused by vehicle tracks.
DISCHARGE CHANNEL	Positively sloped and grassy.	
BRIDGE AND PIERS	None	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	N/A	
APPROACH CHANNEL	N/A	
DISCHARGE CHANNEL	N/A	
BRIDGE AND PIERS	N/A	
GATES AND OPERATION EQUIPMENT	N/A	

INSTRUMENTATION

REMARKS OR RECOMMENDATIONS

VISUAL EXAMINATION

OBSERVATIONS

MONUMENTATION/SURVEYS

None

OBSERVATION WELLS

Standpipes to toe drains can be monitored to determine piezometric head resulting from ground water pressure.

Leaking standpipe at Station 67+00

WELLS

None

PIEZOMETERS

See Observation Wells above.

OTHER

None

RESERVOIR

VISUAL EXAMINATION OF SLOPES	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
	Wooded to vegetated. Gently sloping on all sides.	
SEDIMENTATION	Design provides dead space for sedimentation on bottom of lake.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
	Wide marshland.	
SLOPES	Gentle and wooded or cultivated.	Extensive flood-absorbing area between dam and nearest down- stream dam.
APPROXIMATE NO. OF HOMES AND POPULATION	None	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

SHEET 1

	REMARKS
PLAN OF WORK	Available from SCS (1370 Hamilton St., Somerset, N.J.)
REGIONAL VICINITY MAP	Available from SCS
CONSTRUCTION HISTORY	Available from SCS
TYPICAL SECTIONS OF DAM	Available from SCS
HYDROLOGIC/HYDRAULIC DATA	Available from SCS
OUTLETS - PLAN	Available from SCS
- DETAILS	Available from SCS
- CONSTRAINTS	Available from SCS
- DISCHARGE RATINGS	Available from SCS
RAINFALL/RESERVOIR RECORDS	None kept

ITEM	REMARKS
------	---------

DESIGN REPORTS

Available from SCS

GEOLOGIC REPORTS

Available from SCS

DESIGN COMPUTATIONS
HYDROLOGY & HYDRAULICS
DAM STABILITY
SEEPAGE STUDIES

Available from SCS
Available from SCS
Not available
Available

MATERIALS INVESTIGATIONS
BORING RECORDS
LABORATORY
FIELD

Available
Available
Available
Available

POST-CONSTRUCTION SURVEYS OF DAM

Not performed

BORROW SOURCES

Indicated on plans

ITEM	REMARKS
MONITORING SYSTEMS	None except observation standpipes
MODIFICATIONS	None
HIGH P.O. RECORDS	Not recorded
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None performed
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None
MAINTENANCE OPERATION RECORDS	None kept

REMARKS

ITEM

SPILLWAY PLAN

Available from SCS

SECTIONS

Available from SCS

DETAILS

Available from SCS

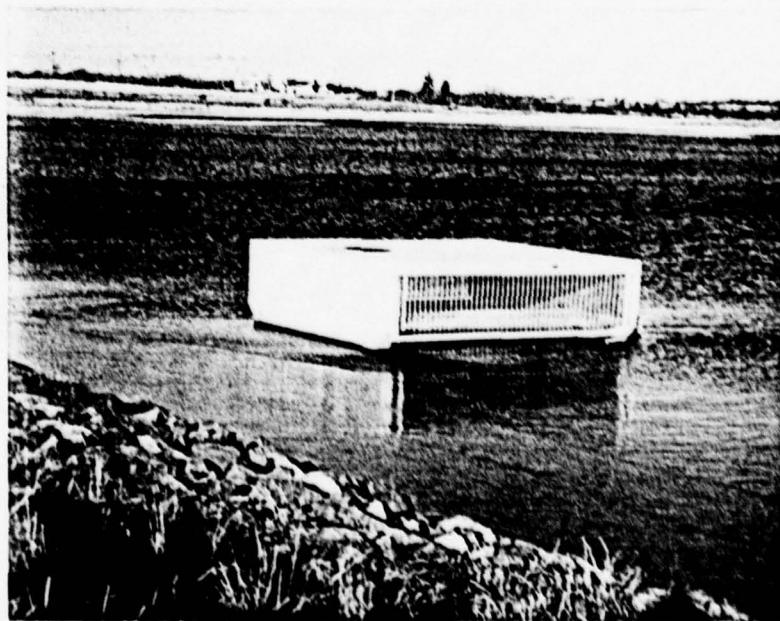
OPERATING EQUIPMENT
PLANS & DETAILS

Available from SCS



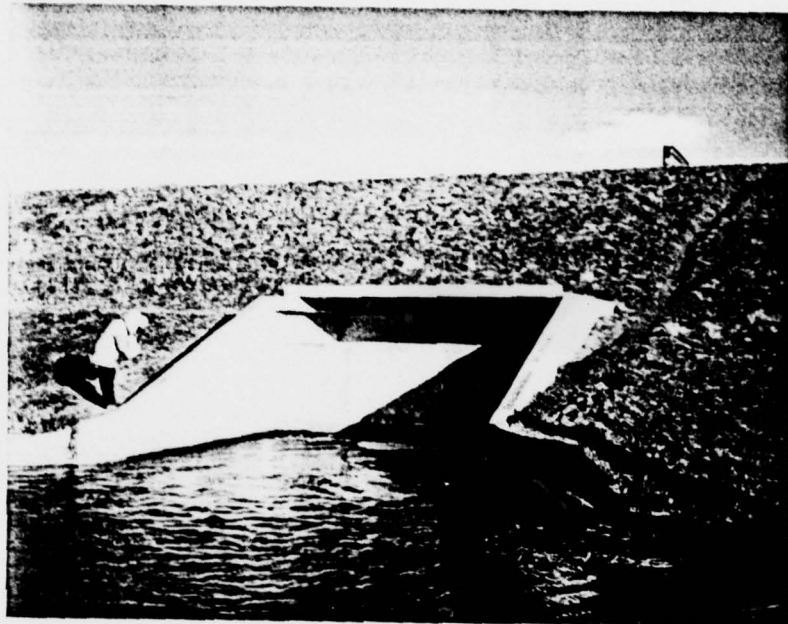
Overview of dam

January, 1979



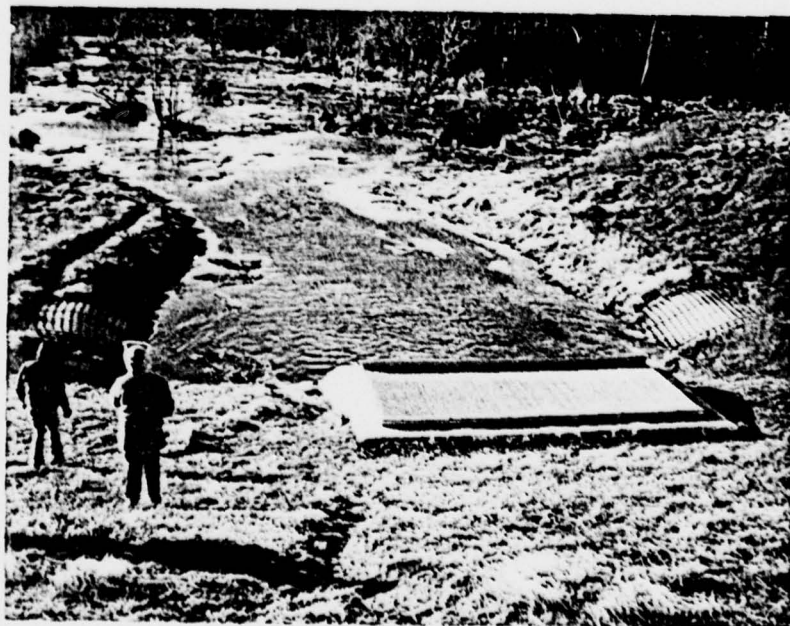
View of intake structure

January, 1979



January, 1979

View of outlet structure



January, 1979

Downstream channel



January, 1979

Erosion gullies in downstream face of dam



January, 1979

Ponded water at toe of dam



January, 1979

Vehicle tracks at toe



January, 1979

View of auxiliary spillway

Dam No. 00322

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 6.3 sq.miles

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 110.0 M.S.L. (1158 acre-feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 114.2 M.S.L. (2450 acre-feet)

ELEVATION MAXIMUM DESIGN POOL: 115.6 M.S.L.

ELEVATION TOP DAM: 118.7 M.S.L.

CREST: _____

a. Elevation 114.2 M.S.L. (Auxiliary spillway)

b. Type Vegetated auxiliary spillway channel

c. Width 300 feet

d. Length 1500 foot long channel

e. Location Spillover Left abutment

f. Number and Type of Gates None

OUTLET WORKS: _____

a. Type Multi-stage drop inlet structure with 60" dia. RCP

b. Location Station 61+50

c. Entrance inverts Orifices at El. 110, 106, 104, 102, - RCP at 97. M.S.L.

d. Exit inverts RCP at El. 94.5 M.S.L.

e. Emergency draindown facilities 24" x 24" gate at El. 97.5 M.S.L.

HYDROMETEOROLOGICAL GAGES: None at site

a. Type _____

b. Location _____

c. Records _____

MAXIMUM NON-DAMAGING DISCHARGE: 16,750 CFS

SUBJECT _____

ASSUMING SITE #4 DAM INSPECTION

PROJECT C227

Sum	24467
-----	-------

INTERMEDIATE

DRAINAGE AREA = 6.3 sq miles

$$= 0.125 + 0.6 \times 6.8$$

$$= 4.21$$

$$Q_p = \frac{484 \times 6.3 \times 1}{4.21}$$

$$= 724 \text{ cfs}$$

BY D. J. M. DATE 1-79

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. A2 OF

CHKD. BY _____ DATE _____

ASSUMPTION SITE #4 DAM INSPECTION

PROJECT C 227

SUBJECT _____

<u>T</u>	<u>T/Tp</u>	<u>Dimensionless</u> <u>ordinate (D.O)</u>	<u>D.C x Qp</u> <u>cfs</u>
0.25	0.06	0.01	7
0.50	0.12	0.02	14
0.75	0.18	0.06	43
1.00	0.24	0.10	72
1.25	0.30	0.16	116
1.50	0.36	0.23	167
1.75	0.42	0.29	210
2.00	0.48	0.40	290
2.25	0.53	0.48	348
2.50	0.59	0.58	420
2.75	0.65	0.68	492
3.00	0.71	0.78	565
3.25	0.77	0.85	615
3.50	0.83	0.91	659
3.75	0.89	0.96	695
4.00	0.95	0.98	710
4.25	1.01	0.998	723
4.50	1.07	0.98	710
4.75	1.13	0.96	695
5.00	1.19	0.92	666
5.25	1.25	0.88	637
5.50	1.31	0.83	601
5.75	1.37	0.77	557
6.00	1.43	0.72	521
6.25	1.48	0.67	485
6.50	1.54	0.62	449
6.75	1.60	0.56	405
7.00	1.66	0.51	369
7.25	1.72	0.47	340
7.50	1.78	0.43	311
7.75	1.84	0.40	290
8.00	1.90	0.37	268

BY.....DATE.....

CHKD. BY.....DATE.....

SUBJECT.....

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. A3 OF.....

PROJECT.....

<u>T</u>	<u>T/T_p</u>	<u>D.O.</u>	<u>Q_p x D.O.</u>
8.25	1.96	0.34	246
8.50	2.02	0.31	224
8.75	2.08	0.28	203
9.00	2.14	0.26	188
9.25	2.20	0.24	174
9.50	2.26	0.22	159
9.75	2.32	0.20	145
10.00	2.38	0.18	130
10.25	2.43	0.172	125
10.50	2.49	0.157	114
10.75	2.55	0.142	103
11.00	2.61	0.128	93
11.25	2.67	0.118	85
11.50	2.73	0.109	79
11.75	2.79	0.099	72
12.00	2.85	0.092	67
12.25	2.91	0.085	62
12.50	2.97	0.078	56
12.75	3.03	0.072	52
13.00	3.09	0.068	49
13.25	3.15	0.063	46
13.50	3.21	0.058	42
13.75	3.27	0.053	38
14.00	3.33	0.049	35
14.25	3.38	0.045	33
14.50	3.44	0.040	29
14.75	3.50	0.036	26
15.00	3.56	0.033	24
15.25	3.62	0.031	22
15.50	3.68	0.029	21
15.75	3.74	0.027	20
16.00	3.80	0.025	18
16.25	3.86	0.023	17

Σ 16,247

BY D. J. M. DATE 1-79

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. A4 OF

CHKD. BY _____ DATE _____

PROJECT C227

SUBJECT _____

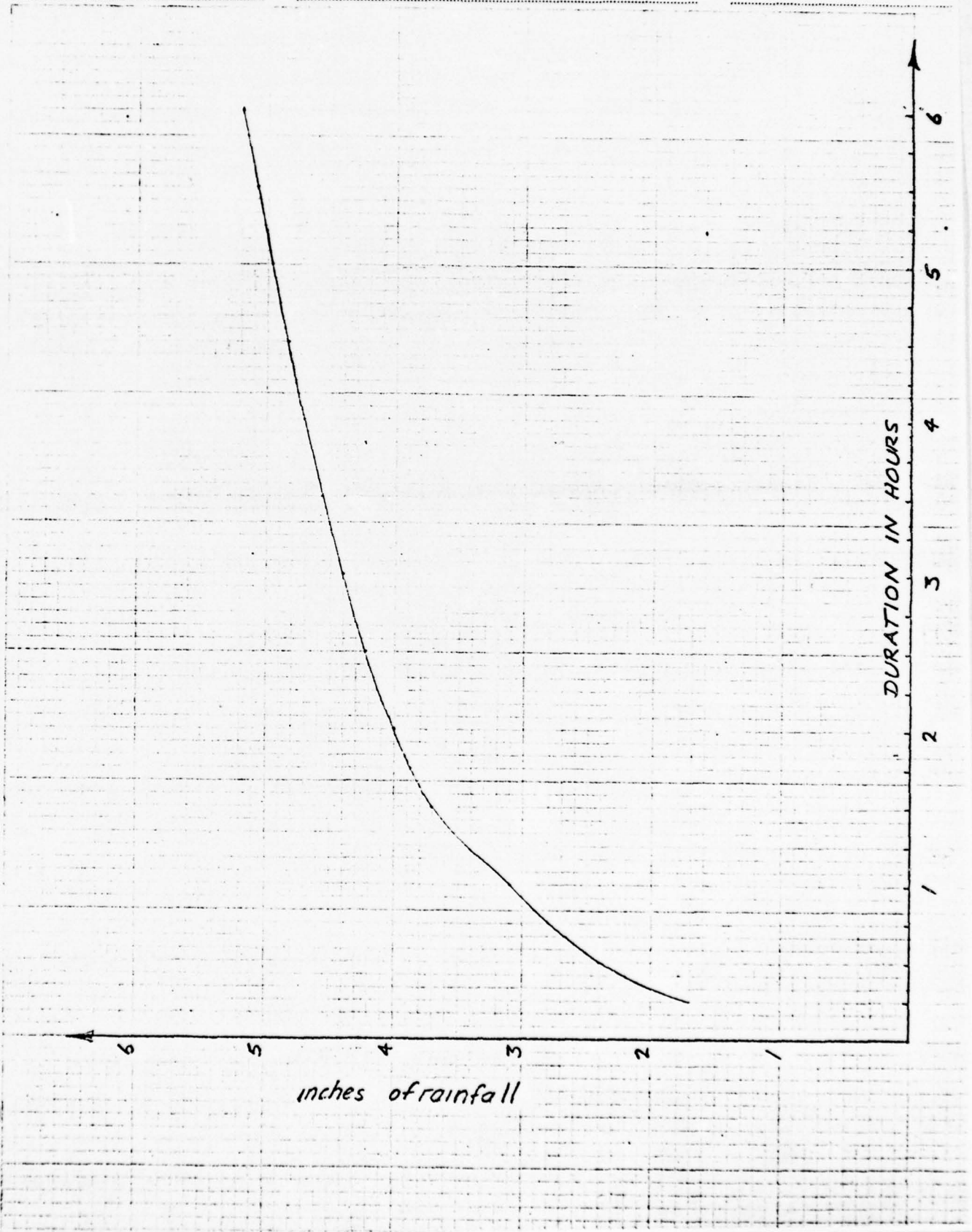
PRECIPITATION DATA FROM T.P. 40 (see depth duration curve overleaf)
8 HMR 35

Time	Precipitation	Δ	Rearrange
0.25	1.7	1.7	0.06
0.50	2.4	0.7	0.06
0.75	2.8	0.4	0.06
1.00	3.1	0.3	0.06
1.25	3.5	0.4	0.07
1.50	3.7	0.2	0.07
1.75	3.86	0.16	0.08
2.00	4.00	0.14	0.09
2.25	4.11	0.11	0.09
2.50	4.22	0.11	0.09
2.75	4.31	0.09	0.11
3.00	4.40	0.09	0.11
3.25	4.49	0.09	0.30
3.50	4.57	0.08	0.70
3.75	4.64	0.07	1.70
4.00	4.71	0.07	0.40
4.25	4.78	0.07	0.40
4.50	4.84	0.06	0.20
4.75	4.90	0.06	0.16
5.00	4.96	0.06	0.14
5.25	5.02	0.06	0.07
5.50	5.08	0.06	0.06
5.75	5.14	0.06	0.06
6.00	5.20	0.06	0.06

BY D. J. M. DATE 1-79
CHKD. BY _____ DATE _____

SUBJECT T.P. 40 & H M R. 35
DEPTH DURATION CURVE

SHEET NO. A5 OF _____
JOB NO. C227



BY D J M DATE 1-79

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. A6 OF

CHKD. BY _____ DATE _____

ASSIGNMENT SITE #4 DAM INSPECTION

PROJECT C 227

SUBJECT _____

STAGE / STORAGE DATA AS COMPUTED BY SCS

Elevation	Storage	Surcharge storage
110.0	1158	0
111.0	1410	252
112.0	1685	527
113.0	2003	845
114.0	2368	1210
115.0	2775	1617
116.0	3191	2033
117.0	3580	2422
118.0	4000	2842
119.0	4420	3262
120.0	4840	3682
121.0	5260	4102

BY L B DATE 2/79

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. A7 OF

CHKD. BY DATE

ASSUNPINK WATERSHED #4

PROJECT C-227

SUBJECT DISCHARGE COMPUTATIONS

ELEV.	LOW STAGE ORIFICE $Q = CLH^{3/2}$ $L = 10 ft$			HIGH STAGE WEIR $Q = CLH^{3/2}$ $L = 30 ft$			CONDUIT FLOW $Q = A\sqrt{64.4(H)/166}$ $A = 19.63 ft^2$			AUXILIARY SPILLWAY $Q = A\sqrt{64.4(H)/166}$ $A = 19.63 ft^2$			OVERTOPPING OF DAM $Q = CLH^{3/2}$ $L = 2900$			ΣQ
	H	C	Q	H	C	Q	H	Q	H	Q	H	C	Q	H	C	Q
110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
110.5	.5	3.2	11	.5	3.2	34	.5	4.55	.5	4.55	.5	3.2	11	.5	3.2	11
111	1	.55	44	1	3.2	96	1	16.5	1	16.5	1	.55	44	1	.55	44
111.5	1.5	.55	54	1.5	3.2	176	1.5	17.5	1.5	17.5	1.5	.55	54	1.5	.55	54
112	2	.55	62	2	3.2	289	2	18.5	2	18.5	2	.55	62	2	.55	62
112.5	2.5	.55	70	2.5	3.4		2.5	19	2.5	19	2.5	.55	70	2.5	.55	70
113	3	.55	76	3	3.4		3	19.5	3	19.5	3	.55	76	3	.55	76
113.5	3.5	.55	83	3.5	3.4		3.5	20.5	3.5	20.5	3.5	.55	83	3.5	.55	83
114	4	.55	88	4	3.4		4	21.5	4	21.5	4	.55	88	4	.55	88
114.5	4.5	.55	94	4.5	3.4		4.5	21.5	4.5	21.5	4.5	.55	94	4.5	.55	94
115																
116																
117																
118																
118.5																
119																
120																
121																

* @ EL. 115. Flow through the 60" pipe begins to control discharge

BY L.B. DATE FEB '79

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. A8 OF

CHKD. BY _____ DATE _____

ASSUMPTION SITE # 4 DAM IN REG.PROJECT C227SUBJECT DRAWDOWN COMPUTATIONS

	ELEV. FT	TOTAL STORAGE ACRE-FT	DIFF. STORAGE ACRE-FT	DISCHARGE		AVERAGE DISCHARGE ACFT/DAY	DRAW DOWN TIME DAYS
				ACTUAL CES	AVER. CES		
NORMAL POOL	110	1160		68			
			389		65	129	3
	108	771		62			
			277		59	117	2.4
	106	494		56			
			181		53	105	1.7
	104	313		49			
			126		45	89	1.4
	102	187		41			
			86		36	71	1.2
	100	101		30			
			59		22	44	1.3
	98	42		14			
			8		7	14	.6
	97.5	34		0			

 $\Sigma 11.6 \text{ days}$

$$Q = CA\sqrt{2gH}$$

$$Q = 19.26\sqrt{H}$$

$$C = .6$$

$$A = 4 \text{ ft}^2$$

COMPUTER OUTPUT

BY DJM DATE _____

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. A10 OF _____

CHKD. BY _____ DATE _____

ASSUNPINK CREEK SITE #4PROJECT C-227SUBJECT LISTING OF CARD INPUT

A	ASSUNPINK SITE#18,19,4 DAM INSPECTIONS NORTH GROUP										D
A	BY D.J.MULLIGAN										
A	FEBRUARY 1979										
B	150	0	15							3	
I	3										
K	0	1								1	
I	INFLOW TO DAM 18										
M	0	-1	1.21	0	1.21						
O	24										
I	0.06	0.06	0.06	0.06	0.07	0.07	0.08	0.09	0.09	0.09	
I	0.11	0.11	0.30	0.70	1.70	0.40	0.40	0.20	0.16	0.14	
I	0.07	0.06	0.06	0.06							
T							0.5	0.1			
U	16										
I	57	233	461	563	518	393	273	199	137	97	
I	67	48	35	25	18	13					
X	0	0	1								
K	1									1	
I	ROUTING THROUGH 18										
Y				1							
I	1										
2	0	49	84	131	184	234	294	354	419		
3	0	4	7	9	57	210	520	950	1500		

A	ASSUNPINK SITE#18,19,4 DAM INSPECTIONS NORTH GROUP										
A	BY D.J.MULLIGAN										
A	FEBRUARY 1979										
B	150	0	15							3	
I	3										
K	0	2								1	
I	INFLOW TO SITE 19 DAM										
M	0	-1	1.77	0	1.77						
O	24										
I	0.06	0.06	0.06	0.06	0.07	0.07	0.08	0.09	0.09	0.09	
I	0.11	0.11	0.30	0.70	1.70	0.40	0.40	0.20	0.16	0.14	
I	0.07	0.06	0.06	0.06							
T							0.5	0.1			
U	24										
I	27	91	203	348	460	524	524	471	396	321	
I	251	203	161	128	106	83	64	51	42	34	
I	28	21	17	14							
X	0	0	1								
K	1									1	
I	ROUTING THROUGH 19										
Y				1							
I	1										
2	0	65	127	195	271	350	435	530	642		
3	0	2	8	11	60	115	243	625	1107		

BY DJM DATE _____

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. ALL OF _____

CHKD. BY _____ DATE _____

ASSUMPINK CREEK SITE 4PROJECT C-227SUBJECT LISTING OF CARD INPUT

A ASSUMPINK SITE#18,19,4 DAM INSPECTIONS NORTH GROUP

A BY D.J.MULLIGAN

A FEBRUARY 1979

B	150	0	15							3
1	3									
K	0	1								1
1	INFLOW TO DAM 18									
M	0	-1	1.21	0	1.21					
0	24									
1	0.06	0.06	0.06	0.06	0.07	0.07	0.08	0.09	0.09	0.09
1	0.11	0.11	0.30	0.70	1.70	0.40	0.40	0.20	0.16	0.14
1	0.07	0.06	0.06	0.06						
T							0.5	0.1		
U	16									
1	57	233	461	563	518	393	273	199	137	97
1	67	48	35	25	18	13				
X	0	0	1							
K	1									1
1	ROUTING THROUGH 18									
Y				1						
1	1									
2	0	49	84	131	184	234	294	354	419	
3	0	4	7	9	57	210	520	950	1500	
K	0	2								1
1	INFLOW TO SITE 19 DAM									
M	0	-1	1.77	0	1.77					
0	24									
1	0.06	0.06	0.06	0.06	0.07	0.07	0.08	0.09	0.09	0.09
1	0.11	0.11	0.30	0.70	1.70	0.40	0.40	0.20	0.16	0.14
1	0.07	0.06	0.06	0.06						
T							0.5	0.1		
U	24									
1	27	91	203	348	460	524	524	471	396	321
1	251	203	161	128	106	83	64	51	42	34
1	28	21	17	14						
X	0	0	1							
K	1									1
1	ROUTING THROUGH 19									
Y				1						
1	1									
2	0	65	127	195	271	350	435	530	642	
3	0	2	8	11	60	115	243	625	1107	
K	2									1
1	COMBINE HYDROGRAPHS FOR SITES 18&19									
K	0	3								1
1	INFLOW TO SITE 4									
M	0	-1	6.3	0	6.3					
0	24									
1	0.06	0.06	0.06	0.06	0.07	0.07	0.08	0.09	0.09	0.09
1	0.11	0.11	0.30	0.70	1.70	0.40	0.40	0.20	0.16	0.14
1	0.07	0.06	0.06	0.06						
T							0.5	0.1		
U	63									
1	7	14	43	72	116	167	210	290	348	420
1	492	565	615	659	695	710	695	666	637	601
1	557	521	485	449	405	369	340	311	290	268
1	246	224	203	188	174	159	145	130	125	114
1	103	93	85	79	72	67	62	56	52	49
1	46	42	38	35	33	29	26	24	22	21
1	20	18	17							
X	0	0	1							
K	2									1
1	TOTAL HYDROGRAPH FOR INFLOW TO SITE#4									
K	1									
1	ROUTING THROUGH RESERVOIR									
Y				1						
1	1									
2	0	527	1210	1617	2033	2422	2842	3262	3682	4102
3	0	62	265	2157	5283	9329	14115	22412	37577	60348
K	99									

BY DJM DATE _____

CHKD. BY _____ DATE _____

SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. A12 OF _____

PROJECT C-227

ASSUNPINK SITE#18,19,4 DAM INSPECTIONS NORTH GROUP
BY D.J. MULLIGAN
FEBRUARY 1979

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
150	0	15	0	0	0	0	0	3	0
			JOPER	NWT					
			3	0					

SUB-AREA RUNOFF COMPUTATION

INFLOW TO DAM 18

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

HYDROGRAPH DATA

IHYDG	IUNG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	-1	1.21	0.0	1.21	0.0	0.0	0	0	0

PRECIP DATA

NP	STORM	DAJ	DAK
24	0.0	0.0	0.0

PRECIP PATTERN

0.06	0.06	0.06	0.06	0.07	0.07	0.08	0.09	0.09	0.09
0.11	0.11	0.30	0.70	1.70	0.40	0.40	0.20	0.16	0.14
0.07	0.06	0.06	0.06						

LOSS DATA

STKR	DLTKR	RTIOL	ERAIN	STKRS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.0	0.0	1.00	0.0	0.0	1.00	0.50	0.10	0.0	0.0

GIVEN UNIT GRAPH, NUHGG= 16

57.	23.	461.	563.	518.	343.	273.	199.	137.	97.
67.	48.	35.	25.	18.	13.				

UNIT GRAPH TOTALS 3137. CFS OR 1.00 INCHES OVER THE AREA

RECESSION DATA

STRIG= 0.0 GRCSN= 0.0 RTIOR= 1.00

END-OF-PERIOD FLOW

TIME	RAIN	EXCS	COMP Q
1	0.06	0.00	0.
2	0.06	0.00	0.
3	0.06	0.00	0.
4	0.04	0.00	0.
5	0.07	0.00	0.
6	0.07	0.00	0.
7	0.08	0.00	0.
8	0.09	0.04	2.
9	0.09	0.06	12.

BY R.I.M. DATE _____
CHKD. BY _____ DATE _____
SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.

ASSUMPINK CREEK SITE 4

SHEET NO. A13 OF _____
PROJECT C-227

10	0.09	0.06	35.
11	0.11	0.08	70.
12	0.11	0.08	110.
13	0.30	0.27	159.
14	0.70	0.67	259.
15	1.70	1.67	522.
16	0.40	0.37	591.
17	0.40	0.37	1485.
18	0.20	0.18	1729.
19	0.16	0.13	1681.
20	0.14	0.11	1450.
21	0.07	0.05	1181.
22	0.06	0.04	947.
23	0.06	0.04	755.
24	0.04	0.04	566.
25	0.0	0.0	431.
26	0.0	0.0	329.
27	0.0	0.0	247.
28	0.0	0.0	180.
29	0.0	0.0	126.
30	0.0	0.0	84.
31	0.0	0.0	44.
32	0.0	0.0	28.
33	0.0	0.0	17.
34	0.0	0.0	10.
35	0.0	0.0	6.
36	0.0	0.0	3.
37	0.0	0.0	2.
38	0.0	0.0	1.
39	0.0	0.0	0.
40	0.0	0.0	0.
41	0.0	0.0	0.
42	0.0	0.0	0.
43	0.0	0.0	0.
44	0.0	0.0	0.
45	0.0	0.0	0.
46	0.0	0.0	0.
47	0.0	0.0	0.
48	0.0	0.0	0.
49	0.0	0.0	0.
50	0.0	0.0	0.
51	0.0	0.0	0.
52	0.0	0.0	0.
53	0.0	0.0	0.
54	0.0	0.0	0.
55	0.0	0.0	0.
56	0.0	0.0	0.
57	0.0	0.0	0.
58	0.0	0.0	0.
59	0.0	0.0	0.
60	0.0	0.0	0.
61	0.0	0.0	0.
62	0.0	0.0	0.
63	0.0	0.0	0.
64	0.0	0.0	0.
65	0.0	0.0	0.
66	0.0	0.0	0.
67	0.0	0.0	0.
68	0.0	0.0	0.
69	0.0	0.0	0.
70	0.0	0.0	0.

71	0.0	0.0	0.
72	0.0	0.0	0.
73	0.0	0.0	0.
74	0.0	0.0	0.
75	0.0	0.0	0.
76	0.0	0.0	0.
77	0.0	0.0	0.
78	0.0	0.0	0.
79	0.0	0.0	0.
80	0.0	0.0	0.
81	0.0	0.0	0.
82	0.0	0.0	0.
83	0.0	0.0	0.
84	0.0	0.0	0.
85	0.0	0.0	0.
86	0.0	0.0	0.
87	0.0	0.0	0.
88	0.0	0.0	0.
89	0.0	0.0	0.
90	0.0	0.0	0.
91	0.0	0.0	0.
92	0.0	0.0	0.
93	0.0	0.0	0.
94	0.0	0.0	0.
95	0.0	0.0	0.
96	0.0	0.0	0.
97	0.0	0.0	0.
98	0.0	0.0	0.
99	0.0	0.0	0.
100	0.0	0.0	0.
101	0.0	0.0	0.
102	0.0	0.0	0.
103	0.0	0.0	0.
104	0.0	0.0	0.
105	0.0	0.0	0.
106	0.0	0.0	0.
107	0.0	0.0	0.
108	0.0	0.0	0.
109	0.0	0.0	0.
110	0.0	0.0	0.
111	0.0	0.0	0.
112	0.0	0.0	0.
113	0.0	0.0	0.
114	0.0	0.0	0.
115	0.0	0.0	0.
116	0.0	0.0	0.
117	0.0	0.0	0.
118	0.0	0.0	0.
119	0.0	0.0	0.
120	0.0	0.0	0.
121	0.0	0.0	0.
122	0.0	0.0	0.
123	0.0	0.0	0.
124	0.0	0.0	0.
125	0.0	0.0	0.
126	0.0	0.0	0.
127	0.0	0.0	0.
128	0.0	0.0	0.
129	0.0	0.0	0.
130	0.0	0.0	0.
131	0.0	0.0	0.

BY DJM DATE _____
CHKD. BY _____ DATE _____
SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.
ASSUNPINK CREEK SITE #4

SHEET NO. A14 OF _____
PROJECT C227

132	0.0	0.0	0.0	0.0	0.0
133	0.0	0.0	0.0	0.0	0.0
134	0.0	0.0	0.0	0.0	0.0
135	0.0	0.0	0.0	0.0	0.0
136	0.0	0.0	0.0	0.0	0.0
137	0.0	0.0	0.0	0.0	0.0
138	0.0	0.0	0.0	0.0	0.0
139	0.0	0.0	0.0	0.0	0.0
140	0.0	0.0	0.0	0.0	0.0
141	0.0	0.0	0.0	0.0	0.0
142	0.0	0.0	0.0	0.0	0.0
143	0.0	0.0	0.0	0.0	0.0
144	0.0	0.0	0.0	0.0	0.0
145	0.0	0.0	0.0	0.0	0.0
146	0.0	0.0	0.0	0.0	0.0
147	0.0	0.0	0.0	0.0	0.0
148	0.0	0.0	0.0	0.0	0.0
149	0.0	0.0	0.0	0.0	0.0
150	0.0	0.0	0.0	0.0	0.0

SUM 5.20 4.26 13444.

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
1729.	559.	146.	90.	13445.
CFS	4.20	4.31	4.31	4.31
INCHES	277.	278.	278.	278.
AC-FT				

HYDROGRAPH ROUTING

ROUTING THROUGH 18

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

ROUTING DATA

QLOSS	CLOSS	AVG	IRIS	ISAME
0.0	0.0	0.0	1	0

MSIPS	MSL	LAG	AMSK	X	TSK	STORA
1	0	0	0.0	0.0	0.0	0.

STOR/SEC	0.	49.	84.	131.	184.	234.	294.	354.	419.
OUTFLOW	0.	4.	7.	9.	57.	210.	520.	950.	1500.

TIME EOP STOR

1	0.	0.	0.	0.	0.	0.	0.	0.	0.
---	----	----	----	----	----	----	----	----	----

2	0.	0.	0.	0.	0.	0.	0.	0.	0.
---	----	----	----	----	----	----	----	----	----

3	0.	0.	0.	0.	0.	0.	0.	0.	0.
---	----	----	----	----	----	----	----	----	----

4	0.	0.	0.	0.	0.	0.	0.	0.	0.
---	----	----	----	----	----	----	----	----	----

5	0.	0.	0.	0.	0.	0.	0.	0.	0.
---	----	----	----	----	----	----	----	----	----

6	0.	0.	0.	0.	0.	0.	0.	0.	0.
---	----	----	----	----	----	----	----	----	----

7	0.	0.	0.	0.	0.	0.	0.	0.	0.
---	----	----	----	----	----	----	----	----	----

8	0.	0.	0.	0.	0.	0.	0.	0.	0.
---	----	----	----	----	----	----	----	----	----

9	0.	0.	0.	0.	0.	0.	0.	0.	0.
---	----	----	----	----	----	----	----	----	----

10	1.	1.	2.	24.	53.	90.	135.	184.	234.
----	----	----	----	-----	-----	-----	------	------	------

11	2.	4.	6.	53.	90.	135.	184.	234.	294.
----	----	----	----	-----	-----	------	------	------	------

12	4.	6.	11.	90.	135.	184.	234.	294.	354.
----	----	----	-----	-----	------	------	------	------	------

13	6.	11.	20.	135.	184.	234.	294.	354.	419.
----	----	-----	-----	------	------	------	------	------	------

14	11.	20.		200.					
----	-----	-----	--	------	--	--	--	--	--

SUBJECT _____

ASSUNPINK CREEK SITE #4

PROJECT C 227

15	19.	390.	2.	76	161.	0.	36.
16	34.	756.	3.	77	160.	0.	36.
17	60.	1258.	5.	78	160.	0.	35.
18	93.	1637.	7.	79	159.	0.	34.
19	128.	1735.	9.	80	158.	0.	34.
20	160.	1566.	35.	81	157.	0.	33.
21	186.	1316.	63.	82	157.	0.	32.
22	206.	1065.	125.	83	156.	0.	32.
23	220.	842.	168.	84	155.	0.	31.
24	230.	651.	198.	85	155.	0.	31.
25	236.	498.	221.	86	154.	0.	30.
26	239.	380.	237.	87	154.	0.	29.
27	240.	288.	242.	88	153.	0.	29.
28	240.	213.	239.	89	152.	0.	28.
29	238.	153.	230.	90	152.	0.	28.
30	235.	105.	218.	91	151.	0.	27.
31	232.	64.	205.	92	151.	0.	27.
32	229.	36.	195.	93	150.	0.	26.
33	226.	22.	184.	94	150.	0.	26.
34	222.	13.	174.	95	149.	0.	25.
35	219.	8.	164.	96	149.	0.	25.
36	216.	5.	154.	97	148.	0.	24.
37	213.	3.	145.	98	148.	0.	24.
38	210.	2.	136.	99	147.	0.	24.
39	207.	1.	128.	100	147.	0.	23.
40	205.	0.	120.	101	146.	0.	23.
41	202.	0.	112.	102	146.	0.	22.
42	200.	0.	106.	103	145.	0.	22.
43	198.	0.	99.	104	145.	0.	21.
44	196.	0.	93.	105	144.	0.	21.
45	194.	0.	87.	106	144.	0.	21.
46	192.	0.	82.	107	143.	0.	20.
47	191.	0.	77.	108	143.	0.	20.
48	189.	0.	72.	109	143.	0.	20.
49	188.	0.	68.	110	142.	0.	19.
50	186.	0.	64.	111	142.	0.	19.
51	185.	0.	60.	112	141.	0.	18.
52	184.	0.	57.	113	141.	0.	18.
53	183.	0.	56.	114	141.	0.	18.
54	181.	0.	55.	115	140.	0.	17.
55	180.	0.	54.	116	140.	0.	17.
56	179.	0.	53.	117	140.	0.	17.
57	178.	0.	52.	118	139.	0.	16.
58	177.	0.	51.	119	139.	0.	16.
59	176.	0.	50.	120	139.	0.	16.
60	175.	0.	49.	121	138.	0.	16.
61	174.	0.	48.	122	138.	0.	15.
62	173.	0.	47.	123	138.	0.	15.
63	172.	0.	46.	124	137.	0.	15.
64	171.	0.	45.	125	137.	0.	14.
65	170.	0.	44.	126	137.	0.	14.
66	169.	0.	44.	127	136.	0.	14.
67	168.	0.	43.	128	136.	0.	14.
68	167.	0.	42.	129	136.	0.	13.
69	167.	0.	41.	130	136.	0.	13.
70	166.	0.	41.	131	135.	0.	13.
71	165.	0.	40.	132	135.	0.	13.
72	164.	0.	39.	133	135.	0.	12.
73	163.	0.	38.	134	135.	0.	12.
74	163.	0.	38.	135	134.	0.	12.
75	162.	0.	37.	136	134.	0.	12.

BY DJM DATE _____
 CHKD. BY _____ DATE _____
 SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.
ASSUNPINK CREEK SITE #4

SHEET NO. A16 OF _____
 PROJECT C-227

137	134.	0.	12.
138	134.	0.	11.
139	133.	0.	11.
140	133.	0.	11.
141	133.	0.	11.
142	133.	0.	11.
143	132.	0.	10.
144	132.	0.	10.
145	132.	0.	10.
146	132.	0.	10.
147	132.	0.	10.
148	131.	0.	9.
149	131.	0.	9.
150	131.	0.	9.

SUM 7106.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	242.	166.	69.	47.	7106.
INCHES		1.27	2.13	2.28	2.28
AC-FT		82.	157.	147.	147.

SUB-AREA RUNOFF COMPUTATION

INFLOW TO SITE 19 DAM

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
2	0	0	0	0	0	1

HYDROGRAPH DATA

IHYDG	IHHG	TAREA	SNAP	IRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	-1	1.77	0.0	1.77	0.0	0.0	0	0	0

PRECIP DATA

NP	STORM	DAJ	DAK
24	0.0	0.0	0.0

PRECIP PATTERN

0.06	0.06	0.06	0.06	0.07	0.07	0.08	0.09	0.09	0.09
0.11	0.11	0.30	0.70	1.70	0.40	0.40	0.20	0.16	0.14
0.07	0.06	0.06	0.06						

LOSS DATA

STRKR	DLTKS	R110L	ERAIN	STRKS	RTIOK	STRIL	CASIL	ALSMX	RTIMP
0.0	0.0	1.00	0.0	0.0	1.00	0.50	0.10	0.0	0.0

GIVEN UNIT GRAPH, NUHGE= 24

27.	91.	203.	348.	460.	524.	524.	471.	396.	321.
251.	203.	161.	128.	106.	83.	64.	51.	42.	34.
28.	21.	17.	14.						

UNIT GRAPH TOTALS 4568. CFS OR 1.00 INCHES OVER THE AREA

RECESSION DATA

STRIC= 0.0 GRCSV= 0.0 RTIOR= 1.00

END-OF-PERIOD FLOW

TIME	RAIN	EXCS	COMP Q
1	0.06	0.00	0.
2	0.06	0.00	0.

BY _____ DATE _____

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. A17 OF _____

CHKD. BY _____ DATE _____

ASSUNPINK CREEK SITE #4

PROJECT _____

SUBJECT _____

3	0.06	0.00	0.	64	0.0	0.0	0.
4	0.06	0.00	0.	65	0.0	0.0	0.
5	0.07	0.00	0.	66	0.0	0.0	0.
6	0.07	0.00	0.	67	0.0	0.0	0.
7	0.08	0.00	0.	68	0.0	0.0	0.
8	0.09	0.04	1.	69	0.0	0.0	0.
9	0.09	0.06	5.	70	0.0	0.0	0.
10	0.09	0.06	15.	71	0.0	0.0	0.
11	0.11	0.08	34.	72	0.0	0.0	0.
12	0.11	0.08	62.	73	0.0	0.0	0.
13	0.30	0.27	104.	74	0.0	0.0	0.
14	0.70	0.67	173.	75	0.0	0.0	0.
15	1.70	1.67	316.	76	0.0	0.0	0.
16	0.40	0.37	558.	77	0.0	0.0	0.
17	0.40	0.37	903.	78	0.0	0.0	0.
18	0.20	0.18	1293.	79	0.0	0.0	0.
19	0.16	0.13	1613.	80	0.0	0.0	0.
20	0.14	0.11	1811.	81	0.0	0.0	0.
21	0.07	0.05	1850.	82	0.0	0.0	0.
22	0.06	0.04	1755.	83	0.0	0.0	0.
23	0.06	0.04	1574.	84	0.0	0.0	0.
24	0.06	0.04	1369.	85	0.0	0.0	0.
25	0.0	0.0	1158.	86	0.0	0.0	0.
26	0.0	0.0	976.	87	0.0	0.0	0.
27	0.0	0.0	809.	88	0.0	0.0	0.
28	0.0	0.0	668.	89	0.0	0.0	0.
29	0.0	0.0	550.	90	0.0	0.0	0.
30	0.0	0.0	442.	91	0.0	0.0	0.
31	0.0	0.0	353.	92	0.0	0.0	0.
32	0.0	0.0	282.	93	0.0	0.0	0.
33	0.0	0.0	226.	94	0.0	0.0	0.
34	0.0	0.0	181.	95	0.0	0.0	0.
35	0.0	0.0	145.	96	0.0	0.0	0.
36	0.0	0.0	113.	97	0.0	0.0	0.
37	0.0	0.0	88.	98	0.0	0.0	0.
38	0.0	0.0	63.	99	0.0	0.0	0.
39	0.0	0.0	32.	100	0.0	0.0	0.
40	0.0	0.0	21.	101	0.0	0.0	0.
41	0.0	0.0	13.	102	0.0	0.0	0.
42	0.0	0.0	8.	103	0.0	0.0	0.
43	0.0	0.0	5.	104	0.0	0.0	0.
44	0.0	0.0	3.	105	0.0	0.0	0.
45	0.0	0.0	2.	106	0.0	0.0	0.
46	0.0	0.0	1.	107	0.0	0.0	0.
47	0.0	0.0	0.	108	0.0	0.0	0.
48	0.0	0.0	0.	109	0.0	0.0	0.
49	0.0	0.0	0.	110	0.0	0.0	0.
50	0.0	0.0	0.	111	0.0	0.0	0.
51	0.0	0.0	0.	112	0.0	0.0	0.
52	0.0	0.0	0.	113	0.0	0.0	0.
53	0.0	0.0	0.	114	0.0	0.0	0.
54	0.0	0.0	0.	115	0.0	0.0	0.
55	0.0	0.0	0.	116	0.0	0.0	0.
56	0.0	0.0	0.	117	0.0	0.0	0.
57	0.0	0.0	0.	118	0.0	0.0	0.
58	0.0	0.0	0.	119	0.0	0.0	0.
59	0.0	0.0	0.	120	0.0	0.0	0.
60	0.0	0.0	0.	121	0.0	0.0	0.
61	0.0	0.0	0.	122	0.0	0.0	0.
62	0.0	0.0	0.	123	0.0	0.0	0.
63	0.0	0.0	0.	124	0.0	0.0	0.

BY DJM DATE _____
 CHKD. BY _____ DATE _____
 SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.
ASSUNPINK CREEK SITE #4

SHEET NO. A18 OF _____
 PROJECT C-227

125	0.0	0.0	0.0	0.0	0.0
126	0.0	0.0	0.0	0.0	0.0
127	0.0	0.0	0.0	0.0	0.0
128	0.0	0.0	0.0	0.0	0.0
129	0.0	0.0	0.0	0.0	0.0
130	0.0	0.0	0.0	0.0	0.0
131	0.0	0.0	0.0	0.0	0.0
132	0.0	0.0	0.0	0.0	0.0
133	0.0	0.0	0.0	0.0	0.0
134	0.0	0.0	0.0	0.0	0.0
135	0.0	0.0	0.0	0.0	0.0
136	0.0	0.0	0.0	0.0	0.0
137	0.0	0.0	0.0	0.0	0.0
138	0.0	0.0	0.0	0.0	0.0
139	0.0	0.0	0.0	0.0	0.0
140	0.0	0.0	0.0	0.0	0.0
141	0.0	0.0	0.0	0.0	0.0
142	0.0	0.0	0.0	0.0	0.0
143	0.0	0.0	0.0	0.0	0.0
144	0.0	0.0	0.0	0.0	0.0
145	0.0	0.0	0.0	0.0	0.0
146	0.0	0.0	0.0	0.0	0.0
147	0.0	0.0	0.0	0.0	0.0
148	0.0	0.0	0.0	0.0	0.0
149	0.0	0.0	0.0	0.0	0.0
150	0.0	0.0	0.0	0.0	0.0

SUM 5.20 4.26 19579.

PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME
 1850. 204. 131. 19579.
 CFS 4.21 4.29 4.29
 INCHES 397. 405. 405.
 AC-FT.

HYDROGRAPH ROUTING

ROUTING THROUGH 19

ISTAD 0 ICOMP 1 IECON 0 ITAPE 0 JPLT 0 JPRT 0 INAME 1

CLOSS 0.0 CLOSS 0.0 IRES 1 ISANE 0
 ROUTING DATA AVG

ACRPS NSTOL LAG AMSKK X YSK STORA
 1 0 0 0.0 0.0 0.0 0.

STORAGE= 0. 55. 127. 195. 271. 350. 435. 530. 642. 0.
 OUTFLOW= 0. 2. 8. 11. 60. 115. 243. 625. 1107. 0.

TIME EOP STOR AVG IN EOP OUT
 1 0. 0. 0. 0. 0.
 2 0. 0. 0. 0. 0.
 3 0. 0. 0. 0. 0.
 4 0. 0. 0. 0. 0.
 5 0. 0. 0. 0. 0.
 6 0. 0. 0. 0. 0.
 7 0. 0. 0. 0. 0.

SUBJECT _____

ASSUNPINK CREEK SITE #4

100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120

8	0.	0.	0.	69	302.	0.	81.
9	0.	3.	0.	70	300.	0.	80.
10	0.	10.	0.	71	298.	0.	79.
11	1.	24.	0.	72	297.	0.	78.
12	2.	48.	0.	73	295.	0.	77.
13	3.	83.	0.	74	293.	0.	76.
14	6.	138.	0.	75	292.	0.	75.
15	11.	245.	0.	76	290.	0.	74.
16	20.	437.	1.	77	289.	0.	72.
17	35.	750.	1.	78	287.	0.	71.
18	58.	1098.	2.	79	286.	0.	70.
19	88.	1453.	4.	80	285.	0.	69.
20	123.	1712.	8.	81	283.	0.	68.
21	161.	1831.	9.	82	282.	0.	67.
22	198.	1802.	13.	83	280.	0.	66.
23	232.	1666.	35.	84	279.	0.	66.
24	261.	1474.	54.	85	278.	0.	65.
25	286.	1264.	71.	86	276.	0.	64.
26	307.	1067.	85.	87	275.	0.	63.
27	323.	892.	96.	88	274.	0.	62.
28	336.	739.	106.	89	272.	0.	61.
29	347.	609.	113.	90	271.	0.	60.
30	355.	496.	122.	91	270.	0.	59.
31	360.	397.	130.	92	269.	0.	59.
32	364.	317.	136.	93	268.	0.	58.
33	366.	254.	140.	94	266.	0.	57.
34	368.	204.	142.	95	265.	0.	56.
35	368.	163.	142.	96	264.	0.	55.
36	368.	129.	142.	97	263.	0.	55.
37	367.	100.	141.	98	262.	0.	54.
38	366.	75.	139.	99	261.	0.	53.
39	364.	47.	136.	100	260.	0.	53.
40	362.	27.	132.	101	258.	0.	52.
41	359.	17.	129.	102	257.	0.	51.
42	357.	11.	125.	103	256.	0.	51.
43	354.	7.	122.	104	255.	0.	50.
44	352.	4.	118.	105	254.	0.	49.
45	350.	2.	115.	106	253.	0.	49.
46	347.	1.	113.	107	252.	0.	48.
47	345.	1.	112.	108	251.	0.	47.
48	343.	0.	110.	109	250.	0.	47.
49	341.	0.	108.	110	249.	0.	46.
50	338.	0.	107.	111	248.	0.	45.
51	336.	0.	105.	112	247.	0.	45.
52	334.	0.	104.	113	247.	0.	44.
53	332.	0.	102.	114	246.	0.	44.
54	330.	0.	101.	115	245.	0.	43.
55	328.	0.	99.	116	244.	0.	43.
56	326.	0.	98.	117	243.	0.	42.
57	324.	0.	97.	118	242.	0.	41.
58	322.	0.	95.	119	241.	0.	41.
59	320.	0.	94.	120	240.	0.	40.
60	318.	0.	93.	121	240.	0.	40.
61	316.	0.	91.	122	239.	0.	39.
62	314.	0.	90.	123	238.	0.	39.
63	312.	0.	89.	124	237.	0.	38.
64	310.	0.	87.	125	236.	0.	38.
65	309.	0.	86.	126	236.	0.	37.
66	307.	0.	85.	127	235.	0.	37.
67	305.	0.	84.	128	234.	0.	36.
68	303.	0.	82.	129	233.	0.	36.

SUBJECT.....

ASSUNPINK CREEK SITE #4

PROJECT C-227

120	233.	0.	35.
131	232.	0.	35.
132	231.	0.	34.
133	231.	0.	34.
134	230.	0.	33.
135	229.	0.	33.
136	228.	0.	33.
137	228.	0.	32.
138	227.	0.	32.
139	226.	0.	31.
140	226.	0.	31.
141	225.	0.	30.
142	225.	0.	30.
143	224.	0.	30.
144	223.	0.	29.
145	223.	0.	29.
146	222.	0.	29.
147	222.	0.	28.
148	221.	0.	28.
149	220.	0.	27.
150	220.	0.	27.

SUN 8951.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	142.	124.	82.	60.	8951.
INCHES		0.65	1.72	1.96	1.96
AC-FT		62.	162.	185.	185.

COMBINE HYDROGRAPHS

COMBINE HYDROGRAPHS FOR SITES 18&19

ISTAG	ICOMP	IECON	ITAPE	JPLY	JPRI	INAME
0	2	0	0	0	0	1

SUM OF 2 HYDROGRAPHS AT 0

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	1.	1.	2.	3.	6.	9.	13.	43.
73.	137.	203.	252.	291.	322.	338.	345.	343.	340.
336.	331.	324.	315.	306.	296.	285.	275.	263.	252.
241.	231.	221.	211.	202.	195.	189.	182.	176.	171.
165.	161.	158.	156.	153.	151.	148.	146.	144.	141.
139.	137.	135.	133.	131.	129.	127.	125.	123.	121.
119.	117.	115.	113.	111.	110.	108.	106.	105.	103.
101.	100.	98.	97.	95.	94.	92.	91.	89.	88.
87.	85.	84.	83.	82.	80.	79.	78.	77.	76.
75.	73.	72.	71.	70.	69.	68.	67.	66.	65.
64.	63.	62.	61.	61.	60.	59.	58.	57.	56.
55.	55.	54.	53.	52.	51.	51.	50.	49.	48.
48.	47.	46.	46.	45.	44.	44.	43.	42.	42.
41.	41.	40.	39.	39.	38.	38.	37.	37.	36.
		PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME			
	CFS	345.	280.	150.	107.	16057.			
	INCHES		0.87	1.87	2.09	2.09			
	AC-FT		139.	298.	332.	332.			

BY DIM DATE _____
 CHKD. BY _____ DATE _____
 SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.

ASSUMPTION CREEK SITE #4

SHEET NO. A-21 OF _____
 PROJECT C-227

SUB-AREA RUNOFF COMPUTATION

INFLOW TO SITE 4

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

HYDROGRAPH DATA

IHYDG	IUNG	TAREA	SNAP	TRSCA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	-1	6.30	0.0	6.30	0.0	0.0	0	0	0

PRECIP DATA

NP	STORM	DAJ	DAK
24	0.0	0.0	0.0

PRECIP PATTERN

0.06	0.06	0.06	0.06	0.07	0.07	0.08	0.09	0.09	0.09
0.11	0.11	0.10	0.10	1.70	0.40	0.40	0.20	0.16	0.14
0.07	0.06	0.06	0.06						

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	SIRTL	CNSTL	ALSMX	RTIMP
0.0	0.0	1.00	0.0	0.0	1.00	0.50	0.10	0.0	0.0

GIVEN UNIT GRAPH, KUHGG= 63

7.	14.	43.	72.	116.	167.	210.	290.	348.	420.
492.	565.	615.	659.	695.	710.	695.	666.	637.	601.
557.	521.	485.	449.	405.	365.	340.	311.	290.	266.
246.	224.	203.	188.	174.	159.	145.	130.	125.	114.
103.	93.	85.	79.	72.	67.	62.	56.	52.	45.
46.	42.	38.	35.	33.	29.	26.	24.	22.	21.
20.	18.	17.							

UNIT GRAPH TOTALS 14814. CFS OR 0.91 INCHES OVER THE AREA

RECESSION DATA

STRKQ= 0.0 GRCSN= 0.0 RTIOR= 1.00

END-OF-PERIOD FLOW

TIME	RAIN	EXCS	COMP Q
1	0.06	0.00	0.
2	0.06	0.00	0.
3	0.06	0.00	0.
4	0.06	0.00	0.
5	0.07	0.00	0.
6	0.07	0.00	0.
7	0.08	0.00	0.
8	0.09	0.04	0.
9	0.09	0.06	1.
10	0.09	0.06	3.
11	0.11	0.08	7.
12	0.11	0.08	13.
13	0.30	0.27	25.
14	0.70	0.67	44.
15	1.70	1.67	84.
16	0.40	0.37	144.
17	0.40	0.37	249.
18	0.20	0.18	378.
19	0.16	0.13	545.

BY DIM DATE _____
CHKD. BY _____ DATE _____
SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.
ASSUNPINK SITE # 4

SHEET NO. A22 OF _____
PROJECT C-227

20	0.14	0.11	738.	81	0.0	0.0	8.
21	0.07	0.05	948.	82	0.0	0.0	5.
22	0.06	0.04	1211.	83	0.0	0.0	3.
23	0.06	0.04	1459.	84	0.0	0.0	2.
24	0.06	0.04	1733.	85	0.0	0.0	1.
25	0.0	0.0	2001.	86	0.0	0.0	1.
26	0.0	0.0	2255.	87	0.0	0.0	0.
27	0.0	0.0	2464.	88	0.0	0.0	0.
28	0.0	0.0	2640.	89	0.0	0.0	0.
29	0.0	0.0	2770.	90	0.0	0.0	0.
30	0.0	0.0	2831.	91	0.0	0.0	0.
31	0.0	0.0	2818.	92	0.0	0.0	0.
32	0.0	0.0	2755.	93	0.0	0.0	0.
33	0.0	0.0	2664.	94	0.0	0.0	0.
34	0.0	0.0	2542.	95	0.0	0.0	0.
35	0.0	0.0	2400.	96	0.0	0.0	0.
36	0.0	0.0	2259.	97	0.0	0.0	0.
37	0.0	0.0	2111.	98	0.0	0.0	0.
38	0.0	0.0	1960.	99	0.0	0.0	0.
39	0.0	0.0	1800.	100	0.0	0.0	0.
40	0.0	0.0	1655.	101	0.0	0.0	0.
41	0.0	0.0	1523.	102	0.0	0.0	0.
42	0.0	0.0	1401.	103	0.0	0.0	0.
43	0.0	0.0	1295.	104	0.0	0.0	0.
44	0.0	0.0	1193.	105	0.0	0.0	0.
45	0.0	0.0	1095.	106	0.0	0.0	0.
46	0.0	0.0	1003.	107	0.0	0.0	0.
47	0.0	0.0	917.	108	0.0	0.0	0.
48	0.0	0.0	844.	109	0.0	0.0	0.
49	0.0	0.0	775.	110	0.0	0.0	0.
50	0.0	0.0	711.	111	0.0	0.0	0.
51	0.0	0.0	650.	112	0.0	0.0	0.
52	0.0	0.0	595.	113	0.0	0.0	0.
53	0.0	0.0	553.	114	0.0	0.0	0.
54	0.0	0.0	505.	115	0.0	0.0	0.
55	0.0	0.0	462.	116	0.0	0.0	0.
56	0.0	0.0	421.	117	0.0	0.0	0.
57	0.0	0.0	385.	118	0.0	0.0	0.
58	0.0	0.0	355.	119	0.0	0.0	0.
59	0.0	0.0	325.	120	0.0	0.0	0.
60	0.0	0.0	300.	121	0.0	0.0	0.
61	0.0	0.0	276.	122	0.0	0.0	0.
62	0.0	0.0	253.	123	0.0	0.0	0.
63	0.0	0.0	235.	124	0.0	0.0	0.
64	0.0	0.0	218.	125	0.0	0.0	0.
65	0.0	0.0	202.	126	0.0	0.0	0.
66	0.0	0.0	185.	127	0.0	0.0	0.
67	0.0	0.0	170.	128	0.0	0.0	0.
68	0.0	0.0	157.	129	0.0	0.0	0.
69	0.0	0.0	145.	130	0.0	0.0	0.
70	0.0	0.0	131.	131	0.0	0.0	0.
71	0.0	0.0	118.	132	0.0	0.0	0.
72	0.0	0.0	108.	133	0.0	0.0	0.
73	0.0	0.0	98.	134	0.0	0.0	0.
74	0.0	0.0	91.	135	0.0	0.0	0.
75	0.0	0.0	83.	136	0.0	0.0	0.
76	0.0	0.0	72.	137	0.0	0.0	0.
77	0.0	0.0	57.	138	0.0	0.0	0.
78	0.0	0.0	26.	139	0.0	0.0	0.
79	0.0	0.0	18.	140	0.0	0.0	0.
80	0.0	0.0	11.	141	0.0	0.0	0.

BY D.J.M. DATE _____
 CHKD. BY _____ DATE _____
 SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.
ASSUNPINK CREEK SITE #4

SHEET NO. A23 OF _____
 PROJECT C-227

142	0.0	0.0	0.
143	0.0	0.0	0.
144	0.0	0.0	0.
145	0.0	0.0	0.
146	0.0	0.0	0.
147	0.0	0.0	0.
148	0.0	0.0	0.
149	0.0	0.0	0.
150	0.0	0.0	0.

SUM 5.20 4.26 63492.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2831.	2035.	661.	423.	63494.
INCHES		3.00	3.91	3.91	3.91
AC-FT		1010.	1313.	1313.	1313.

 COMBINE HYDROGRAPHS

TOTAL HYDROGRAPH FOR INFLOW TO SITE #4

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
0	2	0	0	0	0	1

SUM OF 2 HYDROGRAPHS AT 0

0.	0.	0.	0.	0.	0.	0.	1.	3.
7.	14.	26.	45.	86.	147.	255.	387.	558.
1020.	1349.	1662.	1985.	2292.	2577.	2802.	2985.	3113.
3154.	3086.	2985.	2858.	2706.	2554.	2397.	2235.	2064.
1765.	1632.	1516.	1404.	1298.	1198.	1106.	1027.	953.
815.	755.	711.	661.	615.	571.	534.	501.	469.
415.	390.	369.	351.	333.	314.	297.	281.	267.
237.	225.	213.	204.	194.	182.	165.	152.	123.
109.	105.	101.	99.	96.	94.	92.	91.	89.
87.	85.	84.	83.	82.	80.	79.	78.	77.
75.	73.	72.	71.	70.	69.	68.	67.	66.
64.	63.	62.	61.	61.	60.	59.	58.	57.
55.	55.	54.	53.	52.	51.	51.	50.	49.
48.	47.	46.	46.	45.	44.	44.	43.	42.
41.	41.	40.	39.	39.	38.	38.	37.	36.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3171.	2312.	807.	530.	79548.
INCHES		2.32	3.24	3.32	3.32
AC-FT		1147.	1602.	1644.	1644.

 HYDROGRAPH ROUTING

ROUTING THROUGH RESERVOIR

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

ROUTING DATA

QLOSS	CLOSS	AVG	IRFS	ISANE
-------	-------	-----	------	-------

BY DJM DATE _____
CHKD. BY _____ DATE _____
SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.
ASSUNPINK CREEK SITE #4

SHEET NO. A24 OF
PROJECT C-227

[illegible]

SUBJECT _____

ASSUMPINK CREEK SITE #4

PROJECT C-227

46	1186.	1248.	252.
47	1185.	1152.	257.
48	1201.	1066.	262.
49	1216.	990.	232.
50	1228.	917.	350.
51	1238.	848.	335.
52	1246.	785.	431.
53	1252.	733.	459.
54	1256.	686.	480.
55	1259.	638.	494.
56	1261.	593.	503.
57	1262.	552.	508.
58	1262.	517.	509.
59	1262.	485.	506.
60	1261.	455.	502.
61	1259.	428.	495.
62	1258.	403.	487.
63	1256.	380.	477.
64	1253.	360.	466.
65	1251.	342.	455.
66	1248.	323.	443.
67	1246.	305.	430.
68	1243.	289.	417.
69	1240.	274.	404.
70	1237.	259.	391.
71	1234.	244.	377.
72	1231.	231.	364.
73	1228.	219.	351.
74	1226.	209.	338.
75	1223.	199.	325.
76	1220.	188.	312.
77	1217.	173.	300.
78	1214.	149.	286.
79	1211.	128.	271.
80	1208.	119.	264.
81	1205.	112.	264.
82	1202.	107.	263.
83	1199.	103.	262.
84	1195.	100.	261.
85	1192.	98.	260.
86	1189.	95.	259.
87	1185.	93.	258.
88	1182.	92.	257.
89	1178.	90.	256.
90	1175.	89.	255.
91	1171.	87.	254.
92	1168.	85.	252.
93	1164.	85.	251.
94	1161.	83.	250.
95	1158.	82.	249.
96	1154.	81.	248.
97	1151.	80.	247.
98	1147.	79.	246.
99	1144.	77.	245.
100	1140.	76.	244.
101	1137.	75.	243.
102	1133.	74.	242.
103	1130.	73.	241.
104	1126.	72.	240.
105	1123.	71.	239.
106	1119.	70.	238.
107	1116.	69.	237.
108	1112.	68.	236.
109	1109.	67.	235.
110	1105.	66.	234.
111	1102.	65.	233.
112	1098.	64.	232.
113	1095.	63.	231.

SUBJECT.....

ASSUNPINK CREEK SITE #4

PROJECT C-217

SUN 32705.

.....

		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
HYDROGRAPH AT	1	1729.	559.	140.	90.	1.22
ROUTED TO	0	242.	166.	69.	47.	1.21
HYDROGRAPH AT	2	1850.	801.	204.	131.	1.77
ROUTED TO	0	142.	124.	82.	60.	1.77
2 COMBINED	0	345.	280.	150.	107.	2.98
HYDROGRAPH AT	3	2831.	2035.	661.	423.	6.30
2 COMBINED	0	3171.	2312.	807.	550.	9.28
ROUTED TO	0	509.	445.	294.	218.	9.28