FLDWAVE 3-0-0

Input Summary

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April 12, 2010

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Time Series Information

Allowable Time Interval 1, 2, 3, 4, 6, 8, 12 and 24 hours

Time Series Used:

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[2]	yes
Observed Discharge	L3/T	CMS	I	no	n/a	any[2]	yes
Lateral Inflow	L3/T	CMS	I	no	n/a	any[2]	no
Target Pool Elevation	L	M	I	no	n/a	any[2]	yes
Gate Control Switches	DLES	INT	I	no	n/a	any[2]	yes
Upstream Stage	L	M	I	yes [1]	n/a	any[2]	no
Upstream Discharge	L3/T	CMS	I	yes [1]	n/a	any[2]	no
Downstream Stage	L	M	I	no	n/a	any[2]	no
Downstream Discharge	L3/T	CMS	I	no	n/a	Any[2]	no
Output Stage	L	M	O	no	n/a	Any[3]	no
Output Discharge	L3/T	CMS	O	no	n/a	Any[3]	no
Output Velocity	L/T	M/S	O	no	n/a	Any[3]	no
Observed Tide	L	M	I	no	n/a	any	no
NOS Tide	L	M	I	no	n/a	any	no
Adjusted Tide	L	M	O	no	n/a	any	no
Adjusted Stage	L	M	O	no	n/a	any	no
Adjusted Discharge	L3/T	CMS	O	no	n/a	any	no

[1] These time series must be the same type as the upstream boundaries.
[2] All of these time series must have the same data time interval.
[3] These time series data time interval must be an even increment of the input time series data time interval.

Data Input: Rules

Input Summary: The syntax rules for the input for this Operation are as follows:

- values are input in free format (values separated by blanks or a comma)
- no data may be entered beyond column 72
- enter a zero if no value is to be specified
- decimal points are needed only of the value contains a decimal point
- Comments
  - a comment line must be entered before each data group
  - a blank line or a comment line must be entered before each data group except data groups 0-1 and 0-2
  - these comments will not be retained after the segment definition (i.e., they will not be available to punch out)

'*' indicates the Data Group (DG) is required for any simulation.

'**' indicates the Data Group (DG) is required for any dam break simulation.

Data Input: Descriptions

Data Group	Variable Name	Contents
0-1*	MSG	Description of the data set. A maximum of 20 lines is allowed, the last line must be EOM. Each line may have a maximum of 72 characters.
0-2*	DESC	Type of output display. For echo print of he input parameters, enter 'NODESC.' For a description of the model parameters, enter 'DESC'.

Data Input: Global Parameters

Data Group	Variable Name	Contents
1*	EPSY	Depth tolerance in Newton-Raphson Iteration scheme (0.001-1.0 ft). A good value is 0.01 ft.
	THETA	Acceleration factor in solving tributary junction problem (0.5-1.0). Varies with each problem. A good first choice is 0.8.
	F1	Theta weighting factor (0.5-1.0) in finite difference technique. A good value is 0.6.
	XFACT	Factor to convert units describing the location of the computational points along the routing reach to feet; e.g., if units are in (mi), XFACT = 5280. When using metric units, this factor converts the units to meters: e.g., if units are in(km), XFACT=1000.
	DTHYD	Time interval (hr) of all input hydrographs. If time interval is not constant, set DTHYD = 0. If running in NWSRFS (not in stand-alone mode), set DTHYD > 0..
	DTOUT	Time interval (hr) of all output hydrographs. If running in stand-alone mode (not a part of NWSRFS), set DTOUT = 0.
	METRIC	Parameter indicating if input/output is in English (METRIC = 0) or Metric (METRIC = 1) units. All computations within FLDWAV are done in English units; only the input/output may be displayed in metric units. See Table 1 for units conversion information

Table 1. English/Metric Equivalents

Property	English Unit	Metric Unit	Conversion Factor (English to Metric)
Time	hr	hr	
Length	ft	m	1/3.281
Length	mile	km	1.6093
Flow	ft^3/sec	m^3/sec	1/35.32
Area	ft^2	m^2	1/10.765
Surface Area	acres	km^2	1/247.1
Volume	acre-ft	$10^6 m^3$	1/810.833
Weir Coef.	$ft^{1/2}/sec$	$m^{1/2}/sec$	1/1.811
Unit Weight	lb/ft^3	N/m^3	157.1
Shear Strength	lb/ft^2	N/m^2	47.88
Viscosity (Dynamic)	lb sec/ft^2	N sec/m^2	47.88
Manning n	English and Metric are same		

Note: Although the documentation refers to English units only, the metric option is fully functional. This table should be used to determine comparable units and to convert the recommended values to metric units.

Data Input: Global Parameters (cont.)

Data Group	Variable Name	Contents
2*	JN	Total number of rivers in the system being routed simultaneously.
	NU	Number of values associated with observed hydrographs.
	ITMAX	Maximum number of iterations allowed in the Newton-Raphson Iteration scheme or solving the system of nonlinear equations. If ITMAX = 1, the nonlinear formation degenerates into a linear formation and no iterations are required in the Newton-Raphson iteration procedure. A good value is 10.
	KWARM	Number of time steps used for warm-up procedure. If KWARM = 0, no warm-up is done. If KWARM > 0, the model assumes steady-state initial conditions and will solve the routing equations KWARM times without incrementing the time variable. A good value is 2. If running in NWSRFS (not stand-alone mode) or if initial conditions are not steady-state, set KWARM = 0.
	KFLP	Parameter indicating the use of the floodplain (conveyance) option. If KFLP = 0, no floodplain defined (composite channel used); if KFLP = 1, floodplain used with conveyance (K) generated; if KFLP > 2, floodplain used with K values read in and KFLP is the number of points in the conveyance table.
	NET	Parameter indicating the use of the channel network option. If NET = 0, the network option is not used and a dendritic tree-type system is modeled using the relaxation algorithm. The network option is currently unavailable; set NET = 0.

Data Input: Global Parameters (cont.)

Data Group	Variable Name	Contents
2*	ICOND	Parameter indicating the type of initial conditions. If initial conditions were not modified and will not be read in, set ICOND= 0. If initial conditions are read-in, set ICOND=1 and initial conditions at interpolated cross sections will be interpolated between the read-in values. If running in stand-alone mode (not a part of NWSRFS), set ICOND=0.
	NMAP	Parameter indicating the number of flood mapping scenarios. Each scenario is defined by a river number and the upstream and downstream cross sections on that river between which mapping is to be performed.
	IFUT(2)	Future parameter; enter two zero values for future enhancements.

Data Input: Global Parameters (cont.)

Data Group	Variable Name	Contents
3*	NYQD	Number of sets of stage-discharge values in empirical rating curve at downstream boundary.
	KCG	Number of data points in spillway gate control curve of gate opening (GHT) versus time (TGHT) (DG-38,DG-39). If no movable gates in the system, set KCG = 0.
	NCG	Maximum number of movable gates on any single dam in the system (ICG = 2, DG-29). If no movable gates in the system, set NCG to 0.
	KPRES	Parameter indicating method of computing hydraulic radius (R). If KPRES = 0, then R = A/B where A is cross-sectional flow area and B is channel top width; if KPRES = 1, then R = A/P where P is wetted perimeter.

Data Input: Global Parameters (cont.)

Data Group	Variable Name	Contents
4*	NCS	Number of values in table of top width (BS) versus elevation (HS). This value applies to all cross sections in the river system.
	KPL	Parameter indicating what information will be plotted. If KPL = 0, nothing is plotted; if KPL = 1, water surface elevation (ft-msl) hydrographs are plotted; if KPL = 2, discharge hydrographs are plotted; if KPL = 3, both are plotted. This parameter has nothing to do with the FLDGRF utility. If running in NWSRFS (not in stand-alone mode) and KPL < 0, stages (ft) will be plotted instead of elevations.
	JNK	Parameter indicating if hydraulic information will be printed. If JNK = 0, nothing will be printed; if JNK > 0, hydraulic information will be printed; if JNK < 0, hydraulic information will be printed for specified reaches. See Table 2 for description of intermediate analysis output. A good value is JNK = 4 or 5.
	KREVRS	Parameter indicating use of the low flow filter. If KREVRS = 0, the low flow filter is activated preventing the water surface elevations (WSELs) and discharges from going below the initial condition values; if KREVRS = 1, the low flow filter is off and reverse flow is allowed.
	NFGRF	Parameter indicating if data needed for the FLDGRF utility or FLDAT will be generated. If NFGRF = 0, data will be generated for FLDGRF only; if NFGRF = 1, data will not be generated for either; if NFGRF = 2, data will be generated for FLDAT only.

Data Input: Global Parameters (cont.)

Data Group	Variable Name	Contents
5*	IOBS	Parameter indicating if observed data are available at gaging stations. If IOBS = 0, no data available; if IOBS = 1, data is available; if IOBS=2, observed data are available and the forecast stages will be adjusted using Manning n ranges; if IOBS=3, observed data are available and the forecast stages will be adjusted using specified balances; if IOBS = -1, a mathematical function is used to describe the inflow hydrograph. If running in stand-alone mode (not a part of NWSRFS), IOBS must be less than 2.
	KTERM	Parameter indicating if the terms in equation of motion will be printed as special information. If KTERM = 0, they will not be printed; if KTERM = 1, they will be printed. Normally use KTERM = 0.
	NP	Parameter indicating if Automatic Calibration option is used. If NP = 0, calibration is not used; if NP = -1, automatic calibration of the roughness coefficient (n) is done; if NP = -4, automatic calibration of n using average cross sections is done.
	NPST	Parameter indicating the first value in the computed stage hydrograph which will be used in the statistics needed in the automatic calibration option to determine the Manning n. If NPST = 0, the first value of observed stage hydrograph will be used. If NP = 0, set NPST = 0.
	NPEND	Parameter indicating the last value in the computed stage hydrograph which will be used in the statistics needed in the automatic calibration option to determine the Manning n. If NPEND = 0, the last value of observed stage hydrograph will be used. If NP = 0, set NPEND = 0.

Data Input: Time Parameters

Skip DG-6 if JNK is greater than or equal to 0.

Data Group	Variable Name	Contents
6	TDBG1	Time at which additional intermediate analysis information begins.
	TDBG2	Time at which additional intermediate analysis information ends.
	JNKDBG	Intermediate analysis output indicator (JNK, DG-4). See Table 2 for available intermediate analysis output types.
	JDBG1	First river at which additional intermediate analysis information will be applied.
	JDBG2	Last river at which additional intermediate analysis information will be applied.
	LDBG1	First reach at which intermediate analysis information will be applied during calibration. If NP = 0 (DG-5), LDBG1 is the first cross section where intermediate analysis will be applied during simulation.
	LDBG2	Last reach at which intermediate analysis information will be applied during calibration. After this reach has been calibrated, the model will stop. If NP = 0 (DG-5), LDBG2 is the last cross section where intermediate analysis will be applied during simulation.
	MCMDBG	First iteration during calibration at which intermediate analysis information will be printed. If NP = 0 (DG-5), set MCMDBG=0.

Data Input: Time Parameters (cont.)

Data Group	Variable Name	Contents
7*	TEH	Time (hr) at which routing computations will terminate. If running in NWSRFS (not stand- alone mode), set TEH = 0.
	DTHII	Initial computational time step. If DTHII > 0, a constant time step is used; if DTHII = 0, a variable time step is used based on the inflow hydrographs and dam failure times. If DTHII < 0, an array of time steps (NDT values) will be read in where NDT = the absolute value of DTHII.
	DTHPLT	Time step (hr) at which computed/observed hydrograph data are stored for plotting or printing. If DTHPLT = 0, then set DTHPLT = DTHII. If KPL = 0 (DG-4), set DTHPLT = 0.
	FRDFR	Window for critical Froude number in mixed-flow algorithm. Froude numbers in the range of (1+/- FRDFR) will be treated as though the Froude number is equal to 1. The default value is 0.05.
	DTEXP	Computational time step (hr) for explicit routing. If DTEXP > 0, then a constant time step is used. If DTEXP < 0, then a variable time step is used based on the Courant number (Cn) where Cn = the absolute value of DTEXP. If explicit routing is not used, set DTEXP = 0
	MDT	Divisor for determining the time step (t=tp/MDT). A good value is 20 for subcritical flow or 40 for supercritical flow. If a constant time step is read-in (DTHII not equal to 0), set MDT=0.

Data Input: Time Parameters (cont.)

Skip DG-8 and DG-9 if time step array is not used (DTHII greater than or equal 0).

Data Group	Variable Name	Contents
8	DTHIN(K)	Computational time step to be used until time TDTIN(K). K index goes from 1 to NDT (DG-7).
9	TDTIN(K)	Time at which DTHIN(K) is no longer used. K index goes from 1 to NDT (DG-7).

Data Input: Levee Parameters

Data Group	Variable Name	Contents
10*	NLEV	Total number of cross-section reaches in the system that have levees.
	DHLV	The difference between the maximum and minimum crest elevations along the reach (this is sometimes useful to prevent numerical problems with suddenly large outflows when the levee is first overtopped. If NLEV = 0, set DHLV to zero.
	DTHLV	Computational time step to be used during levee overtopping/failure. If NLEV = 0, set DTHLV = 0.

Skip DG-11 if no levees in the system (NLEV=0).

11	NJFM(K)	Sequence number of river from which levee overtopping/failure flow is passed from reach K.
	NIFM(K)	Sequence number of reach along the river from which levee flow passing into reach NITO(K).
	NJTO(K)	Sequence number of river or pond receiving flow from levee overtopping/failure in reach K.
	NITO(K)	Sequence number of the reach along the river receiving flow from reach NIFM(K). If the receiving channel is a pond (i.e., level pool routing done), set NITO(K) = 0.

Repeat DG-11 for each levee reach (K=1,NLEV).

Data Input: Flood Mapping Parameters

Skip DG-11a if no flood mapping is to be performed (NMAP = 0).

Data Group	Variable Name	Contents
11a	MPRV(L)	Sequence number of river on which flood mapping is to be performed.
	MPLOC(1,L)	Sequence number of cross section at upstream limit of flood map.
	MPLOC(2,L)	Sequence number of cross section at downstream limit of flood map.
	DTMAP(L)	Time step for flood animation
	SYSPTH(LL,L)	River system name used in FLDVIEW path for flood map L. LL index goes from 1 to 6
	TWNPTH(LL,L)	Town name used in FLDVIEW path for flood map L. LL index goes from 1 to 6

Repeat DG-11a for each mapping scenario (L=1,NMAP).

Format is (3I5, F5.0, 1X, 6A4, 1X, 6A4)

Data Input: River Parameters

Data Group	Variable Name	Contents
12*	NBT(J)	Total number of actual cross sections on river J.
	NPT(1,J)	Beginning cross-section number (after interpolation) on river J for which intermediate analysis information will be printed. This parameter is required when JNK is greater than or equal to 9.
	NPT(2,J)	Final cross-section number (after interpolation) on river J for which intermediate analysis information will be printed. This parameter is required when JNK is greater than or equal to 9.
	MRV(J)	Number of river into which river J flows. Omit this field for main river (J=1). Note that tributary (J-1) is river J.
	NJUN(J)	Sequence number of cross section immediately upstream of tributary (J-1) confluence (this section coincides with the upstream extremity of the small sub-reach which is equivalent in length to the tributary width). Omit this field for main river (J=1).
	ATF(J)	Azimuth angle (degrees) that tributary J makes with the main river at the confluence. Omit this field for main river (J = 1).
	EPQJ(J)	Discharge tolerance in Newton-Raphson Iteration scheme in main river (J=1) or in Tributary Iteration Scheme (J > 1).
	COFW(J)	Coefficient of wind stress (1.1E-06 to 3.0E- 06) on river J.
	VWIND(J)	Wind velocity (ft/sec) on river J; (+) if directed upstream; (-) if directed downstream.
	WINAGL(J)	Acute angle (degrees) that wind makes with the channel axis of river J.

Repeat DG-12 for each river (J=1,JN).

Data Input: River Parameters (cont.)

Data Group	Variable Name	Contents
13*	KU(J)	Parameter indicating the type of upstream boundary condition being specified for the main river and tributaries; if KU(J) = 1, a stage hydrograph is the upstream boundary condition; if KU(J) = 2, a discharge hydrograph is the upstream boundary condition.
	KD(J)	Parameter indicating the type of downstream boundary condition being specified for the main river (KD(1)) and the tributaries (KD(J) where J goes from 2 to JN); if KD(1)=0, an observed tide hydrograph is specified which will be blended with a simulated tide hydrograph; if KD(1) or KD(J) = 1, a stage hydrograph is the downstream boundary condition; if KD(1) = 2, a discharge hydrograph is the downstream boundary condition; if KD(1) = 3, a single-valued rating curve of discharge as a function of stage is the boundary condition; if KD(1) = 4, a looped rating curve is generated based on Manning's equation where the friction slope is computed based on the momentum equation; if KD(1) = 5, normal flow computed from Manning's equation is the downstream boundary condition; if KD(1) = 7, a looped rating curve is generated where the friction slope is computed based on conveyance; if KD(1) = 1 and NYQD > 0, a single-valued rating curve in which Q is a function of the computed water surface minus the read-in value of STN is the boundary condition. If running in stand-alone mode (not a part of NWSRFS), KD(1) must be greater than zero. In the case of tributaries, a stage hydrograph is generated at the downstream boundary and KD(J) is always equal to zero.
	NQL(J)	Total number of lateral flows on river J.
	NGAGE(J)	Total number of observed time series along river J (routing reach) which will be compared with computed time series; also, denotes total number of stations for which computed values will be plotted independently of FLDGRF.

Data Input: River Parameters (cont.)

Data Group	Variable Name	Contents
13*	NRCM1(J)	Total number of Manning n reaches on river J.
	NQCM(J)	Total number of values in the Manning n table. Also, denotes whether Manning n is a function of water surface elevation (NQCM(J) > 0) or discharge (NQCM(J) < 0). If NQCM(J) = 0, Manning n is a function of water surface elevation and the number of table values is equal to NCS.
	NSTR(J)	Total number of computed time series (stage, discharge, or velocity) to be stored on each river. (Number of output time series on each river). If running in stand-alone mode (not a part of NWSRFS), set NSTR(J)=0.
	NICE(J)	Total number reaches that contain ice.
	IFUT(2)	Future parameters; enter two zero values for future enhancements.

Repeat DG-13 for each river (J = 1,JN).

Data Input: River Parameters (cont.)

Data Group	Variable Name	Contents
14*	MIXF(J)	Parameter indicating the flow regime in river J. If MIXF(J) = 0, river J has subcritical flow; if MIXF(J) = 1, river J has supercritical flow; if MIXF(J) > 1, there is a mixture of subcritical and supercritical flow throughout river J at varying times; if MIXF(J) = 2, the hydraulic jump can move upstream or downstream; if MIXF(J) = 3, the hydraulic jump moves only if the Froude number exceeds 2; if MIXF(J) = 4, the hydraulic jump is stationary; if MIXF(J) = 5, a modified implicit technique (LPI) is used to solve mixed flows.
	MUD(J)	Parameter indicating the use of the mud/debris flow option on river J. If MUD(J) = 0, dynamic routing of non-mudflow (water) will be done; if MUD(J) = 1, dynamic routing of mudflow will be done.
	KFTR(J)	Parameter indicating the use of Kalman filter option on river J. If KFTR(J) = 0, Kalman filter option is not used; if KFTR(J) = 1, Kalman filter option will be used. Kalman filter can be turned on to update the forecast if river J has stage observations for more than 2 gaging stations.
	KLOS(J)	Parameter indicating the computation of volume losses in river J. If KLOS(J) = 0, the losses will not be computed; if KLOS(J) = 1, the losses will be computed.
	IFUT(6)	Future parameters; enter six zero values for future enhancements.

Repeat DG-14 for each river (J = 1,JN).

Data Input: LPI Routing Parameters

Skip DG-15 if LPI technique is not used in system (all MIXF(J)'s are not equal to 5).

Data Group	Variable Name	Contents
15	KLPI(K)	Power (m) used in the LPI technique. Values range from 1 to 10 where m = 10 approaches the fully dynamic technique and m = 1 approaches the diffusion technique. K index goes from 1 to the number of rivers using the LPI technique. A good value is 5.

Data Input: Mudflow Parameters

Skip DG-16 if MUDFLOW option is not used in system (all MUD(J)'s = 0).

Data Group	Variable Name	Contents
16	UW1(J)	Unit weight (lb/cu-ft) of mud/debris fluid on river J.
	VIS1(J)	Dynamic viscosity (lb-sec/sq-ft) of mud/debris fluid in river J. Omit this parameter if MUD(J) not equal to 1.
	SHR1(J)	Initial yield stress of shear strength (lb/sq-ft) of mud/debris fluid on river J. Omit this parameter if MUD(J) not equal to 1.
	POWR1(J)	Exponent in power function representing the stress-rate of strain relation of fluid in river J; if Bingham plastic is assumed for fluid, set POWR1(J) = 1.0. Omit this parameter if MUD(J) not equal to 1.
	IWF1(J)	Parameter indicating dry bed routing on river J. If IWF1(J) = 0, the base flow at t=0 will be used all along the routing reach; if IWF1(J) > 0, wave front tracking will be used where the wave front velocity (Vw) is a function of the channel velocity (V); if IWF1(J)=1, Vw =VN-4; if IWF1(J)=2, Vw=(KW)(VN- 4); if IWF1(J) = 3, Vw =Vmax,where Vmax is the maximum velocity in the channel reach, N is the current location of the wave front and KW is the kinematic wave factor. Omit this parameter if MUD(J) not equal to 1.

Repeat DG-16 for each river with mudflow (MUD(J) > 0, J = 1,JN).

Data Input: Channel Loss Parameters

Skip DG-17 if volume flow losses are not computed in system (all KLOS(J)'s = 0).

Data Group	Variable Name	Contents
17	XLOS(1,J)	Beginning location (mi) of the reaches where flow loss will occur on river J.
	XLOS(2,J)	Ending location (mi) of the reaches where flow loss will occur on river J.
	QLOS(J)	Percentage of the loss in terms of total active flow amount; (-) for loss and (+) for gain.
	ALOS(J)	Loss distribution coefficient for river J (0.3-3.0). For a linear loss distribution, set ALOS(J) = 1.

Repeat DG-17 for each river with volume flow losses (KLOS(J) > 0, J = 1,JN).

Data Input: Reach Parameters

Data Group	Variable Name	Contents
18*	XT(I,J)	Location of station or cross section where computations are made (units can be anything since XFACT converts these units to ft); I index goes from 1 to NBT(J).
19*	DXM(I,J)	Minimum computational distance step between cross sections. If DXM(I,J) is less than the distance between two adjacent cross sections read in, then intermediate cross sections are created within the program via a linear interpolation procedure. I index goes from 1 to NBT(J)-1.
20*	KRCHT(I,J)	Parameter indicating routing method or internal boundary condition in each reach. See Table 3 for a description of each type. I index goes from 1 to (NBT(J)-1).

Repeat DG-18 through DG-20 for each river (J=1,JN).

Table 3. Routing Methods and Internal Boundaries

KRCHT(I,J)	Definitions
0	Implicit Dynamic Routing
1	Implicit (Diffusion) Routing
2	Kinematic Routing
3	Kinematic Routing (SF=S0)
4	Level Pool Routing
5	Explicit Dynamic Routing (Upwind)
6	Implicit (Local Partial Inertial) Routing
7	Muskingum-Cunge Routing (from CROUTE)
8	Quasi-Dynamic Routing (less 1st inertia term)
10	Dam
11	Dam + Q=f(Y)
21	Dam + Y=f(Q)
12	Dam + Q=f(YY)
13	Dam + Q=f(Y-YY)
14	Dam + Multiple Movable Gates C=f(Y,HG,FR)
15	Dam + Average Movable Gates (Corps of Engineers Type)
28	Lock and Dam
35	Bridge

Variable Definitions

Q=flow
Y=pool elevation
YY=tailwater elevation
HG=centerline of gate
C=gate coefficient
FR=Froude number

Data Input: Levee Parameters

Skip DG-21 through DG-25 if NLEV = 0.

Data Group	Variable Name	Contents
21	HWLV(L)	Elevation (ft-msl) of top of levee, ridge line, etc. where weir-flow occurs. This elevation is located on the upstream end of the levee reach. If HWLV(L) < 0, discharge flows through a pipe and the absolute value of HWLV(L) is the invert elevation of pipe.
	WCLV(L)	Weir-flow discharge coefficient for x reach where weir flow (inflow or outflow) may occur. Coefficient ranges from 2.6 to 3.2; if there is a pipe connection(HWLV(L) < 0), the weir coefficient = the absolute value of (8.02 times the discharge loss coefficient times the maximum area of the pipe).
	TFLV(L)	Time (hr) from start of levee failure (crevasse) until the opening or breach is its maximum size. Set TFLV(L)=0 if the levee does not fail.
	BLVMX(L)	Final width (ft) of levee crevasse which is assumed to have a rectangular shape (200-5000 ft). Set BLVMX(L) = 0 if the levee does not fail.
	HFLV(L)	Elevation (ft-msl) of water surface when levee starts to fail. Set HFLV(L) = 0 if the levee does not fail.
	HLVMN(L)	Final elevation (ft-msl) of bottom of levee crevasse. Set HLVMN(L) = 0 if the levee does not fail.
	SLV(L)	Slope of levee L (ft/ft). This parameter is used to interpolate levee reaches. Interpolation is done from the upstream end of the reach.

Data Input: Levee Pipe Parameters

Skip DG-22 if levee has no drainage pipe (HWLV(L) is greater than or equal to 0).

Data Group	Variable Name	Contents
22	HPLV(L)	Centerline elevation (ft-msl) of flood drainage pipe (with flood gate).
	DPLV(L)	Diameter (ft) of flood drainage pipe.

Repeat DG-21 and DG-22 for each levee reach (L = 1,NLEV).

Data Input: Levee Pond Parameters

Skip DG-23 through DG-25 if no ponds exist in the system (NITO(L) > 0, L=1,NLEV).

Data Group	Variable Name	Contents
23	HPOND(L)	Initial water surface elevation (ft-msl) of storage pond L in levee option.
24	SAPOND(K,L)	Surface area (acres) of storage pond L corresponding to elevation HSAP in the area-elevation curve. These values should be entered from the top of the pond (maximum elevation) to the bottom. K index goes from 1 to 8. If less than 8 values are needed to describe the pond, set the remaining values to zero.
25	HSAP(K,L)	Elevation (ft-msl) corresponding to SAPOND in the area elevation curve. These values should be entered from the top of the pond (maximum elevation) to the bottom. K index goes from 1 to 8. If less than 8 values are needed to describe the pond, set the remaining values to zero.

Repeat DG-23 through DG-25 for each pond (L = 1 to number of ponds).

Data Input: Levee Reservoir Parameters

Skip DG-26 through DG-47 if no internal boundaries in the system (all KRCHT < 10).

Skip DG-26 through DG-43 if internal boundary K is not a dam (KRCHT(K,J) < 10 or KRCHT(K,J) > 30).

Skip DG-26 and DG-27 if internal boundary K is not a reservoir (KRCHT(K,J) is not equal to 4 or [KRCHT(1,J) < 10 or KRCHT(1,J) > 30]).

Data Group	Variable Name	Contents
26	SAR(L,K,J)	Surface area (acres) of reservoir behind dam at elevation HSAR(L,K,J). Values should be read in from the top of the reservoir to the bottom of the reservoir. L index goes from 1 to 8; if less than 8 values are needed to describe the reservoir, set the remaining values to zero.
27	HSAR(L,K,J)	Elevation (ft-msl) at which reservoir surface area SAR(L,K,J) is defined. Values should be read in from the top of the reservoir to the bottom of the reservoir. L index goes from 1 to 8; if less than 8 values are needed to describe the reservoir, set the remaining values to zero.

Data Input: Dam Parameters

Data Group	Variable Name	Contents
28**	LAD(K,J)	Reach number corresponding to location of dam K.
	HDD(K,J)	Elevation (ft-msl) of top of dam.
	CLL(K,J)	Length (ft) of the dam crest less the length of the uncontrolled spillway and gates. If CLL(K,J) is entered as a negative value, the length of the dam crest is variable with elevation and will be specified later as DG-30 and DG-31.
	CDOD(K,J)	Discharge coefficient for uncontrolled weir flow over the top of the dam (2.6-3.1).
	QTD(K,J)	Discharge (cfs) through turbines. This flow is assumed constant from start of computations until the dam is 1/4 breached; thereafter, QTD(K,J) is assumed to linearly decrease to zero when ½ breached; QTD(K,J) may also be considered leaking or constant spillway flow. If this flow is time-dependent, QTD(K,J) is entered with any negative value and the time series for QTD(K,J) is specified later on DG-32 and DG-33.
	ICHAN(K,J)	Parameter indicating if channel conditions at dam K will switch from manual control (e.g., lock and dam controlled by the lockmaster) to channel control (i.e., unsteady flow conditions). If no manual control, set ICHAN(K,J) = 0; if channel control switch is allowed, set ICHAN(K,J) = 1.

If dam is represented by a rating curve only, set all values in DG-28 to zero except LAD(K,J).

Data Input: Dam Parameters (cont.)

Data Group	Variable Name	Contents
29**	ICG(K,J)	Parameter indicating type of movable gate structure. If ICG(K,J) = 0, no movable gates exist; if ICG(K,J) = 1, movable gates exist using an average gate opening; if ICG(K,J) = 2, multiple movable gates exist with independent gate openings.
	HSPD(K,J)	Elevation (ft-msl) of uncontrolled spillway crest. If no spillway exists, set HSPD(K,J) = 0.
	SPL(K,J)	Crest length (ft) of uncontrolled spillway. If no spillway exists, let SPL(K,J) = 0.
	CSD(K,J)	Discharge coefficient of uncontrolled spillway (2.6-3.2). If CSD(K,J) < 0, the failure starts in the spillway at its crest and failure is confined to a length of the spillway. If nospillway exists, set CSD(K,J) = 0. If spillway is represented by an empirical rating curve, set CSD(K,J) = 0 and HSPD(K,J) > 0. Note that only one empirical rating is allowed at the dam. If several rating curves exist at the dam, they should be combined and entered as one rating curve.
	HGTD(K,J)	Elevation (ft-msl) of center of gate openings for average moveable gates.
	CGD(K,J)	Discharge coefficient for gate flow (0.60-0.80) times the area of the gates (sq-ft). If no gate exists, set CGD(K,J) = 0. If gates are represented by an empirical rating curve, set CGD(K,J) = 0. Note that only one empirical rating is allowed at the dam. If several rating curves exist at the dam, they should be combined and entered as one rating curve. If the average moveable gate option is used and submergence effects are expected, an empirical rating curve with built-in submergence should be used.

If dam is represented by a rating curve only, set all values in DG-29 to zero except HSPD(K,J). If the rating curve is a differential head rating curve, set HSPD(K,J) to zero, also.

Data Input: Dam Parameters (Variable Dam Crest)

Skip DG-30 and DG-31 if the dam crest length is constant (CLL(K,J) is greater than or equal to zero, DG-28).

Data Group	Variable Name	Contents
30	HCRESL(L,K,J)	Elevation (ft-msl) associated with variable length of dam crest, CRESL(L,K,J), for dam. Values should be read-in starting at the minimal crest elevation to the maximum elevation. L index goes from 1 to 8; if less than 8 values are needed to describe the dam crest, set the remaining values to zero.
31	CRESL(L,K,J)	Variable length (ft) of dam crest for a given elevation, HCRESL(L,K,J). L index goes from 1 to 8; if less than 8 values are needed to describe the dam crest, set the remaining values to zero.

Data Input: Dam Parameters (Variable Turbine Flow)

Skip DG-32 through DG-39 if running in NWSRFS (not stand-alone mode).

Skip DG-32 and DG-33 if the turbine flow is constant (QTD(K,J), DG-28, is greater than or equal to 0)

Data Group	Variable Name	Contents
32	QTT(L,K,J)	Variable discharge (cfs) through the turbines; this flow is time dependent. L index goes from 1 to NU (DG-2).
33	TQT(L,K,J)	Time (hr) associated with discharge through turbines, QTT(L,K,J). L index goes from 1 to NU (DG-2).

Data Input: Dam Parameters (Rating Curve)

Skip DG-34 and DG-35 if no rating curve is generated for the spillway or gate structure (KRCHT(K,J), DG-20,) is not equal to 11,21,12, 13).

Data Group	Variable Name	Contents
34	RHI(L,K,J)	Head (ft) above spillway crest or gate center. Head is associated with spillway or gate flow, RQI(L,K,J), in rating curve. If KRCHT(K,J)=13, then RHI(L,K,J) is the differential head between the pool and tailwater. L index goes from 1 to 8; if less than 8 values are needed to describe the rating curve, set the remaining values to zero.
35	RQI(L,K,J)	Discharge (cfs) of spillway or gate rating curve corresponding to RHI(L,K,J). L index goes from 1 to 8; if less than 8 values are needed to describe the rating curve, set the remaining values to zero.

Data Input: Dam Parameters (Movable Gates)

Skip DG-36 through DG-39 if no multiple movable gates (KRCHT(K,J) is not equal to 14).

Data Group	Variable Name	Contents
36	NG(K,J)	Number of movable gates in dam K.
37	GSIL(L,K,J)	Elevation (ft-msl) of the bottom of gate L.
	GWID(L,K,J)	Width of gate opening on gate L.
38	TGHT(I,L,K,J)	Time (hr) associated with gate opening GHT(L,K,J). I index goes from 1 to KCG (DG-3).
39	GHT(I,L,K,J)	Distance (ft) from bottom of gate to gate sill, GSIL(I,L,K,J). This distance is time dependent and is associated with the time array TGHT(I,L,K,J); I index goes from 1 to KCG.

Repeat DG-37 through DG-39 for each movable gate (L = 1,NG(K,J)).

Data Input: Dam Parameters (Average Movable Gates)

Skip DG-39a through DG-39c if no average movable gates (KRCHT(K,J) is not equal to 15).

Data Group	Variable Name	Contents
39a	TCG(L,K,J)	Time (hr) associated with gate opening QGH(L,K,J). L index goes from 1 to KCG (DG-3).
39b	QG H(,L,K,J)	Distance (ft) from bottom of gate to gate sill, HGT(K,J). This distance is time dependent and is associated with the time array TCG(L,K,J); L index goes from 1 to KCG (DG-3).
39c	CGCG(L,K,J)	Average spillway gate width (ft) opened at time TCG(L,K,J). L index goes from 1 to KCG (DG-3).

Data Input: Dam Parameters (Lock and Dam)

Skip DG-40 through DG-45 if internal boundary is not a lock and dam (KRCHT(K,J), DG-20, is not equal to 28).

Data Group	Variable Name	Contents
40	PTAR(K,J)	Elevation (ft-msl) of water surface in headwater 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 via gates to maintain the pool elevation at this target elevation.
	CHTW(K,J)	Elevation ft-msl) of water surface in tailwater pool at downstream face of lock and dam; this elevation is considered the elevation at which the lock-master can no longer control the flow through the dam and the flow becomes channel controlled; usually this elevation will be equal to or slightly less than the target pool elevation.
	GZPL(K,J)	Gage correction to convert pool stages to mean sea level datum.

Skip DG-42 and DG-43 if running in NWSRFS (not in stand-alone mode).

42	POLH(L,K,J)	Target pool elevation (same as PTAR(K,J)) for each time step; if POLH(L,K,J) = 0.0 is read-in, then PTAR(K,J) is used for POLH(L,K,J). L index goes from 1 to NU (DG-2). These elevations are associated with the inflow hydrograph time array.

Note: DG-40 and DG-41 have been combined into one DG (DG-40).

Data Input: Dam Parameters (Lock and Dam (cont.))

Skip DG-43 if lock and dam will not be manually controlled (ICHAN(K,J) = 0, DG-28).

Data Group	Variable Name	Contents
43	ITWT(L,K,J)	Parameter indicating if gates control the flow; if ITWT(L,K,J) = 0, flow is controlled by the gates; if ITWT(L,K,J) = 1, flow is not controlled by the gates, e.g., the entire dam is removed as in the case of the low lift dams on the lower Ohio River and the flow becomes channel controlled. L index goes from 1 to NU (DG-2). These gate control switches are associated with the inflow hydrograph time array.

Skip DG-44 and DG-45 if no rating curve is generated for the lock and dam (ICHAN(K,J) is not equal to 2).

44	RHI(L,K,J)	Elevation (ft-msl) associated with flow, RQI(L,K,J), in rating curve describing the lock and dam. L index goes from 1 to 8; if less than 8 values are needed to describe the rating curve, set the remaining values to zero.
45	RQI(L,K,J)	Discharge (cfs) of rating curve corresponding to RHI(L,K,J). L index goes from 1 to 8; if less than 8 values are needed to describe the rating curve, set the remaining values to zero.

Data Input: Bridge Parameters

Skip DG-46 through DG-48 if internal boundary is not a bridge (KRCHT(K,J) is not equal to 35).

Data Group	Variable Name	Contents
46	LAD(K,J)	Reach number corresponding to location of bridge K.
	EMBEL2(K,J)	Crest elevation (ft-msl) of uppermost portion of road embankment.
	EMBW2(K,J)	Crest length (ft) of uppermost portion of road embankment (including bridge opening) measured across valley and perpendicular to flow.
	EMBEL1(K,J)	Crest elevation (ft-msl) of lower portion (emergency overflow) of road embankment. If nonexistent, set EMBEL1(K,J) = 0.
	EMBW1(K,J)	Crest length (ft) of lower portion of road embankment measured across valley and perpendicular to flow. If nonexistent, set EMBW1(K,J) = 0.
	BRGW(K,J)	Width (ft) of top of road embankment as measured parallel to flow.
	CDBRG(K,J)	Coefficient of discharge of flow through bridge opening (see Chow, Open Channel Hydraulics, pages 476-490).

Data Input: Bridge Parameters (Bridge Opening)

Data Group	Variable Name	Contents
47	BRGHS(L,K,J)	Elevations (ft-msl) associated with widths of bridge opening; the brige opening should be closed by setting the last BRGHS(L,K,J) slightly higher (say 0.1 ft.) than the previous value; start at invert and proceed upwards. L index goes from 1 to 8; if less than 8 values are needed to describe the bridge opening, set the remaining values to zero.
48	BRGBS(L,K,J)	Width (ft) associated with BRGHS(L,K,J) elevation of bridge opening; the bridge opening should be closed by setting the last BRGBS(L,K,J) = 0; start at invert and proceed upwards. L index goes from 1 to 8; if less than 8 values are needed to describe the bridge opening, set the remaining values to zero.

Data Input: Dam/Bridge Failure Parameters

Skip DG-49 if internal boundary is not a dam or a bridge.

Data Group	Variable Name	Contents
49**	TFH(K,J)	Time (hr) from beginning of breach formation until it reaches its maximum size in dam/bridge K.
	DTHDB(K,J)	Computational time step (hr) to be used after failure of dam/bridge K. If DTHDB(K,J) = 0, the time step size will be computed as TFH(K,J)/MDT; if multiple dams/bridges have failed, the smallest time step will be used during computations.
	HFDD(K,J)	Elevation (ft) of water when failure of dam/embankment K commences. If HFDD(K,J) < 0, failure commences at time equal to the absolute value of HFDD(K,J) (hr).
	BBD(K,J)	Final (maximum) width (ft) of bottom of breach.
	ZBCH(K,J)	Side slope (1 vertical : ZBCH(K,J) horizontal) of breach.
	YBMIN(K,J)	Lowest elevation (ft-msl) that bottom of breach reaches.
	BREXP(K,J)	Exponent used in development of breach. Varies from 1 to 4; a typical value is 1.
	CPIP(K,J)	Centerline elevation (ft-msl) of piping breach. If breach is overtopping, set CPIP(K,J) = 0.

Repeat DG-26 through DG-49 for each dam/bridge on river J, K = 1,NDB where NDB is the number of dams/bridges; then repeat again for each river (J = 1,JN).

Data Input: Lateral Flow Parameters

Skip DG-50 and DG-51 if NQL(J) is less than or equal to 0.

Data Group	Variable Name	Contents
50	LQ1(K,J)	Sequence number of upstream cross section with lateral inflow. LQ1(K,J) must be placed in columns 1-10.
	STNAME(K,J)	Time series identifier for cross section with lateral flow. STNAME(K,J) may be up to 8 characters long and it must begin in column 13. Omit this field if running in stand-alone mode.
	DTYPE(K,J)	Time series data type for cross section with lateral flow. DTYPE(K,J) may be up to 4 characters long and it must begin in column 22. Omit this field if running in stand-alone mode.

Skip DG-49 if running in NWSRFS (not stand-alone mode).

51	QL(L,K,J)	Lateral inflow at cross section LQ1(K,J). L index goes from 1 to NU. This hydrograph is associated with the inflow hydrograph time array.

Repeat DG-50 and DG-51 for each lateral flow (K = 1,NQL(J), DG-13); then repeat again for each river (J = 1,JN).

Data Input: Gage Parameters

Skip DG-52 through DG-55 if NGAGE(J) = 0 (DG-13).

Data Group	Variable Name	Contents
52	NGS(K,J)	Sequence number of cross section that is an observed/plotting station. NGS(K,J) must be placed in columns 1-10.
	GZ(K,J)	Gage correction to convert observed stages to mean sea level datum. GZ(K,J) must be placed in columns 11-20. Omit this field if KPL = 2 (DG-4) or IOBS is less than or equal to 0 (DG-5).
	STNAME(K,J)	Time series identifier for cross section where observed data will be available or where plotting will be done. STNAME(K,J) may be up to 8 characters long and it must begin in column 23 (it must begin in column 13 if GZ(K,J) is omitted). If running in stand-alone mode, STNAME(K,J) may be up to 20 characters long.
	DTYPE(K,J)	Time series data type for cross section where observed data will be available or where plotting will be done. DTYPE(K,J) may be up to 4 characters long and it must begin in column 32 (it must begin in column 22 if GZ(K,J) is omitted). Omit this field if running in stand-alone mode.

Skip DG-53 if running in NWSRFS (not stand-alone mode) or IOBS (DG-5) is less than or equal to 0.

53	STT(L,K,J)	Observed stage or discharge time series at cross section NGS(K,J). L index goes from 1 to NU. The time array associated with this hydrograph is the same as for the inflow hydrograph. If a value is missing, set it to -999.

Data Input: Gage Parameters (cont.)

Skip DG-54 & DG-55 if KPL (DG-4) is not equal to 3 or IOBS (DG-5) is less than or equal to 0.

Skip DG-54 if running in stand-alone mode (not a part of NWSRFS).

Data Group	Variable Name	Contents
54	STNAME(K,J)	Time series identifier for cross section where observed discharges will be available or where discharges will be plotted. STNAME(K,J) may be up to 8 characters long and it must begin in column 3.
	DTYPE(K,J)	Time series data type for cross section where observed discharges will be available or where discharges will be plotted. DTYPE(K,J) may be up to 4 characters long and it must begin in column 12. Omit this field if running in stand-alone mode.

Skip DG-55 if running in NWSRFS (not stand-alone mode).

55	STQ(L,K,J)	Observed discharge time series at cross section NGS(K,J), DG-50. L index goes from 1 to NU (DG-2). The time array associated with this hydrograph is the same as for the inflow hydrograph.

Repeat DG-52 through DG-55 for each gaging station (K = 1,NGAGE(J), DG-13); then repeat the group for each river (J = 1,JN).

Data Input: Output Time Series Parameters

Skip DG-56 if NSTR(J) = 0 (DG-13) or if running in stand-alone mode (not a part of NWSRFS).

Data Group	Variable Name	Contents
56	NST(K,J)	Sequence number of upstream cross section with an output time series. NST(K,J) must be placed in columns 1-10.
	STNAME(K,J)	Time series identifier for cross section with output time series. STNAME(K,J) may be up to 8 characters long and it must begin in column 13.
	DTYPE(K,J)	Time series data type for cross section with output time series. DTYPE(K,J) may be up to 4 characters long and it must begin in column 22.
	GZO(K,J)	Gage correction to convert output water surface elevations to stages. GZO(K,J) must be placed in columns 26-36. If the output time series is not stage, set GZO(K,J) = 0.

Repeat DG-56 for each output time series (K = 1,NSTR(J), DG-13); then repeat the group for each river (J = 1,JN).

Data Input: Upstream Boundary Parameters (Generated)

Skip DG-57 if IOBS is greater than or equal to 0.

Data Group	Variable Name	Contents
57	TPG(J)	Time (hr) from initial steady flow to peak of specified upstream boundary hydrograph (used in mathematical function describing the hydrograph).
	RHO(J)	Ratio of peak value of specified hydrograph to initial value of the hydrograph.
	GAMA(J)	Ratio of time TG to TPG(J), where TG is time from initial steady flow to center of gravity of the specified hydrograph. GAMA(J) must be > 1.
	YQI(J)	Initial steady discharge (cfs) or water surface elevation (ft-msl) at the upstream boundary.

Repeat DG-57 for each river (J = 1,JN).

Data Input: Upstream Boundary Parameters (Observed)

Skip DG-58 through DG-60 if KU(J) > 2 (DG-13).

Skip DG-58 and DG-59 if running in NWSRFS (not stand-alone mode).

Data Group	Variable Name	Contents
58*	ST1(L,J)	Stages (ft) or discharges (cfs) at upstream boundary of river J. L index goes from 1 to NU (DG-2).

Skip DG-57 if DTHYD>0 (DG-1).

59	T1(L,J)	Time array associated with upstream hydrograph ST1(L,J). L index goes from 1 to NU (DG-2).

Data Input: Upstream Boundary Parameters (Observed)

Skip DG-60 if running in stand-alone mode (not a part of NWSRFS) and KU(J)=2 (DG-13).

Data Group	Variable Name	Contents
60*	STM(J)	Minimum stage (ft) or discharge (cfs) allowed at the upstream boundary. STM(J) must be placed in columns 1-10. Omit this parameter if running in stand-alone mode (not a part of NWSRFS).
	GZ1(J)	Gage correction to convert upstream stages to mean sea level datum. GZ1(J) must be placed in columns 11-20. Omit this parameter if KU(J) = 2 (DG-13).
	STNAME(J)	Time series identifier for stages (ft) or discharges (cfs) at the upstream boundary. STNAME(J) may be up to 8 characters long and it must begin in column 23 (it must begin in column 13 if GZ1(J) is omitted). Omit this parameter if running in stand-alone mode (not a part of NWSRFS).
	DTYPE(J)	Time series data type for observed stages (Ft) or discharges (cfs) at the upstream boundary. DTYPE(J) may be up to 4 characters long and it must begin in column 32 (it must begin in column 22 if GZ1(J) is omitted). Omit this parameter if running in stand-alone mode (not a part of NWSRFS).

Repeat DG-58 through DG-60 for each river (J = 1,JN).

Data Input: Downstream Boundary Parameters

Skip DG-61 through DG-67 if KD(J) = 0 (DG-13).

Skip DG-61 through DG-65 if KD(1) > 2 (DG-13).

Skip DG-61 if running in NWSRFS (not stand-alone mode).

Data Group	Variable Name	Contents
61	STN(K,1)	Observed stages (KD(1) = 1) or discharges (KD(1) = 2) at downstream boundary of main river. K index goes from 1 to NU (DG-2).

Skip DG-62 if running in stand-alone mode (not a part of NWSRFS) and KD(1) is not equal to 0, 1 or 3 (DG-13).

62	GZN	Gage correction (ft-msl) to convert downstream stages to mean sea level datum. GZN must be placed in columns 1-10. Omit this field if KD(1) is not equal to 1 or 3(DG-13).
	DTYPE	Time series identifier for tide (KD(1) = 0, DG-13) stages (KD(1) = 1, DG-13) or discharges(KD(1) = 2, DG-13) at downstream boundary of main river. STNAME may be up to 8 characters long and it must begin in column 13 (it must begin in column 1 if GZN is omitted). Omit this field if running in stand-alone mode (not a part of NWSRFS).
	STNAME	Time series data type for stages (ft) or discharges (cfs) at the downstream boundary. DTYPE may be up to 4 characters long and it must begin in column 22 (it must begin in column 12 if GZN is omitted). Omit this field if running in stand-alone mode (not a part of NWSRFS).

Data Input: Downstream Boundary Parameters (Tide)

Skip DG-63 through DG-65 if running in stand-alone mode (not a part of NWSRFS).

Skip DG-63 and DG-64 if the NOS tide is not used for the downstream boundary (KD(1), DG-13, is not equal to 0).

Data Group	Variable Name	Contents
63	STNAME	Time series identifier for NOS simulated tide at the downstream boundary. STNAME may be up to 8 characters long and it must begin in column 3.
	DTYPE	Time series data type for NOS simulated tide at the downstream boundary. DTYPE may be up to 4 characters long and it must begin in column 13.
	RIVNAM	Name of river using tide data. RIVNAM may be up to 8 characters long and must begin in column 33. Omit this field if downstream boundary is not a tide (KD(1) not equal to zero, DG-13).
64	STNAME	Time series identifier for the adjusted tide at the downstream boundary. STNAME may be up to 8 characters long and it must begin in column 3.
	DTYPE	Time series data type for the adjusted tide at the downstream boundary. DTYPE may be up to 4 characters long and it must begin in column 13.

Data Input: Adjusted Time Series Descriptors

Skip DG-65 if computed hydrographs are not adjusted (IOBS, DG-5, is less than 2).

Data Group	Variable Name	Contents
65	STNAME(K,J)	Time series identifier for cross section location where the computed stage or discharge hydrograph will be adjusted based on observed data. STNAME may be up to 8 characters long and it must begin in column 3.
	DTYPE(K,J)	Time series data type for cross section location where the computed stage or discharge hydrograph will be adjusted based on observed data. DTYPE may be up to 4 characters long and it must begin in column 13.

Repeat DG-65 for each gaging station (K = 1,NGAGE(J), DG-13); then repeat the group for each river (J = 1,JN).

Data Input: Rating Curve Parameters (D/S)

Skip DG-66 if KD(1), DG-13, is not equal to 0, or if running in stand-alone mode (not a part of NWSRFS).

Skip DG-66 through DG-68 if NYQD = 0 (DG-3) OR KD(1) is not equal to 3 (DG-13).

Skip DG-66 if running in stand-alone mode (not a part of NWSRFS).

Data Group	Variable Name	Contents
66	STNAME	Rating curve identifier for cross section at downstream boundary on main river. STNAME may be up to 8 characters long and it must begin in column 1.

Skip DG-67 and DG-68 if running in NWSRFS (not stand-alone mode).

67	YQD(K)	Stages (ft) used to define the empirical rating curve at the downstream boundary on the main river. K goes from 1 to NYQD.
68	QYQD(K)	Discharge (cfs) used to define the empirical rating curve at the downstream boundary on the main river. K goes from 1 to NYQD.

Skip DG-69 if KD(1) is not equal to 5.

69	SLFI(1)	Bed/initial water surface slope (ft/ft) of the main river. This slope is used to generate the single-valued rating curve at the downstream boundary.

Data Input: Lock and Dam Parameters

Skip DG-70 and DG-71 if internal boundary is not a lock and dam (KRCHT(K,J) is not equal to 28, DG-20) or if running in stand-alone mode (not a part of NWSRFS).

Data Group	Variable Name	Contents
70	STNAME(K,J)	Time series identifier for cross section with target pool elevations. STNAME(K,J) may be up to 8 characters long and it must begin in column 3.
	DTYPE(K,J)	Time series data type for cross section with target pool elevations. DTYPE(K,J) may be up to 4 characters long and it must begin in column 12.

Skip DG-69 if lock and dam will never switch to channel control (ICHAN(K,J) = 0, DG-28)

71	STNAME(K,J)	Time series identifier for cross section with gate control switches. STNAME(K,J) may be up to 8 characters long and it must begin in column 3.
	DTYPE(K,J)	Time series data type for cross section with gate control switches. DTYPE(K,J) may be up to 4 characters long and it must begin in column 12.

Repeat DG-70 and DG-71 for each lock and dam (KRCHT(K,J) = 28, DG-20); then repeat the group for each river (J = 1,JN).

Data Input: CALXS Parameters

Skip DG-72 through DG-77 if NP is not equal to -4.

Data Group	Variable Name	Contents
72	IFXC(I,J)	Parameter indicating if cross section has special properties when CALXS option is used. If no special properties, IFXC(I,J) = 0; if actual section is to be read in, IFXC(I,J) = 1; I index goes from 1 to NBT(J), DG-12.
73	HSC(J)	Invert elevation (ft) at the most upstream cross section on river J.
74	KAM	Parameter indicating the method for reading in cross sections in the calibration reach. If KAM = 0, cross sections are described as topwidth versus depth (B versus Y) at key points in the cross section (see Figure 1); if KAM = 1, cross sections are described as the power function B = kYm where m is a shape factor and k is a scaling factor (see Figure 2).
	CHNMN(I,J)	The minimum acceptable Manning n value computed during automatic calibration for calibration reach I. The default value is 0.013.
	CHNMX(I,J)	The maximum acceptable value of Manning n value computed during automatic calibration for calibration reach I. The default value is 0.25.
	SXS	Average channel bottom slope (ft/mi) along calibration reach I.

Data Input: CALXS Parameters (cont.)

Skip DG-75 if KAM= 0.

Data Group	Variable Name	Contents
75	FKC(I,J)	Scaling parameter of the channel in-bank portion of cross section in calibration reach I described in power function.
	FMC(I,J)	Shape factor for the channel in-bank portion of cross section in calibration reach I described in power function.
	FKF(I,J)	Scaling parameter of floodplain portion of cross section in calibration reach I described in power function.
	FMF(I,J)	Shape factor for floodplain portion of cross section in calibration reach I described in power function.
	FKO(I,J)	Scaling parameter of dead storage (inactive) portion of cross section in calibration reach I described in power function.
	FMO(I,J)	Shape factor for dead storage (inactive) portion of cross section in calibration reach I described in power function.
	HB	Depth (ft) of cross section at top of bank.
	HF	Depth (ft) of cross section at top of floodplain.

Data Input: CALXS Parameters (cont.)

Skip DG-76 and DG-77 if KAM = 1.

Data Group	Variable Name	Contents
76	B1	Active top width (ft) of typical cross section in calibration reach I at depth Y1 (half of channel depth).
	B2	Active top width (ft) of typical cross section in calibration reach I at depth Y2 (top of bank).
	B3	Active top width (ft) of typical cross section in calibration reach I at depth Y3 (midpoint of floodplain). Enter zero if no floodplain.
	B4	Active top width (ft) of typical cross section in calibration reach I at depth Y4 (maximum flood depth). Enter zero if no floodplain.
	B5	Dead storage (inactive) top width (ft) of typical cross section in calibration reach I at depth Y3. Enter zero if no inactive storage.
	B6	Dead storage (inactive) top width (ft) of typical cross section in calibration reach I at depth Y4. Enter zero if no inactive storage.

Data Input: CALXS Parameters (cont.)

Data Group	Variable Name	Contents
77	Y1	Depth (ft) of typical cross section in calibration reach I at mid-point between the invert and top of bank.
	Y2	Depth (ft) of typical cross section in calibration reach I at top of bank.
	Y3	Depth (ft) measured from invert of typical cross section in calibration reach I to midpoint between the top of bank and estimated maximum flood elevation.
	Y4	Depth (ft) of typical cross section in calibration reach I at an estimated maximum flood elevation.

Repeat DG-74 through DG-77 for each calibration reach (I = 1,NGAGE(J)-1).

Data Input: Cross Section Parameters

Data Group	Variable Name	Contents
78*	FLST(I,J)	Elevation (ft-msl) at which flooding commences. If no flood stage, enter zero.
	YDI(I,J)	Initial water surface elevation (ft-msl) at cross section I. If steady state conditions exist, the YDI value at the downstream location of the main river and pool levels behind dams must be read in (all other values are entered as zero) and the model will do backwater computations; otherwise, all values are read in. Omit this parameter if running in NWSRFS (not stand-alone mode).
	QDI(I,J)	Initial discharge (cfs) at cross section I. If steady state conditions exist, all QDI values are read in as zero and the QDI values are generated by summation of flows from upstream to downstream. If KU(J) is not equal to 2, the upstream discharge (QDI(I,J)) must be read in. If unsteady-state condition exists, all QDI values are read in. Omit this parameter if running in NWSRFS (not stand-alone mode).
	AS(1,I,J)	Active channel cross-sectional area (sq ft) below the lowest HS elevation in cross section I.
	XLAT(I,J)	Latitude (in decimal degrees) of channel centerline at cross section I.
	XLON(I,J)	Longitude (in decimal degrees) of channel centerline at cross section I.

Data Input: Cross Section Parameters (cont.)

Skip DG-79 through DG-85 if NP = -4 and IFXC(I,J) = 0.

Data Group	Variable Name	Contents
	HS(L,I,J)	
79*		Elevation (ft-msl) corresponding to each top width BS(L,I,J). Elevations are entered from the bottom of the cross section upward; L index goes from 1 to NCS.
80*	BS(L,I,J)	Top width (ft) of active flow portion of channel/valley cross section corresponding to each elevation HS(L,I,J). L index goes from 1 to NCS.

Skip DG-81 and DG-82 if KFLP=0.

81	BSL(L,I,J)	Top width (ft) of active flow portion of left floodplain corresponding to each elevation HS(L,I,J). L index goes from 1 to NCS.
82	BSR(L,I,J)	Top width (ft) of active flow portion of right floodplain corresponding to each elevation HS(L,I,J). L index goes from 1 to NCS.
83*	BSS(L,I,J)	Top width (ft) of dead storage (inactive) portion of channel/valley cross section corresponding to each elevation HS(L,I,J). K index goes from 1 to NCS; if no inactive storage exists, enter zero.

Data Input: Cross Section Parameters (cont.)

Skip DG-84 and DG-85 if KFLP is less than or equal to 1.

Data Group	Variable Name	Contents
84	HKC(L,I,J)	Elevation (ft-msl) corresponding to the conveyance QKC(L,I,J). L index goes from 1 to KFLP.
85	QKC(L,I,J)	Conveyance corresponding to elevation HKC(L,I,J). I index goes from 1 to KFLP.

Repeat DG-78 through DG-85 for each cross section (I = 1,NBT(J)).

Repeat DG-72 through DG-85 for each river (J = 1,JN).

Data Input: Sinuosity Parameters

Skip DG-86 if KFLP is not equal to 1.

Data Group	Variable Name	Contents
86	SNM(L,I,J)	Sinuosity coefficient (channel flow-path length/floodplain flow-path length corresponding to each elevation HS(L,I,J). L index goes from 1 to NCS.

Repeat DG-86 for all reaches (I = 1,NBT(J)-1).

Data Input: Expansion-Contraction Parameters

Data Group	Variable Name	Contents
87*	FKEC(I,J)	Expansion or contraction coefficients. Expansion coefficients vary from -.05 to -.75 and contraction coefficients vary from +.10 to +.40, the larger values are associated with very abrupt changes in cross section along the river; if expansion/contraction is negligible, set FKEC(I,J) = 0. I index goes from 1 to NBT(J) -1.

Data Input: Roughness Parameters

Data Group	Variable Name	Contents
88*	NCM(I,J)	Station number of upstream-most station in subreach that has the same Manning n. I index goes from 1 to NRCM1(J).
89*	CM(L,I,J)	Manning n corresponding to each YQCM(L,I,J) value. L index goes from 1 to NQCM(J); if NQCM(J) = 0, Manning n values are treated as in the DAMBRK program where Manning n is a function of the average elevation between two cross sections and L index goes from 1 to NCS.

Skip DG-90 and DG-91 if KFLP = 0.

90	CML(L,I,J)	Manning n corresponding to each YQCM(L,I,J) value for left floodplain. L index goes from 1 to NQCM(J); the same rules apply for NQCM(J) as were previously stated in DG-86.
91	CMR(L,I,J)	Manning n corresponding to each YQCM(L,I,J) value for right floodplain. L index goes from 1 to NQCM(J); the same rules apply for NQCM(J) as were previously stated in DG-86.

Skip DG-92 if NQCM(J) = 0.

92	YQCM(L,I,J)	Water surface elevation (ft-msl) or discharges (cfs) associated with Manning n. L index goes from 1 to NQCM(J).

Repeat DG-89 through DG-92 for each Manning reach (I = 1, NRCM1(J)).

Repeat DG-86 through DG-92 for each river (J = 1,JN).

Data Input: Ice Parameters

Skip DG-92a if NICE(J) (DG-13) is equal to 0.

Data Group	Variable Name	Contents
92a	ICE(1,L,J)	Upstream location of ice block L.
	ICE(2,L,J)	Downstream location of ice block L.
	TICE(L,J)	Thickness of ice block L.
	CMICE(L,J)	Roughness coefficient due to the ice block L.
	TMICE1(L,J)	Time at which ice block L begins to form
	TMICE2(L,J)	Time at which ice block L completely melted
	DTICE(L,J)	Time required to for complete formation of ice block L. The same amount of time will be used to melt the ice block.

Repeat DG-92a for each ice block (L = 1, NICE(J), DG-13); then repeat the group for each river (J = 1, JN).

Data Input: Adjusted Time Series Parameters

Skip DG-93 through DG-99 if running in stand-alone mode (not a part of NWSRFS).

Skip DG-93-95 if IOBS (DG-5) is not equal to 3

Data Group	Variable Name	Contents
93	NSLC(J)	Total number of slices used to adjust the computed time series. J index goes from 1 to JN.
94	NQSL(J)	Parameter indicating adjustment statistics are a function of water surface elevation (NQSL (J) = 0), or discharge (NQSL (J) = 1). J index goes from 1 to JN.
95	SLICE(L,K,J)	Stage (ft) or discharge (cfs) range into which the statistics lie. A hydrograph will be divided into NSLC(J) elevation or discharge ranges (slices) and adjusted based on the root mean square error and bias. L index goes from 1 to NSLC(J).

Data Input: Adjusted Time Series Parameters (cont.)

Skip DG-96 through DG-99 if IOBS, DG-5, is less than 2.

Data Group	Variable Name	Contents
96	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, no adjustment is made to the computed stage. L index goes from 1 to NSLC(J).
97	FBIASO(L,K,J)	Bias associated with FRMSO (L,K,J). L index goes from 1 to NSLC(J).
98	RRMSO(L,K,J)	Root mean square error (rms) on the rising limb of hte 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. L index goes from 1 to NSLC(J).
99	RBIASO(L,K,J)	Bias associated with RRMSO (L,K,J). L index goes from 1 to NSLC(J).

Repeat DG-95 through DG-99 for each adjusted time series (K = 1, NGAG(J), DG-13); then repeat the group for each river (J = 1, JN).

Data Input: Initial Conditions (Water Elevations)

Skip DG-100 through DG-104 if ICOND=1 (DG-2).

Data Group	Variable Name	Contents
100	YDI(I,J)	Initial water surface elevation referenced to msl (ft) at each cross section. Each field represents a cross section. I=1,NBT(J) (DG-12). If all fields are left blank, the program will generate the YDI's via 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 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 via a solution of the steady flow backwater equation.

Repeat DG-100 for each river (J=1,JN).

Data Input: Initial Conditions (Flows)

Data Group	Variable Name	Contents
	QDI(I,J)	Initial discharges (cfs) at each cross section Each field represents a cross section I=1,NB(J) (DG-12).
101		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 DG-101 for each river (J=1,JN).

Data Input: Initial Conditions (Lateral Flows)

Skip DG-102 if no lateral flow in the system (NQL(J)=0, DG-13, for all rivers J=1,JN).

Data Group	Variable Name	Contents
102	QLI(K,J)	Initial lateral flow (cfs) for each reach with lateral flow. Each field represents a lateral flow reach. K=1,NQL(J) (DG-13).

Repeat DG-102 for each river with lateral flow (NQL(J) not equal to 0, J=1,JN).

Data Input: Initial Conditions (Lock and Dams)

Skip DG-103 and DG-104 if no lock and dams in the system (all KRCHT values equal zero, DG-20).

Data Group	Variable Name	Contents
103	PLTI(K,J)	Initial target pool elevation for each lock and dam. Each field represents a lock and dam, K=1,NUMLAD(J) where NUMLAD(J) is the sum of KRCHT=28, DG-20).

Repeat DG-103 for each river with locks and dams.

104	IWTI(K,J)	Initial gate control switch for each lock and dam. Each field represents a lock and dam, K=1,NUMLAD(J) where NUMLAD(J) is the sum of KRCHT=28, DG-20).

Repeat DG-104 for each river with locks and dams.

Data Input: FLDGRF Parameters

Skip DG-105 and DG-106 if NFGRF = 1 (DG-4).

Data Group	Variable Name	Contents
105*	MESAGE	40-character message describing the data set for use in FLDGRF.
106*	RIVER(J)	16-character name associated with river J. There is no comment line prior to this data group.

Repeat DG-106 for each river (J = 1,JN).