UNNAMED BROOK
LAMPREY RIVER WATERSHED
NEW HAMPSHIRE

DROWN'S DAM-BREAK FLOOD ANALYSIS

SEPTEMBER 1984

US Army Corps
of Engineers
New England Division

DROWN'S DAM

DAM-BREAK FLOOD

ANALYSIS

SUBMITTED TO:

DEPARTMENT OF THE ARMY

NEW ENGLAND DIVISION

WALTHAM, MASSACHUSETTS

SUBMITTED BY:

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CONTRACT NUMBER:

DACW33-83-D-0002

SEPTEMBER 1984

DROWNS DAM

DAM-BREAK FLOOD ANALYSIS

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DROWN'S DAM

DAM-BREAK FLOOD ANALYSIS

1. INTRODUCTION AND PURPOSE

This report presents the finding of a dam-break flood analysis performed for Drown's Dam. The dam is owned, operated, and maintained by the Water Resources Board of New Hampshire. Included in this report is a description of the pertinent features of the dam, the procedure used for the analysis, the assumed dam-break conditions and resulting effects on downstream flooded areas. This study was not performed because of any known likelihood of a dam-break at Drown's Dam. Its purpose is to provide quantitative information for emergency planning use.

2. DAM DESCRIPTION

Identification No.:	NH00136
Name of Dam:	Drown's Dam
Town:	Nottingham
County and State:	Rockingham County, New Hampshire
Stream:	Tributary of Bean River

Drown's Dam is 18 feet high, averages 24 feet in width, and is 235 feet long. It is an earthen embankment contained between two vertical dry masonry (stone) walls. A concrete facing was placed on the upstream face in three different years: 1946, 1964, and 1972. The dam has four sections of spillway, two uncontrolled sections, 21 feet long, placed on either side of a 4-foot wide stoplog spillway, and 50-foot wide emergency, grass-covered spillway in the left (west) abutment. Drown's Dam, Dolloff Dam, and Gove Dike impound Pawtuckaway Pond. The pond is used now for recreational purposes, is 3 miles long, and has a surface area of about 900 acres. Maximum storage is 11,700 acre-feet.

3. PERTINENT DATA

Data is taken from "Phase I Inspection Report" for Drown's Dam dated July 1978.

a. Drainage Area. The drainage area consists of 20.66 square miles (13,225 acres) of predominantly wooded terrain.

b. Discharge at Damsite.

(1) Outlet works (conduits) - none

(2) Maximum known flood at damsite is unknown.

(3) Ungated spillway capacity at maximum pool elevation- 520 cfs @ elev. 252.7' NGVD.

(4) Stoplog spillway capacity at recreational pool elevation (250 NGVD) is estimated to be 300 cfs assuming removal of all stoplogs.

(5) Stoplog capacity at maximum pool elevation - 450 cfs @ elev 252.7' NGVD*

(6) Total spillway capacity at maximum pool elevation - 970 cfs @ elev. 252.7' NGVD*

c. Elevation. (ft. NGVD)

(1) Top of Dam - 254.9

(2) Recreation pool - 250

(3) Spillway crest (gated) - 241 (assuming all stoplogs removed)

(4) Streambed at centerline of dam - 240 - Downstream at toe of stoplog spillway.

d. Reservoir (miles)

(1) Length of recreation pool - 3

e. Storage (acre-feet)

(1) Recreation pool - 11,500

*Maximum pool elevation based on Dolloff Dam.

(2) Top of Dam - 11,700 (storage based on Dolloff Dam)

f. Reservoir Surface (acres)

(1) Top of dam - 1130

(2) Maximum pool - 980

(3) Recreation pool - 900

(4) Spillway crest - 420

g. Dam

(1) Type - Earthen embankment between vertical dry masonry walls, upstream wall is concrete faced.

(2) Length - 235'

(3) Height - 18' (structural height)

(4) Top Width - 24'

(5) Side Slopes - Vertical

(6) Zoning - unknown

(7) Impervious core - unknown

(8) Cutoff - unknown

(9) Grout curtain - unknown (foundation and spot grouting done in past)

h. Spillway

(1) Type - ungated and stoplog

(2) Length of weir - 42' (ungated); 4' (stoplog)

(3) Crest elevation - 250' NGVD (ungated); 241' NGVD (all stoplogs removed)

(4) Gates - none

(5) U/S Channel - Pawtuckaway Pond

(6) D/S Channel - about 50 feet wide, immediately downstream appears to be bedrock, further downstream bottom covered by silt, sand, gravel, cobbles, and boulders; brush and tree overhang channel with fallen logs in channel.

(7) General - four-foot wide steel grate access bridge over spillway.

4. VALLEY DESCRIPTION

The dam spans an unnamed tributary approximately 1.5 miles upstream of its confluence with the Bean River. The Bean River then flows another 0.5 mile to its confluence with the North River. The North River continues for another 8 miles to its confluence with the Lamprey River, a major tributary in the Piscataqua River Basin.

The river valley below Drown's Dam is heavily wooded during its 10 mile course to the Lamprey River. The first 3 miles the river has a mild slope with a generally wide floodplain. From approximately mile 3 to mile 7 the slope increases steeply, with a narrow river and vally. From mile 7 to the confluence with the Lamprey River at mile 10.0 the river returns to a moderate to flat slope with a wide floodplain.

5. MODEL DESCRIPTION

The Drown's Dam dam-break analysis was made using the HEC version of the "National Weather Service Dam-Break Flood Forecasting Computer Model", developed by D.L. Fread, Research Hydrologist, Office of Hydrology, National Weather Service, NOAA, Silver Spring, Maryland 20910. Input for the model consisted of: (a) Storage characteristics of the resevoir, (b) selected geometry and duration of the breach development, (c) hydraulic inflows, (d) hydraulic roughness coefficients, and (e) active and inactive flow regions. Based on the input data, the model computes the dam-break outflow hydrograph and routes it downstream. Dynamic unsteady flow routing is performed by a "honing" iterative process governed by the requirements of both the principles of conservation of mass and momentum. The analysis provides output on the attentuation of the flood hydrograph, resulting flood stages, and timing of the flood wave as it progresses downstream.

6. ASSUMED DAM-BREAK CONDITIONS

The magnitude of a flood resulting form the hypothetical failure of Drown's Dam is a function of many different

parameters including size of breach, initial pool level and storage, rate of breach formation, channel and overbank roughness, and antecedent flow conditions. Engineering assumptions of conditions which could be reasonable expected to exist prior to a failure of Drown's Dam, were used in the base flood analysis as presented below:

(1) Initial Pool Level: 253.8 feet NGVD, 3.8 feet above top of flashboards

(2) Breach Invert: 240 feet NGVD.

(3) Breach Base Width: 60 feet, trapezodial side slopes 1V: 0.5H.

(4) Time to Complete Formation of Breach: 1 hour.

(5) Downstream Channel Roughness: Mannings's "n" = .030 to .100

(6) Pre-Brech Flow: The pre-breach river flow was assumed equal to the flood of record which was estimated by using a cfs/sq. mi.value based upon similar drainage area. Inflow in to Pawtuckaway Pond was 2600 cfs, which was distributed equally between Dolloff Dam and Drown's Dam. Drown's Dam portion was 1300 cfs.

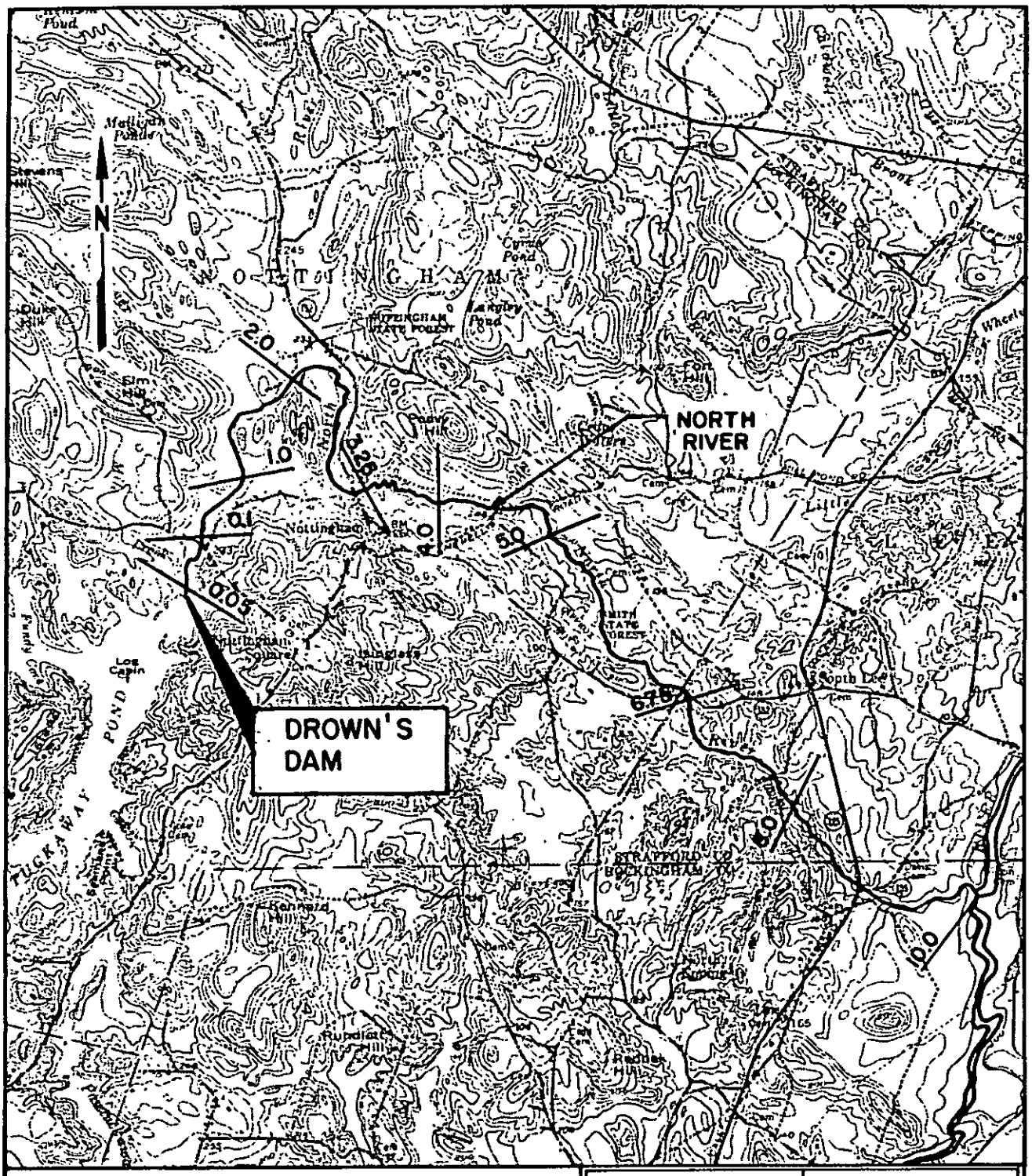
7. RESULTS

The resulting peak stage flood profiles are shown on plates 2 through 4. Timing of the peak stage and leading edge of the flood wave are also indicated on the profile. Because of the scarcity of good topographic mapping in the areas, profiles are shown in feet above normal summertime (July-August) low water (NLW). Users of the information can establish depth of flooding at particular properties by establishing its relative elevation with respect to the adjacent stream level. Variations in depth above NLW progressing downstream, is attributable to changes in natural stream hydraulic capacity as well as changes in peak discharge. Peak discharge throughout the study reach associated with the development of the peak stage profile along with discharge and stage hydrographs for three stations downstream from Drown's Dam are shown on plate 5. The three stations are located .05, 3.25, 6.75 miles downstream of the dam.

The peak dam-break discharge from Drown's Dam is 11,380 cfs producing a rise of 8 feet above the NLW stage at a point

.05 miles downstream from the dam. The peak discharge decreases to 7,920 cfs with an attendant rise of stage of 9 feet at a mile 3.25 below dam. At mile 6.75 below the dam the discharge is 7910 cfs producing a rise of 9 feet over NLW stage.

Because of the large reservoir capacity of Pawtuckaway Pond, a large outflow is maintained from the breached Drown's Dam. The natural valley storage of the river valley is expended and high flows occur in the river 10.0 miles downstream. Some attenuation of the peak flow does occur in the first 2 miles below the dam, but from there to the limit of study at mile 10.0, very little attenuation occurs. It is, therefore, recommended that relative depths of flooding above MLW at the end of the study reach be used in estimating flood potentials further downstream on the Lamprey River.



MAP BASED UPON U.S.G.S
MT. PAWTUCKAWAY, N.H QUADRANGLE
1957

CROSS-SECTION LOCATION IN
MILES BELOW DAM

SCALE IN MILES

1 0 1

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DROWN'S DAM

DAM BREAK FLOOD ANALYSIS

INDEX MAP

PLATE I

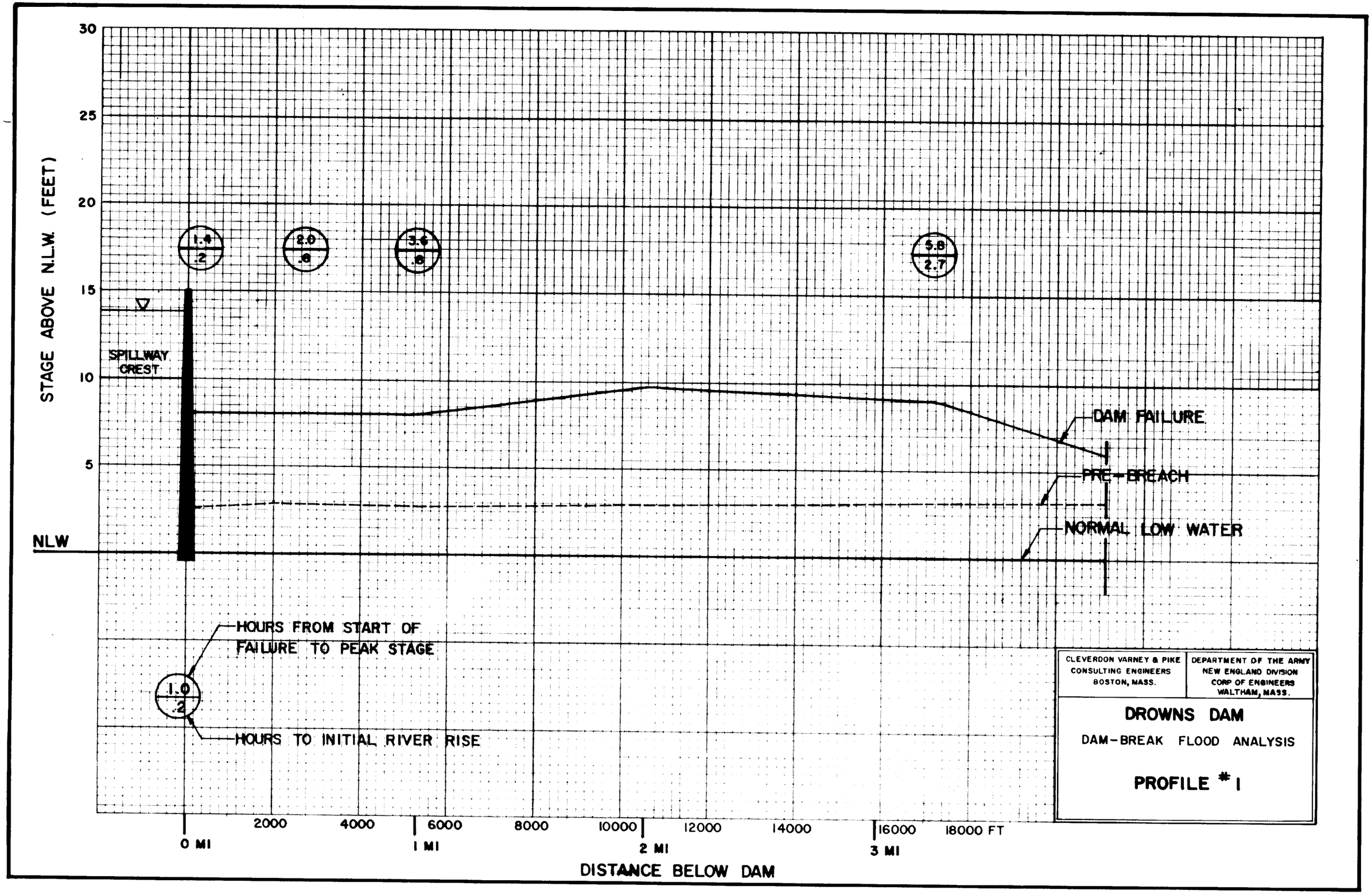
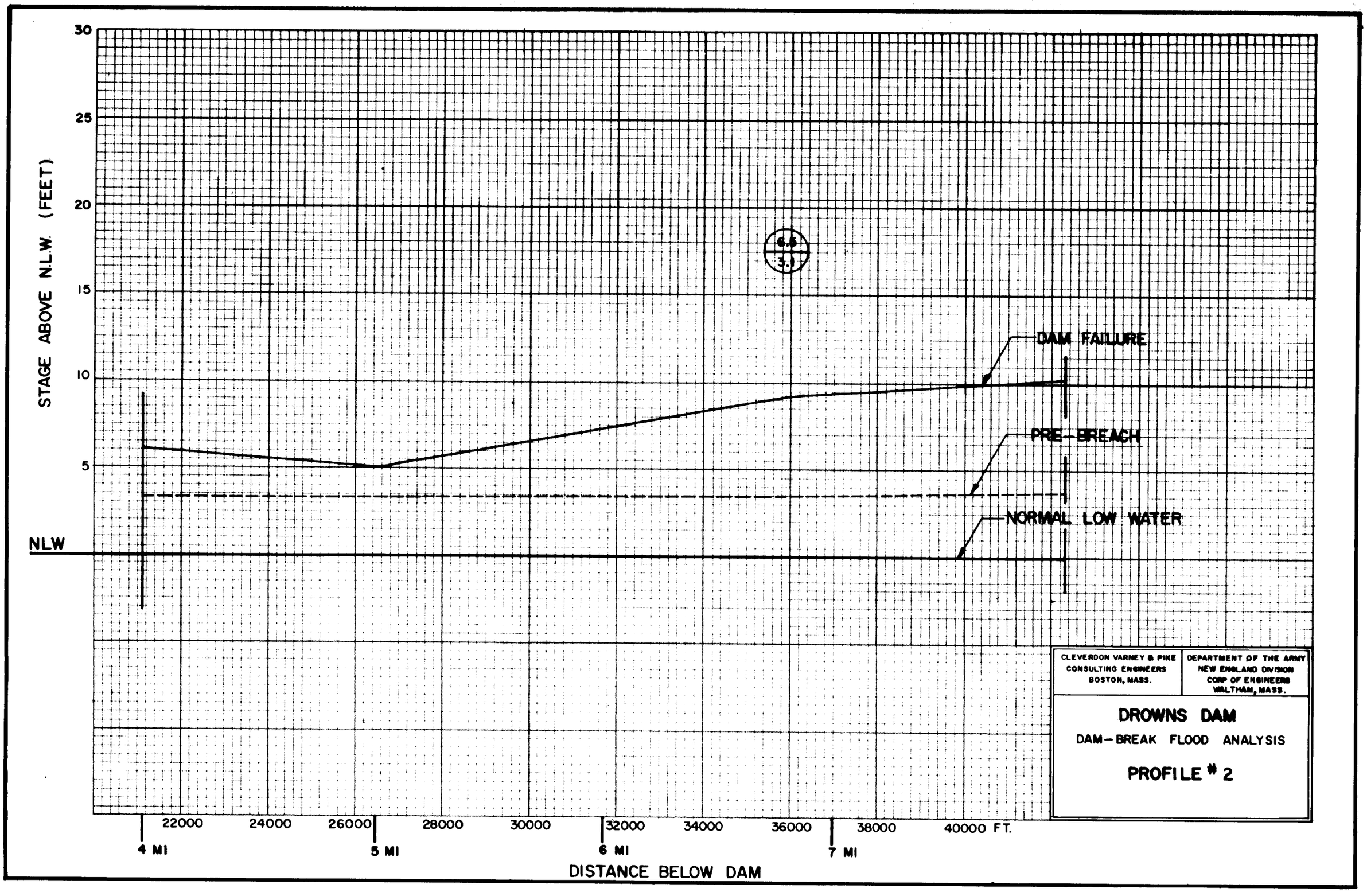

STAGE ABOVE N.L.W. (FEET)
30
25
20
15
10
5
NLW
SPILLWAY CREST
1.4
.2
2.0
.8
3.6
.8
5.8
2.7
DAM FAILURE
PRE-BREACH
NORMAL LOW WATER
HOURS FROM START OF FAILURE TO PEAK STAGE
1.0
.2
HOURS TO INITIAL RIVER RISE
2000
4000
6000
8000
10000
12000
14000
16000
18000 FT
0 MI
1 MI
2 MI
3 MI
DISTANCE BELOW DAM
CLEVERDON VARNEY & PIKE
CONSULTING ENGINEERS
BOSTON, MASS.
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORP OF ENGINEERS
WALTHAM, MASS.
DROWNS DAM
DAM-BREAK FLOOD ANALYSIS
PROFILE #1

PLATE 2


STAGE ABOVE N.L.W. (FEET)
30
25
20
15
10
5
NLW
6.5
3.1
DAM FAILURE
PRE-BREACH
NORMAL LOW WATER
22000
24000
26000
28000
30000
32000
34000
36000
38000
40000 FT.
4 MI
5 MI
6 MI
7 MI
DISTANCE BELOW DAM
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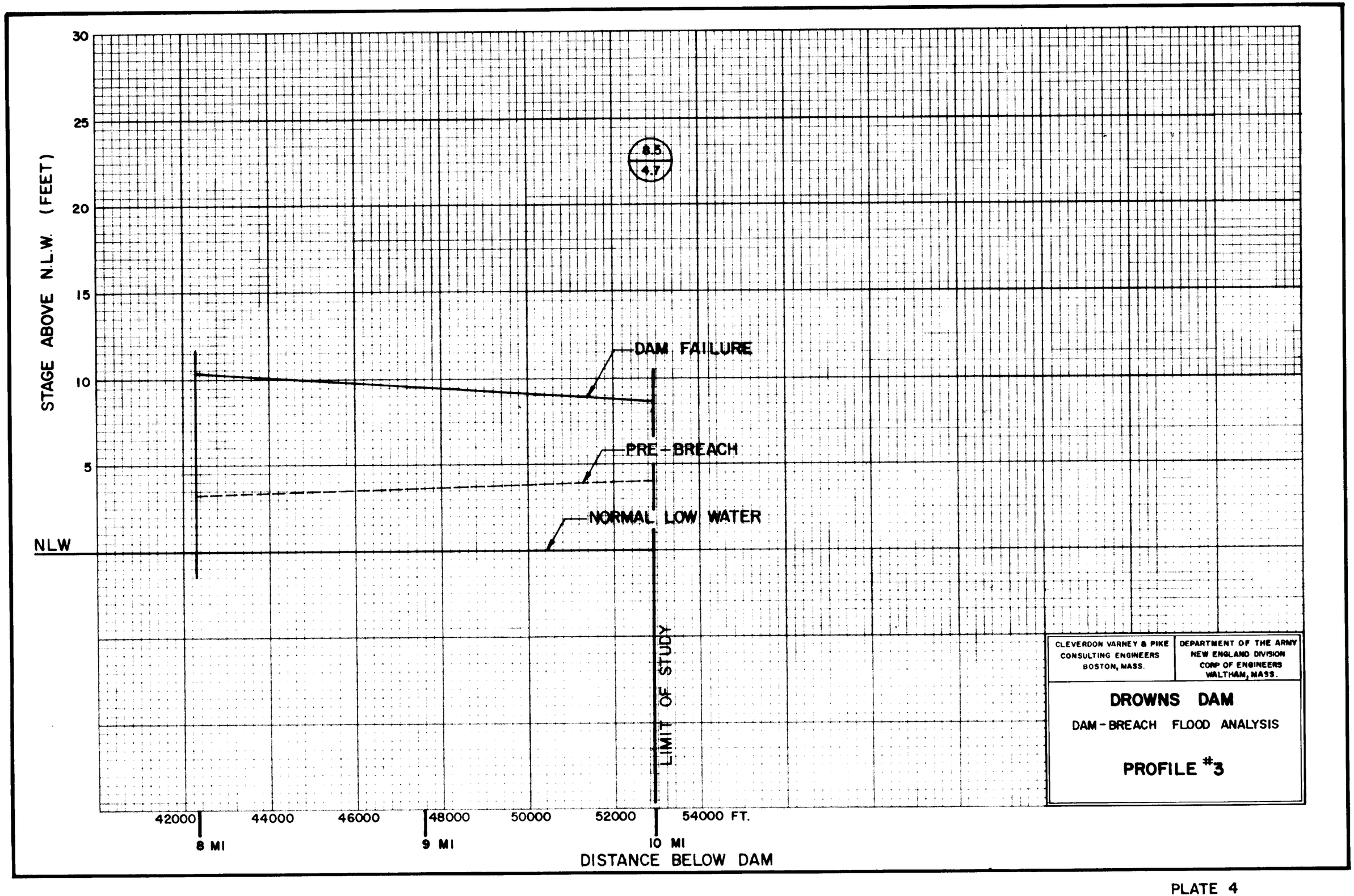
NEW ENGLAND DIVISION
CORP OF ENGINEERS
WALTHAM, MASS.
DROWNS DAM
DAM-BREAK FLOOD ANALYSIS
PROFILE # 2

PLATE 3


STAGE ABOVE N.L.W. (FEET)
30
25
20
15
10
5
NLW
8.5
4.7
DAM FAILURE
PRE - BREACH
NORMAL LOW WATER
LIMIT OF STUDY
42000
44000
46000
48000
50000
52000
54000 FT.
8 MI
9 MI
10 MI
DISTANCE BELOW DAM
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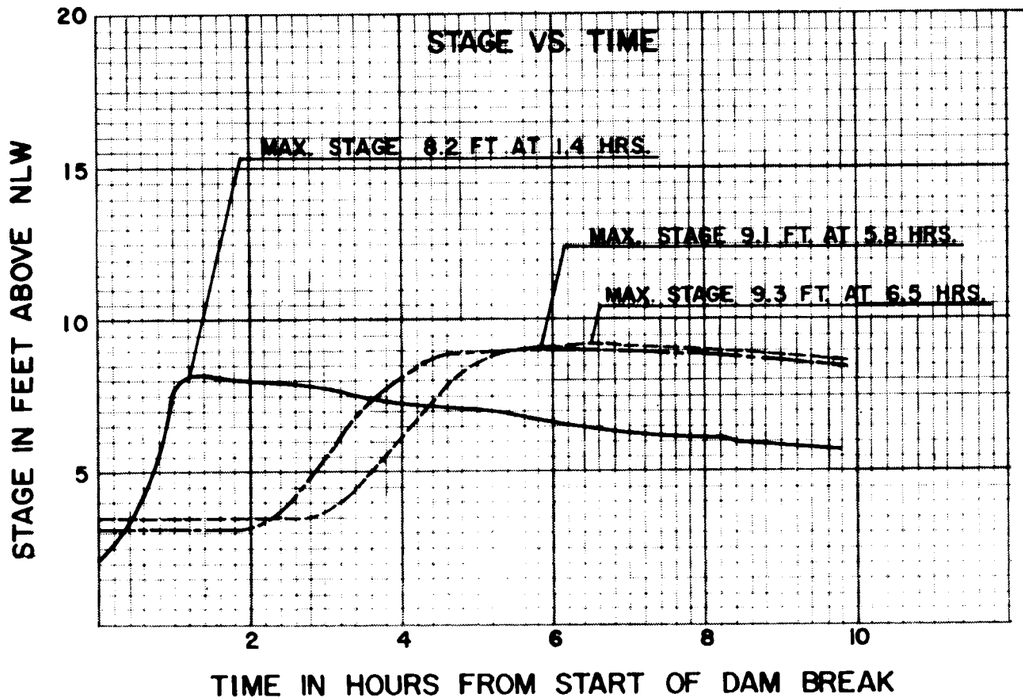
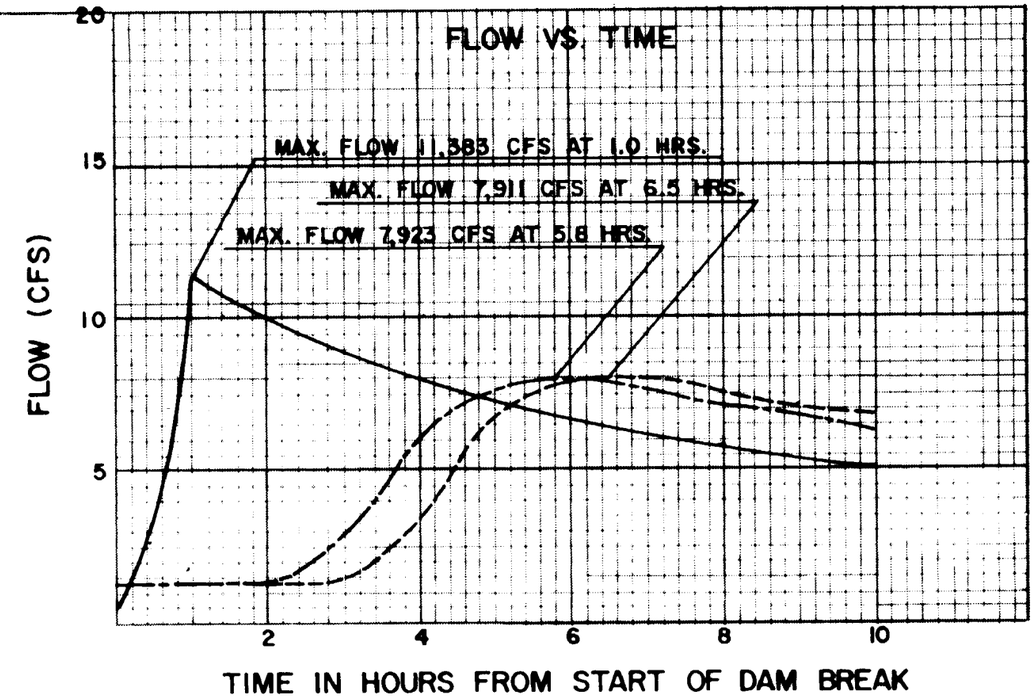
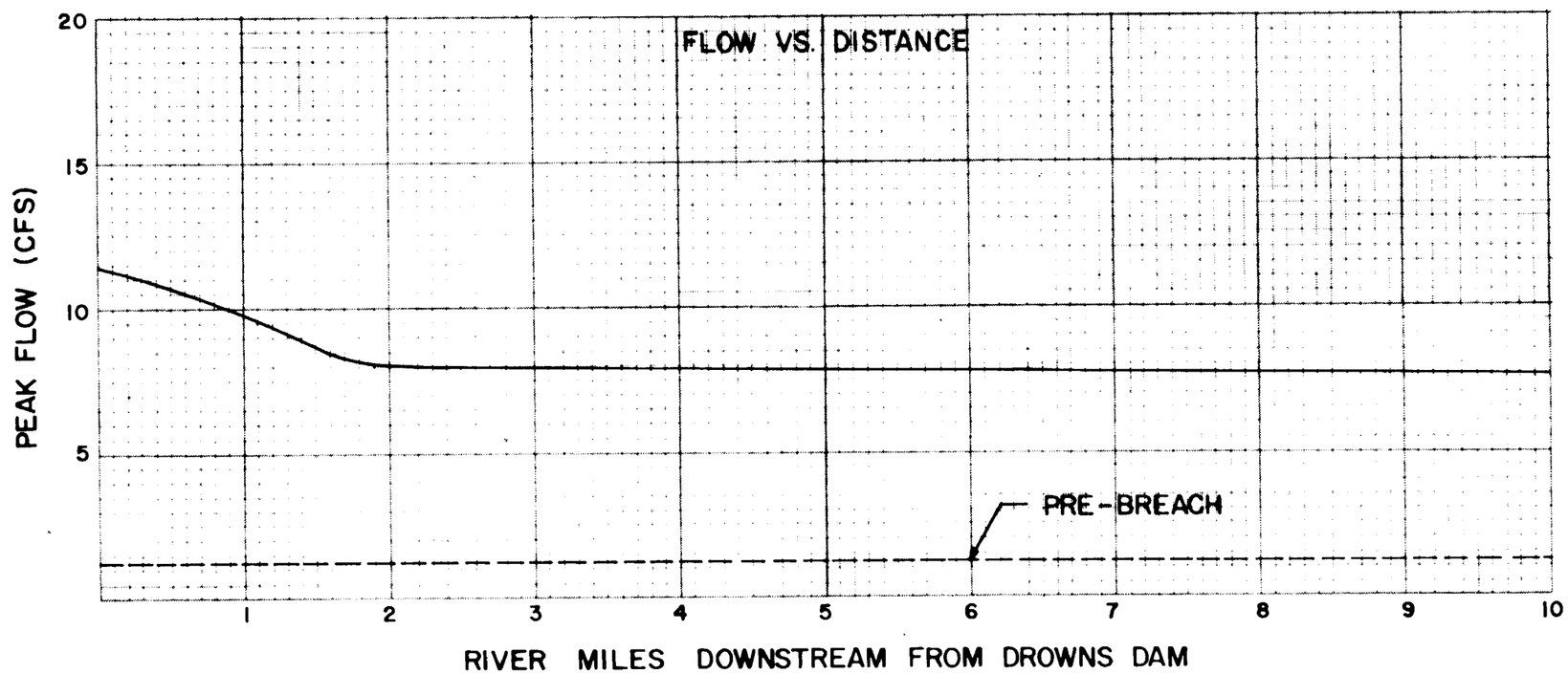
WALTHAM, MASS.
DROWNS DAM
DAM - BREACH FLOOD ANALYSIS
PROFILE #3

PLATE 4







NLW DATUM (FT. NGVD)

STA. 1 RM. 0.05 = 234 ———
STA. 2 RM. 3.25 = 215 — — —
STA. 3 RM. 6.75 = 112 - - - -

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DROWNS DAM

DAM-BREAK FLOOD ANALYSIS

BASE FLOOD DISCHARGES STAGES & TIMING

```
*HECFORMAT
*ECHO
*FORMATTED
*10FIELDS
*COMPOSITE
ID DROWNS DAM
ID NORTH RIVER
ID G. MERCER
ID C.V & P. ENGS
ID BOSTON, MA
IO      1       10       10
IP      3        0
QI   1300
SN PAWTUCKAWAY POND
SE 252.7      250      241      240      235
SA   985      903      422      280        0
DN DROWNS DAM
DD   255      250        0    253.8       30     .060      240
DB     1    253.8       60      240       .5
DO     0      175        0       10
RN REACH 1
RG     1        2        3        5        8       10
RC   0.0        0      0.0      0.0
XI  0.05                                                  0.15
XE   233      237      242      247      251      256      260      265
XC    55      349      444      495      694      970     1041     1200
NC  .035     .045     .050     .060     .070     .080     .090     .100
XI   0.5                                                  0.15
XE   230      237      244      251      259      266      273      280
XC    50      500     1000     1200     1500     2000     2200     2700
XO     0      243      248      412      528      392      556      420
NC  .035     .045     .050     .060     .070     .080     .090     .100
XI   1.0                                                  0.15
XE   228      235      243      250      258      265      273      280
XC    50      743     1500     2000     2500     3000     3500     4000
XO     0      500      808      840      948      900      880      880
NC  .035     .045     .050     .060     .070     .080     .090     .100
XI   2.0                                                  0.15
XE   224      232      240      248      256      264      272      280
XC    50      400     1500     2000     2500     3000     3500     4000
XO     0     1125     1500     1489     1479     1419     1309     1200
NC  .035     .045     .050     .060     .070     .080     .090     .100
XI  3.25                                                  0.20
XE   214      220      225      230      236      241      247      252
XC    40      150      689      850     1288     1525     1892     2050
NC  .035     .045     .050     .060     .070     .080     .090     .100
XI   4.0                                                  0.20
XE   203      211      219      227      236      244      252      260
XC    50      320      591      952     1373     1872     2496     3120
NC  .035     .045     .050     .060     .070     .080     .090     .100
XI   5.0                                                  0.30
XE   182      190      199      207      215      223      232      240
XC    50      212      395      616      846     1153     1645     2083
NC  .035     .045     .050     .060     .070     .080     .090     .100
XI  6.75                                                  0.10
```

INPUT DATA FILE

APPENDIX A

XE	111	116	122	127	133	139	145	150
XC	40	150	359	434	668	1201	1312	1500
NC	.035	.045	.050	.060	.070	.080	.090	.100
XI	8.0						0.05	
XE	98	104	110	116	122	128	134	140
XC	50	334	520	706	867	978	1089	1200
NC	.035	.045	.050	.060	.070	.080	.090	.100
XI	10.0							
XE	95	101	108	114	121	127	134	140
XC	50	474	852	1176	1625	1800	2200	3000
XO	0	0	0	0	0	575	1050	1000
NC	.035	.045	.050	.060	.070	.080	.090	.100
ZZ								

ANALYSIS OF THE DOWNSTREAM FLOOD HYDROGRAPH

PRODUCED BY THE DAM BREAK OF

DROWNS DAM

ON

NORTH RIVER

ANALYSIS BY

G. MERCER
C.V & P. ENGS
BOSTON, MA

BASED ON PROCEDURE DEVELOPED BY

DANNY L. FREAD, PH.D., RESEARCH HYDROLOGIST
HYDROLOGIC RESEARCH LABORATORY
W23, OFFICE OF HYDROLOGY
NOAA, NATIONAL WEATHER SERVICE
SILVER SPRING, MARYLAND 20910

```
*******************************
*******************************
***                         ***
***  SUMMARY OF INPUT DATA  ***
***                         ***
*******************************
*******************************
```

PARAMETER	VARIABLE	VALUE
**********	******	*******
NUMBER OF DYNAMIC ROUTING REACHES	KKN	1
TYPE OF RESERVOIR ROUTING	KUI	0
MULTIPLE DAM INDICATOR	MULDAM	0
PRINTING INSTRUCTIONS FOR INPUT SUMMARY	KDMP	3
NO. OF RESERVOIR INFLOW HYDROGRAPH POINTS	ITEH	1
INTERVAL OF CROSS-SECTION INFO PRINTED OUT WHEN JNK=9	NPRT	0
FLOOD-PLAIN MODEL PARAMETER	KFLP	0
LANDSLIDE PARAMETER	KSL	0

DROWNS DAM RESERVOIR

TABLE OF ELEVATION VS SURFACE AREA

SURFACE AREA (ACRES) SA(K)	ELEVATION (FT) HSA(K)
985.0	252.70
903.0	250.00
422.0	241.00
290.0	240.00
0.0	235.00
0.0	0.00
0.0	0.00
0.0	0.00

DROWNS DAM RESERVOIR AND BREACH PARAMETERS

PARAMETER	UNITS	VARIABLE	VALUE
LENGTH OF RESERVOIR	MI	RLM	0.00
ELEVATION OF WATER SURFACE	FT	YO	253.80
SIDE SLOPE OF BREACH		Z	.50
ELEVATION OF BOTTOM OF BREACH	FT	YBMIN	240.00
WIDTH OF BASE OF BREACH	FT	BB	60.00

WIDTH OF BASE OF BREACH	FT	BB	60.00
TIME TO MAXIMUM BREACH SIZE	HR	TFH	1.00
ELEVATION (MSL) OF BOTTOM OF DAM	FT	DATUM	240.00
VOLUME-SURFACE AREA PARAMETER		VOL	0.00
ELEVATION OF WATER WHEN BREACHED	FT	HF	253.00
ELEVATION OF TOP OF DAM	FT	HD	255.00
ELEVATION OF UNCONTROLLED SPILLWAY CREST	FT	HSP	250.00
ELEVATION OF CENTER OF GATE OPENINGS	FT	HGT	0.00
DISCHARGE COEF. FOR UNCONTROLLED SPILLWAY		CS	175.00
DISCHARGE COEF. FOR GATE FLOW		CG	0.00
DISCHARGE COEF. FOR UNCONTROLLED WEIR FLOW		CDO	10.00
DISCHARGE THRU TURBINES	CFS	QT	0.00

DHF(INTERVAL BETWEEN INPUT HYDROGRAPH ORDINATES) = 10.00 HRS.

TEH(TIME AT WHICH COMPUTATIONS TERMINATE) = 10.0000 HRS.

INFLOW HYDROGRAPH TO DROWNS DAM
****

1300.00

TIME OF INFLOW HYDROGRAPH ORDINATES

0.0000

CROSS-SECTIONAL PARAMETERS FOR NORTH RIVER
BELOW DROWNS DAM

PARAMETER	VARIABLE	VALUE
**********	******	*******

NUMBER OF CROSS-SECTIONS	NS	10
MAXIMUM NUMBER OF TOP WIDTHS	NCS	8
NUMBER OF CROSS-SECTIONAL HYDROGRAPHS TO PLOT	NTT	6

TYPE OF OUTPUT OTHER THAN HYDROGRAPH PLOTS	JNK	0
CROSS-SECTIONAL SMOOTHING PARAMETER	KSA	0
DOWNSTREAM SUPERCRITICAL OR NOT	KSUPC	0
NO. OF LATERAL INFLOW HYDROGRAPHS	LQ	0
NO. OF POINTS IN GATE CONTROL CURVE	KCG	0

NUMBER OF CROSS-SECTION WHERE HYDROGRAPH DESIRED
(MAX NUMBER OF HYDROGRAPHS = 6)
****

1 2 3 5 9 10

CROSS-SECTIONAL VARIABLES FOR NORTH RIVER
BELOW DROWNS DAM

PARAMETER	UNITS	VARIABLE
LOCATION OF CROSS-SECTION	MI	XS(I)
ELEVATION (MSL) OF FLOODING AT CROSS-SECTION	FT	FSTG(I)
ELEV CORRESPONDING TO EACH TOP WIDTH	FT	HS(K,I)
TOP WIDTH CORRESPONDING TO EACH ELEV (ACTIVE FLOW PORTION)	FT	BS(K,I)
TOP WIDTH CORRESPONDING TO EACH ELEV (OFF-CHANNEL PORTION)	FT	BSS(K,I)
SURFACE AREA CORRESPONDING TO EACH ELEV (ACTIVE FLOW PORTION)	ACRES	DSA(K,I)
SURFACE AREA CORRESPONDING TO EACH ELEV (OFF-CHANNEL PORTION)	ACRES	SSA(K,I)
NUMBER OF CROSS-SECTION		I
NUMBER OF ELEVATION LEVEL		K

CROSS-SECTION NUMBER 1
****

XS(I) = .050 FSTG(I) = 0.00 XSL(I) = 0.0 XSR(I) = 0.0

XS(I) = .250 FSTG(I) = 0.00 XSL(I) = 0.0 XSR(I) = 0.0

HS ...	233.0	237.0	242.0	247.0	251.0	256.0	260.0	265.0
BS ...	55.0	349.0	444.0	495.0	694.0	970.0	1041.0	1200.0
BSS ...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

CROSS-SECTION NUMBER 2
****

XS(I) = .500 FSTG(I) = 0.00 XSL(I) = 0.0 XSR(I) = 0.0

HS ...	230.0	237.0	244.0	251.0	259.0	266.0	273.0	280.0
BS ...	50.0	500.0	1000.0	1200.0	1500.0	2000.0	2200.0	2700.0
BSS ...	0.0	243.0	248.0	412.0	528.0	392.0	556.0	420.0

CROSS-SECTION NUMBER 3
****

XS(I) = 1.000 FSTG(I) = 0.00 XSL(I) = 0.0 XSR(I) = 0.0

HS ...	228.0	235.0	243.0	250.0	258.0	265.0	273.0	280.0
BS ...	50.0	743.0	1500.0	2000.0	2500.0	3000.0	3500.0	4000.0
BSS ...	0.0	500.0	808.0	840.0	948.0	900.0	880.0	880.0

CROSS-SECTION NUMBER 4
****

XS(I) = 2.000 FSTG(I) = 0.00 XSL(I) = 0.0 XSR(I) = 0.0

HS ...	224.0	232.0	240.0	248.0	256.0	264.0	272.0	280.0
BS ...	50.0	400.0	1500.0	2000.0	2500.0	3000.0	3500.0	4000.0
BSS ...	0.0	1125.0	1500.0	1489.0	1479.0	1419.0	1309.0	1200.0

CROSS-SECTION NUMBER 5
****

XS(I) = 3.250 FSTG(I) = 0.00 XSL(I) = 0.0 XSR(I) = 0.0

HS ...	214.0	220.0	225.0	230.0	236.0	241.0	247.0	252.0
BS ...	40.0	150.0	689.0	850.0	1288.0	1525.0	1892.0	2050.0
BSS ...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

CROSS-SECTION NUMBER 6
****

XS(I) = 4.000 FSTG(I) = 0.00 XSL(I) = 0.0 XSR(I) = 0.0

HS ...	203.0	211.0	219.0	227.0	236.0	244.0	252.0	260.0
BS ...	50.0	320.0	591.0	952.0	1373.0	1872.0	2496.0	3120.0
BSS ...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

CROSS-SECTION NUMBER 7
****

XS(I) = 5.000 FSTG(I) = 0.00 XSL(I) = 0.0 XSR(I) = 0.0

HS ...	182.0	190.0	199.0	207.0	215.0	223.0	232.0	240.0
BS ...	50.0	212.0	395.0	616.0	946.0	1153.0	1645.0	2083.0
BSS ...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

CROSS-SECTION NUMBER 8
****

XS(I) = 6.750 FSTG(I) = 0.00 XSL(I) = 0.0 XSR(I) = 0.0

HS ...	111.0	116.0	122.0	127.0	133.0	139.0	145.0	150.0
BS ...	40.0	150.0	359.0	434.0	668.0	1201.0	1312.0	1500.0
BSS ...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

CROSS-SECTION NUMBER 9
****

XS(I) = 8.000 FSTG(I) = 0.00 XSL(I) = 0.0 XSR(I) = 0.0

HS ...	98.0	104.0	110.0	116.0	122.0	128.0	134.0	140.0
BS ...	50.0	334.0	520.0	706.0	867.0	978.0	1089.0	1200.0
BSS ...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

CROSS-SECTION NUMBER 10
****

XS(I) = 10.000 FSTG(I) = 0.00 XSL(I) = 0.0 XSR(I) = 0.0

HS ...	95.0	101.0	108.0	114.0	121.0	127.0	134.0	140.0
BS ...	50.0	474.0	852.0	1176.0	1625.0	1800.0	2200.0	3000.0
BSS ...	0.0	0.0	0.0	0.0	0.0	575.0	1050.0	1000.0

MANNING N ROUGHNESS COEFFICIENTS FOR THE GIVEN REACHES
(CM(K,I),K=1,NCS) WHERE I = REACH NUMBER
****

REACH 1 ...	.035	.045	.050	.060	.070	.080	.090	.100
REACH 2 ...	.035	.045	.050	.060	.070	.080	.090	.100
REACH 3 ...	.035	.045	.050	.060	.070	.080	.090	.100
REACH 4 ...	.035	.045	.050	.060	.070	.080	.090	.100
REACH 5 ...	.035	.045	.050	.060	.070	.080	.090	.100

REACH 6 ...	.035	.045	.050	.060	.070	.080	.090	.100
REACH 7 ...	.035	.045	.050	.060	.070	.080	.090	.100
REACH 8 ...	.035	.045	.050	.060	.070	.080	.090	.100
REACH 9 ...	.035	.045	.050	.060	.070	.080	.090	.100

1

CROSS-SECTIONAL VARIABLES FOR NORTH RIVER
BELOW DROWNS DAM

PARAMETER	UNITS	VARIABLE
MINIMUM COMPUTATIONAL DISTANCE USED BETWEEN CROSS-SECTIONS	MI	DXM(I)
CONTRACTION - EXPANSION COEFFICIENTS BETWEEN CROSS-SECTIONS		FKC(I)

REACH NUMBER	DXM(I)	FKC(I)
1	.150	0.000
2	.150	0.000
3	.150	0.000
4	.150	0.000
5	.200	0.000
6	.200	0.000
7	.300	0.000
8	.100	0.000
9	.050	0.000

DOWNSTREAM FLOW PARAMETERS FOR NORTH RIVER
BELOW DROWNS DAM

PARAMETER	UNITS	VARIABLE	VALUE
MAX DISCHARGE AT DOWNSTREAM EXTREMITY	CFS	QMAXD	0.0
MAX LATERAL OUTFLOW PRODUCING LOSSES	CFS/FT	QLL	0.000
INITIAL SIZE OF TIME STEP	HR	DTHM	0.0000
INITIAL WATER SURFACE ELEVATION DOWNSTREAM	FT	YDN	0.00
SLOPE OF CHANNEL DOWNSTREAM OF DAM	FT/MI	SOM	30.00
THETA WEIGHTING FACTOR		THETA	0.00
CONVERGENCE CRITERION FOR STAGE	FT	EPSY	0.000
TIME AT WHICH DAM STARTS TO FAIL	HR	TFI	0.00

TOTAL VOLUME IN RESERVOIR BEHIND
DROWNS DAM = 9562.3 ACRE-FEET

DEFINITION OF VARIABLES IN RESERVOIR DEPLETION TABLE

PARAMETER	UNITS	VARIABLE
TIME STEP FROM START OF ANALYSIS		I
ITERATIONS NECESSARY TO SOLVE FLOW EQUATIONS		K
ELAPSED TIME FROM START OF ANALYSIS	HRS	TTP(I)
TOTAL OUTFLOW FROM DAM	CFS	Q(I)
ELEVATION OF WATER SURFACE AT DAM	FT	H2
ELEVATION OF BOTTOM OF BREACH	FT	YB
EST DEPTH OF FLOW IMMEDIATELY DOWNSTREAM	FT	D
SUBMERGENCE COEFFICIENT		SUB
VELOCITY CORRECTION		VCOR
TOTAL VOLUME DISCHARGED FROM TIME OF BREACH	AC-FT	OUTVOL

RECTANGULAR BREACH DISCHARGE COEFFICIENT COFR

INFLOW TO RESERVOIR CFS QI(I)

BREACH OUTFLOW CFS QBRECH

SPILLWAY OUTFLOW CFS QSPIL

RESERVOIR DEPLETION TABLE

I	K	TTP(I)	Q(I)	H2	YB	D	SUB	VCOR	OUTVOL	BB	COFR	QI(I)	QBRECH	QSPIL
***	**	******	********	*******	*******	*******	****	****	*********	****	****	*****	******	*****
1	0	0.000	1296	253.80	253.80	235.48	1.00	1.00	0.0	0.0	3.10	1300.	0.	1296.
2	1	.020	1296	253.80	253.52	235.48	1.00	1.01	2.1	1.2	3.10	1300.	1.	1296.
3	1	.040	1299	253.80	253.25	235.48	1.00	1.00	4.3	2.4	3.10	1300.	3.	1296.
4	1	.060	1305	253.80	252.97	235.49	1.00	1.00	6.4	3.6	3.10	1300.	9.	1296.
5	1	.080	1315	253.80	252.70	235.50	1.00	1.00	8.6	4.8	3.10	1300.	19.	1296.
6	1	.100	1329	253.80	252.42	235.51	1.00	1.00	10.8	6.0	3.10	1300.	33.	1296.
7	1	.120	1348	253.80	252.14	235.53	1.00	1.00	13.0	7.2	3.10	1300.	52.	1296.
8	1	.140	1372	253.80	251.87	235.55	1.00	1.00	15.3	8.4	3.10	1300.	76.	1296.
9	1	.160	1402	253.80	251.59	235.58	1.00	1.00	17.5	9.6	3.10	1300.	107.	1296.
10	1	.180	1439	253.80	251.32	235.61	1.00	1.00	19.9	10.8	3.10	1300.	143.	1296.
11	1	.200	1482	253.80	251.04	235.65	1.00	1.00	22.3	12.0	3.10	1300.	186.	1296.
12	1	.220	1531	253.80	250.76	235.69	1.00	1.00	24.8	13.2	3.10	1300.	236.	1296.
13	1	.240	1589	253.80	250.49	235.74	1.00	1.00	27.4	14.4	3.10	1300.	294.	1296.
14	1	.260	1653	253.80	250.21	235.79	1.00	1.00	30.1	15.6	3.10	1300.	358.	1295.
15	1	.280	1726	253.80	249.94	235.85	1.00	1.00	32.9	16.8	3.10	1300.	431.	1295.
16	1	.300	1806	253.80	249.66	235.91	1.00	1.00	35.8	18.0	3.10	1300.	512.	1295.
17	1	.320	1896	253.80	249.38	235.98	1.00	1.00	38.8	19.2	3.10	1300.	602.	1294.
18	1	.340	1993	253.79	249.11	236.05	1.00	1.00	42.1	20.4	3.10	1300.	700.	1294.
19	1	.360	2100	253.79	248.83	236.13	1.00	1.00	45.4	21.6	3.10	1300.	808.	1293.
20	1	.380	2216	253.79	248.56	236.21	1.00	1.00	49.0	22.8	3.10	1300.	924.	1292.
21	1	.400	2341	253.79	248.28	236.29	1.00	1.00	52.8	24.0	3.10	1300.	1051.	1291.
22	1	.420	2476	253.79	248.00	236.38	1.00	1.00	56.8	25.2	3.10	1300.	1187.	1290.
23	1	.440	2621	253.79	247.73	236.48	1.00	1.00	61.0	26.4	3.10	1300.	1332.	1289.
24	1	.460	2776	253.78	247.45	236.57	1.00	1.00	65.4	27.6	3.10	1300.	1488.	1288.
25	1	.480	2941	253.78	247.18	236.67	1.00	1.00	70.2	28.8	3.10	1300.	1655.	1287.
26	1	.500	3117	253.78	246.90	236.77	1.00	1.00	75.2	30.0	3.10	1300.	1832.	1286.
27	1	.520	3304	253.78	246.62	236.88	1.00	1.00	80.5	31.2	3.10	1300.	2020.	1284.
28	1	.540	3501	253.77	246.35	236.98	1.00	1.00	86.1	32.4	3.10	1300.	2219.	1282.
29	1	.560	3709	253.77	246.07	237.08	1.00	1.00	92.1	33.6	3.10	1300.	2429.	1280.
30	1	.580	3928	253.76	245.80	237.17	1.00	1.00	98.4	34.8	3.10	1300.	2651.	1278.
31	1	.600	4159	253.76	245.52	237.26	1.00	1.00	105.0	36.0	3.10	1300.	2884.	1276.
32	1	.620	4401	253.76	245.24	237.36	1.00	1.00	112.1	37.2	3.10	1300.	3128.	1274.
33	1	.640	4655	253.75	244.97	237.46	1.00	1.00	119.6	38.4	3.10	1300.	3385.	1271.
34	1	.660	4921	253.74	244.69	237.56	1.00	1.00	127.5	39.6	3.10	1300.	3654.	1268.
35	1	.680	5199	253.74	244.42	237.66	1.00	1.00	135.9	40.8	3.10	1300.	3935.	1265.
36	1	.700	5489	253.73	244.14	237.77	1.00	1.00	144.7	42.0	3.10	1300.	4228.	1262.
37	1	.720	5791	253.72	243.86	237.87	1.00	1.00	154.0	43.2	3.10	1300.	4534.	1258.
38	1	.740	6106	253.72	243.59	237.98	1.00	1.00	163.9	44.4	3.10	1300.	4852.	1254.
39	1	.760	6433	253.71	243.31	238.09	1.00	1.00	174.2	45.6	3.10	1300.	5183.	1250.
40	1	.780	6773	253.70	243.04	238.21	1.00	1.00	185.2	46.8	3.10	1300.	5528.	1246.
41	1	.800	7126	253.69	242.76	238.33	1.00	1.00	196.6	48.0	3.10	1300.	5885.	1241.
42	1	.820	7491	253.68	242.48	238.44	1.00	1.00	208.7	49.2	3.10	1300.	6254.	[illegible]

41	1	.800	7126	253.69	242.76	238.33	1.00	1.00	196.6	48.0	3.10	1300.	5885.	1241.
42	1	.820	7491	253.68	242.48	238.44	1.00	1.00	208.7	49.2	3.10	1300.	6256.	1236.
43	1	.840	7870	253.67	242.21	238.56	1.00	1.01	221.4	50.4	3.10	1300.	6639.	1231.
44	1	.860	8262	253.66	241.93	238.68	1.00	1.01	234.8	51.6	3.10	1300.	7037.	1225.
45	1	.880	8667	253.65	241.66	238.81	1.00	1.01	248.7	52.8	3.10	1300.	7448.	1219.
46	1	.900	9085	253.64	241.38	238.93	1.00	1.01	263.4	54.0	3.10	1300.	7872.	1213.
47	1	.920	9517	253.62	241.10	239.06	1.00	1.01	278.8	55.2	3.10	1300.	8311.	1207.
48	1	.940	9963	253.61	240.83	239.19	1.00	1.01	294.9	56.4	3.10	1300.	8763.	1200.
49	1	.960	10422	253.59	240.55	239.32	1.00	1.01	311.7	57.6	3.10	1300.	9230.	1193.
50	1	.980	10896	253.58	240.28	239.45	1.00	1.01	329.4	58.8	3.10	1300.	9711.	1185.

RESERVOIR DEPLETION TABLE

I	K	TTP(I)	Q(I)	H2	YB	D	SUB	VCOR	OUTVOL	BB	COFR	QI(I)	QBRECH	QSPIL
***	**	******	********	*******	*******	*******	****	****	********	****	****	*****	******	*****
51	1	1.000	11383	253.56	240.00	239.59	1.00	1.01	347.8	60.0	3.10	1300.	10206.	1177.
52	1	1.020	11361	253.55	240.00	239.58	1.00	1.01	366.6	60.0	3.10	1300.	10193.	1169.
53	1	1.040	11334	253.53	240.00	239.57	1.00	1.01	385.3	60.0	3.10	1300.	10173.	1161.
54	1	1.060	11306	253.51	240.00	239.57	1.00	1.01	404.0	60.0	3.10	1300.	10154.	1153.
55	1	1.080	11279	253.50	240.00	239.56	1.00	1.01	422.7	60.0	3.10	1300.	10134.	1145.
56	1	1.100	11251	253.48	240.00	239.55	1.00	1.01	441.3	60.0	3.10	1300.	10115.	1137.
57	1	1.120	11224	253.46	240.00	239.54	1.00	1.01	459.9	60.0	3.10	1300.	10096.	1129.
58	1	1.140	11197	253.45	240.00	239.54	1.00	1.01	478.4	60.0	3.10	1300.	10076.	1121.
59	1	1.160	11169	253.43	240.00	239.53	1.00	1.01	496.9	60.0	3.10	1300.	10057.	1113.
60	1	1.180	11142	253.42	240.00	239.52	1.00	1.01	515.4	60.0	3.10	1300.	10038.	1105.
61	1	1.200	11115	253.40	240.00	239.51	1.00	1.01	533.8	60.0	3.10	1300.	10019.	1097.
62	1	1.220	11089	253.38	240.00	239.51	1.00	1.01	552.1	60.0	3.10	1300.	10000.	1089.
63	1	1.240	11062	253.37	240.00	239.50	1.00	1.01	570.4	60.0	3.10	1300.	9981.	1082.
64	1	1.260	11035	253.35	240.00	239.49	1.00	1.01	588.7	60.0	3.10	1300.	9962.	1074.
65	1	1.280	11009	253.34	240.00	239.48	1.00	1.01	606.9	60.0	3.10	1300.	9943.	1066.
66	1	1.300	10982	253.32	240.00	239.48	1.00	1.01	625.1	60.0	3.10	1300.	9924.	1059.
67	1	1.320	10956	253.30	240.00	239.47	1.00	1.01	643.2	60.0	3.10	1300.	9905.	1051.
68	1	1.340	10929	253.29	240.00	239.46	1.00	1.01	661.3	60.0	3.10	1300.	9887.	1043.
69	1	1.360	10903	253.27	240.00	239.45	1.00	1.01	679.3	60.0	3.10	1300.	9868.	1036.
70	1	1.380	10877	253.26	240.00	239.45	1.00	1.01	697.3	60.0	3.10	1300.	9849.	1028.
71	1	1.400	10851	253.24	240.00	239.44	1.00	1.01	715.3	60.0	3.10	1300.	9831.	1021.
72	1	1.420	10825	253.22	240.00	239.43	1.00	1.01	733.2	60.0	3.10	1300.	9812.	1013.
73	1	1.440	10799	253.21	240.00	239.43	1.00	1.01	751.1	60.0	3.10	1300.	9794.	1006.
74	1	1.460	10774	253.19	240.00	239.42	1.00	1.01	768.9	60.0	3.10	1300.	9775.	999.
75	1	1.480	10748	253.18	240.00	239.41	1.00	1.01	786.7	60.0	3.10	1300.	9757.	991.
76	1	1.500	10722	253.16	240.00	239.40	1.00	1.01	804.4	60.0	3.10	1300.	9739.	984.
77	1	1.520	10697	253.15	240.00	239.40	1.00	1.01	822.1	60.0	3.10	1300.	9721.	977.
78	1	1.540	10671	253.13	240.00	239.39	1.00	1.01	839.8	60.0	3.10	1300.	9702.	970.
79	1	1.560	10646	253.12	240.00	239.38	1.00	1.01	857.4	60.0	3.10	1300.	9684.	962.
80	1	1.580	10621	253.10	240.00	239.38	1.00	1.01	875.0	60.0	3.10	1300.	9666.	955.
81	1	1.600	10596	253.08	240.00	239.37	1.00	1.01	892.5	60.0	3.10	1300.	9648.	948.
82	1	1.620	10571	253.07	240.00	239.36	1.00	1.01	910.0	60.0	3.10	1300.	9630.	941.
83	1	1.640	10546	253.05	240.00	239.35	1.00	1.01	927.5	60.0	3.10	1300.	9612.	934.
84	1	1.660	10521	253.04	240.00	239.35	1.00	1.01	944.9	60.0	3.10	1300.	9594.	927.
85	1	1.680	10496	253.02	240.00	239.34	1.00	1.01	962.3	60.0	3.10	1300.	9577.	920.
86	1	1.700	10471	253.01	240.00	239.33	1.00	1.01	979.6	60.0	3.10	1300.	9559.	913.
87	1	1.720	10447	252.99	240.00	239.33	1.00	1.01	996.9	60.0	3.10	1300.	9541.	906.
88	1	1.740	10422	252.98	240.00	239.32	1.00	1.01	1014.1	60.0	3.10	1300.	9524.	899.
89	1	1.760	10398	252.96	240.00	239.31	1.00	1.01	1031.3	60.0	3.10	1300.	9506.	892.
90	1	1.780	10373	252.95	240.00	239.31	1.00	1.01	1048.5	60.0	3.10	1300.	9488.	886.
91	1	1.800	10349	252.93	240.00	239.30	1.00	1.01	1065.6	60.0	3.10	1300.	947[illegible]	879.

92	1	1.820	10325	252.92	240.00	239.29	1.00	1.01	1082.7	60.0	3.10	1300.	9454.	872.
93	1	1.840	10301	252.90	240.00	239.29	1.00	1.01	1099.8	60.0	3.10	1300.	9436.	865.
94	1	1.860	10277	252.89	240.00	239.28	1.00	1.01	1116.8	60.0	3.10	1300.	9419.	859.
95	1	1.880	10253	252.87	240.00	239.27	1.00	1.01	1133.7	60.0	3.10	1300.	9402.	852.
96	1	1.900	10229	252.86	240.00	239.27	1.00	1.01	1150.7	60.0	3.10	1300.	9384.	845.
97	1	1.920	10205	252.84	240.00	239.26	1.00	1.01	1167.6	60.0	3.10	1300.	9367.	839.
98	1	1.940	10182	252.83	240.00	239.25	1.00	1.01	1184.4	60.0	3.10	1300.	9350.	832.
99	1	1.960	10158	252.81	240.00	239.25	1.00	1.01	1201.2	60.0	3.10	1300.	9333.	826.
100	1	1.980	10134	252.80	240.00	239.24	1.00	1.01	1218.0	60.0	3.10	1300.	9316.	819.

RESERVOIR DEPLETION TABLE

I	K	TTP(I)	Q(I)	H2	YB	D	SUB	VCOR	OUTVOL	BB	COFR	QI(I)	QBRECH	QSPIL
***	**	******	********	*******	*******	*******	****	****	*********	****	****	*****	******	*****
101	1	2.000	10111	252.78	240.00	239.23	1.00	1.01	1234.7	60.0	3.10	1300.	9299.	813.
102	1	2.020	10088	252.77	240.00	239.23	1.00	1.01	1251.4	60.0	3.10	1300.	9282.	806.
103	1	2.042	10062	252.75	240.00	239.22	1.00	1.01	1269.7	60.0	3.10	1300.	9263.	799.
104	1	2.066	10034	252.73	240.00	239.21	1.00	1.01	1289.8	60.0	3.10	1300.	9243.	791.
105	1	2.093	10003	252.72	240.00	239.20	1.00	1.01	1311.9	60.0	3.10	1300.	9221.	783.
106	1	2.122	9970	252.69	240.00	239.19	1.00	1.01	1336.0	60.0	3.10	1300.	9196.	774.
107	1	2.154	9933	252.67	240.00	239.18	1.00	1.01	1362.5	60.0	3.10	1300.	9170.	764.
108	1	2.190	9892	252.64	240.00	239.17	1.00	1.01	1391.6	60.0	3.10	1300.	9140.	753.
109	1	2.229	9848	252.62	240.00	239.16	1.00	1.01	1423.3	60.0	3.10	1300.	9108.	741.
110	1	2.272	9800	252.59	240.00	239.14	1.00	1.01	1458.2	60.0	3.10	1300.	9073.	728.
111	1	2.319	9748	252.55	240.00	239.13	1.00	1.01	1496.3	60.0	3.10	1300.	9035.	714.
112	1	2.371	9691	252.52	240.00	239.11	1.00	1.01	1537.9	60.0	3.10	1300.	8993.	698.
113	1	2.428	9628	252.48	240.00	239.09	1.00	1.01	1583.5	60.0	3.10	1300.	8947.	681.
114	1	2.490	9561	252.43	240.00	239.08	1.00	1.01	1633.3	60.0	3.10	1300.	8898.	663.
115	1	2.559	9487	252.38	240.00	239.05	1.00	1.01	1687.6	60.0	3.10	1300.	8843.	644.
116	1	2.635	9407	252.33	240.00	239.03	1.00	1.01	1746.9	60.0	3.10	1300.	8784.	623.
117	1	2.719	9320	252.27	240.00	239.00	1.00	1.01	1811.6	60.0	3.10	1300.	8720.	600.
118	1	2.811	9225	252.21	240.00	238.98	1.00	1.01	1882.0	60.0	3.10	1300.	8650.	575.
119	1	2.912	9123	252.14	240.00	238.95	1.00	1.01	1958.6	60.0	3.10	1300.	8575.	549.
120	1	3.023	9013	252.07	240.00	238.91	1.00	1.01	2042.0	60.0	3.10	1300.	8493.	521.
121	1	3.145	8894	251.99	240.00	238.88	1.00	1.01	2132.5	60.0	3.10	1300.	8404.	491.
122	1	3.280	8767	251.90	240.00	238.84	1.00	1.01	2230.7	60.0	3.10	1300.	8308.	459.
123	1	3.428	8629	251.81	240.00	238.80	1.00	1.01	2337.1	60.0	3.10	1300.	8205.	425.
124	1	3.591	8483	251.71	240.00	238.76	1.00	1.01	2452.2	60.0	3.10	1300.	8093.	390.
125	1	3.770	8326	251.60	240.00	238.71	1.00	1.01	2576.6	60.0	3.10	1300.	7974.	353.
126	1	3.967	8159	251.48	240.00	238.66	1.00	1.01	2710.8	60.0	3.10	1300.	7845.	314.
127	1	4.184	7981	251.35	240.00	238.60	1.00	1.01	2855.3	60.0	3.10	1300.	7708.	274.
128	1	4.422	7794	251.21	240.00	238.54	1.00	1.01	3010.7	60.0	3.10	1300.	7562.	233.
129	2	4.684	7597	251.06	240.00	238.48	1.00	1.01	3177.5	60.0	3.10	1300.	7406.	192.
130	2	4.973	7390	250.90	240.00	238.41	1.00	1.01	3356.1	60.0	3.10	1300.	7240.	150.
131	2	5.290	7175	250.74	240.00	238.34	1.00	1.01	3547.1	60.0	3.10	1300.	7065.	110.
132	2	5.639	6952	250.55	240.00	238.27	1.00	1.01	3750.8	60.0	3.10	1300.	6880.	72.
133	2	6.023	6724	250.36	240.00	238.19	1.00	1.01	3967.8	60.0	3.10	1300.	6686.	38.
134	2	6.445	6493	250.16	240.00	238.11	1.00	1.01	4198.4	60.0	3.10	1300.	6482.	11.
135	2	6.910	6268	249.94	240.00	238.04	1.00	1.01	4443.4	60.0	3.10	1300.	6269.	0.
136	2	7.420	6044	249.71	240.00	237.96	1.00	1.01	4703.4	60.0	3.10	1300.	6045.	0.
137	2	7.983	5810	249.47	240.00	237.88	1.00	1.01	4978.7	60.0	3.10	1300.	5811.	0.
138	2	8.601	5566	249.21	240.00	237.79	1.00	1.01	5269.4	60.0	3.10	1300.	5566.	0.
139	2	9.281	5313	248.94	240.00	237.70	1.00	1.01	5575.1	60.0	3.10	1300.	5313.	0.
140	2	10.029	5052	248.65	240.00	237.60	1.00	1.01	5895.5	60.0	3.10	1300.	5052.	0.

PARAMETER	UNITS	VARIABLE	VALUE
INITIAL FLOW	CFS	Q(1)	1296.
MAX FLOW	CFS	QM	11383.
FINAL FLOW	CFS	Q(NU)	5052.
TIME TO MAX FLOW	HRS	TP	1.00
NUMBER OF TIME STEPS		NNU	140
TOTAL VOLUME DISCHARGED FROM RESERVOIR	AC-FT	DISVOL	5896.
NUMBER OF INTERMEDIATE STATIONS		NN(NS)	86
NUMBER OF TIME STEPS		NNU	140

TIME PARAMETERS OF OUTFLOW HYDROGRAPH IMMEDIATELY DOWNSTREAM OF DAM

PARAMETER	UNITS	VARIABLE	VALUE
TIME TO FAILURE	HR	TFH	1.000
TIME TO START OF RISING LIMB OF HYDROGRAPH	HR	TFO	0.000
TIME TO PEAK	HR	TP	1.000
TIME STEP SIZE	HR	DTHI	.050

ROUTING COMPLETED.

KTIME=142 ALLOWABLE KTIME= 698 TT= 10.0

1

PROFILE OF CRESTS AND TIMES FOR NORTH RIVER
BELOW DROWNS DAM

RVR MILE FROM DAM	MAX ELEV (FT)	MAX FLOW (CFS)	TIME MAX ELEV(HR)	MAX VEL (FT/SEC)	MAX VEL (MI/HR)	FLOOD ELEV (FT)	TIME FLOOD ELEV (HR)
.050	242.16	11383	1.400	4.26	2.90	0.00	0.00
.200	241.14	11016	1.550	3.66	2.50	0.00	0.00
.350	240.14	10783	1.700	3.48	2.37	0.00	0.00
.500	239.14	10603	2.000	3.47	2.37	0.00	0.00
.667	238.20	10383	2.650	3.22	2.20	0.00	0.00
.833	237.52	10093	3.200	2.90	1.98	0.00	0.00
1.000	237.07	9733	3.600	2.42	1.65	0.00	0.00
1.167	236.67	9358	3.850	2.40	1.64	0.00	0.00
1.333	236.26	9006	4.100	2.39	1.63	0.00	0.00
1.500	235.81	8711	4.300	2.40	1.64	0.00	0.00
1.667	235.28	8429	4.500	2.46	1.68	0.00	0.00
1.833	234.63	8235	4.700	2.60	1.77	0.00	0.00
2.000	233.68	8123	4.900	3.08	2.10	0.00	0.00
2.156	232.63	8055	5.100	2.99	2.04	0.00	0.00
2.313	231.57	8008	5.250	2.92	1.99	0.00	0.00
2.469	230.51	7976	5.400	2.87	1.96	0.00	0.00
2.625	229.45	7953	5.550	2.83	1.93	0.00	0.00
2.781	228.36	7939	5.600	2.81	1.92	0.00	0.00
2.938	227.23	7930	5.752	2.85	1.94	0.00	0.00
3.094	225.95	7925	5.752	3.02	2.06	0.00	0.00
3.250	224.07	7923	5.752	3.82	2.61	0.00	0.00
3.500	219.80	7920	5.905	4.65	3.17	0.00	0.00
3.750	215.44	7919	5.905	5.05	3.44	0.00	0.00
4.000	210.81	7917	6.057	5.58	3.80	0.00	0.00
4.200	206.81	7917	6.057	5.66	3.86	0.00	0.00
4.400	202.84	7916	6.057	5.76	3.93	0.00	0.00
4.600	198.86	7914	6.210	5.90	4.02	0.00	0.00
4.800	195.38	7914	6.210	5.55	3.78	0.00	0.00
5.000	188.87	7914	6.057	9.63	6.56	0.00	0.00
5.350	176.41	7913	6.362	6.74	4.60	0.00	0.00
5.700	160.01	7913	6.210	10.98	7.49	0.00	0.00
6.050	148.85	7912	6.515	5.69	3.88	0.00	0.00
6.400	130.54	7911	6.210	14.94	10.18	0.00	0.00
6.750	121.26	7910	6.515	4.33	3.09	0.00	0.00
6.854	119.91	7910	6.515	4.52	3.08	0.00	0.00
6.958	118.57	7909	6.515	4.50	3.07	0.00	0.00
7.062	117.25	7907	6.667	4.48	3.05	0.00	0.00
7.167	115.96	7905	6.667	4.45	3.03	0.00	0.00
7.271	114.70	7903	6.667	4.39	2.99	0.00	0.00
7.375	113.49	7901	6.820	4.31	2.94	0.00	0.00
7.479	112.37	7897	6.972	4.17	2.84	0.00	0.00
7.583	111.38	7889	7.125	3.95	2.69	0.00	0.00
7.687	110.59	7879	7.277	3.60	2.46	0.00	0.00
7.792	109.99	7866	7.430	3.20	2.18	0.00	0.00
7.896	109.59	7848	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

7.792	109.99	7866	7.430	3.20	2.18	0.00	0.00
7.896	109.58	7848	7.582	2.77	1.89	0.00	0.00
8.000	109.30	7830	7.582	2.36	1.61	0.00	0.00
8.050	109.18	7821	7.735	2.34	1.60	0.00	0.00
8.100	109.06	7811	7.735	2.33	1.59	0.00	0.00

PROFILE OF CRESTS AND TIMES FOR NORTH RIVER
BELOW DROWNS DAM

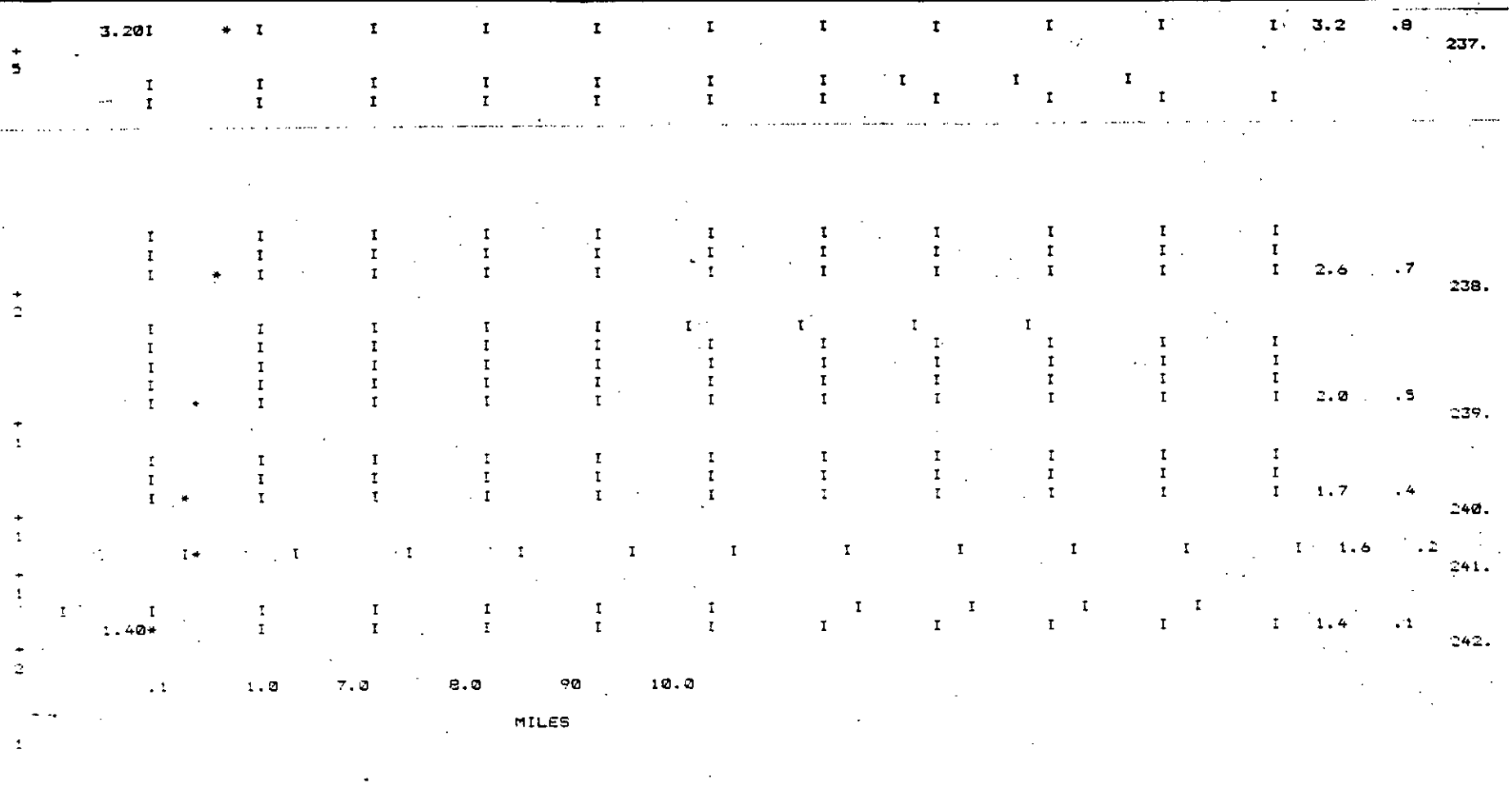
RVR MILE FROM DAM	MAX ELEV (FT)	MAX FLOW (CFS)	TIME MAX ELEV(HR)	MAX VEL (FT/SEC)	MAX VEL (MI/HR)	FLOOD ELEV (FT)	TIME FLOOD ELEV (HR)
8.150	108.95	7801	7.735	2.31	1.57	0.00	0.00
8.200	108.63	7793	7.735	2.30	1.57	0.00	0.00
8.250	108.71	7784	7.735	2.29	1.56	0.00	0.00
8.300	108.59	7775	7.735	2.28	1.55	0.00	0.00
8.350	108.47	7766	7.887	2.27	1.55	0.00	0.00
8.400	108.36	7757	7.887	2.25	1.53	0.00	0.00
8.450	108.24	7749	7.887	2.24	1.53	0.00	0.00
8.500	108.12	7741	7.887	2.23	1.52	0.00	0.00
8.550	108.01	7732	7.887	2.23	1.52	0.00	0.00
8.600	107.89	7724	7.887	2.21	1.50	0.00	0.00
8.650	107.77	7717	8.040	2.20	1.50	0.00	0.00
8.700	107.66	7709	8.040	2.19	1.49	0.00	0.00
8.750	107.54	7701	8.040	2.18	1.49	0.00	0.00
8.800	107.43	7693	8.040	2.17	1.48	0.00	0.00
8.850	107.31	7687	8.040	2.16	1.47	0.00	0.00
8.900	107.20	7680	8.040	2.16	1.47	0.00	0.00
8.950	107.09	7673	8.040	2.15	1.47	0.00	0.00
9.000	106.97	7666	8.196	2.14	1.46	0.00	0.00
9.050	106.86	7660	8.196	2.13	1.45	0.00	0.00
9.100	106.74	7653	8.196	2.13	1.45	0.00	0.00
9.150	106.63	7648	8.196	2.12	1.45	0.00	0.00
9.200	106.52	7642	8.196	2.12	1.44	0.00	0.00
9.250	106.40	7637	8.196	2.10	1.43	0.00	0.00
9.300	106.29	7632	8.196	2.10	1.43	0.00	0.00
9.350	106.17	7627	8.353	2.10	1.43	0.00	0.00
9.400	106.06	7622	8.353	2.09	1.43	0.00	0.00
9.450	105.94	7617	8.353	2.08	1.42	0.00	0.00
9.500	105.83	7613	8.353	2.08	1.42	0.00	0.00
9.550	105.71	7609	8.353	2.08	1.42	0.00	0.00
9.600	105.60	7605	8.353	2.08	1.42	0.00	0.00
9.650	105.48	7601	8.353	2.07	1.41	0.00	0.00
9.700	105.37	7597	8.353	2.07	1.41	0.00	0.00
9.750	105.25	7595	8.353	2.07	1.41	0.00	0.00
9.800	105.13	7592	8.353	2.07	1.41	0.00	0.00
9.850	105.01	7589	8.353	2.07	1.41	0.00	0.00
9.900	104.90	7586	8.512	2.07	1.41	0.00	0.00
9.950	104.78	7583	8.512	2.07	1.41	0.00	0.00
10.000	104.66	7582	8.512	2.07	1.41	0.00	0.00

PEAK ELEVATION PROFILE

MILES

ELEV
FEET.. MILE ...

.1 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0



DISCHARGE HYDROGRAPH FOR NORTH RIVER ... STATION NUMBER 1
BELOW DROWNS DAM AT MILE .05

GAGE ZERO = 233.00 MAX ELEVATION REACHED BY FLOOD WAVE = 242.16
FLOOD STAGE NOT AVAILABLE
MAX STAGE = 9.16 AT TIME = 1.400 HOURS
MAX FLOW = 11383. AT TIME = 1.000 HOURS

HR	STAGE	FLOW	0	5000	10000	15000	20000	25000
3.6	1296	*	I	I	I	I	I	I
.2	3.7	1482	I *	I	I	I	I	I
.4	4.4	2342	I *	I	I	I	I	I
.6	5.6	4160	I *	I	I	I	I	I
.8	7.0	7126	I	I *	I	I	I	I
1.0	8.7	11383	I	I	I *	I	I	I
1.2	9.1	11116	I	I	I *	I	I	I
1.4	9.2	10852	I	I	I *	I	I	I
1.6	9.1	10596	I	I	I*	I	I	I
1.8	9.1	10350	I	I	I*	I	I	I
2.0	9.0	10111	I	I	*	I	I	I
2.2	8.9	9881	I	I	*	I	I	I
2.4	8.9	9659	I	I	*I	I	I	I
2.6	8.8	9444	I	I	*I	I	I	I
2.8	8.7	9237	I	I	* I	I	I	I
3.0	8.6	9037	I	I	* I	I	I	I

2.8	8.7	9237	I	I	*	I	I	I	I	I
3.0	8.6	9037	I	I	*	I	I	I	I	I
3.2	8.6	8843	I	I	*	I	I	I	I	I
3.4	8.5	8656	I	I	*	I	I	I	I	I
3.6	8.4	8475	I	I	*	I	I	I	I	I
3.8	8.3	8301	I	I	*	I	I	I	I	I
4.0	8.3	8132	I	I	*	I	I	I	I	I
4.2	8.2	7969	I	I	*	I	I	I	I	I
4.4	8.1	7812	I	I	*	I	I	I	I	I
4.6	8.1	7661	I	I	*	I	I	I	I	I
4.8	8.0	7514	I	I	*	I	I	I	I	I
5.0	7.9	7372	I	I	*	I	I	I	I	I
5.2	7.9	7236	I	I	*	I	I	I	I	I
5.4	7.8	7105	I	I	*	I	I	I	I	I
5.6	7.7	6977	I	I	*	I	I	I	I	I
5.8	7.7	6857	I	I	*	I	I	I	I	I
6.0	7.6	6739	I	I	*	I	I	I	I	I
6.2	7.5	6627	I	I	*	I	I	I	I	I
6.4	7.5	6519	I	I	*	I	I	I	I	I
6.6	7.4	6418	I	I	*	I	I	I	I	I
6.8	7.4	6322	I	I	*	I	I	I	I	I
7.0	7.3	6229	I	I	*	I	I	I	I	I
7.2	7.3	6141	I	I	*	I	I	I	I	I
7.4	7.2	6054	I	I	*	I	I	I	I	I
7.6	7.2	5970	I	I	*	I	I	I	I	I
7.8	7.1	5887	I	I	*	I	I	I	I	I
8.0	7.1	5804	I	I	*	I	I	I	I	I
8.2	7.1	5725	I	I*		I	I	I	I	I
8.4	7.0	5646	I	I*		I	I	I	I	I
8.6	7.0	5568	I	I*		I	I	I	I	I
8.8	6.9	5492	I	I*		I	I	I	I	I
9.0	6.9	5418	I	I*		I	I	I	I	I
9.2	6.8	5344	I	I*		I	I	I	I	I
9.4	6.8	5272	I	I*		I	I	I	I	I
9.6	6.7	5202	I	*		I	I	I	I	I
9.8	6.7	5132	I	*		I	I	I	I	I

DISCHARGE HYDROGRAPH FOR NORTH RIVER ... STATION NUMBER 4
BELOW DROWNS DAM AT MILE .50

GAGE ZERO = 230.00 MAX ELEVATION REACHED BY FLOOD WAVE = 239.14
FLOOD STAGE NOT AVAILABLE
MAX STAGE = 9.14 AT TIME = 2.000 HOURS
MAX FLOW = 10603 AT TIME = 1.450 HOURS

HR	STAGE	FLOW	0	5000	10000	15000	20000	25000
0.0	3.9	1296	I *	I	I	I	I	I
.2	3.9	1305	I *	I	I	I	I	I
.4	4.0	1501	I *	I	I	I	I	I
.6	4.6	2315	I *	I	I	I	I	I
.8	5.8	4276	I	*I	I	I	I	I
1.0	7.3	7738	I	I *	I	I	I	I
1.2	8.5	10206	I	I	*	I	I	I
1.4	8.9	10589	I	I	I*	I	I	I
1.6	9.1	10554	I	I	I*	I	I	I
1.8	9.1	10395	I	I	I*	I	I	I
2.0	9.1	10197	I	I	*	I	I	I
2.2	9.1	9987	I	I	*	I	I	I

2.4	9.1	9776	I
2.6	9.1	9568	I
2.8	9.1	9365	I
3.0	9.0	9168	I
3.2	9.0	8976	I
3.4	8.9	8791	I
3.6	8.9	8611	I
3.8	8.8	8436	I
4.0	8.8	8268	I
4.2	8.7	8105	I
4.4	8.7	7948	I
4.6	8.6	7795	I
4.8	8.6	7648	I
5.0	8.5	7505	I
5.2	8.5	7368	I
5.4	8.4	7234	I
5.6	8.3	7106	I
5.8	8.3	6982	I
6.0	8.2	6863	I
6.2	8.2	6747	I
6.4	8.1	6637	I
6.6	8.1	6532	I
6.8	8.0	6432	I
7.0	8.0	6336	I
7.2	7.9	6244	I
7.4	7.9	6156	I
7.6	7.8	6069	I
7.8	7.8	5985	I
8.0	7.7	5901	I
8.2	7.7	5820	I
8.4	7.6	5740	I
8.6	7.6	5661	I
8.8	7.5	5584	I
9.0	7.5	5508	I
9.2	7.4	5433	I
9.4	7.4	5360	I
9.6	7.3	5288	I
9.8	7.3	5218	I

DISCHARGE HYDROGRAPH FOR NORTH RIVER ... STATION NUMBER 7
BELOW DROWNS DAM AT MILE 1.00

GAGE ZERO = 228.00 MAX ELEVATION REACHED BY FLOOD WAVE = 237.07
FLOOD STAGE NOT AVAILABLE
MAX STAGE = 9.07 AT TIME = 3.600 HOURS
MAX FLOW = 9734 AT TIME = 2.000 HOURS

HR	STAGE	FLOW	0	2000	4000	6000	8000	10000
0.0	3.7	1296	I	I	I	I	I	I
.2	3.7	1296	I	I	I	I	I	I
.4	3.7	1304	I	I	I	I	I	I
.6	3.8	1417	I	I	I	I	I	I
.8	4.1	1929	I	I	I	I	I	I
1.0	4.9	3426	I	I	I	I	I	I
1.2	6.2	6304	I	I	I	I	I	I
1.4	7.2	8460	I	I	I	I	I	I
1.6	7.9	9358	I	I	I	I	I	I
1.8	8.3	9670	I	I	I	I	I	I

1.6	7.9	9358	
1.8	8.3	9670	
2.0	8.5	9734	
2.2	8.7	9686	
2.4	8.8	9581	
2.6	8.9	9452	
2.8	9.0	9308	
3.0	9.0	9162	
3.2	9.1	9009	
3.4	9.1	8854	
3.6	9.1	8700	
3.8	9.1	8549	
4.0	9.1	8401	
4.2	9.0	8256	
4.4	9.0	8115	
4.6	9.0	7976	
4.8	8.9	7840	
5.0	8.9	7708	
5.2	8.9	7577	
5.4	8.8	7450	
5.6	8.8	7326	
5.8	8.7	7205	
6.0	8.7	7087	
6.2	8.6	6972	
6.4	8.6	6861	
6.6	8.5	6754	
6.8	8.4	6650	
7.0	8.4	6551	
7.2	8.3	6455	
7.4	8.3	6363	
7.6	8.2	6273	
7.8	8.2	6186	
8.0	8.1	6101	
8.2	8.1	6016	
8.4	8.0	5934	
8.6	8.0	5853	
8.8	7.9	5774	
9.0	7.9	5696	
9.2	7.8	5619	
9.4	7.8	5544	
9.6	7.7	5470	
9.8	7.7	5397	

DISCHARGE HYDROGRAPH FOR NORTH RIVER ... STATION NUMBER 2:
BELOW DROWNS DAM AT MILE 3.25
GAGE ZERO = 214.00 MAX ELEVATION REACHED BY FLOOD WAVE = 224.07
FLOOD STAGE NOT AVAILABLE
MAX STAGE = 10.07 AT TIME = 5.752 HOURS
MAX FLOW = 7923 AT TIME = 5.752 HOURS

HR	STAGE	FLOW
.1	4.2	1296
.3	4.2	1296
.5	4.2	1296
.7	4.2	1296
.9	4.2	1296
1.1	4.2	1296
1.3	4.2	1296

1.5	4.2	1296	I * I
1.7	4.2	1297	I * I
1.9	4.2	1306	I * I
2.1	4.3	1346	I * I
2.3	4.5	1479	I * I
2.5	4.9	1790	I *I
2.7	5.5	2264	I I*
2.9	6.0	2639	I * I
3.1	6.7	3011	I * I
3.3	7.4	3637	I * I
3.5	8.0	4353	I * I
3.7	8.5	5048	I * I
3.9	8.9	5697	I * I
4.1	9.3	6260	I I*
4.3	9.5	6722	I * I
4.5	9.7	7087	I * I
4.7	9.8	7369	I * I
4.9	9.9	7578	I * I
5.1	10.0	7728	I *I
5.3	10.0	7829	I *I
5.5	10.1	7891	I *I
5.7	10.1	7918	I * I
5.9	10.1	7920	I * I
6.1	10.1	7903	I * I
6.3	10.1	7867	I *I
6.5	10.0	7819	I *I
6.7	10.0	7760	I *I
6.9	10.0	7693	I * I
7.1	9.9	7619	I * I
7.3	9.9	7541	I * I
7.5	9.9	7459	I * I
7.7	9.8	7374	I * I
7.9	9.8	7288	I * I
8.1	9.8	7200	I * I
8.3	9.7	7113	I * I
8.5	9.7	7026	I * I
8.7	9.6	6939	I * I
8.9	9.6	6853	I * I
9.1	9.6	6769	I * I
9.3	9.5	6685	I * I
9.5	9.5	6602	I * I
9.7	9.4	6521	I * I
9.9	9.4	6441	I * I

DISCHARGE HYDROGRAPH FOR NORTH RIVER ... STATION NUMBER 34
BELOW DROWNS DAM AT MILE 6.75

GAGE ZERO = 111.00 MAX ELEVATION REACHED BY FLOOD WAVE = 121.26
FLOOD STAGE NOT AVAILABLE
MAX STAGE = 10.26 AT TIME = 6.515 HOURS
MAX FLOW = 7911 AT TIME = 6.515 HOURS

HR	STAGE	FLOW	0 2000 4000 6000 8000 10000
.1	4.5	1296	I * I I I I I
.3	4.5	1297	I * I I I I I
.5	4.5	1297	I * I I I I I

1.0	4.5	1296	
1.1	4.5	1296	
1.3	4.5	1297	
1.5	4.5	1297	
1.7	4.5	1297	
1.9	4.5	1296	
2.1	4.5	1296	
2.3	4.5	1296	
2.5	4.5	1297	
2.7	4.5	1306	
2.9	4.6	1345	
3.1	4.8	1484	
3.3	5.2	1809	
3.5	5.8	2250	
3.7	6.3	2644	
3.9	6.8	3148	
4.1	7.4	3817	
4.3	8.0	4529	
4.5	8.5	5259	
4.7	9.0	5898	
4.9	9.3	6435	
5.1	9.6	6876	
5.3	9.8	7219	
5.5	10.0	7471	
5.7	10.1	7649	
5.9	10.2	7773	
6.1	10.2	7855	
6.3	10.3	7896	
6.5	10.3	7910	
6.7	10.3	7901	
6.9	10.2	7873	
7.1	10.2	7831	
7.3	10.2	7779	
7.5	10.2	7716	
7.7	10.1	7646	
7.9	10.1	7571	
8.1	10.0	7492	
8.3	10.0	7409	
8.5	10.0	7324	
8.7	9.9	7239	
8.9	9.9	7153	
9.1	9.8	7067	
9.3	9.8	6982	
9.5	9.7	6896	
9.7	9.7	6812	
9.9	9.6	6728	

DISCHARGE HYDROGRAPH FOR NORTH RIVER ... STATION NUMBER 86
BELOW GAGDAM AT MILE 10.00

GAGERO = 95.00 MAX ELEVATION REACHED BY FLOOD WAVE = 104.66
FLOOD STAGE NOT AVAILABLE
MAX STAGE = 9.66 AT TIME = 8.512 HOURS
MAX FLOW = 7582 AT TIME = 8.353 HOURS

HR STAGE FLOW 0 2000 4000 6000 8000 10000

```
 .3    5.0    1297  I     *   I          I          I          I          I
 .5    5.0    1297  I     *   I          I          I          I          I
 .7    5.0    1297  I     *   I          I          I          I          I
 .9    5.0    1297  I     *   I          I          I          I          I
1.1    5.0    1297  I     *   I          I          I          I          I

1.3    5.0    1297  I     *   I          I          I          I          I
1.5    5.0    1297  I     *   I          I          I          I          I
1.7    5.0    1297  I     *   I          I          I          I          I
1.9    5.0    1297  I     *   I          I          I          I          I
2.1    5.0    1297  I     *   I          I          I          I          I
2.3    5.0    1297  I     *   I          I          I          I          I
2.5    5.0    1297  I     *   I          I          I          I          I
2.7    5.0    1297  I     *   I          I          I          I          I
2.9    5.0    1297  I     *   I          I          I          I          I
3.1    5.0    1297  I     *   I          I          I          I          I
3.3    5.0    1297  I     *   I          I          I          I          I
3.5    5.0    1299  I     *   I          I          I          I          I
3.7    5.0    1306  I      *  I          I          I          I          I
3.9    5.0    1321  I      *  I          I  1       I          I          I
4.1    5.0    1355  I      *  I          I          I          I          I
4.3    5.1    1425  I      *  I          I          I          I          I
4.5    5.2    1546  I       * I          I          I          I          I
4.7    5.5    1741  I        *I          I          I          I          I
4.9    5.8    2043  I         *          I          I          I          I
5.1    6.2    2497  I         I *        I          I          I          I
5.3    6.6    3074  I         I    *     I          I          I          I
5.5    7.1    3700  I         I        *I          I          I          I
5.7    7.5    4319  I         I         I *        I          I          I
5.9    7.9    4891  I         I         I   *      I          I          I
6.1    8.3    5420  I         I         I      *   I          I          I
6.3    8.6    5878  I         I         I        *I          I          I
6.5    8.8    6272  I         I         I         I*         I          I
6.7    9.0    6605  I         I         I         I  *       I          I
6.9    9.2    6872  I         I         I         I   *      I          I
7.1    9.3    7087  I         I         I         I    *     I          I
7.3    9.4    7256  I         I         I         I     *    I          I
7.5    9.5    7382  I         I         I         I      *   I          I
7.7    9.6    7472  I         I         I         I      *   I          I
7.9    9.6    7533  I         I         I         I       *  I          I
8.1    9.6    7569  I         I         I         I       *  I          I
8.3    9.7    7581  I         I         I         I       *  I          I
8.5    9.7    7576  I         I         I         I       *  I          I
8.7    9.7    7557  I         I         I         I       *  I          I
8.9    9.6    7524  I         I         I         I       *  I          I
9.1    9.6    7481  I         I         I         I      *   I          I
9.3    9.6    7429  I         I         I         I      *   I          I
9.5    9.6    7372  I         I         I         I      *   I          I
9.7    9.5    7308  I         I         I         I      *   I          I
9.9    9.5    7241  I         I         I         I     *    I          I
1
 READY.
LOGOUT

B384638 LOG OFF  14.41.0743
SBU =       1.723
TIO =  165743

   00.32.2 OUT.
```