Section A4

Special Commands

and

Output Control

A4.1 $B Record - Transmissive Boundary Condition (optional)

The $B record is used to suspend the sedimentation computations at each downstream boundary. The sediment discharge for each downstream boundary is set to the rate of sediment leaving the next upstream cross section. Use this option when sediment deposits at the downstream boundary and there is no physical explanation for it (e.g., as in a supercritical flow reach when the sediment concentration is very high). See Section 3.4.2.4 for a brief discussion of this option.

Field	Variable	Value	Description
0	ID	$B	Record identification.
2	ISBT	1	Approaching sediment discharge is transmitted past the outflow boundary section without change. This turns the option on.
		2	Sediment discharge is calculated at the outflow boundary. This returns the computation to the default conditions; i.e., it turns this option off.

Table A4-1
$B – Transmissive Boundary

```
$KYD
$B          2
$RSTNG
RC    3    100      0      0    520    525    528
 field1|field 2|field 3|field 4|field 5|field 6|field 7|..
Q   AB  Time Step 1, A level hydraulics, B level sediment
2   100
I    60
W     1
Q       Time Step 2 – No Output
2   200
W     2
              .
              .
$$END
```

A4.2 $DREDGE Record - Dredging Option (optional)

The $DREDGE record initiates dredging calculations to be performed at all cross sections where dredging parameters have been specified (H.6 - H.10). When the depth of water required for navigation (draft depth) specified in Field 2 is not available, HEC-6 will determine dredging elevations and compute the volume of dredged material removed during dredging. The dredging option is initiated at the beginning of the next time step following the $DREDGE record. It continues to operate until turned off by a $NODREDGE record later in the hydrologic data. The first $DREDGE record must not precede the records which define the first time step. See Section 3.2.4 and Section 6.4.1 for further discussion of this option.

Field	Variable	Value	Description
0	ID	$DREDGE	Record identification.
2	DFT	+	Depth of water required for navigation.

Note: Detailed dredging output can be obtained by entering a print level flag in column 8 of the $DREDGE record. Print levels range from Level A, which provides a small level of output to Level E which produces a detailed trace output through the dredging routines. For example, the $DREDGE record in Table A4-2 the following record will turn on the dredging option, specify a draft depth of 10 ft and obtain a B level trace output.

Table A4-2
Example – $DREDGE Record

```
$RYO
 field1|field 2|field 3|field 4|field 5|field 6|field 7|...
Q   AB  Time Step 1, A level hydraulics, B level sediment
2   100
R   521
T    60
W     1
$DREDGEB      10
Q   A  Time Step 2 – A level sediment output
2   200
W     2
      .
      .
$$END
```

A4.3 $NODREDGE Record - Dredging Option (optional)

The presence of a $NODREDGE record stops the dredging option triggered previously by the $DREDGE record.

Field	Variable	Value	Description
0	ID	$NODREDGE	Record identification

A4.4 $EX Record - Exner Options (optional)

HEC-6 has two different methods for solving the Exner equation. Method 1 (also known as EXNER1) is the original method used by HEC-6 prior to Version 4.0. Method 1 is described in detail in Section 2.3.3. Method 2 (a.k.a. EXNER5) is currently the default method used in HEC-6. A detailed discussion of this method can be found in Section 2.3.4.

The purpose of the $EX record is to provide the user access to Method 1. To exercise this option, place a $EX record with a 1 in field 1 immediately after the $HYD record. Otherwise, HEC-6 will default to Method 2.

Field	Variable	Value	Description
0	ID	$EX	Record identification.
1	OPTION	1	Method 1 for hydraulic sorting will be used (see Section 2.3.3).
		2	Method 2 for hydraulic sorting will be used (see Section 2.3.4). Default.

Table A4-3
$EX – Alternate Exner Equation

```
$HYD
$EX     1
  field 1|field 2|field 3|field 4|field 5|field 6|field 7|...
Q    AB  Time Step 1, A/B Level Output
2    100
I     60
W      1
R    521
Q        Time Step 2 – No Output
2    200
W      2
       .
       .
       .
$$END
```

A4.5 $GR Record - Cross Section Shape Option (optional)

By default, HEC-6 retains the original cross section shape by adjusting the elevation of each cross section point below the water surface and within the movable bed by a constant amount for deposition and erosion after each time step. The $GR option 2 causes HEC-6 to vary the depth of deposit in a cross section according to the depth of flow. Thus, deeper portions of a cross section will receive more deposited material than more shallow areas. The elevation of each point in the wet portion of the movable bed is still adjusted, but the amount of deposition at each point depends on the depth of flow at that point in the cross section. Erosion remains uniform. Figures 3-12 and 3-13 in Section 3.7.3 illustrate this operation.

Field	Variable	Value	Description
0	ID	$GR	Record identification.
1	OPTION	2	Vary the amount of deposition depending on depth. (A "2" in field 1 turns the $GR option on.)
		0	Move Y-coordinates by a constant amount after each computation. (A "0" in field 1 turns the $GR option off; i.e., this returns the method of deposition back to the default.)

Table A4-4
$GR - Nonuniform Deposition Option

```
$KYD
$GR   2
 field 1|field 2|field 3|field 4|field 5|field 6|field 7|...
$RATING
RC    3    100     0     0    520   525   528
Q   AB  Time Step 1, A/B Level Output
2   100
I    60
W     1
Q       Time Step 2 - No Output
2   200
W     2
              .
              .
              .
$$END
```

A4.6 $KL - $KI Records - Channel *n* Values by Relative Roughness (optional)

When a $KL record is encountered, HEC-6 ignores the Manning's *n* values for the channel given on the NC and/or NV records and calculates bed roughness as a function of the bed material gradation via Limerinos' (1970) relative roughness method. A detailed description of this option is given in Section 3.2.2.

Field	Variable	Value	Description
0	ID	$KL	Record identification. Use Limerinos' Roughness Method.
		$KI	Use Manning's *n* values. Default Method.

Table A4-5
$KL – Limerinos' Relative Roughness Option

```
$KYD
$KL
 field1|field 2|field 3|field 4|field 5|field 6|field 7|...
$RATING
RC    3    100     0     0    520    525    528
Q     AB  Time Step 1, A/B Level Output
2     100
I      60
W       1
Q       Time Step 2 – No Output
2     200
W       2
              .
              .
              .
$$END
```

A4.7 $PRT Record - Selective Output Option (optional)

The $PRT record is used alone to turn output on or off for all cross sections. It is also used preceding CP and PS records to generate output at specified cross sections. An END record is required at the end of the CP-PS record set to mark the end of the selective output request. See Example Problem 6 in Chapter 6 for an example of this option.

Field	Variable	Value	Description
0	ID	$PRT	Record identification.
Column 8	OPTION	N	Turn output off at all sections.
		A	Turn output on at all sections.

blank	Directs HEC-6 to look for CP and PS records to determine selected cross sections for output.

Table A4-6
$PTR – Selective Output Option

```
$KYD
  Turn output OFF for ALL cross section
$PRT  N
  field1|field 2|field 3|field 4|field 5|field 6|field 7|...
$RATING
RC     3     100       0       0     520     525     528
Q   AB  Time Step 1, A level hydraulics, B level sediment
2    100
I     60
W      1
  Turn output ON for ALL cross section
$PRT  A
Q       Time Step 2 – B level sediment output
2    200
W      2
Q       Time Step 3 – B level sediment
2    200
W      2
  Turn output on at cross sections 15.0 and 33.2 ONLY
$PRT
CP     1
PN          15.0    33.2
  field1|field 2|field 3|field 4|field 5|field 6|field 7|...
$RATING
RC     3     120       0       0     530     536     540
Q       Time Step 4 – C level sediment
2    200
W      2
                .
                .
                .
$$END
```

A4.8 CP Record - Selective Output (see $PRT record - optional)

The CP record defines the stream segment for which the cross sections given on the PS record(s) apply. Each CP record must be followed by one or more PS records.

Field	Variable	Value	Description
0	ID	CP	Record identification.
2	NGDS	+	Stream segment number.

A4.9 PS Record - Selective Output (see $PRT Record - optional)

Use the PS record to specify the cross sections where output is desired. Each set of PS records applies to the stream segment defined on the CP record immediately preceding it. Additional PS records may be used if more than ten cross sections per stream segment are requested. When specifying the desired cross section for printing, use its identification number, as entered on the X1 record.

Field	Variable	Value	Description
0	ID	PS	Record identification.
1-10	SECNO	+	Enter the identification number of the desired cross section as given in Field 1 of the X1 record. HEC-6 generates output for each SECNO on the current stream segment defined by the preceding CP record.

A4.10 END Record - Selective Output (see $PRT Record; optional)

An END record is used to indicate the end of the $PRT data. This record should be placed after the last PS record. If output for cross sections on more than one stream segment is desired, sets of CP and PS records may be stacked one after another. The END record is inserted only after the last set.

Field	Variable	Value	Description
0	ID	END	Record identification.

A4.11 $RATING Record - Tailwater Rating (optional)

A starting water surface elevation must be specified at the downstream boundary for every time step. HEC-6 provides several methods for prescribing this downstream boundary condition. Specification of a tailwater rating curve is one of these methods.

The rating curve is specified using a $RATING record followed by a set of RC records. The $RATING record indicates that a set of RC records follows containing rating curve information. The rating curve can be input immediately after the $HYD record or before any Q record in the hydrologic data. Once a rating curve has been input it can be changed by inputting a new rating curve (a new set of $RATING and RC records) before any Q record later in the hydrologic data. Table A4-6 illustrates the use of the $RATING option.

Field	Variable	Value	Description
0	ID	$RATING	Record identification.

A4.12 RC Record - Tailwater Rating

The RC (rating curve) records prescribe the tailwater elevation as a rating curve.

Field	Variable	Value	Description
0	ID	RC	Record identification.
1			Leave blank.
2	MNI	+	The number of water surface values that will be read. (May not exceed forty).
3	TINT	+	The discharge interval between water surface values in cfs. Use as small an interval as desired, but it must be a constant for the full range of water surface elevations that follow.
4	QBASE	+	If the first discharge in the table is not zero enter its value here in cfs.
5	GZRO	+	If the rating table is a stage-discharge curve rather than elevation-discharge, enter gage zero here.
6	RAT(1)	+	Lowest water surface elevation or stage goes here.
7-10	RAT(2)... RAT(MNI)		Continue entering water surface elevation or stage values defining the rating curve using Fields 7-10 on this record and Fields 2-10 on continuation RC records. A maximum of forty points can be entered to define the curve.

A4.13 $SED Record - Water Discharge-Sediment Load Table (optional)

This HEC-6 command option allows the user to change a sediment load table during a simulation. A change to a sediment load table can be made by either entering a new sediment load table definition on LPOINT, LQ, LT and LF records or by altering the existing table with a ratio defined on an LRATIO record.

A $SED command precedes a LPOINT, LQ, LT, LF record combination that defines the discharge-sediment load rating curve. It should also precede an LRATIO record. The LPOINT record is used to specify the location where the new sediment load table applies. It is required with the LQ, LT and LF records. An END record completes the $SED data records.

If the sediment load table for the main stem or a tributary is to be replaced, see the input descriptions for the LQ, LT and LF records given in Sections A2.10 to A2.12. However, if the sediment load table for a local inflow or outflow is to be replaced, refer to the input description for the LQL, LTL, and LFL records given in Sections A2.15 to A2.17 instead (i.e. LQ, LT, LF records are used for the main channel and tributaries. The LQL, LTL and LFL records are used for local inflows and outflows).

Field	Variable	Value	Description
0	ID	$SED	Record identification.

Table A4-7

$SED – Replace Sediment Load Table

```
$KYD
 field1|field 2|field 3|field 4|field 5|field 6|field 7|...
$RATING
RC     3     100       0       0     520     525     528
Q    AB  Time Step 1, A/B Level Output
2    100
I     60
W      1
$SED
LPOINT         1       1
L2
LT
LT CLAY
                .
                .
LT VCS
END
Q        Time Step 2 – No Output
2    200
W      2
$SED
LRATIO         3       0     1.1
                .
                .
Q    AB  Time Step n, A/B Level Output
2    100
W      1
$$END
```

A4.14 LPOINT Record - Inflow Point Identification for the Water Discharge-Sediment Load Table (optional)

The LPOINT record defines the stream segment and/or inflow point whose sediment load table will be modified by the succeeding set of LQ, LT, and LF records. The LPOINT record is only used with the $SED option and should not be used with the L records in the sediment data.

Field	Variable	Value	Description
0	ID	LPOINT	Record identification.
2	NGDS	+	Stream segment number
3	NLOC	+	Local inflow/outflow point number.

A4.15 LRATIO Record - Ratio for the Water Discharge-Sediment Load Table (optional)

When changing the sediment discharge with the $SED option, the existing sediment-discharge load table can be modified by entering an LRATIO record with a constant multiplier, rather than by entering a whole new table.

Field	Variable	Value	Description
0	ID	LRATIO	Record identification.
2	NGDS	+	Stream segment number.
3	NLOC	+	Local inflow/outflow point number.
4	RATIO	+	Existing sediment-discharge rating curve will be multiplied by RATIO.

A4.16 END Record - Termination Record for the $SED Option

An END record is used to indicate the end of the changes made to the sediment load table(s). This record should be inserted after the last LRATIO or LF record. If changes are to be made to more than one sediment load table, LRATIO records and/or sets of LPOINT, LQ, LT, LF records may be stacked one after another. Insert the END record only after the last set of change records.

Field	Variable	Value	Description
0	ID	END	Record identification

A4.17 $VOL Record - Compute Cumulative Volume and Deposits at all Sections (optional)

The $VOL command causes HEC-6 to calculate the cumulative bed change and load passing each cross section.

Field	Variable	Value	Description
0	ID	$VOL	Record identification
Column 7	OPTION	X	Causes HEC-6 to look for a VJ record immediately after the $VOL command and compute the storage volume for a table of elevations specified on succeeding VR records.
Column 8	TRACE	A	Additional output showing cumulative weight of sediment passing each cross section by size class.
		B	A-level output plus extra trace information from the PRTVOL and STOVOL routines. (Not recommend for normal applications.)

A4.18 VJ Record - Elevation Table for Cumulative Volume Computations (optional; see $VOL Record)

Field	Variable	Value	Description
0	ID	VJ	Record identification.
1	JM	1-30	The number of elevation values which are listed on the following VR records. Limited to thirty values.
2	AVGSLO	0	Compute volumes based on planes with no slope.
		+	Compute volumes based on planes having slope AVGSLO.

A4.19 VR Record - Elevation Table for Cumulative Volume Computations (optional; see $VOL Record)

Field	Variable	Value	Description
0	ID	VR	Record identification.
1	ELSTO(1)	-, 0, +	Enter up to thirty elevations in Fields 1 through 10 on this and succeeding VR records.