V.3.3-DWOPER DYNAMIC WAVE ROUTING OPERATION

Identifier: DWOPER

Application: All programs

Description: This Operation is a dynamic wave flood routing model that routes an inflow hydrograph to a point downstream. It can be used on a single river or system of rivers where storage routing methods are inadequate due to the effects of backwater, tides and mild channel bottom slopes. The model is based on the complete one-dimensional St. Venant equations. A weighted four-point nonlinear implicit finite difference scheme is used to obtain solutions to the St. Venant equations using a Newton-Raphson iterative technique.

Operation DWOPER has a number of features (Fread, 1978) which make it applicable to a variety of natural river systems for real-time forecasting. It is designed to accommodate various boundary conditions and irregular cross sections located at unequal distances along a single multiple-reach river or several such rivers having a dendritic configuration. It allows for roughness parameters to vary with location and stage or discharge. Temporally varying lateral inflows, wind effects, bridge effects, off-channel storage and weir-flow channel bifurcations to simulate levee overtopping are included among its features. Time steps are chosen solely on the basis of desired accuracy since the implicit finite difference technique is not restricted to the very small time steps of explicit techniques due to numerical stability considerations. This enables DWOPER to be very efficient as to computational time for simulating slowly varying floods of several days duration.

Allowable Data Time Intervals: 1, 2, 3, 4, 6, 8, 12 and 24 hours

Time Series Used: Time series used in this Operation are as follows:

General Type	Dimn	Units	Use	Required	Form of Output T.S.	Data Time Interval	Missing Values Allowed
Observed Stage	L	M	I	no	n/a	any 3/	yes
Observed Discharge	L3/T	CMS	I	no	n/a	any 3/	yes
Lateral Inflow	L3/T	CMS	I	no	n/a	any 3/	no
Target Pool Elevation	L	M	I	no	n/a	any 3/	yes

General Type	Dimn	Units	Use	Required	Form of Output T.S.	Data Time Interval	Missing Values Allowed
Gate Control Switches	DLES	INT	I	no	n/a	any 3/	yes
Upstream Stage 1/	L	M	I	yes 2/	n/a	any 3/	no
Upstream Discharge 1/	L3/T	CMS	I	yes 2/	n/a	any 3/	no
Downstream Stage	L	M	I	no	n/a	any 3/	no
Downstream Discharge	L3/T	CMS	I	no	n/a	any 3/	no
Output Stage	L	M	O	no	n/a	any 4/	no
Output Discharge	L3/T	CMS	O	no	n/a	any 4/	no
Percent Flow Diverted	DLES	PCTD	I	no	n/a	any 3/	yes
Computed Flow Diversion	L3/T	CMS	O	no	n/a	any 3/	no
Observed Tide	L	M	I	no	n/a	1 hour	yes
Simulated Tide	L	M	I	no	n/a	1 hour	no
Adjusted Tide	L	M	O	no	n/a	1 hour	no

1/ Upstream boundaries must be either all upstream stages or all upstream discharges.

2/ These time series must be the same type as the upstream boundaries.

3/ All of these time series must have the same data time interval.

4/ These time series data time interval must be an even increment of the input time series data time interval.

Input Summary: The card input for this Operation is as follows:

Card	Columns	Format	Variable Name	Contents
1	1-5	I5	JN	Total number of rivers in the system.
	6-10	I5	NBMAX	Maximum number of cross sections on any river.
2	1-10	F10.0	DHF	Data time interval for all input time series in hours.
	11-20	F10.0	DHFO	Data time interval for all output time series in hours. The value cannot be less than DHF. If it is greater than DHF, then it must be by an even increment.
	21-30	F10.0	TM	Data time interval for routing computations in hours. TM can be any value and it does not have to be tied to the input or output time series intervals. A good value is computed as the time to peak of the shortest inflow hydrograph divided by 20.
	31-40	I10	KITPR	Parameter used to indicate how often information will be stored for printing and plotting. This value when multiplied by the computational time interval (TM) produces the time interval which will be used to print specified information and/or plot specified hydrographs.
See Note 1/.				
3	1-10	F10.0	EPSY	Depth tolerance in Newton-Raphson Iteration scheme (0.001 - 1.0 FT). A good value is 0.01 FT.
	11-20	F10.0	EPSQ	Discharge tolerance in Newton-Raphson Iteration scheme (1. - 10,000. CFS) EPSQ=EPSY*V*B; where V is the average velocity and B is the average topwidth.

Card	Columns	Format	Variable Name	Contents
	21-30	F10.0	EPSQJ	Discharge tolerance in the tributary iteration scheme (1. - 10,000. CFS). EPSQJ=EPSQ.
	31-40	F10.0	THETA	Acceleration factor in solving tributary junction problem (0.5 - 1.0). Varies with each problem. A good first choice is 0.8.
	41-50	F10.0	F1	θ weighting factor (0.5 - 1.0). A good value is 0.55.
	51-60	F10.0	XFACT	Factor to convert units describing the locations of the cross sections along the routing reach to feet; e.g. if units are in miles, XFACT=5280.
4	1-10	I10	NU	Parameter indicating the existence of an inflow hydrograph; if NU=0, inflow hydrograph is generated using a mathematical function; if NU>0, inflow hydrograph exists. The inflow hydrograph can be generated for single river problems only (JN=1). Also, the inflow hydrograph cannot be generated when running the model operationally.
	11-20	I10	NCT	Parameter indicating type of extrapolation used in Newton-Raphson Iteration scheme to determine estimates of unknowns; if NCT=0, no extrapolation is done; if NCT=1, extrapolation is linear; if NCT=2, extrapolation is parabolic. A good value is NCT=1.
	21-30	I10	ICD	If any boundary hydrograph changes by more than the value of this parameter (in feet) from the last time step, extrapolation is not used. A good value is ICD=1.

Card	Columns	Format	Variable Name	Contents
	31-40	I10	NYQD	Parameter indicating rating curve boundary; if NYQD=0, no rating curve; if NYQD>0, downstream boundary is a single valued rating curve table.
	41-50	I10	ITMAX	Maximum number of iterations allowed in the Newton-Raphson Iteration scheme for solving the system of nonlinear equations. Also, if this value is less than zero, the model will not warm-up. A good value is -9.
	51-60	I10	NCML	Number of values in the Manning's n versus stage or discharge table; this is the same for all Manning's n reaches.
	61-70	I10	KTERM	Parameters indicating if terms in equation of motion will be computed and printed as special information; if KTERM=0, they will not be printed; if KTERM=1, they will be printed. Normally use KTERM=0.
5	1-10	I10	NCS	Number of values in the table of topwidths versus elevations referenced to Mean Sea Level (MSL); this is the same for all cross sections.
	11-20	I10	NCSS	Number of values in the table of topwidths of storage section versus elevations referenced to MSL; this is the same for all cross sections with off-channel storage.
	21-30	I10	NP	Dummy parameter - set NP=0.
	31-40	I10	KPL	Parameter indicating what information will be plotted; if KPL=0, nothing will be plotted; if KPL=1, stage hydrographs will be plotted;

Card	Columns	Format	Variable Name	Contents
				if KPL=2, discharge hydrographs will be plotted.
	41-50	I10	KPL2	Parameter indicating if observed data are available; if KPL2=0, no observed data are available; if KPL2=1, some observed data are available; if KPL2=2, observed data are available and the forecast stages will be adjusted using Manning n ranges; if KPL2=3, observed data are available and the forecast stages will be adjusted using specific balances.
	51-60	I10	JNK	Parameter indicating if computed water surface elevations, velocities and discharges will be printed; if JNK=0, they will not be printed; if JNK=1, they will be printed.
	61-70	I10	NPEND	Dummy parameter - set NPEND=0.
6	1-10	I10	NB(J)	Number of cross sections along each Jth river. Cross sections are numbered in order from upstream to downstream on each river.
	11-20	I10	NJUN(J)	Sequence number of cross section along the main river immediately upstream of the tributary confluence (this section coincides with the upstream extremity of the small subreach which is equivalent in length to the tributary width). Leave blank for the main river (J=1).
	21-30	F10.0	ATF(J)	Acute angle (degrees) that the tributary makes with the main river at the confluence. Leave blank for the main river (J=1).

Card	Columns	Format	Variable Name	Contents
	31-40	F10.0	COFW(J)	Coefficient of wind stress (1.1x10**-6 to 3.0x10**-6). Leave blank if wind effects are not considered.
	41-50	F10.0	VWIND(J)	Wind velocity (FT/SEC) - positive if directed upstream or negative if directed downstream. Leave blank if wind effects are not considered.
	51-60	F10.0	WINAGL(J)	Acute angle (degrees) that wind makes with the channel axis. Leave blank if wind effects are not considered.
Repeat Card number 6 for each river (J=1,JN Card number 1).				
7	1-70	7I10	KU(J)	Parameter indicating the type of upstream boundary condition on each river; if KU(J)=1, a stage hydrograph or if KU(J)=2, a discharge hydrograph is the upstream boundary condition. Each field represents a river. J=1,JN.
8	1-70	7I10	KD(J)	Parameter indicating the type of downstream boundary condition being specified for the main river; if KD(1)=0, an observed tide hydrograph is specified which will be blended with a simulated tide hydrograph; if KD(1)=1, a stage hydrograph is specified; if KD(1)=2, a discharge hydrograph is specified; if KD(1)=3, a single valued rating curve with discharge as a function of stage is specified; if KD(1)=4, a loop rating curve is computed; or if KD(1)=5, normal flow computed from Manning's equation with the channel bottom slope used as the energy slope is specified. The downstream boundary for the

Card	Columns	Format	Variable Name	Contents
				tributaries, (KD(J),J=2,JN), should always be stage, (KD(J)=1), except for levee overtopping simulation in which the overflow is ponded beyond the levees (KD(J)=2). Each field represents a river. If a field is left blank, a stage boundary is assumed (KD(J)=1). J=1,JN.
9	1-10	F10.0	SO	Average bottom slope on the main river (FT/FT).
Omit Card number 9 if KD(1) ≠ 5.				
10	1-70	7F10.0	NRT1(J)	Indicates the number of cross sections where computed hydrographs will be plotted. If there is observed data (KPL2=1), then only cross sections with observed data can be plotted. If the is no observed data (KPL2=0), then any cross sections can be plotted. Each field represents a river. J=1,JN.
11	1-70	7I10	NSTR(J)	Total number of computed stage hydrographs to be stored on each river (Number of output time series on each river). Each field represents a river. J=1,JN.
12	1-70	7I10	NQL(J)	Total number of lateral flows on each river. Each field represents a river. J=1,JN.
13	1-70	7I10	NDIV(J)	Total number of flow diversions on each river. Each field represents a river. J=1,JN.
14	1-70	7I10	NWJ(J)	Number of △x reaches on each river where levee overtopping may occur or where the flow is received from the overtopped reach. Each field represents a river. J=1,JN. All fields

Card	Columns	Format	Variable Name	Contents
				should be left blank except for the ones pertaining to the main river and the river receiving the flow.
15	1-70	7I10	NWJX(K,1)	Sequence number of the cross section at the upstream end of each △x reach in which levee overtopping and/or failure may occur on the main river. Each field represents a △x reach. K=1,NWJ(1).
Omit Card number 15 if NWJ(1)=0.				
16	1-10	F10.0	HWH(K)	Elevation reference to MSL (FT) of top of levee, ridge line, etc. where levee overtopping may occur; elevation is average throughout the △x reach where overtopping occurs.
	11-20	F10.0	WC(K)	Weir-flow discharge coefficient where overtopping (inflow or outflow) may occur (2.6 - 3.2).
	21-30	F10.0	TFL(K)	Time (HR) from start of levee failure (crevasse) until the opening or breach is its maximum size. Leave this field blank if the levee does not fail.
	31-40	F10.0	BBL(K)	Final width (FT) of levee crevasse which is assumed to have a rectangular shape. Leave this field blank if the levee does not fail.
	41-50	F10.0	HFL(K)	Water surface elevation (FT) when the levee starts to fail. Leave this field blank if the levee does not fail.
	51-60	F10.0	HMINL(K)	Final elevation referenced to MSL (FT) of the bottom of the levee crevasse. Leave this field blank if the levee does not fail.

Card	Columns	Format	Variable Name	Contents
				See Note 2/.
				Repeat Card number 16 for each levee △x reach on the main river. (K=1,NWJ(1) Card number 14)
				Omit Card number 16 if NWJ(1)=0.
17	1-70	7I10	NWJX(K,J)	Sequence number of each △x reach receiving flow from the main river. Each field represents a △x reach. K=1,NWJ(J) where J is the number of the tributary receiving flow.
				Omit Card number 17 if NWJ(J)=0.
18	1-70	7I10	NUMLAD(J)	Total number of locks and dams on each river. Each field represents a river. J=1,JN.
19	1-10	I10	LAD(L,J)	Sequence number of the cross section at the upstream end of each △x reach in which a lock and dam is located; cross sections are numbered from upstream to downstream extremities of a routing reach commencing with 1 and going to NB(J) (from Card number 6). If LAD(L,J) is negative, the dam is modeled using a rating curve instead of the pool elevation time series.
	11-20	F10.0	POLTAR(L,J)	Water surface elevation (FT) of head water pool at upstream face of lock and dam; this elevation is considered the target pool elevation; the lock-master controls the flow through the dam using gates to maintain the pool elevation at this target elevation.
	21-30	F10.0	CHCTW(L,J)	Water surface elevation (FT) of tailwater pool at downstream face of lock and dam; this elevation is considered the elevation at

Card	Columns	Format	Variable Name	Contents
				which the lock-master can no longer control the flow through the dam and the flow becomes channel control; usually this elevation will be equal to or slightly less than the target pool elevation (POLTAR(L,J)). If LAD(L,J) is negative, set CHCTW(L,J) = 0. If CHCTW(L,J) is negative, the dam is modeled as an uncontrolled weir where |CHCTW(L,J)| is equal to the crest length times the weir coefficient.
	31-40	F10.0	GZPL(L,J)	Gage correction (FT) to convert pool levels to MSL.

Repeat Card number 19 for each lock and dam (L=1,NUMLAD(J)); then repeat the group for each river having a lock and dam (NUMLAD(J) ≠ 0 J=1,JN).

Omit Card number 19 if NUMLAD(J)=0.

20	1-70	7I10	NNYQ(J)	Parameter indicating Manning's n is a function of water surface elevation (NNYQ(J)=0), discharge (NNYQ(J)=1) or constant (NNYQ(J)=0). Each field represents a river. J=1,JN.
21	1-70	7I10	NRCM1(J)	Total number of different Manning's n subreaches used on each river. Each field represents a river J=1,JN.

If KD(1)=4 OR 5 (from Card number 8) increase NRCM1(1) by 1.

22	1-70	7I10	NCM(K,J)	Sequence number of the downstream most cross section in a subreach that has the same Manning's n value. Each field represents a Manning's n subreach K=1,NRCM1(J).

If KD(1)=4 or 5, let the last NCM value on the main river equal NB(1)+1.

Repeat Card number 22 for each river (J=1,JN).

Card	Columns	Format	Variable Name	Contents
23	1-70	7F10.0	YQCM(L,K,J)	Water surface elevation (FT) or discharges (CFS) associated with Manning's n in the Manning's n table. Each field represents a table value. L=1,NCML (from Card number 4).

Repeat Card number 23 for each Manning's n subreach (K=1,NRCM1(1)).

If KD(1)=4 or 5, let the last set of YQCM values on the main river equal the previous set.

Repeat each group of Card number 23 for each river (J=1,JN).

24	1-70	7F10.0	CM(L,K,J)	Manning's n corresponding to each YQCM(L,K,J) value. Each field represents a table value. L=1,NCML (from Card number 4).

Repeat Card number 24 for each Manning's n subreach (K=1,NRCM1(1)).

If KD(1)=4 or 5, let the last set of CM values on the main river equal the previous set.

Repeat each group of Card number 24 for each river (J=1,JN).

25	1-70	7F10.0	X(I,J)	Distance of each cross section from the mouth of the channel which is in units of length. Multiplying this distance by XFACT (from Card number 3) converts the distance to feet. Each field represents a cross section. I=1,NB(J) (from Card number 6).
26	1-70	7F10.0	FKC(I,J)	Expansion or contraction coefficients (expansion coefficients vary from -0.50 to -1.00 and contraction coefficients vary from +0.1 to +0.4 depending on the sharpness of the transition section). Leave field blank if cross section is not an expansion or contraction. Each field represents a cross section I=1,NB(J).

Card	Columns	Format	Variable Name	Contents
Repeat Card sequence 25 and 26 for each river (J=1,JN).				
27	1-70	7F10.0	BS(K,I,J)	Topwidths of channel cross section (FT) in the topwidth versus elevation table. Each field represents a table value. K=1,NCS (from Card number 5).
Repeat Card number 27 for each cross section (I=1,NB(J)).				
28	1-70	7F10.0	HS(K,I,J)	Elevations referenced to MSL (FT) corresponding to each topwidth (BS). Each field represents a table value. K=1,NCS (from Card number 5).
Repeat Card number 28 for each cross section (I=1,NB(J)).				
29	1-70	7F10.0	AS(1,I,J)	Active channel cross sectional area (FT2) below the lowest HS elevation on each cross section. Each field represents a cross section. I=1,NB(J) (from Card number 6).
Repeat Card sequence 27, 28 and 29 for each river (J=1,JN).				
30	1-70	7I0	NCSS1(J)	Total number of cross sections that have off-channel storage. Each field represents a river. J=1,JN.
Omit Card number 30 if NCSS=0 (from Card number 5).				
31	1-70	7I10	NCSSS(K,J)	Sequence number of a cross section that has off-channel storage. Each field represents a cross section with off-channel storage. K=1,NCSS1(J) (from Card number 30).
Repeat Card number 31 for each river with off-channel storage NCSS1(J) ≠ 0, J=1,JN).				
Omit Card number 31 if NCSS=0.				
32	1-70	7F10.0	BSS(L,I,J)	Topwidth (FT) of off-channel storage cross sections in the topwidth versus

Card	Columns	Format	Variable Name	Contents
				elevation table for off-channel storage. Each field represents a table value. L=1,NCSS (from Card number 5).
33	1-70	7F10.0	HSS(L,I,J)	Elevations referenced to MSL (FT) corresponding to the BSS values. Each field represents a table value. L=1,NCSS.
34	1-10	F10.0	ASS(1,I,J)	Off-channel storage cross sectional area below the lowest HSS elevation.

Repeat Card sequence 32, 33 and 34 for each cross section having off-channel storage (I=1,NCSS1(J)); then repeat the group of Card sequence 32,33 and 34 for each river having off channel storage (NCSS1(J) ≠ 0 J=1,JN).

Omit Cards number 32, 33 and 34 if NCSS=0.

35	1-10	2A4,2X	STTNAM(L,J)

Time series identifier for cross section where observed data are available or where plotting will be done.

	11-15	A4,1X	DTYPE(L,J) Time series data type for cross section where observed data are available or where plotting will be done.
	16-20	I5	NT(L,J) Sequence number of cross section where observed data are available or where plotting will be done.
	21-30	F10.0	FLDHT(L,J) Flood elevation of cross section where observed data are available or where plotting is done.
	31-40	F10.0	GZ(L,J) Gage correction to convert observed stages to MSL.

Repeat Card number 35 for each cross section to be plotted (L=1,NRT1(J) Card number 10).

Then repeat each group of Card number 35 for each river (J=1,JN).

Omit this Card group if NRT1(J)=0.

Card	Columns	Format	Variable Name	Contents
36	1-10	2A4,2X	STTNAM(K,J)	Output time series identifier.
	11-15	A4,1X	DTYPE(K,J)	Output time series data type.
	16-20	I5	NST(K,J)	Sequence number of output time series cross section.
	21-30	F10.0	GZO(K,J)	Gage correction factor to convert output time series values from (MSL) to stages. Omit this field if the output time series is discharge.

Repeat Card number 36 for each output time-series (K=1,NSTR(J)) (from Card number 11); then repeat each group of Card number 36 for each river (J=1,JN).

Omit this Card group if NSTR(J)=0.

37	1-10	2A4,2X	STTNAM	Time series identifier (I,J) for cross section with flow diversion.
	11-15	A4,1X	DTYPE	Time series data type for cross section with flow diversion.
	16-20	I5	LDIV	Sequence number of cross section with flow diversion.

See Note 3/.

Repeat Card number 37 for each cross section with flow diversion (I=1,NDIV(J)) (from Card number 14); then repeat each group of Card number 37 for each river (J=1,JN).

Omit this Card group if NDIV(J)=0.

38	1-10	2A4,2X	STTNAM(I,J)	Time series identifier for cross section with lateral flow.
	11-15	A4,1X	DTYPE(I,J)	Time series data type for cross section with lateral flow.
	16-20	I5	LQ(I,J)	Sequence number of cross section with lateral flow.

Repeat Card number 38 for each cross section with lateral flow

Card	Columns	Format	Variable Name	Contents

(I=1,NQL(J)) (from Card number 12); then repeat each group of Card number 38 for each river (J=1,JN).

Omit this Card group if NQL(J)=0.

39	1-10	2A4,2X	STTNAM(K,J)	Time series identifier for cross sections with target pool elevations.
	11-15	A4,1X	DTYPE(K,J)	Time series data type for cross sections with target pool elevations.

Repeat Card number 39 for each lock and dam (K=1,NUMLAD(J) Card number 18).

Omit this Card group if NUMLAD(J)=0 or LAD(K,J)< 0.

40	1-10	2A4,2X	STTNAM	Time series identifier (K,J) for cross section with gate control switches.
	11-15	A4,1X	DTYPE(K,J)	Time series data type for cross section with gate control switches.

See Note 4/.

Repeat Card number 40 for each lock and dam (K=1,NUMLAD(J) Card number 18).

Omit this Card group if NUMLAD(J)=0.

Repeat Card sequence 39 and 40 for each river (J=1,JN).

41	1-10	2A4,2X	STTNAM(J)	Time series identifier for upstream boundary.
	11-20	A4,6X	DTYPE(J)	Time series data type for upstream boundary.
	21-30	F10.0	STM(J)	Minimum stage or discharge allowed at the upstream boundary.
	31-40	F10.0	GZ1(J)	Gage correction (FT) to convert upstream stages to MSL. Omit this field if upstream boundary is discharge.

Repeat Card number 41 for each river (J=1,JN).

Card	Columns	Format	Variable Name	Contents
Omit Card number 41 if NU=0 (from Card number 4).				
42	1-10	2A4,2X	STTNAM	Time series identifier for downstream boundary.
	11-20	A4,6X	DTYPE	Time series data type for downstream boundary.
	21-30	F10.0	GZN	Gage correction (FT) to convert downstream stages to MSL. Omit this field if downstream boundary is not stage.
Omit Card number 42 if KD(1) > 2 (from Card number 8).				
43	1-10	2A4,2X	STTNAM	Time series identifier for NOS tide.
	11-15	A4,1X	DTYPE	Time series data type for NOS tide.
	16-19	A4	RIVNAM	Name of river with tide boundary.
44	1-10	2A4,2X	STTNAM	Time series identifier for adjusted tide data.
Omit Cards number 43 and 44 if KD(1) ≠ 0 (from Card number 8).				
	11-15	A4,1X	DTYPE	Time series data type for adjusted tide data.
45	1-10	2A4,2X	STTNAM(L,J)	Time series identifier for cross section where computed data will be adjusted.
	11-15	A4,1X	DTYPE(L,J)	Time series data type for cross section where computed data will be adjusted.
Repeat Card number 45 for each cross section with data to be adjusted (L=1,NRT1(J), except if the downstream cross section on the main river (NT(L,1)=NB(J)); then repeat each group of Card number 45 for each river (J=1,JN).				
Omit Card number 45 if KDL2 ≠ 3.				
46	1-8	2A4	STTNAM	Rating Curve identifier for downstream boundary on internal boundary.
Omit Card number 46 if NYQD=0 (from Card number 4).				

Card	Columns	Format	Variable Name	Contents
47	1-10	F10.0	TP	Time (HR) to peak of upstream hydrograph.
	11-20	F10.0	RHO	Ratio of peak value of specified hydrograph to initial value of hydrograph.
	21-30	F10.0	GAMMA	Ratio of time TG to TP where TG is the time from initial steady flow to the center of gravity of the specified hydrograph (GAMMA must be greater than 1.0).
	31-40	F10.0	YI	Initial steady discharge (CFS) or water surface elevation (FT) at upstream boundary.

Omit Card number 47 if NU ≠ 0 (from Card number 4).

48	1-10	I10	NSLICE	Number of slices used to adjust the computed time series.
49	1-70	7I10	NQSL(J)	Parameter indicating adjustment statistics are a function of water surface elevation (NQSL(J)=0) or discharge (NQSL(J)=1). Each field represents a river, J=1,JN.

Omit card numbers 48 and 49 if KPL2 ≠ 3 (from Card number 5).

50	1-70	7F10.0	SLICE(L,K,J)	Stage (FT) or discharge (CFS) range. A hydrograph will be divided into NSLICE h/q ranges (slices) and adjusted based on the rms error and bias. Each field represents a table value, L=1,NSLICE.

Omit card number 50 if KPL2 ≠ 3 (from Card number 5).

51	1-70	7F10.0	FRMSO(L,K,J)	Root mean square error (rms) on the falling limb of the hydrograph within each slice. This value is used when no observed data exists in the slice for the current runtime. If FRMSO(L,K,J)=0,

Card	Columns	Format	Variable Name	Contents
				no adjustment is made to the computed stage. Each field represents a slice, L=1,NSLICE.
Omit Cards numbers 45-51 if KPL2 < 2 (from Card number 5).				
52	1-70	7F10.0	FBIASO(L,K,J)	Bias associated with FRMSO(L,K,J). Each field represents a slice, L=1,NSLICE.
53	1-70	7F10.0	RRMSO(L,K,J)	Root mean square error (rms) on the rising limb of the hydrograph within each slice. This value is used when no observed data exists in the slice for the current runtime. If RRMSO(L,K,J)= 0, no adjustment is made to the computed stage. Each field represents a slice, L=1,NSLICE.
54	1-70	7F10.0	RBIASO	Bias associated with RRMSO(L,K,J). Each field represents a slice, L=1,NSLICE.
Repeat card sequence 50-54 for each adjusted time series (K=1,NRT1(J)); then repeat each group of card sequence 50-54 for each river (J=1,JN).				
55	1-70	7F10.0	YDI(I,J)	Initial water surface elevation referenced to MSL (FT) at each cross section. Each field represents a cross section. I=1,NB(J) (from Card number 6). If all fields are left blank, the program will generate the YDI's using linear interpolation between gaging stations (this is allowed when gaging stations exist at the upstream extremities of all rivers and the downstream extremity of the main stem). If the upstream extremity of each river does not have an observed hydrograph, this YDI value must be supplied along with

Card	Columns	Format	Variable Name	Contents
				all the blanks for the other YDI's. If all fields are left blank except at the downstream extremity of the main stem river where the actual YDI is read in, the program will generate the YDI's using a solution of the steady flow backwater equation.
Repeat Card number 45 for each river (J=1,JN).				
56	1-70	7F10.0	QDI(I,J)	Initial discharges (CFS) at each cross section Each field represents a cross section I=1,NB(J) (from Card number 6). If all fields are left blank except at the upstream extremity of each river, the program will generate the QDI's by summation of the flows from the upstream to downstream boundaries, including tributary inflow to the main stem and lateral inflow occurring along either the main stem or tributaries.
Repeat Card number 46 for each river (J=1,JN).				
57	1-72	7F10.0	QLI(K,J)	Initial lateral flow (CFS) for each reach with lateral flow. Each field represents a lateral flow reach. K=1,NQL(J) (from Card number 12).
Repeat Card number 47 for each river with lateral flow (NQL(J) ≠ 0 J=1,JN).				
Omit Card number 47 if NQL(J)=0.				
58	1-70	7F10.0	DVI(K,J)	Initial percent of flow diverted from each reach diverting flow. Each field represents a flow diversion reach. K=1,NDIV(J) (from Card number 13).
Repeat Card number 48 for each river with flow diversions (NDIV(J) ≠ 0 J=1,JN).				

Card	Columns	Format	Variable Name	Contents
Omit Card number 48 if NDIV(J)=0.				
59	1-70	7F10.0	PLTI(K,J)	Initial target pool elevation for each lock and dam. Each field represents a lock and dam. K=1,NUMLAD(J) (from Card number 18).
Repeat Card number 49 for each river with locks and dams (NUMLAD(J) ≠ 0 J=1,JN).				
Omit Card number 49 if NUMLAD(J)=0.				
60	1-70	7I10	IWTI(K,J)	Initial gate control switch for each lock and dam. Each field represents a lock and dam. K=1,NUMLAD(J) (from Card number 18).
See Note 4/.				
Repeat Card number 50 for each river with locks and dams (NUMLAD(J) ≠ 0 J=1,JN).				
Omit Card Number D(J)=0.				
61	1-72	18A4	DONE	Message to be written at the end of input deck.

Notes:

1/ Information will be printed at the time interval specified by the TM and KITPR parameters on Card 2. However, when deciding the time interval for plotting, special relationship must be upheld between the TM, KITPR and DHF parameters on Card 2. If TDHF=TM*KITPR, then TDHF must be an even increment of DHF or DHF must be an even increment of TDHF. If these criteria are not met, then the computed hydrographs will be plotted using the TDHF time interval and any observed hydrographs will not be plotted since the input time series interval (DHF) does not properly match the plotting time interval (TDHF).

2/ Overtopping of levees with the resulting flow ponded within the confines of a blocked tributary can be simulated by using cards 15 and 16 and a value of (2) for KD(J) on card 8. Also required is a tributary having a continuous low flow discharge and a large overbank and off-channel storage area representing the storage in the ponded area outside the levees. Interior drainage back into the river through a gravity-controlled check valve and pipe can also be simulated in the same manner, except HWH (from Card number 16) is the pipe invert elevation and WC (from Card number 16) is computed as 6.4 x pipe cross sectional area (FT2). Of course, the △x reach in which the pipe extends through the levee should be a

relatively short reach (say 50 to 100 FT). If the receiving tributary of the overtopping levee flow is hydraulically connected to the main river, KD(2) on card 8 should have value of 1.

3/ The time series consisting of the percent of flow diverted may have missing data. If the data is missing, then the amount of flow diverted at that time step is set equal to the amount of flow diverted at the previous time step. If the initial percent of flow diverted is missing, then no flow is initially diverted from the channel.

4/ The gate control switches are used to denote whether the gates are being used to control the flow. If the gates do not control, then the flow is governed by the St. Venant Equations. In the ITWT time series a value of zero implies that the gates are in control and a value of one (1) implies that the gates are not in operation. If any values are found missing, the gates are considered to be in operation. If the initial gate control switch is missing, then it is set equal to zero.

Sample Input and Output: Sample input is shown in Figure 1. Sample output from the parameter print routine is shown in Figure 2. Sample execution printer output is shown in Figure 3a, 3b and 3c; Figure 3a shows a plot of observed and computed stages; Figure 3b shows an example of the statistics; and Figure 3c shows an example of the hydraulic information at the current time step.

Execution Printer Output: The execution output for this Operation is controlled by three input parameters on Card 5:

- o JNK - how much information is to be generated
- o KPL - whether or not plots and statistical information is to be generated
- o KPL2 - whether or not observed data are available for plotting or generating statistical information

Output options are:

1.	JNK=0, KPL=0	No output
2.	JNK=0, KPL=1,KPL2=0	Plots of computed stage
3.	JNK=0, KPL=2, KPL2=0	Plots of computed discharge
4.	JNK=0, KPL=1, KPL2=1	Plots of observed and computed stages and summary of statistics (root mean square error and bias error)
5.	JNK=0, KPL=2, KPL2=1	Plots of observed and computed discharges and summary of statistics
6.	JNK=1, KPL=1 or 2, KPL2=0 or 1	A table showing the time step (HR), current time (HR), number of iterations for each river, cross section location (MI), Manning's n, water surface elevation (FT MSL),

depth (FT), Froude number, velocity (FT/SEC), discharge (1000 CFS), levee flow (1000 CFS), active flow area (1000 FT2) and total topwidth (FT) at even time increments specified by the KITPR parameter on Card 2, plus any of the plot options in (1) through (5). This option also prints the total number of iterations needed for each river when using the Newton-Raphson Iteration technique, as well as more detail statistical information

There is no default printer option. JNK, KPL, KPL2 and KITPR must be supplied by the user.

Error and Warning Messages: The error and warning messages generated by this Operation and the corrective action to take when they occur are as follows:

A. Messages that can occur during setup.

1. **ERROR** EXECUTION TERMINATED BECAUSE WORKING SPACE NEEDED (XXXXX) EXCEEDS WORKING SPACE REQUIRED (YYYYY).

   Action: The size of the D array needs to be increased.

2. **ERROR** OUTPUT TIME SERIES INTERVAL (DHFO=XX) MUST BE GREATER THAN OR EQUAL TO THE COMPUTATIONAL TIME STEP (TM=XXXXX).

   Action: Increase the output time series interval to be at least as large as the computational time step.

3. **ERROR** OUTPUT TIME SERIES INTERVAL (DHFO=XX) IS NOT AN EVEN MULTIPLE OF THE COMPUTATIONAL TIME STEP (TM=XXXXX).

   Action: Change the output time interval such that DHFO = K * TM where K is a positive integer.

4. **WARNING** OBSERVED DATA TIME STEP (DHF=XX) IS NOT AN EVEN INCREMENT OF THE TIME STEP FOR PLOTTING COMPUTED DATA (TM=XXXXX KITPR=YYYYY) THEREFORE THE OBSERVED DATA WILL NOT BE PLOTTED.

   Action: Verify time steps and if plots are desired make DHF=K*TM*KITPR or K*DHF=TM*KITPR where K is a positive integer.

5. **ERROR** AUTOMATIC CALIBRATION CANNOT BE USED WHEN THE INFLOW HYDROGRAPH IS GENERATED (NU=0).

   Action: If automatic calibration is desired, then specify inflow hydrograph and set NU>0. If automatic calibration is

not desired set NP=0.

6. **ERROR** NUMBER OF COMPUTATIONAL POINTS (NBJ=XXX) EXCEEDS MAXIMUM NUMBER OF COMPUTATIONAL POINTS ALLOWED (NBMAX=YYY). PROGRAM TERMINATED.

   Action: Check the number of cross sections on each river (NB(J)) and set NBMAX equal to the largest value.

7. **ERROR** KU VALUE MUST BE EQUAL TO '1' OR '2' KU(X)=Y NOT ACCEPTED.

   Action: Check upstream boundary condition. If necessary, redefine it to be either stage (KU(J)=1) or discharge (KU(J)=2).

8. **WARNING** DOWNSTREAM BOUNDARY ON TRIBUTARIES CAN ONLY BE STAGE. KD(X)=Y NOT ALLOWED. KD(X) HAS BEEN SET TO '1'.

   Action: Unless blocked tributary option is used set KD(J)=1 or 0.

9. **WARNING** THIS IS TO AFFIRM THAT RIVER NO. X IS BLOCKED (KD(J)=2). THEREFORE NO FLOW FROM THIS TRIBUTARY WILL ENTER THE MAIN RIVER.
   Action: If the blocked tributary option is not desired, then set KD(J)=1 or 0.

10. **ERROR** AUTOMATIC CALIBRATION OPTION CANNOT BE USED ON LEVEE PROBLEMS.

    Action: If automatic calibration option is not desired set NP=0.

11. **ERROR** MANNING'S N VALUES (CM) CANNOT BE SET TO ZERO WHEN THE AUTOMATIC CALIBRATION OPTION IS NOT USED.

    Action: Read in Manning's n values.

12. **ERROR** KPL MUST BE EQUAL TO '1' OR '2'. XXXXXXXX NOT ACCEPTED.

    Action: Set KPL on Card number 5 to '1' or '2'.

13. **ERROR** STAGE CAN ONLY HAVE UNITS OF 'M '. 'XXXX' NOT ACCEPTED.

    Action: Check the time series header card and change it if necessary.

14. **WARNING** MISSING DATA ARE NOT ALLOWED IN AUTOMATIC CALIBRATION RUN.

    Action: Check for missing dating points and fill the space with interpolated values.

15. **WARNING** ON RIVER NO. XXX STATION YYYYYYYY WITH DATA TYPE ZZZZ MAY HAVE MISSING DATA. MISSING DATA POINTS WILL NOT BE PLOTTED OR INCLUDED IN STATISTICS.

    Action: Check missing data points and fill them if these points are to be plotted and included in statistics.

16. **ERROR** TIME SERIES I.D. 'DUMMY ' IS NOT ACCEPTABLE WHEN AUTOMATIC CALIBRATION OPTION IS NOT USED.

    Action: Check the time series identifier and redefine if necessary.

17. **ERROR** TIME SERIES I.D. 'DUMMY ' IS NOT ACCEPTABLE FOR OUTPUT TIME SERIES.

    Action: Check the time series identifier and redefine it if necessary.

18. **ERROR** THE ALLOWABLE DIMENSIONS FOR OUTPUT TIME SERIES ARE 'XXXX'. 'YYYY' IS NOT ALLOWED.

    Action: Check the time series header and redefine it if necessary.

19. **ERROR** GATE CONTROL DATA CAN ONLY HAVE UNITS OF 'M '. 'XXXX' NOT ACCEPTED.

    Action: Check the time series header and redefine it if necessary.

20. **ERROR** GATE CONTROL SWITCHES CAN ONLY HAVE UNITS OF 'INT '. 'XXXX' NOT ACCEPTED.

    Action: Check the time series header and redefine it if necessary.

21. **ERROR** INFLOW HYDROGRAPH CAN BE GENERATED (NU=0) ON A SINGLE CHANNEL ONLY (JN=1). JN=XX NOT ALLOWED. PROGRAM TERMINATED.

    Action: If the problem has more than one river, then set NU>0 and specify an input time series for each upstream boundary.

22. **ERROR** LEVEE MUST BE PLACED ON THE MAIN CHANNEL; THEREFORE NWJ(1) CANNOT BE EQUAL TO ZERO.

    Action: If possible make the channel containing the levee the main stem and let fictitious tributary connect to it.

23. **WARNING** ON RIVER NO. XXX STATION YYYYYYYY WITH DATA TYPE ZZZZ MAY HAVE MISSING DATA. MISSING DATA POINTS WILL BE GIVEN VALUES OF ZERO.

    Action: No action necessary.

24. **WARNING** THE TABLE OF TOPWIDTHS VS ELEVATIONS IS NOT COMPLETE FOR SECTION WWW ON RIVER NO. XX. THE LAST GOOD VALUE IS AT LEVEL YYY WHICH HAS AN ELEVATION OF ZZZZZZZZZZ FEET. AT ELEVATIONS HIGHER THAN THIS, THE MODEL WILL LINEARLY EXTRAPOLATE FROM THE LAST TWO POINTS.

    Action: Fill the table with the proper number of values.

25. **WARNING** THE TABLE OF TOPWIDTHS VS ELEVATIONS (INACTIVE) IS NOT COMPLETE FOR SECTION WWW ON RIVER NO. XX. THE LAST GOOD VALUE IS AT LEVEL YYY WHICH HAS AN ELEVATION OF ZZZZZZZZZZ FEET. AT ELEVATIONS HIGHER THAN THIS, THE MODEL WILL LINEARLY EXTRAPOLATE FROM THE LAST TWO POINTS.

    Action: Fill the table with the proper number of values.

26. **WARNING** ON RIVER NO. XX CROSS SECTION NO. YYY HAS BOTH LATERAL FLOW AND FLOW DIVERSION; THEREFORE ONLY THE LATERAL FLOW WILL BE CONSIDERED IN COMPUTATIONS.

    Action: Remove either the lateral flow or the flow diversion.

27. **WARNING** NO. OF MANNING N REACHES ARE NOT EQUAL TO NO. OF OBSERVED CROSS SECTIONS LESS ONE, SO COMPUTATIONS CAN NOT BE MADE.

    Action: Redefine the number of Manning's n reaches.

28. **ERROR** THE ALLOWABLE DIMENSIONS FOR ADJUSTED TIDE TIME SERIES ARE 'XXXX'. 'YYYY' IS NOT ALLOWED.

    Action: Check the time series header and redefine it if necessary

29. **ERROR** THE ALLOWABLE DIMENSIONS FOR ADJUSTED STAGE TIME SERIES ARE 'XXXX'. 'YYYY' IS NOT ALLOWED.

    Action: Check the time series header and redefine it if necessary

B. Messages that can occur during execution.

1. **WARNING** NEGATIVE TOPWIDTH HAS BEEN COMPUTED AT CROSS SECTION NO. XXXXX ON RIVER NO. YY. START TIME STEP REDUCTION.

    Action: Check cross section and redefine it if necessary.

2. **WARNING** NEGATIVE AREA HAS BEEN COMPUTED AT CROSS SECTION NO. XXXXX ON RIVER NO. YY. START TIME STEP REDUCTION.

    Action: Check cross section and redefine it if necessary.

3. **WARNING** THERE IS NO OBSERVED DATA FOR THIS RUN PERIOD. (LDACPD=XXXXXXXXXX LHRCPD=YY) (IDA=ZZZZZZZZZZ IHR=WW). NO STATISTICS CAN BE DONE.

Action: Check the run period and redefine it if necessary.

4. **WARNING** ON RIVER NO. XX THE INFLOW HYDROGRAPH AT LOW FLOW CONDITIONS WENT BELOW THE MINIMUM VALUES SPECIFIED -- MINIMUM VALUES WERE USED.

   Action: Check the hydrograph at low flow condition and redefine it if necessary.

5. **WARNING** THE TOTAL NO. OF EXTRAPOLATIONS ALLOWED HAS BEEN EXCEEDED. ALL FUTURE TIME STEP VALUES HAVE BEEN SET TO THE LAST STAGE OR DISCHARGE VALUES. CARRYOVER ARRAYS AS WELL AS OUTPUT TIME SERIES ARRAYS WILL ALSO BE FILLED WITH THE LAST COMPUTED STAGE AND DISCHARGE VALUES. FOR FURTHER INFORMATION ON AUTOMATIC TAKE-UP PROCEDURE PLEASE REFER TO PAGE V.3.3-DWOPER-5 OF THE USERS MANUAL. PROGRAM TERMINATED.

   Action: Correct previous error and warning messages and resubmit.

6. **WARNING** NONCONVERGENCE OCCURRED AT XXXXXXXXXX HOURS. START FIXUP PROCEDURE.

   Action: Check the problem setup to be sure that cross sections can handle the flow being passed through. Also check to see if the time step and distance interval are adequate.

7. **WARNING** EXTRAPOLATION HAS OCCURRED AT TT= XXXXXXXXXX.

   Action: Correct previous error and warning messages and resubmit.

8. **WARNING** STEP-BACKWATER ALGORITHM DID NOT CONVERGE AT CROSS SECTION NO. XXXXX ON RIVER NO. YYY.

   Action: Check the initial conditions and cross sections to see if they are compatible.

9. **WARNING** ON RIVER NO. XXX THE MAXIMUM WSEL (MAX ELEV) IS GREATER THAN THE HIGHEST ELEVATION FOR TOPWIDTH (MAX HS) FOR THE FOLLOWING SECTIONS: SECTION NO. RVR MILE MAX HS MAX ELEV)

   Action: Change the topwidth versus elevation table so that the maximum elevation is included in the table.

10. **ERROR** SPACE NEEDED: XXXXXXXX, SPACE AVAILABLE: XXXXXXXX AND NOT ENOUGH SPACE TO FILL ARRAYS. CONTACT YOUR FOCAL POINT AT HRL. THE DWOPER OPERATION WILL BE SKIPPED.

C. Messages that can occur during carryover transfer:

1. **WARNING** THE XXXXXX PARAMETER ON CARD NUMBER XX HAS BEEN CHANGED.

   Action: No action necessary.

2. **WARNING** OFF CHANNEL STORAGE HAS BEEN ADDED TO CROSS SECTION NO. XXX ON RIVER NO. YY.

   Action: No action necessary.

3. **WARNING** OFF CHANNEL STORAGE HAS BEEN OMITTED FROM CROSS SECTION NO. XXX ON RIVER NO. YY.

   Action: No action necessary.

4. **WARNING** CARRYOVER CANNOT BE TRANSFERRED IN THIS OPERATION BECAUSE OF PREVIOUS WARNINGS. INPUT CARRYOVER IS USED.

   Action: No action necessary.

Carryover Transfer Rules: The following rules apply during the carryover transfer process:

1. Carryover values are initial water surface elevations and discharges at each cross section, initial lateral flow at each lateral flow point, percent of flow initially diverted from the channel, initial target pool elevations and initial gate control switches.

2. Carryover can be transferred (i.e. existing carryover kept) only if none of the following parameters have been changed from one set of data to the next:

Parameter	Card No.	Parameter	Card No.
NBMAX	1	FKC(I,J)	26
NP	5	*NCSS	5
SO	9	*NCML	4
NB(J)	6	*CM(L,K,J)	24
NQL(J)	12	*YQCM(L,K,J)	
23			
LQ(I,J)	38	*NCS	5
NDIV(J)	13	*BS(K,I,J)	27
LDIV((I,J)	37	*HS(K,I,J)	28
NUMLAD(J)	18	*AS(K,I,J)	29
LAD(L,J)	19	*NCSS1(J)	30
NRCM1(J)	21	*NCSSS(K,J)	31
NNYQ(J)	20	*HSS(L,I,J)	33
NCM(K,J)	22	*BSS(L,I,J)	32
X(I,J)	25	*ASS(L,I,J)	34

   If any of the above parameters have been changed, no carryover transfer will take place (i.e. the carryover values input during the redefinition will be used). The parameters with the (*) beside them may be changed if the change occurs above the initial conditions (e.g., the cross section properties may be changed as long as table values below the initial conditions remain the same as before).

Card Punch Limitations: All integer values and alphanumeric names

for this Operation are punched out exactly as they are read in. All real values are punched with an F10.2 format with the following exceptions:

Variable Name	Card	Punch Format
EPSY	3	F10.4
YQCM	22	F10.0 (for discharge)
		F10.2 (for stage)
CM	23	F10.4
SO	9	F10.6
FRMSO	51	F10.4
FBDIASO	52	F10.4
RRMSO	53	F10.4
RBIASO	54	F10.4
SLICE	50	F10.0 (for discharge)
		F10.2 (for stage)
STM	41	F10.0

Figure 1. Sample Card Input For Operation DWOPER

```
                                    - Column -
    5   10   15   20   25   30   35   40   45   50   55   60   65   70   75   80
----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+

DWOPER      GLFSW
    4   60
6.        6.        6.                  1
.01       1.        1.        .8        .6        5280.
          1         0         1         0         9         8         0
          8         5         0         1         1         0         0
          60
          21        26  90.     0.        0.        0.
          12        36  90.     0.        0.        0.
          20        42  90.     0.        0.        0.
           2         2         2         2
           4         1         1         1
           4         1         1         1
           6         0         0         0
           3         0         0         0
           0         0         0         0
           0         0         0         0
           0         0         1         0
           7  51.37    1.20     0.
           1         1         1         1
           4         1         1         1
          30        39        60        61
          21
          12
          20
0.          500.     10000.    20000.    75000.    100000.   150000.
250000.
0.          500.     10000.    20000.    100000.   125000.   150000.
300000.
0.         1000.     25000.    50000.    100000.   150000.   200000.
300000.
0.         1000.     25000.    50000.    100000.   150000.   200000.
300000.
0.          500.     5000.     10000.    15000.    20000.    30000.
75000.
0.          500.     5000.     10000.    50000.     75000.    90000.
200000.
-50000.    -5000.    0.        1000.     2000.      5000.    20000.
45000.
0.0350      .0350     .0350     .0350     .0350     .0350     .0350
0.0350
0.0354    0.0324    0.0270    0.0255    0.0300     .0300     .0300
0.0300
0.0300      .0300     .0300     .0300     .0300     .0300     .0300
0.0300
0.0300      .0300     .0300     .0300     .0300     .0300     .0300
0.0300
0.0270    0.0300    0.0380    0.0450    0.0470    0.0500    0.0500
0.0500
0.0270    0.0250    0.0230    0.0280    0.0350    0.0350    0.0350
0.0350
0.0400      .0350     .0250     .0200     .0200     .0250     .0350
0.0400
190.0     189.00    188.0     187.00    186.0     185.0     184.0
183.0     182.75    182.5     182.0     180.0     179.5     179.0
178.5     178.0     177.5     177.1     177.0     175.0     172.5
170.01    170.0     167.5     166.3     165.1     165.0     163.5
162.5     160.0     157.5     155.0     153.75    152.5     151.3
150.1     150.      126.0     116.6     115.0     110.0     105.1
105.0     100.0      95.0      90.0      85.0     84.75     82.11
79.25      79.2      75.0      67.55     67.5     50.64     33.75
```

Figure 1. Sample Card Input For Operation DWOPER (continued)

```
                                          - Column -
    5   10   15   20   25   30   35   40   45   50   55   60   65   70   75   80
----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+

25.32     16.89      8.46      0.
0.
0.
0.
0.
0.
0.
0.
0.
0.
20.0      19.00     18.00     17.00     16.00     15.00     14.00
13.00     12.00     11.00     10.00      9.00      8.00      7.00
6.00      5.00       4.00      3.00      2.00      1.00      0.00
 0.
 0.
 0.
20.0      19.0      18.0      16.0      14.0      12.0      10.01
10.0       7.50     5.0        2.50      0.
 0.
 0.
44.0      41.0      38.0      35.0      32.0      29.0      26.0
23.0      20.0      18.0      16.0      14.0      12.0      10.0
 8.0       6.0       4.0       2.0       1.0       0.0
 0.
 0.
 0.
0.        1.0        50.0      500.0    1000.0    2000.0    5000.0
7500.0
0.        1.0        50.0      500.0    1000.0    2000.0    5000.0
7500.0
0.        1.0        50.0      500.0    1000.0    2000.0    5000.0
7500.0
0.        1.0        50.0      500.0    1000.0    2000.0    5000.0
7500.0
0.        1.0        50.0      500.0    1000.0    2000.0    5000.0
7500.0
0.        1.0        50.0      500.0    1000.0    2000.0    5000.0
7500.0
0.        1.0        50.0      500.0    1000.0    2000.0    5000.0
7500.0
0.        1.0        50.0      500.0    1000.0    2000.0    5000.0
7500.0
0.        1.0        50.0      500.0    1000.0    2000.0    5000.0
7500.0
0.        1.0        50.0      500.0    1000.0    2000.0    5000.0
7500.0
0.        1.0        50.0      500.0    1000.0    2000.0    5000.0
7500.0
0.        1.0        50.0      500.0    1000.0    2000.0    5000.0
7500.0
0.        1.0        50.0      500.0    1000.0    2000.0    5000.0
7500.0
0.        1.0        50.0      500.0    1000.0    2000.0    5000.0
7500.0
0.        1.0        50.0      500.0    1000.0    2000.0    5000.0
7500.0
0.        1.0        50.0      500.0    1000.0    2000.0    5000.0
7500.0
0.        1.0        50.0      500.0    1000.0    2000.0    5000.0
7500.0
```

Figure 1. Sample Card Input For Operation DWOPER (continued)

```
                                        - Column -
    5   10   15   20   25   30   35   40   45   50   55   60   65   70   75   80
----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+

0.        1.0        50.0      500.0    1000.0    2000.0    5000.0
7500.0
0.        1.0        50.0      500.0    1000.0    2000.0    5000.0
7500.0
0.        1.0        50.0      500.0    1000.0    2000.0    5000.0
7500.0
0.        1.0        50.0      500.0    1000.0    2000.0    5000.0
7500.0
0.        1.0        50.0      500.0    1000.0    2000.0    5000.0
7500.0
0.        1.0        50.0      500.0    1000.0    2000.0    5000.0
7500.0
0.        1.0       100.0      500.0    2000.0    3000.0    5000.0
7500.0
0.        1.0       100.0      500.0    2500.0    3250.0    5000.0
7500.0
0.        1.0       150.0      800.0    3000.0    3500.0    5000.0
7500.0
0.        1.0       150.0     1000.0    3500.0    3500.0    5000.0
7500.0
0.        1.0       150.0     1000.0    3500.0    3500.0    5000.0
7500.0
0.        1.0       150.0     1000.0    3500.0    3500.0    5000.0
7500.0
0.        1.0       150.0      500.0    1000.0    2000.0    3500.0
3500.0
0.        1.0       150.0      500.0    1000.0    2000.0    3500.0
3500.0
0.        1.0       150.0      500.0    1000.0    2000.0    3500.0
3500.0
0.        1.0       150.0      500.0    1000.0    2000.0    3500.0
3500.0
0.        1.0       150.0      500.0    1000.0    2000.0    3500.0
3500.0
0.        1.0       150.0      500.0    1000.0    2000.0    3500.0
3500.0
0.        1.0       150.0      500.0    1000.0    2000.0    3500.0
3500.0
0.        1.0       500.0     1000.0    1500.0    3000.0    3500.0
3800.0
0.        1.0       500.0     2000.0    3000.0    5000.0    6000.0
3800.0
0.        1.0       500.0     2000.0    4500.0    5000.0    6000.0
3800.0
0.        1.0       500.0     2000.0    4500.0    5000.0    6000.0
3800.0
0.        1.0       500.0     2000.0    4500.0    5000.0    6000.0
5000.0
0.        1.0       500.0     2000.0    4500.0    5000.0    6000.0
5000.0
0.        1.0       500.0     2000.0    4500.0    5000.0    6000.0
5000.0
0.        1.0       500.0     2000.0    4500.0    5000.0    6000.0
5000.0
0.        1.0       500.0     2000.0    4500.0    5000.0    6000.0
5000.0
0.        1.0       500.0     2000.0    4500.0    5000.0    6000.0
5000.0
0.        1.0       500.0     2000.0    4500.0    5000.0    6000.0
5000.0
```

Figure 1. Sample Card Input For Operation DWOPER (continued)

```
                                 - Column -
    5   10   15   20   25   30   35   40   45   50   55   60   65   70   75   80
----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+

0.        1.0       500.0     2000.0    4500.0    5000.0    6000.0
5000.0
0.        1.0       500.0     2000.0    4500.0    5000.0    6000.0
5000.0
0.        1.0       500.0     2000.0    4500.0    5000.0    6000.0
5000.0
0.        1.0       750.0     2200.0    4500.0    5000.0    6000.0
6000.0
0.        1.0       750.0     2200.0    4500.0    5000.0    6000.0
6000.0
0.        1.0       750.0     2200.0    4500.0    5000.0    6000.0
6000.0
0.        1.0       750.0     2200.0    4500.0    5000.0    6000.0
6000.0
0.        1.0       750.0     2200.0    4500.0    5000.0    6000.0
6000.0
0.        1.0       750.0     2200.0    4500.0    5000.0    6000.0
6000.0
0.        1.0       750.0     2200.0    4500.0    5000.0    6000.0
6000.0
0.        1.0       750.0     2200.0    4500.0    5000.0    6000.0
6000.0
0.        1.0       750.0     2200.0    4500.0    5000.0    6000.0
6000.0
0.        1.0       750.0     2200.0    4500.0    5000.0    6000.0
6000.0
    170.00    174.00    175.00    180.00    190.00    200.00    210.00
    230.00
    160.00    164.00    165.00    170.00    180.00    190.00    200.00
    220.00
    150.00    154.00    155.00    160.00    170.00    180.00    190.00
    210.00
    140.00    144.00    145.00    150.00    160.00    170.00    180.00
    200.00
    130.00    134.00    135.00    140.00    150.00    160.00    170.00
    190.00
    125.00    129.00    130.00    135.00    145.00    155.00    165.00
    185.00
    120.00    124.00    125.00    130.00    140.00    150.00    160.00
    180.00
    115.00    119.00    120.00    125.00    135.00    145.00    155.00
    175.00
    113.75    117.75    118.75    123.75    133.75    143.75    153.75
    173.00
    112.50    116.50    117.50    122.50    132.50    142.50    152.50
    172.50
    110.00    114.00    115.00    125.00    135.00    145.00    155.00
    165.00
    100.00    104.00    105.00    115.00    125.00    135.00    145.00
    155.00
     98.00    102.00    103.00    108.00    118.00    128.00    138.00
     158.00
     96.00    100.00    101.00    106.00    116.00    126.00    136.00
     156.00
     94.00     98.00     99.00    104.00    114.00    124.00    134.00
     154.00
     92.00     96.00     97.00    102.00    112.00    122.00    132.00
     152.00
     90.00     94.00     95.00    100.00    110.00    120.00    130.00
     150.00
```

Figure 1. Sample Card Input For Operation DWOPER (continued)

```
                                        - Column -
    5   10   15   20   25   30   35   40   45   50   55   60   65   70   75   80
----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+

     88.08     92.00     93.00     98.00    108.00    118.00    128.00
     148.00
     88.00     92.00     93.00     98.00    108.00    118.00    128.00
     148.00
     82.00     86.00     87.00     92.00    102.00    112.00    122.00
     142.00
     77.00     81.00     82.00     87.00     97.00    107.00    117.00
     137.00
     71.02     75.02     76.02     81.00     91.00    101.00    111.00
     130.00
     71.00     75.00     76.00     81.00     91.00    101.00    111.00
     130.00
     64.75     68.75     69.75     75.00     85.00     95.00    105.00
     120.00
     61.75     65.75     66.75     72.50     82.50     92.50    102.50
     120.00
     58.75     62.75     63.75     70.00     80.00     90.00    100.00
     120.00
     58.50     62.50     63.50     70.00     80.00     90.00    100.00
     120.00
     55.00     59.00     60.00     67.00     77.00     87.00     97.00
     117.00
     53.00     57.00     58.00     63.00     73.00     83.00     93.00
     113.00
     47.00     51.00     52.00     57.00     67.00     77.00     87.00
     107.00
     43.00     47.00     48.00     54.00     64.00     74.00     84.00
     104.00
     40.00     44.00     45.00     48.00     58.00     72.00     82.00
     98.00
     38.00     42.00     43.00     46.00     56.00     71.00     81.00
     96.00
     36.00     40.00     41.00     44.00     54.00     69.00     80.00
     190.00
     34.00     38.00     39.00     42.00     52.00     67.00     80.00
     188.00
     32.10     36.00     37.00     40.00     50.00     65.00     80.00
     186.00
     32.00     36.00     37.00     40.00     50.00     65.00     80.00
     186.00
     28.00     32.00     33.00     36.00     46.00     65.00     80.00
     180.00
     26.00     30.00     31.00     35.00     45.00     65.00     80.00
     179.00
     25.72     29.72     30.72     34.72     44.72     64.00     74.00
     178.00
     24.86     28.86     29.86     33.86     43.86     64.00     74.00
     178.00
     24.02     28.00     29.00     33.00     43.00     63.00     75.00
     178.00
     24.00     28.00     29.00     33.00     43.00     63.00     75.00
     178.00
     22.30     26.30     27.30     31.30     42.00     62.00     75.00
     178.00
     20.70     24.70     25.70     29.70     40.00     60.00     75.00
     178.00
     19.00     23.00     24.00     28.00     38.00     58.00     65.00
     165.00
     18.00     22.00     23.00     27.00     37.00     57.00     65.00
     165.00
```

Figure 1. Sample Card Input For Operation DWOPER (continued)

```
                                  - Column -
    5   10   15   20   25   30   35   40   45   50   55   60   65   70   75   80
----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+

     17.00     21.00     22.00     26.00     36.00     56.00     65.00
     155.00
     16.50     20.50     21.50     25.50     35.50     55.00     60.00
     160.00
     16.00     20.00     21.00     25.00     35.00     55.00     60.00
     160.00
     15.97     20.00     21.00     25.00     35.00     55.00     60.00
     160.00
     15.00     19.00     20.00     25.00     35.00     55.00     60.00
     160.00
     13.01     17.00     18.00     23.00     34.00     54.00     60.00
     160.00
     13.00     17.00     18.00     23.00     34.00     54.00     60.00
     160.00
      9.00     13.00     14.00     19.00     30.00     50.00     60.00
      160.00
      5.00      9.00     10.00     15.00     25.00     50.00     60.00
      160.00
      4.50      8.50      9.50     13.90     23.00     51.60     58.00
      158.00
      4.00      8.00      9.00     13.40     23.00     51.60     58.00
      158.00
      3.50      7.50      8.50     12.90     23.00     51.60     58.00
      158.00
      3.00      7.00      8.00     12.40     23.00     51.60     58.00
      158.00
0.
0.
0.
0.
0.
0.
0.
0.
0.
0.        10.0       100.0     150.0      250.0     400.0    2000.0
7500.0
0.        10.0       100.0     150.0      250.0     400.0    2000.0
7500.0
0.        10.0       100.0     150.0      250.0     400.0    2000.0
7500.0
0.        10.0       100.0     150.0      250.0     400.0    2000.0
7500.0
0.        10.0       100.0     150.0      250.0     400.0    2000.0
7500.0
0.        10.0       100.0     150.0      250.0     400.0    2000.0
7500.0
0.        10.0       100.0     150.0      250.0     400.0    2000.0
7500.0
0.        10.0       100.0     150.0      250.0     400.0    2000.0
7500.0
0.        10.0       100.0     150.0      250.0     400.0    2000.0
7500.0
0.        10.0       100.0     150.0      250.0     400.0    2000.0
7500.0
0.        10.0       100.0     150.0      250.0     400.0    2000.0
7500.0
0.        10.0       100.0     150.0      250.0     400.0    2000.0
7500.0
0.        10.0       100.0     150.0      250.0     400.0    2000.0
```

Figure 1. Sample Card Input For Operation DWOPER (continued)

```
                                        - Column -
    5   10   15   20   25   30   35   40   45   50   55   60   65   70   75   80
----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+

7500.0
0.        10.0       100.0     150.0      250.0     400.0    2000.0
7500.0
0.        10.0       100.0     150.0      250.0     400.0    2000.0
7500.0
0.        10.0       100.0     150.0      250.0     400.0    2000.0
7500.0
0.        10.0       100.0     150.0      250.0     400.0    2000.0
7500.0
0.        10.0       100.0     150.0      250.0     400.0    2000.0
7500.0
0.        10.0       100.0     150.0      250.0     400.0    2000.0
7500.0
0.        10.0       100.0     150.0      250.0     400.0    2000.0
7500.0
0.        10.0       100.0     150.0      250.0     400.0    2000.0
7500.0
80.0      84.0       85.0      90.0       95.0     100.0     110.0     1
140.0
78.0      82.0       83.0      88.0       93.0      98.0     108.0     1
138.0
77.0      81.0       82.0      87.0       92.0      97.0     107.0     1
137.0
76.0      80.0       81.0      86.0       91.0      96.0     106.0     1
136.0
75.0      79.0       80.0      85.0       90.0      95.0     105.0     1
135.0
74.0      78.0       79.0      84.0       89.0      94.0     104.0     1
134.0
73.0      77.0       78.0      83.0       88.0      93.0     103.0     1
133.0
72.0      76.0       77.0      82.0       87.0      92.0     102.0     1
132.0
71.0      75.0       76.0      81.0       86.0      91.0     101.0     1
131.0
70.0      74.0       75.0      80.0       85.0      90.0     100.0     1
130.0
69.0      73.0       74.0      79.0       84.0      89.0      99.0     1
129.0
68.0      72.0       73.0      78.0       83.0      88.0      98.0     1
128.0
67.0      71.0       72.0      77.0       82.0      87.0      97.0     1
127.0
66.0      70.0       71.0      76.0       81.0      86.0      96.0     1
126.0
65.0      69.0       70.0      75.0       80.0      85.0      95.0     1
125.0
64.0      68.0       69.0      74.0       79.0      84.0      94.0     1
124.0
63.0      67.0       68.0      73.0       78.0      83.0      93.0     1
123.0
62.0      66.0       67.0      72.0       77.0      82.0      92.0     1
122.0
61.0      65.0       66.0      71.0       76.0      81.0      91.0     1
121.0
60.0      64.0       65.0      70.0       75.0      80.0      90.0     1
120.0
58.6      62.6       63.6      70.0       75.0      80.0      90.0     1
120.0
0.
```

Figure 1. Sample Card Input For Operation DWOPER (continued)

```
                                        - Column -
    5   10   15   20   25   30   35   40   45   50   55   60   65   70   75   80
----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+

0.
0.
0.        5.0       100.0     500.0     1000.0    1200.0    1500.0
2000.0
0.        5.0       100.0     500.0     1000.0    1200.0    1500.0
2000.0
0.        5.0       100.0     500.0     1000.0    1200.0    1500.0
2000.0
0.        5.0       100.0     500.0     1000.0    1500.0    2000.0
4500.0
0.        5.0       100.0     500.0     1000.0    1500.0    2000.0
4500.0
0.        5.0       100.0     500.0     1000.0    1500.0    2000.0
4500.0
0.        5.0       100.0     500.0     1000.0    1500.0    2000.0
4500.0
0.        5.0       100.0     500.0     1000.0    1500.0    2000.0
2500.0
0.        5.0       100.0     500.0     1000.0    1500.0    2000.0
2500.0
0.        5.0       100.0     500.0     1000.0    1500.0    2000.0
2500.0
0.        5.0       100.0     500.0     1000.0    1500.0    2000.0
2500.0
0.        5.0       100.0     500.0     1000.0    1500.0    2000.0
2500.0
52.0      56.0      57.0       62.0      67.0      77.0      87.0
97.0
51.0      55.0      56.0       61.0      66.0      76.0      86.0
96.0
50.0      54.0      55.0       60.0      65.0      75.5      86.5
96.5
48.0      52.0      53.0       58.0      63.0      73.0      84.0
94.0
46.0      50.0      51.0       56.0      61.0      71.0      81.0
91.0
44.0      48.0      49.0       54.0      59.0      69.0      79.0
89.0
42.01     46.0      47.0       51.0      56.0      66.0      76.0
86.0
42.0      46.0      47.0       51.0      56.0      66.0      76.0
86.0
39.5      43.5      44.5       48.5      53.5      63.5      73.5
83.5
37.0      41.0      42.0       47.0      52.0      62.0      72.0
82.0
34.5      38.5      39.5       44.5      50.0      60.0      70.0
80.0
32.       36.       37.0       42.0      47.0      57.0      67.0
77.0
0.
0.
      0.0       10.0      25.0      175.0     5000.0    7500.0    8000.0
   8000.00
      0.0       10.0      25.0      175.0     5000.0    7500.0    8000.0
   8000.00
      0.0       10.0      25.0      175.0     5000.0    7500.0    8000.0
   8000.00
      0.0       10.0      25.0      175.0     5000.0    7500.0    8000.0
   8000.00
```

Figure 1. Sample Card Input For Operation DWOPER (continued)

```
                                   - Column -
    5   10   15   20   25   30   35   40   45   50   55   60   65   70   75   80
----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+

       0.0      10.0      25.0     175.0    5000.0    7500.0    8000.0
   8000.00
       0.0      10.0      25.0     175.0    5000.0    7500.0    8000.0
   8000.00
       0.0      10.0      25.0     175.0    5000.0    7500.0    8000.0
   8000.00
       0.0      10.0      25.0     175.0    5000.0    7500.0    8000.0
   8000.00
       0.0      10.0      25.0     175.0    5000.0    7500.0    8000.0
   8000.00
       0.0      10.0      25.0     175.0    5000.0    7500.0    8000.0
   8000.00
       0.0      10.0      25.0     175.0    5000.0    7500.0    8000.0
   8000.00
       0.0      10.0      25.0     175.0    5000.0    7500.0    8000.0
   8000.00
       0.0      10.0      25.0     175.0    5000.0    7500.0    8000.0
   8000.00
       0.0      10.0      25.0     175.0    5000.0    7500.0    8000.0
   8000.00
       0.0      10.0      25.0     175.0    5000.0    7500.0    8000.0
   8000.00
       0.0      10.0      25.0     175.0    5000.0    7500.0    8000.0
   8000.00
       0.0      10.0      25.0     175.0    5000.0    7500.0    8000.0
   8000.00
       0.0      10.0      25.0     175.0    5000.0    7500.0    8000.0
   8000.00
       0.0      10.0      25.0     175.0    5000.0    7500.0    8000.0
   8000.00
       0.0      10.0      25.0     175.0    5000.0    7500.0    8000.0
   8000.00
      40.0      44.0      45.0      51.0      66.0      76.0      86.0
     190.0
      38.0      42.0      43.0      49.0      64.0      74.0      84.0
     190.0
      36.0      40.0      41.0      47.0      62.0      72.0      82.0
     190.0
      34.0      38.0      39.0      45.0      60.0      70.0      80.0
     190.0
      33.0      37.0      38.0      44.0      59.0      69.0      79.0
     190.0
      32.0      36.0      37.0      43.0      58.0      68.0      78.0
     190.0
      31.0      35.0      36.0      42.0      57.0      67.0      77.0
     190.0
      30.0      34.0      35.0      41.0      56.0      66.0      76.0
     190.0
      29.0      33.0      34.0      40.0      55.0      65.0      75.0
     190.0
      28.5      32.5      33.5      39.5      54.5      64.5      74.5
     189.0
      28.0      32.0      33.0      39.0      54.0      64.0      74.0
     188.0
      27.5      31.5      32.5      38.5      53.5      63.5      73.5
     187.0
      27.0      31.0      32.0      38.0      53.0      63.0      73.0
     186.0
      26.5      30.5      31.5      37.5      52.5      62.5      72.5
     185.0
```

Figure 1. Sample Card Input For Operation DWOPER (continued)

```
                                    - Column -
    5   10   15   20   25   30   35   40   45   50   55   60   65   70   75   80
----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+

      26.0      30.0      31.0      37.0      52.0      62.0      72.0
     184.0
      25.5      29.5      30.5      36.5      51.5      61.5      71.5
     183.0
      25.0      29.0      30.0      36.0      51.0      61.0      71.0
     182.0
     24.50      28.5      29.5      35.5      50.5      60.5      70.5
    181.0
     24.25     28.25     29.25     35.25     50.25     60.25     70.25
    180.5
      24.0      28.0      29.0      35.0      50.0      60.0      70.0
     180.0
0.
0.
0.
         0         0         4         0
         4         5         6         7
 0.0      500.0     2500.0    2500.0      0.0
58.0      63.0      73.0      84.0       94.0
 0.
 0.0      500.0     2500.0    2500.0      0.0
56.0      61.0      71.0      81.0       91.0
 0.
 0.0      500.0     2500.0    2500.0      0.0
54.0      59.0      69.0      79.0       89.0
 0.
 0.0      500.0     2500.0    2500.0      0.0
51.0      56.0      66.0      76.0       86.0
 0.
TLSSW     STG      1  190.0   175.0
HATSW     STG     30   67.0    52.0
MSY       STG     39   45.0    31.0
GLFSW     STG     60   20.4    8.00
GDWSW     STG      1  102.0   85.00
PORSE     STG      1   87.0    57.0
GLMSW     STG      1   54.0    40.0
HATSW     SQIN    30
HATSW     SSTG    30  52.
MSY       SQIN    39
MSY       SSTG    39  31.
GLFSW     SQIN    60
GLFSW     SSTG    60   8.
HATSWU    SQIN    18
HATSWL    SQIN    22
GLFSWLOC  SQIN    50
JNESW     PELV
JNESW     GTCS
TLSSW     SQIN      100.
GDWSW     SQIN       10.
PORSE     QINE      100.
GLMSW     QINE       10.
0.        0.         0.        0.        0.        0.        0.
0.        0.         0.        0.        0.        0.        0.
0.        0.         0.        0.        0.        0.        0.
0.        0.         0.        0.        0.        0.        0.
0.        0.         0.        0.        0.        0.        0.
0.        0.         0.        0.        0.        0.        0.
0.        0.         0.        0.        0.        0.        0.
0.        0.         0.       11.28
```

Figure 1. Sample Card Input For Operation DWOPER (continued)

```
                                        - Column -
    5   10   15   20   25   30   35   40   45   50   55   60   65   70   75   80
----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+

0.        0.         0.        0.        0.        0.        0.
0.        0.         0.        0.        0.        0.        0.
0.        0.         0.        0.        0.        0.        0.
0.        0.         0.        0.        0.        0.        0.
0.        0.         0.        0.        0.        0.        0.
0.        0.         0.        0.        0.        0.        0.
0.        0.         0.        0.        0.        0.        0.
0.        0.         0.        0.        0.        0.        0.
599.
0.
0.
0.
0.
0.
0.
0.
0.
17.
0.
0.
1069.
0.
32.
0.
0.
19.       26.       15.
-999.
        0
  ** END OF DATA ON TEXORADO RIVER:  TULSA - GULF OF MEXICO ---
```

Figure 2. Sample Output From Operation DWOPER Print Parameter Routine

```
*******************

DWOPER   OPERATION     NAME=GLFSW        PREVIOUS NAME=

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


                     DYNAMIC WAVE OPERATION

       JN NBMAX
         4   60


          DHF      DHFO       TM        KITPR
            6.        6.      6.00         1


         EPSY     EPSQ     EPSQJ      THETA       F1      XFACT
        0.0100      1.00      1.00    0.8000    0.6000   5280.00


           NU        NCT       ICD      NYQD      ITMAX     NCML      KTERM
            1          0         1         0         9         8          0


           NCS      NCSS       NP        KPL      KPL2       JNK      NPEND
            8         5         0         1         1         0          0


        NB(1)   NJUN(J)    ATF(J)   COFW(J)  VWIND(J) WINAGL(J), J=1,JN
           60                         0.00      0.00      0.00
           21        26     90.00      0.00      0.00      0.00
           12        36     90.00      0.00      0.00      0.00
           20        42     90.00      0.00      0.00      0.00


    KU(J), J=1,JN
            2         2         2         2


    KD(J), J=1,JN
            4         1         1         1


    NRT1(J), J=1,JN
            4         1         1         1


    NSTR(J), J=1,JN
            6         0         0         0


    NQL(J), J=1,JN
            3         0         0         0


    NDIV(J), J=1,JN
            0         0         0         0


    NWJ(J), J=1,JN
            0         0         0         0


    NUMLAD(J), J=1,JN
            0         0         1         0


      LAD(1,L)  POLTAR(L) CHCTW(L)    GZPL(L)  LAD(2,L),  L=1,NUMLAD(3)
            7     51.37      1.20      0.00         8


    NNYQ(J), J=1,JN
            1         1         1         1


    NRCM1(J), J=1,JN
            4         1         1         1


    NCM(K,1), K=1,NRCM1(1)
           30        39        60        61


    NCM(K,2), K=1,NRCM1(2)
           21
```

Figure 2. Sample Output From Operation DWOPER Print Parameter Routine (continued)

```
NCM(K,3), K=1,NRCM1(3)
        12


NCM(K,4), K=1,NRCM1(4)
        20


YQCM(L,K,1), K=1,NRCM1(1), L=1,NCM
        0.00      500.00    10000.00    20000.00    75000.00   100000.00   150000.00   250000.00
        0.00      500.00    10000.00    20000.00   100000.00   125000.00   150000.00   300000.00
        0.00     1000.00    25000.00    50000.00   100000.00   150000.00   200000.00   300000.00
        0.00     1000.00    25000.00    50000.00   100000.00   150000.00   200000.00   300000.00


YQCM(L,K,2), K=1,NRCM1(2), L=1,NCM
        0.00      500.00     5000.00    10000.00    15000.00    20000.00    30000.00    75000.00


YQCM(L,K,3), K=1,NRCM1(3), L=1,NCM
        0.00      500.00     5000.00    10000.00    50000.00    75000.00    90000.00   200000.00


YQCM(L,K,4), K=1,NRCM1(4), L=1,NCM
    -50000.00    -5000.00        0.00     1000.00     2000.00     5000.00    20000.00    45000.00


CM(L,K,1), K=1,NRCM1(1), L=1,NCM
   0.035000  0.035000  0.035000  0.035000  0.035000  0.035000  0.035000  0.035000
   0.035400  0.032400  0.027000  0.025500  0.030000  0.030000  0.030000  0.030000
   0.030000  0.030000  0.030000  0.030000  0.030000  0.030000  0.030000  0.030000
   0.030000  0.030000  0.030000  0.030000  0.030000  0.030000  0.030000  0.030000


CM(L,K,2), K=1,NRCM1(2), L=1,NCM
   0.027000  0.030000  0.038000  0.045000  0.047000  0.050000  0.050000  0.050000


CM(L,K,3), K=1,NRCM1(3), L=1,NCM
   0.027000  0.025000  0.023000  0.028000  0.035000  0.035000  0.035000  0.035000


CM(L,K,4), K=1,NRCM1(4), L=1,NCM
   0.040000  0.035000  0.025000  0.020000  0.020000  0.025000  0.035000  0.040000


X(I,1), I=1,NB(1)
       190.00      189.00      188.00      187.00      186.00      185.00      184.00      183.00      182.75      182.50
       182.00      180.00      179.50      179.00      178.50      178.00      177.50      177.10      177.00      175.00
       172.50      170.01      170.00      167.50      166.30      165.10      165.00      163.50      162.50      160.00
       157.50      155.00      153.75      152.50      151.30      150.10      150.00      126.00      116.60      115.00
       110.00      105.10      105.00      100.00       95.00       90.00       85.00       84.75       82.11       79.25
        79.20       75.00       67.55       67.50       50.64       33.75       25.32       16.89        8.46        0.00


FKC(I,1), I=1,NB(1)
        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00
        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00
        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00
        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00
        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00
        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00


X(I,2), I=1,NB(2)
        20.00       19.00       18.00       17.00       16.00       15.00       14.00       13.00       12.00       11.00
        10.00        9.00        8.00        7.00        6.00        5.00        4.00        3.00        2.00        1.00
         0.00


FKC(I,2), I=1,NB(2)
        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00
        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00
        0.00


X(I,3), I=1,NB(3)
        20.00       19.00       18.00       16.00       14.00       12.00       10.01       10.00        7.50        5.00
         2.50        0.00


FKC(I,3), I=1,NB(3)
        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00
        0.00        0.00


X(I,4), I=1,NB(4)
        44.00       41.00       38.00       35.00       32.00       29.00       26.00       23.00       20.00       18.00
        16.00       14.00       12.00       10.00        8.00        6.00        4.00        2.00        1.00        0.00
```

Figure 2. Sample Output From Operation DWOPER Print Parameter Routine (continued)

```
FKC(I,4), I=1,NB(4)
        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00
        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00


BS(K,I,1), K=1,NCS
  I=  1        0.00      1.00     50.00    500.00   1000.00   2000.00   5000.00   7500.00
  I=  2        0.00      1.00     50.00    500.00   1000.00   2000.00   5000.00   7500.00
  I=  3        0.00      1.00     50.00    500.00   1000.00   2000.00   5000.00   7500.00
  I=  4        0.00      1.00     50.00    500.00   1000.00   2000.00   5000.00   7500.00
  I=  5        0.00      1.00     50.00    500.00   1000.00   2000.00   5000.00   7500.00
  I=  6        0.00      1.00     50.00    500.00   1000.00   2000.00   5000.00   7500.00
  I=  7        0.00      1.00     50.00    500.00   1000.00   2000.00   5000.00   7500.00
  I=  8        0.00      1.00     50.00    500.00   1000.00   2000.00   5000.00   7500.00
  I=  9        0.00      1.00     50.00    500.00   1000.00   2000.00   5000.00   7500.00
  I= 10        0.00      1.00     50.00    500.00   1000.00   2000.00   5000.00   7500.00
  I= 11        0.00      1.00     50.00    500.00   1000.00   2000.00   5000.00   7500.00
  I= 12        0.00      1.00     50.00    500.00   1000.00   2000.00   5000.00   7500.00
  I= 13        0.00      1.00     50.00    500.00   1000.00   2000.00   5000.00   7500.00
  I= 14        0.00      1.00     50.00    500.00   1000.00   2000.00   5000.00   7500.00
  I= 15        0.00      1.00     50.00    500.00   1000.00   2000.00   5000.00   7500.00
  I= 16        0.00      1.00     50.00    500.00   1000.00   2000.00   5000.00   7500.00
  I= 17        0.00      1.00     50.00    500.00   1000.00   2000.00   5000.00   7500.00
  I= 18        0.00      1.00     50.00    500.00   1000.00   2000.00   5000.00   7500.00
  I= 19        0.00      1.00     50.00    500.00   1000.00   2000.00   5000.00   7500.00
  I= 20        0.00      1.00     50.00    500.00   1000.00   2000.00   5000.00   7500.00
  I= 21        0.00      1.00     50.00    500.00   1000.00   2000.00   5000.00   7500.00
  I= 22        0.00      1.00     50.00    500.00   1000.00   2000.00   5000.00   7500.00
  I= 23        0.00      1.00     50.00    500.00   1000.00   2000.00   5000.00   7500.00
  I= 24        0.00      1.00    100.00    500.00   2000.00   3000.00   5000.00   7500.00
  I= 25        0.00      1.00    100.00    500.00   2500.00   3250.00   5000.00   7500.00
  I= 26        0.00      1.00    150.00    800.00   3000.00   3500.00   5000.00   7500.00
  I= 27        0.00      1.00    150.00   1000.00   3500.00   3500.00   5000.00   7500.00
  I= 28        0.00      1.00    150.00   1000.00   3500.00   3500.00   5000.00   7500.00
  I= 29        0.00      1.00    150.00   1000.00   3500.00   3500.00   5000.00   7500.00
  I= 30        0.00      1.00    150.00    500.00   1000.00   2000.00   3500.00   3500.00
  I= 31        0.00      1.00    150.00    500.00   1000.00   2000.00   3500.00   3500.00
  I= 32        0.00      1.00    150.00    500.00   1000.00   2000.00   3500.00   3500.00
  I= 33        0.00      1.00    150.00    500.00   1000.00   2000.00   3500.00   3500.00
  I= 34        0.00      1.00    150.00    500.00   1000.00   2000.00   3500.00   3500.00
  I= 35        0.00      1.00    150.00    500.00   1000.00   2000.00   3500.00   3500.00
  I= 36        0.00      1.00    150.00    500.00   1000.00   2000.00   3500.00   3500.00
  I= 37        0.00      1.00    500.00   1000.00   1500.00   3000.00   3500.00   3800.00
  I= 38        0.00      1.00    500.00   2000.00   3000.00   5000.00   6000.00   3800.00
  I= 39        0.00      1.00    500.00   2000.00   4500.00   5000.00   6000.00   3800.00
  I= 40        0.00      1.00    500.00   2000.00   4500.00   5000.00   6000.00   3800.00
  I= 41        0.00      1.00    500.00   2000.00   4500.00   5000.00   6000.00   5000.00
  I= 42        0.00      1.00    500.00   2000.00   4500.00   5000.00   6000.00   5000.00
  I= 43        0.00      1.00    500.00   2000.00   4500.00   5000.00   6000.00   5000.00
  I= 44        0.00      1.00    500.00   2000.00   4500.00   5000.00   6000.00   5000.00
  I= 45        0.00      1.00    500.00   2000.00   4500.00   5000.00   6000.00   5000.00
  I= 46        0.00      1.00    500.00   2000.00   4500.00   5000.00   6000.00   5000.00
  I= 47        0.00      1.00    500.00   2000.00   4500.00   5000.00   6000.00   5000.00
  I= 48        0.00      1.00    500.00   2000.00   4500.00   5000.00   6000.00   5000.00
  I= 49        0.00      1.00    500.00   2000.00   4500.00   5000.00   6000.00   5000.00
  I= 50        0.00      1.00    500.00   2000.00   4500.00   5000.00   6000.00   5000.00
  I= 51        0.00      1.00    750.00   2200.00   4500.00   5000.00   6000.00   6000.00
  I= 52        0.00      1.00    750.00   2200.00   4500.00   5000.00   6000.00   6000.00
  I= 53        0.00      1.00    750.00   2200.00   4500.00   5000.00   6000.00   6000.00
  I= 54        0.00      1.00    750.00   2200.00   4500.00   5000.00   6000.00   6000.00
  I= 55        0.00      1.00    750.00   2200.00   4500.00   5000.00   6000.00   6000.00
  I= 56        0.00      1.00    750.00   2200.00   4500.00   5000.00   6000.00   6000.00
  I= 57        0.00      1.00    750.00   2200.00   4500.00   5000.00   6000.00   6000.00
  I= 58        0.00      1.00    750.00   2200.00   4500.00   5000.00   6000.00   6000.00
  I= 59        0.00      1.00    750.00   2200.00   4500.00   5000.00   6000.00   6000.00
  I= 60        0.00      1.00    750.00   2200.00   4500.00   5000.00   6000.00   6000.00


HS(K,I,1), K=1,NCS
  I=  1      170.00    174.00    175.00    180.00    190.00    200.00    210.00    230.00
  I=  2      160.00    164.00    165.00    170.00    180.00    190.00    200.00    220.00
  I=  3      150.00    154.00    155.00    160.00    170.00    180.00    190.00    210.00
  I=  4      140.00    144.00    145.00    150.00    160.00    170.00    180.00    200.00
  I=  5      130.00    134.00    135.00    140.00    150.00    160.00    170.00    190.00
  I=  6      125.00    129.00    130.00    135.00    145.00    155.00    165.00    185.00
  I=  7      120.00    124.00    125.00    130.00    140.00    150.00    160.00    180.00
  I=  8      115.00    119.00    120.00    125.00    135.00    145.00    155.00    175.00
  I=  9      113.75    117.75    118.75    123.75    133.75    143.75    153.75    173.00
  I= 10      112.50    116.50    117.50    122.50    132.50    142.50    152.50    172.50
  I= 11      110.00    114.00    115.00    125.00    135.00    145.00    155.00    165.00
  I= 12      100.00    104.00    105.00    115.00    125.00    135.00    145.00    155.00
  I= 13       98.00    102.00    103.00    108.00    118.00    128.00    138.00    158.00
  I= 14       96.00    100.00    101.00    106.00    116.00    126.00    136.00    156.00
  I= 15       94.00     98.00     99.00    104.00    114.00    124.00    134.00    154.00
  I= 16       92.00     96.00     97.00    102.00    112.00    122.00    132.00    152.00
  I= 17       90.00     94.00     95.00    100.00    110.00    120.00    130.00    150.00
  I= 18       88.08     92.00     93.00     98.00    108.00    118.00    128.00    148.00
  I= 19       88.00     92.00     93.00     98.00    108.00    118.00    128.00    148.00
```

Figure 2. Sample Output From Operation DWOPER Print Parameter Routine (continued)

I= 20	82.00	86.00	87.00	92.00	102.00	112.00	122.00	142.00
I= 21	77.00	81.00	82.00	87.00	97.00	107.00	117.00	137.00
I= 22	71.02	75.02	76.02	81.00	91.00	101.00	111.00	130.00
I= 23	71.00	75.00	76.00	81.00	91.00	101.00	111.00	130.00
I= 24	64.75	68.75	69.75	75.00	85.00	95.00	105.00	120.00
I= 25	61.75	65.75	66.75	72.50	82.50	92.50	102.50	120.00
I= 26	58.75	62.75	63.75	70.00	80.00	90.00	100.00	120.00
I= 27	58.50	62.50	63.50	70.00	80.00	90.00	100.00	120.00
I= 28	55.00	59.00	60.00	67.00	77.00	87.00	97.00	117.00
I= 29	53.00	57.00	58.00	63.00	73.00	83.00	93.00	113.00
I= 30	47.00	51.00	52.00	57.00	67.00	77.00	87.00	107.00
I= 31	43.00	47.00	48.00	54.00	64.00	74.00	84.00	104.00
I= 32	40.00	44.00	45.00	48.00	58.00	72.00	82.00	98.00
I= 33	38.00	42.00	43.00	46.00	56.00	71.00	81.00	96.00
I= 34	36.00	40.00	41.00	44.00	54.00	69.00	80.00	190.00
I= 35	34.00	38.00	39.00	42.00	52.00	67.00	80.00	188.00
I= 36	32.10	36.00	37.00	40.00	50.00	65.00	80.00	186.00
I= 37	32.00	36.00	37.00	40.00	50.00	65.00	80.00	186.00
I= 38	28.00	32.00	33.00	36.00	46.00	65.00	80.00	180.00
I= 39	26.00	30.00	31.00	35.00	45.00	65.00	80.00	179.00
I= 40	25.72	29.72	30.72	34.72	44.72	64.00	74.00	178.00
I= 41	24.86	28.86	29.86	33.86	43.86	64.00	74.00	178.00
I= 42	24.02	28.00	29.00	33.00	43.00	63.00	75.00	178.00
I= 43	24.00	28.00	29.00	33.00	43.00	63.00	75.00	178.00
I= 44	22.30	26.30	27.30	31.30	42.00	62.00	75.00	178.00
I= 45	20.70	24.70	25.70	29.70	40.00	60.00	75.00	178.00
I= 46	19.00	23.00	24.00	28.00	38.00	58.00	65.00	165.00
I= 47	18.00	22.00	23.00	27.00	37.00	57.00	65.00	165.00
I= 48	17.00	21.00	22.00	26.00	36.00	56.00	65.00	155.00
I= 49	16.50	20.50	21.50	25.50	35.50	55.00	60.00	160.00
I= 50	16.00	20.00	21.00	25.00	35.00	55.00	60.00	160.00
I= 51	15.97	20.00	21.00	25.00	35.00	55.00	60.00	160.00
I= 52	15.00	19.00	20.00	25.00	35.00	55.00	60.00	160.00
I= 53	13.01	17.00	18.00	23.00	34.00	54.00	60.00	160.00
I= 54	13.00	17.00	18.00	23.00	34.00	54.00	60.00	160.00
I= 55	9.00	13.00	14.00	19.00	30.00	50.00	60.00	160.00
I= 56	5.00	9.00	10.00	15.00	25.00	50.00	60.00	160.00
I= 57	4.50	8.50	9.50	13.90	23.00	51.60	58.00	158.00
I= 58	4.00	8.00	9.00	13.40	23.00	51.60	58.00	158.00
I= 59	3.50	7.50	8.50	12.90	23.00	51.60	58.00	158.00
I= 60	3.00	7.00	8.00	12.40	23.00	51.60	58.00	158.00

AS(K,I,1), K=1,NCS

I= 1	0.00	2.00	27.50	1402.50	8902.50	23902.50	58902.50	183902.50
I= 2	0.00	2.00	27.50	1402.50	8902.50	23902.50	58902.50	183902.50
I= 3	0.00	2.00	27.50	1402.50	8902.50	23902.50	58902.50	183902.50
I= 4	0.00	2.00	27.50	1402.50	8902.50	23902.50	58902.50	183902.50
I= 5	0.00	2.00	27.50	1402.50	8902.50	23902.50	58902.50	183902.50
I= 6	0.00	2.00	27.50	1402.50	8902.50	23902.50	58902.50	183902.50
I= 7	0.00	2.00	27.50	1402.50	8902.50	23902.50	58902.50	183902.50
I= 8	0.00	2.00	27.50	1402.50	8902.50	23902.50	58902.50	183902.50
I= 9	0.00	2.00	27.50	1402.50	8902.50	23902.50	58902.50	179215.00
I= 10	0.00	2.00	27.50	1402.50	8902.50	23902.50	58902.50	183902.50
I= 11	0.00	2.00	27.50	2777.50	10277.50	25277.50	60277.50	122777.50
I= 12	0.00	2.00	27.50	2777.50	10277.50	25277.50	60277.50	122777.50
I= 13	0.00	2.00	27.50	1402.50	8902.50	23902.50	58902.50	183902.50
I= 14	0.00	2.00	27.50	1402.50	8902.50	23902.50	58902.50	183902.50
I= 15	0.00	2.00	27.50	1402.50	8902.50	23902.50	58902.50	183902.50
I= 16	0.00	2.00	27.50	1402.50	8902.50	23902.50	58902.50	183902.50
I= 17	0.00	2.00	27.50	1402.50	8902.50	23902.50	58902.50	183902.50
I= 18	0.00	1.96	27.46	1402.46	8902.46	23902.46	58902.46	183902.47
I= 19	0.00	2.00	27.50	1402.50	8902.50	23902.50	58902.50	183902.50
I= 20	0.00	2.00	27.50	1402.50	8902.50	23902.50	58902.50	183902.50
I= 21	0.00	2.00	27.50	1402.50	8902.50	23902.50	58902.50	183902.50
I= 22	0.00	2.00	27.50	1397.00	8897.00	23897.00	58897.00	177647.00
I= 23	0.00	2.00	27.50	1402.50	8902.50	23902.50	58902.50	177652.50
I= 24	0.00	2.00	52.50	1627.50	14127.50	39127.50	79127.50	172877.50
I= 25	0.00	2.00	52.50	1777.50	16777.50	45527.50	86777.50	196152.50
I= 26	0.00	2.00	77.50	3046.25	22046.25	54546.25	97046.25	222046.25
I= 27	0.00	2.00	77.50	3815.00	26315.00	61315.00	103815.00	228815.00
I= 28	0.00	2.00	77.50	4102.50	26602.50	61602.50	104102.50	229102.50
I= 29	0.00	2.00	77.50	2952.50	25452.50	60452.50	102952.50	227952.50
I= 30	0.00	2.00	77.50	1702.50	9202.50	24202.50	51702.50	121702.50
I= 31	0.00	2.00	77.50	2027.50	9527.50	24527.50	52027.50	122027.50
I= 32	0.00	2.00	77.50	1052.50	8552.50	29552.50	57052.50	113052.50
I= 33	0.00	2.00	77.50	1052.50	8552.50	31052.50	58552.50	111052.50
I= 34	0.00	2.00	77.50	1052.50	8552.50	31052.50	61302.50	446302.50
I= 35	0.00	2.00	77.50	1052.50	8552.50	31052.50	66802.50	444802.50
I= 36	0.00	1.95	77.45	1052.45	8552.45	31052.45	72302.45	443302.44
I= 37	0.00	2.00	252.50	2502.50	15002.50	48752.50	97502.50	484402.50
I= 38	0.00	2.00	252.50	4002.50	29002.50	105002.50	187502.50	677502.50
I= 39	0.00	2.00	252.50	5252.50	37752.50	132752.50	215252.50	700352.50
I= 40	0.00	2.00	252.50	5252.50	37752.50	129332.50	184332.50	693932.50
I= 41	0.00	2.00	252.50	5252.50	37752.50	133417.50	188417.50	760417.50
I= 42	0.00	1.99	252.49	5252.49	37752.49	132752.50	198752.50	765252.50
I= 43	0.00	2.00	252.50	5252.50	37752.50	132752.50	198752.50	765252.50
I= 44	0.00	2.00	252.50	5252.50	40027.50	135027.50	206527.50	773027.50
I= 45	0.00	2.00	252.50	5252.50	38727.50	133727.50	216227.50	782727.50

Figure 2. Sample Output From Operation DWOPER Print Parameter Routine (continued)

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  I= 46        0.00      2.00    252.50   5252.50  37752.50 132752.50 171252.50 721252.50
  I= 47        0.00      2.00    252.50   5252.50  37752.50 132752.50 176752.50 726752.50
  I= 48        0.00      2.00    252.50   5252.50  37752.50 132752.50 182252.50 677252.50
  I= 49        0.00      2.00    252.50   5252.50  37752.50 130377.50 157877.50 707877.50
  I= 50        0.00      2.00    252.50   5252.50  37752.50 132752.50 160252.50 710252.50
  I= 51        0.00      2.01    377.52   6277.52  39777.52 134777.52 162277.52 762277.50
  I= 52        0.00      2.00    377.50   7752.50  41252.50 136252.50 163752.50 763752.50
  I= 53        0.00      1.99    377.49   7752.50  44602.50 139602.50 172602.50 772602.50
  I= 54        0.00      2.00    377.50   7752.50  44602.50 139602.50 172602.50 772602.50
  I= 55        0.00      2.00    377.50   7752.50  44602.50 139602.50 194602.50 794602.50
  I= 56        0.00      2.00    377.50   7752.50  41252.50 160002.50 215002.50 815002.50
  I= 57        0.00      2.00    377.50   6867.50  37352.50 173202.50 208402.50 808402.50
  I= 58        0.00      2.00    377.50   6867.50  39027.50 174877.50 210077.50 810077.50
  I= 59        0.00      2.00    377.50   6867.50  40702.50 176552.50 211752.50 811752.50
  I= 60        0.00      2.00    377.50   6867.50  42377.50 178227.50 213427.50 813427.50


BS(K,I,2), K=1,NCS
  I=  1        0.00     10.00    100.00    150.00    250.00    400.00   2000.00   7500.00
  I=  2        0.00     10.00    100.00    150.00    250.00    400.00   2000.00   7500.00
  I=  3        0.00     10.00    100.00    150.00    250.00    400.00   2000.00   7500.00
  I=  4        0.00     10.00    100.00    150.00    250.00    400.00   2000.00   7500.00
  I=  5        0.00     10.00    100.00    150.00    250.00    400.00   2000.00   7500.00
  I=  6        0.00     10.00    100.00    150.00    250.00    400.00   2000.00   7500.00
  I=  7        0.00     10.00    100.00    150.00    250.00    400.00   2000.00   7500.00
  I=  8        0.00     10.00    100.00    150.00    250.00    400.00   2000.00   7500.00
  I=  9        0.00     10.00    100.00    150.00    250.00    400.00   2000.00   7500.00
  I= 10        0.00     10.00    100.00    150.00    250.00    400.00   2000.00   7500.00
  I= 11        0.00     10.00    100.00    150.00    250.00    400.00   2000.00   7500.00
  I= 12        0.00     10.00    100.00    150.00    250.00    400.00   2000.00   7500.00
  I= 13        0.00     10.00    100.00    150.00    250.00    400.00   2000.00   7500.00
  I= 14        0.00     10.00    100.00    150.00    250.00    400.00   2000.00   7500.00
  I= 15        0.00     10.00    100.00    150.00    250.00    400.00   2000.00   7500.00
  I= 16        0.00     10.00    100.00    150.00    250.00    400.00   2000.00   7500.00
  I= 17        0.00     10.00    100.00    150.00    250.00    400.00   2000.00   7500.00
  I= 18        0.00     10.00    100.00    150.00    250.00    400.00   2000.00   7500.00
  I= 19        0.00     10.00    100.00    150.00    250.00    400.00   2000.00   7500.00
  I= 20        0.00     10.00    100.00    150.00    250.00    400.00   2000.00   7500.00
  I= 21        0.00     10.00    100.00    150.00    250.00    400.00   2000.00   7500.00


HS(K,I,2), K=1,NCS
  I=  1       80.00     84.00     85.00     90.00     95.00    100.00    110.00    140.00
  I=  2       78.00     82.00     83.00     88.00     93.00     98.00    108.00    138.00
  I=  3       77.00     81.00     82.00     87.00     92.00     97.00    107.00    137.00
  I=  4       76.00     80.00     81.00     86.00     91.00     96.00    106.00    136.00
  I=  5       75.00     79.00     80.00     85.00     90.00     95.00    105.00    135.00
  I=  6       74.00     78.00     79.00     84.00     89.00     94.00    104.00    134.00
  I=  7       73.00     77.00     78.00     83.00     88.00     93.00    103.00    133.00
  I=  8       72.00     76.00     77.00     82.00     87.00     92.00    102.00    132.00
  I=  9       71.00     75.00     76.00     81.00     86.00     91.00    101.00    131.00
  I= 10       70.00     74.00     75.00     80.00     85.00     90.00    100.00    130.00
  I= 11       69.00     73.00     74.00     79.00     84.00     89.00     99.00    129.00
  I= 12       68.00     72.00     73.00     78.00     83.00     88.00     98.00    128.00
  I= 13       67.00     71.00     72.00     77.00     82.00     87.00     97.00    127.00
  I= 14       66.00     70.00     71.00     76.00     81.00     86.00     96.00    126.00
  I= 15       65.00     69.00     70.00     75.00     80.00     85.00     95.00    125.00
  I= 16       64.00     68.00     69.00     74.00     79.00     84.00     94.00    124.00
  I= 17       63.00     67.00     68.00     73.00     78.00     83.00     93.00    123.00
  I= 18       62.00     66.00     67.00     72.00     77.00     82.00     92.00    122.00
  I= 19       61.00     65.00     66.00     71.00     76.00     81.00     91.00    121.00
  I= 20       60.00     64.00     65.00     70.00     75.00     80.00     90.00    120.00
  I= 21       58.60     62.60     63.60     70.00     75.00     80.00     90.00    120.00


AS(K,I,2), K=1,NCS
  I=  1        0.00     20.00     75.00    700.00   1700.00   3325.00  15325.00 157825.00
  I=  2        0.00     20.00     75.00    700.00   1700.00   3325.00  15325.00 157825.00
  I=  3        0.00     20.00     75.00    700.00   1700.00   3325.00  15325.00 157825.00
  I=  4        0.00     20.00     75.00    700.00   1700.00   3325.00  15325.00 157825.00
  I=  5        0.00     20.00     75.00    700.00   1700.00   3325.00  15325.00 157825.00
  I=  6        0.00     20.00     75.00    700.00   1700.00   3325.00  15325.00 157825.00
  I=  7        0.00     20.00     75.00    700.00   1700.00   3325.00  15325.00 157825.00
  I=  8        0.00     20.00     75.00    700.00   1700.00   3325.00  15325.00 157825.00
  I=  9        0.00     20.00     75.00    700.00   1700.00   3325.00  15325.00 157825.00
  I= 10        0.00     20.00     75.00    700.00   1700.00   3325.00  15325.00 157825.00
  I= 11        0.00     20.00     75.00    700.00   1700.00   3325.00  15325.00 157825.00
  I= 12        0.00     20.00     75.00    700.00   1700.00   3325.00  15325.00 157825.00
  I= 13        0.00     20.00     75.00    700.00   1700.00   3325.00  15325.00 157825.00
  I= 14        0.00     20.00     75.00    700.00   1700.00   3325.00  15325.00 157825.00
  I= 15        0.00     20.00     75.00    700.00   1700.00   3325.00  15325.00 157825.00
  I= 16        0.00     20.00     75.00    700.00   1700.00   3325.00  15325.00 157825.00
  I= 17        0.00     20.00     75.00    700.00   1700.00   3325.00  15325.00 157825.00
  I= 18        0.00     20.00     75.00    700.00   1700.00   3325.00  15325.00 157825.00
  I= 19        0.00     20.00     75.00    700.00   1700.00   3325.00  15325.00 157825.00
  I= 20        0.00     20.00     75.00    700.00   1700.00   3325.00  15325.00 157825.00
  I= 21        0.00     20.00     75.00    875.00   1875.00   3500.00  15500.00 158000.00
```

Figure 2. Sample Output From Operation DWOPER Print Parameter Routine (continued)

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BS(K,I,3), K=1,NCS
  I=  1         0.00      5.00    100.00    500.00   1000.00   1200.00   1500.00   2000.00
  I=  2         0.00      5.00    100.00    500.00   1000.00   1200.00   1500.00   2000.00
  I=  3         0.00      5.00    100.00    500.00   1000.00   1200.00   1500.00   2000.00
  I=  4         0.00      5.00    100.00    500.00   1000.00   1500.00   2000.00   4500.00
  I=  5         0.00      5.00    100.00    500.00   1000.00   1500.00   2000.00   4500.00
  I=  6         0.00      5.00    100.00    500.00   1000.00   1500.00   2000.00   4500.00
  I=  7         0.00      5.00    100.00    500.00   1000.00   1500.00   2000.00   4500.00
  I=  8         0.00      5.00    100.00    500.00   1000.00   1500.00   2000.00   2500.00
  I=  9         0.00      5.00    100.00    500.00   1000.00   1500.00   2000.00   2500.00
  I= 10         0.00      5.00    100.00    500.00   1000.00   1500.00   2000.00   2500.00
  I= 11         0.00      5.00    100.00    500.00   1000.00   1500.00   2000.00   2500.00
  I= 12         0.00      5.00    100.00    500.00   1000.00   1500.00   2000.00   2500.00


HS(K,I,3), K=1,NCS
  I=  1        52.00     56.00     57.00     62.00     67.00     77.00     87.00     97.00
  I=  2        51.00     55.00     56.00     61.00     66.00     76.00     86.00     96.00
  I=  3        50.00     54.00     55.00     60.00     65.00     75.50     86.50     96.50
  I=  4        48.00     52.00     53.00     58.00     63.00     73.00     84.00     94.00
  I=  5        46.00     50.00     51.00     56.00     61.00     71.00     81.00     91.00
  I=  6        44.00     48.00     49.00     54.00     59.00     69.00     79.00     89.00
  I=  7        42.01     46.00     47.00     51.00     56.00     66.00     76.00     86.00
  I=  8        42.00     46.00     47.00     51.00     56.00     66.00     76.00     86.00
  I=  9        39.50     43.50     44.50     48.50     53.50     63.50     73.50     83.50
  I= 10        37.00     41.00     42.00     47.00     52.00     62.00     72.00     82.00
  I= 11        34.50     38.50     39.50     44.50     50.00     60.00     70.00     80.00
  I= 12        32.00     36.00     37.00     42.00     47.00     57.00     67.00     77.00


AS(K,I,3), K=1,NCS
  I=  1         0.00     10.00     62.50   1562.50   5312.50  16312.50  29812.50  47312.50
       I=  2         0.00     10.00     62.50   1562.50   5312.50  16312.50  29812.50  47312.50
  I=  3         0.00     10.00     62.50   1562.50   5312.50  16862.50  31712.50  49212.50
  I=  4         0.00     10.00     62.50   1562.50   5312.50  17812.50  37062.50  69562.50
  I=  5         0.00     10.00     62.50   1562.50   5312.50  17812.50  35312.50  67812.50
  I=  6         0.00     10.00     62.50   1562.50   5312.50  17812.50  35312.50  67812.50
  I=  7         0.00      9.98     62.48   1262.47   5012.48  17512.47  35012.48  67512.48
  I=  8         0.00     10.00     62.50   1262.50   5012.50  17512.50  35012.50  57512.50
  I=  9         0.00     10.00     62.50   1262.50   5012.50  17512.50  35012.50  57512.50
  I= 10         0.00     10.00     62.50   1562.50   5312.50  17812.50  35312.50  57812.50
  I= 11         0.00     10.00     62.50   1562.50   5687.50  18187.50  35687.50  58187.50
  I= 12         0.00     10.00     62.50   1562.50   5312.50  17812.50  35312.50  57812.50

BS(K,I,4), K=1,NCS
  I=  1         0.00     10.00     25.00    175.00   5000.00   7500.00   8000.00   8000.00
  I=  2         0.00     10.00     25.00    175.00   5000.00   7500.00   8000.00   8000.00
  I=  3         0.00     10.00     25.00    175.00   5000.00   7500.00   8000.00   8000.00
  I=  4         0.00     10.00     25.00    175.00   5000.00   7500.00   8000.00   8000.00
  I=  5         0.00     10.00     25.00    175.00   5000.00   7500.00   8000.00   8000.00
  I=  6         0.00     10.00     25.00    175.00   5000.00   7500.00   8000.00   8000.00
  I=  7         0.00     10.00     25.00    175.00   5000.00   7500.00   8000.00   8000.00
  I=  8         0.00     10.00     25.00    175.00   5000.00   7500.00   8000.00   8000.00
  I=  9         0.00     10.00     25.00    175.00   5000.00   7500.00   8000.00   8000.00
  I= 10         0.00     10.00     25.00    175.00   5000.00   7500.00   8000.00   8000.00
  I= 11         0.00     10.00     25.00    175.00   5000.00   7500.00   8000.00   8000.00
  I= 12         0.00     10.00     25.00    175.00   5000.00   7500.00   8000.00   8000.00
  I= 13         0.00     10.00     25.00    175.00   5000.00   7500.00   8000.00   8000.00
  I= 14         0.00     10.00     25.00    175.00   5000.00   7500.00   8000.00   8000.00
  I= 15         0.00     10.00     25.00    175.00   5000.00   7500.00   8000.00   8000.00
  I= 16         0.00     10.00     25.00    175.00   5000.00   7500.00   8000.00   8000.00
  I= 17         0.00     10.00     25.00    175.00   5000.00   7500.00   8000.00   8000.00
  I= 18         0.00     10.00     25.00    175.00   5000.00   7500.00   8000.00   8000.00
  I= 19         0.00     10.00     25.00    175.00   5000.00   7500.00   8000.00   8000.00
  I= 20         0.00     10.00     25.00    175.00   5000.00   7500.00   8000.00   8000.00


HS(K,I,4), K=1,NCS
  I=  1        40.00     44.00     45.00     51.00     66.00     76.00     86.00    190.00
  I=  2        38.00     42.00     43.00     49.00     64.00     74.00     84.00    190.00
  I=  3        36.00     40.00     41.00     47.00     62.00     72.00     82.00    190.00
  I=  4        34.00     38.00     39.00     45.00     60.00     70.00     80.00    190.00
  I=  5        33.00     37.00     38.00     44.00     59.00     69.00     79.00    190.00
  I=  6        32.00     36.00     37.00     43.00     58.00     68.00     78.00    190.00
  I=  7        31.00     35.00     36.00     42.00     57.00     67.00     77.00    190.00
  I=  8        30.00     34.00     35.00     41.00     56.00     66.00     76.00    190.00
  I=  9        29.00     33.00     34.00     40.00     55.00     65.00     75.00    190.00
  I= 10        28.50     32.50     33.50     39.50     54.50     64.50     74.50    189.00
  I= 11        28.00     32.00     33.00     39.00     54.00     64.00     74.00    188.00
  I= 12        27.50     31.50     32.50     38.50     53.50     63.50     73.50    187.00
  I= 13        27.00     31.00     32.00     38.00     53.00     63.00     73.00    186.00
  I= 14        26.50     30.50     31.50     37.50     52.50     62.50     72.50    185.00
  I= 15        26.00     30.00     31.00     37.00     52.00     62.00     72.00    184.00
  I= 16        25.50     29.50     30.50     36.50     51.50     61.50     71.50    183.00
  I= 17        25.00     29.00     30.00     36.00     51.00     61.00     71.00    182.00
  I= 18        24.50     28.50     29.50     35.50     50.50     60.50     70.50    181.00
  I= 19        24.25     28.25     29.25     35.25     50.25     60.25     70.25    180.50
  I= 20        24.00     28.00     29.00     35.00     50.00     60.00     70.00    180.00
```

Figure 2. Sample Output From Operation DWOPER Print Parameter Routine (continued)

```
AS(K,I,4), K=1,NCS
  I=  1         0.00     20.00     37.50    637.50  39450.00 101950.00 179450.001011450.00
  I=  2         0.00     20.00     37.50    637.50  39450.00 101950.00 179450.001027450.00
  I=  3         0.00     20.00     37.50    637.50  39450.00 101950.00 179450.001043450.00
  I=  4         0.00     20.00     37.50    637.50  39450.00 101950.00 179450.001059450.00
  I=  5         0.00     20.00     37.50    637.50  39450.00 101950.00 179450.001067450.00
  I=  6         0.00     20.00     37.50    637.50  39450.00 101950.00 179450.001075450.00
  I=  7         0.00     20.00     37.50    637.50  39450.00 101950.00 179450.001083450.00
  I=  8         0.00     20.00     37.50    637.50  39450.00 101950.00 179450.001091450.00
  I=  9         0.00     20.00     37.50    637.50  39450.00 101950.00 179450.001099450.00
  I= 10         0.00     20.00     37.50    637.50  39450.00 101950.00 179450.001095450.00
  I= 11         0.00     20.00     37.50    637.50  39450.00 101950.00 179450.001091450.00
  I= 12         0.00     20.00     37.50    637.50  39450.00 101950.00 179450.001087450.00
  I= 13         0.00     20.00     37.50    637.50  39450.00 101950.00 179450.001083450.00
  I= 14         0.00     20.00     37.50    637.50  39450.00 101950.00 179450.001079450.00
  I= 15         0.00     20.00     37.50    637.50  39450.00 101950.00 179450.001075450.00
  I= 16         0.00     20.00     37.50    637.50  39450.00 101950.00 179450.001071450.00
  I= 17         0.00     20.00     37.50    637.50  39450.00 101950.00 179450.001067450.00
  I= 18         0.00     20.00     37.50    637.50  39450.00 101950.00 179450.001063450.00
  I= 19         0.00     20.00     37.50    637.50  39450.00 101950.00 179450.001061450.00
  I= 20         0.00     20.00     37.50    637.50  39450.00 101950.00 179450.001059450.00


NCSS1(J), J=1,JN
          0         0         4         0


NCSSS(K,3), K=1,NCSS1(3)
          4         5         6         7


BSS(K,  4,3), K=1,NCSS
         0.00      500.00     2500.00     2500.00        0.00

HSS(K,  4,3), K=1,NCSS
        58.00       63.00       73.00       84.00       94.00

ASS(K,  4,3), K=1,NCSS
         0.00     1250.00    16250.00    43750.00    56250.00


BSS(K,  5,3), K=1,NCSS
         0.00      500.00     2500.00     2500.00        0.00

HSS(K,  5,3), K=1,NCSS
        56.00       61.00       71.00       81.00       91.00

ASS(K,  5,3), K=1,NCSS
         0.00     1250.00    16250.00    41250.00    53750.00


BSS(K,  6,3), K=1,NCSS
         0.00      500.00     2500.00     2500.00        0.00

HSS(K,  6,3), K=1,NCSS
        54.00       59.00       69.00       79.00       89.00

ASS(K,  6,3), K=1,NCSS
         0.00     1250.00    16250.00    41250.00    53750.00


BSS(K,  7,3), K=1,NCSS
         0.00      500.00     2500.00     2500.00        0.00

HSS(K,  7,3), K=1,NCSS
        51.00       56.00       66.00       76.00       86.00

ASS(K,  7,3), K=1,NCSS
         0.00     1250.00    16250.00    41250.00    53750.00


TIME SERIES FOR OBSERVED DATA -- RIVER NO.1
    T.S. NO.        ID.          DATA TYPE          SECT NO.          FLDHT          GAGE ZERO
          1         TLSSW             STG              1             190.00             175.00
          2         HATSW             STG             30              67.00              52.00
          3         MSY               STG             39              45.00              31.00
          4         GLFSW             STG             60              20.40               8.00


TIME SERIES FOR OBSERVED DATA -- RIVER NO.2
    T.S. NO.        ID.          DATA TYPE          SECT NO.          FLDHT          GAGE ZERO
          1         GDWSW             STG              1             102.00              85.00


TIME SERIES FOR OBSERVED DATA -- RIVER NO.3
    T.S. NO.        ID.          DATA TYPE          SECT NO.          FLDHT          GAGE ZERO
          1         PORSE             STG              1              87.00              57.00
```

Figure 2. Sample Output From Operation DWOPER Print Parameter Routine (continued)

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TIME SERIES FOR OBSERVED DATA -- RIVER NO.4
    T.S. NO.        ID.          DATA TYPE          SECT NO.          FLDHT          GAGE ZERO
        1          GLMSW             STG               1              54.00              40.00


OUTPUT TIME SERIES INFO -- RIVER NO. 1
    T.S. NO.        ID.          DATA TYPE          SECT NO.          GAGE ZERO
        1          HATSW             SQIN              30
        2          HATSW             SSTG              30               52.00
        3          MSY               SQIN              39
        4          MSY               SSTG              39               31.00
        5          GLFSW             SQIN              60
        6          GLFSW             SSTG              60                8.00


LATERAL INFLOW TIME SERIES INFO -- RIVER NO. 1
     I        ID.        TYPE         LQ
     1     HATSWU        SQIN         18
     2     HATSWL        SQIN         22
     3     GLFSWLOC      SQIN         50


TIME SERIES INFO FOR POOL ELEVATIONS -- RIVER NO. 3
     I        ID.        TYPE
     1     JNESW         PELV


TIME SERIES INFO FOR GATE CONTROL SWITCHES -- RIVER NO. 3
     I        ID.        TYPE
     1     JNESW         GTCS


TIME SERIES FOR UPSTREAM BOUNDARY
 T.S. NO.    ID.       DATA TYPE      MIN. VALUE   GAGE ZERO
     1     TLSSW         SQIN           100.00
     2     GDWSW         SQIN            10.00
     3     PORSE         QINE           100.00
     4     GLMSW         QINE            10.00


  ** END OF DATA ON TEXORADO RIVER:  TULSA - GULF OF MEXICO ---

      INITIAL WATER SURFACE ELEVATIONS FOR RIVER NO. 1
         0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00
         0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00
         0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00
         0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00
         0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00
         0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00       11.28

      INITIAL WATER SURFACE ELEVATIONS FOR RIVER NO. 2
         0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00
         0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00
         0.00

      INITIAL WATER SURFACE ELEVATIONS FOR RIVER NO. 3
         0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00
         0.00        0.00

      INITIAL WATER SURFACE ELEVATIONS FOR RIVER NO. 4
         0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00
         0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00

      INITIAL DISCHARGES FOR RIVER NO. 1
       599.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00
         0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00
         0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00
         0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00
         0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00
         0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00

      INITIAL DISCHARGES FOR RIVER NO. 2
        17.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00
         0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00
         0.00

      INITIAL DISCHARGES FOR RIVER NO. 3
      1069.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00
         0.00        0.00

      INITIAL DISCHARGES FOR RIVER NO. 4
        32.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00
         0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00        0.00

      INITIAL LATERAL INFLOWS FOR RIVER NO. 1
        19.00       26.00       15.00

      INITIAL TARGET POOL ELEVATIONS FOR RIVER NO. 3
      -999.00
```

Figure 2. Sample Output From Operation DWOPER Print Parameter Routine (continued)

Figure 3a. Plot of observed and computed stages from Operation DWOPER

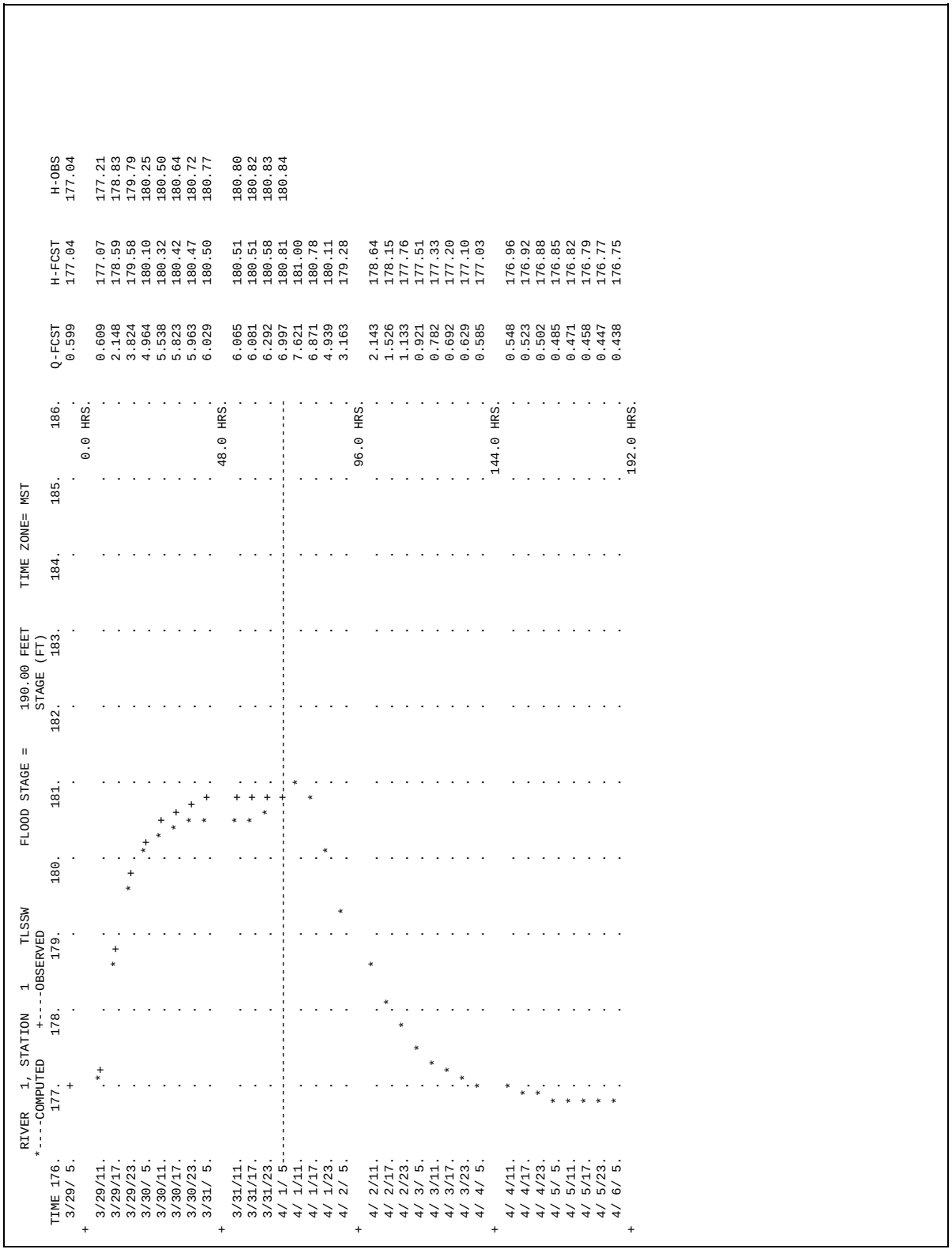

Figure 3b. Example of statistics from Operation DWOPER

RIVER 1, STATION 1 TLSSW STG

TIME	OBSERVED ELEVATION (FT ABOVE MSL)	COMPUTED ELEVATION (FT ABOVE MSL)	COMP - OBS (FT)	DISCHARGE (1000 CFS)
1	177.21	177.06	-0.14	0.6
2	178.83	178.58	-0.25	2.1
3	179.79	179.59	-0.20	3.8
4	180.25	180.10	-0.14	5.0
5	180.50	180.33	-0.17	5.5
6	180.64	180.43	-0.21	5.8
7	180.72	180.48	-0.25	6.0
8	180.77	180.50	-0.27	6.0
9	180.80	180.51	-0.29	6.1
10	180.82	180.52	-0.30	6.1
11	180.83	180.59	-0.24	6.3
12	180.84	180.81	-0.02	7.0
13	-999.00	181.01	-999.00	7.6

RMS ERROR = 0.221 BIAS = -0.208 1 POINTS MISSING

Figure 3c. Example of hydraulic information from Operation DWOPER

RIVER= 1 QU(1)= 0.599 YU(1)= 177.05 QU(N)= 1.777 YU(N)= 11.28

J	I	X(MI)	H(MSL)	V(FPS)	A(TSQFT)	B(FT)	BT(FT)	Q(TCFS)	MANN. N	WAVHT	FROUDE	DEP(FT)	KR	QL(TCFS)	MRV
1	1	190.000	177.05	1.88	0.319	234.	234.	0.5990	0.0350	0.00	0.28	7.05	0	0.0000	0
1	2	189.000	166.61	2.66	0.225	195.	195.	0.5990	0.0350	0.00	0.44	6.61	0	0.0000	0
1	3	188.000	157.12	1.78	0.336	241.	241.	0.5990	0.0350	0.00	0.27	7.12	0	0.0000	0
1	4	187.000	146.50	2.94	0.204	185.	185.	0.5990	0.0350	0.00	0.49	6.50	0	0.0000	0
1	5	186.000	137.22	1.67	0.359	249.	249.	0.5990	0.0350	0.00	0.24	7.22	0	0.0000	0
1	6	185.000	132.22	1.67	0.360	250.	250.	0.5990	0.0350	0.00	0.24	7.22	0	0.0000	0
1	7	184.000	127.22	1.67	0.359	249.	249.	0.5990	0.0350	0.00	0.24	7.22	0	0.0000	0
1	8	183.000	122.22	1.67	0.360	250.	250.	0.5990	0.0350	0.00	0.24	7.22	0	0.0000	0
1	9	182.750	120.96	1.68	0.357	249.	249.	0.5990	0.0350	0.00	0.25	7.21	0	0.0000	0
1	10	182.500	119.84	1.53	0.392	261.	261.	0.5990	0.0350	0.00	0.22	7.34	0	0.0000	0
1	11	182.000	117.57	1.96	0.305	166.	166.	0.5990	0.0350	0.00	0.25	7.57	0	0.0000	0
1	12	180.000	107.57	1.96	0.305	166.	166.	0.5990	0.0350	0.00	0.25	7.57	0	0.0000	0
1	13	179.500	105.34	1.53	0.391	260.	260.	0.5990	0.0350	0.00	0.22	7.34	0	0.0000	0
1	14	179.000	103.35	1.52	0.393	261.	261.	0.5990	0.0350	0.00	0.22	7.35	0	0.0000	0
1	15	178.500	101.32	1.55	0.385	259.	259.	0.5990	0.0350	0.00	0.22	7.32	0	0.0000	0
1	16	178.000	99.42	1.46	0.411	268.	268.	0.5990	0.0350	0.00	0.21	7.42	0	0.0000	0
1	17	177.500	97.09	1.82	0.329	238.	238.	0.5990	0.0350	0.00	0.27	7.09	0	0.0000	0
1	18	177.100	95.66	1.25	0.479	289.	289.	0.5990	0.0350	0.00	0.17	7.58	0	0.0000	0
1	19	177.000	95.33	1.59	0.387	259.	259.	0.6180	0.0350	0.00	0.23	7.33	0	0.0000	0
1	20	175.000	89.84	1.16	0.534	306.	306.	0.6180	0.0350	0.00	0.15	7.84	0	0.0000	0
1	21	172.500	84.73	1.24	0.498	295.	295.	0.6180	0.0350	0.00	0.17	7.73	0	0.0000	0
1	22	170.010	78.63	1.32	0.467	286.	286.	0.6180	0.0350	0.00	0.18	7.61	0	0.0000	0
1	23	170.000	78.60	1.39	0.462	284.	284.	0.6440	0.0350	0.00	0.19	7.60	0	0.0000	0
1	24	167.500	72.09	1.30	0.496	279.	279.	0.6440	0.0350	0.00	0.17	7.34	0	0.0000	0
1	25	166.300	68.94	1.47	0.438	252.	252.	0.6440	0.0350	0.00	0.20	7.19	0	0.0000	0
1	26	165.100	65.54	1.26	0.513	336.	336.	0.6440	0.0350	0.00	0.18	6.79	0	0.0000	0
1	27	165.000	65.28	1.20	0.552	383.	383.	0.6610	0.0350	0.00	0.18	6.78	0	0.0000	0
1	28	163.500	61.97	1.09	0.608	389.	389.	0.6610	0.0350	0.00	0.15	6.97	0	0.0000	0
1	29	162.500	59.69	1.15	0.574	437.	437.	0.6610	0.0350	0.00	0.18	6.69	0	0.0000	0
1	30	160.000	54.16	1.17	0.566	301.	301.	0.6610	0.0350	0.00	0.15	7.16	0	0.0000	0
1	31	157.500	50.39	1.10	0.603	290.	290.	0.6610	0.0323	0.00	0.13	7.39	0	0.0000	0
1	32	155.000	46.99	1.09	0.605	382.	382.	0.6610	0.0323	0.00	0.15	6.99	0	0.0000	0
1	33	153.750	45.00	1.08	0.612	384.	384.	0.6610	0.0323	0.00	0.15	7.00	0	0.0000	0
1	34	152.500	42.94	1.12	0.588	376.	376.	0.6610	0.0323	0.00	0.16	6.94	0	0.0000	0
1	35	151.300	41.06	1.05	0.632	390.	390.	0.6610	0.0323	0.00	0.14	7.06	0	0.0000	0
1	36	150.100	40.60	0.49	1.360	530.	530.	0.6610	0.0320	0.00	0.05	8.50	0	0.0000	0
1	37	150.000	40.57	0.56	3.081	1029.	1029.	1.7300	0.0317	0.00	0.06	8.57	0	0.0000	0
1	38	126.000	35.94	0.45	3.881	1969.	1969.	1.7300	0.0317	0.00	0.06	7.94	0	0.0000	0
1	39	116.600	34.12	0.47	3.643	1671.	1671.	1.7300	0.0317	0.00	0.06	8.12	0	0.0000	0
1	40	115.000	33.81	0.48	3.588	1659.	1659.	1.7300	0.0300	0.00	0.06	8.09	0	0.0000	0
1	41	110.000	32.87	0.50	3.455	1628.	1628.	1.7300	0.0300	0.00	0.06	8.01	0	0.0000	0
1	42	105.100	31.66	0.60	2.907	1497.	1497.	1.7300	0.0300	0.00	0.08	7.64	0	0.0000	0
1	43	105.000	31.63	0.62	2.857	1484.	1484.	1.7620	0.0300	0.00	0.08	7.63	0	0.0000	0
1	44	100.000	29.98	0.60	2.933	1504.	1504.	1.7620	0.0300	0.00	0.08	7.68	0	0.0000	0
1	45	95.000	28.32	0.62	2.846	1482.	1482.	1.7620	0.0300	0.00	0.08	7.62	0	0.0000	0
1	46	90.000	26.97	0.52	3.392	1614.	1614.	1.7620	0.0300	0.00	0.06	7.97	0	0.0000	0
1	47	85.000	25.07	0.84	2.089	1276.	1276.	1.7620	0.0300	0.00	0.12	7.07	0	0.0000	0
1	48	84.750	24.98	0.52	3.410	1618.	1618.	1.7620	0.0300	0.00	0.06	7.98	0	0.0000	0
1	49	82.110	24.38	0.54	3.254	1581.	1581.	1.7620	0.0300	0.00	0.07	7.88	0	0.0000	0
1	50	79.250	23.49	0.66	2.665	1435.	1435.	1.7620	0.0300	0.00	0.09	7.49	0	0.0000	0
1	51	79.200	23.48	0.53	3.353	1649.	1649.	1.7770	0.0300	0.00	0.07	7.51	0	0.0000	0
1	52	75.000	22.41	0.59	3.021	1448.	1448.	1.7770	0.0300	0.00	0.07	7.41	0	0.0000	0
1	53	67.550	20.74	0.51	3.516	1544.	1544.	1.7770	0.0300	0.00	0.06	7.73	0	0.0000	0
1	54	67.500	20.73	0.51	3.502	1541.	1541.	1.7770	0.0300	0.00	0.06	7.73	0	0.0000	0
1	55	50.640	16.08	0.69	2.563	1353.	1353.	1.7770	0.0300	0.00	0.09	7.08	0	0.0000	0
1	56	33.750	13.69	0.35	5.115	1819.	1819.	1.7770	0.0300	0.00	0.04	8.69	0	0.0000	0
1	57	25.320	13.14	0.34	5.294	1950.	1950.	1.7770	0.0300	0.00	0.04	8.64	0	0.0000	0
1	58	16.890	12.59	0.34	5.188	1932.	1932.	1.7770	0.0300	0.00	0.04	8.59	0	0.0000	0
1	59	8.460	11.99	0.36	4.995	1899.	1899.	1.7770	0.0300	0.00	0.04	8.49	0	0.0000	0
1	60	0.000	11.28	0.39	4.610	1831.	1831.	1.7770	0.0300	0.00	0.04	8.28	0	0.0000	0

FRMX= 0.493 IFRMX= 4 FRMN= 0.036 IFRMN= 57