Section A2

Sediment Properties

and

Transport Functions

A2.1 Title Records - Comments (five required - T4 - T8)

Five Title Records are required to precede the sediment data for each segment in a network. They each have a T in Column 1 and the sequence number in Column 2. The number four is suggested for the first sequence number. A Data Echo print option is available; see below for details.

Field	Variable	Value	Description
0	ID	T4	Record identification in Columns 1 and 2. T4, T5, T6, T7, and T8 for the fourth through eighth title records, respectively.
Column 4 of T4 record only	OPTION	B	Data Echo. Each input record is echoed to the output file as it is read. This is available to help the user verify the initial conditions and is not recommended for normal use. To exercise this option, enter B in Column 4 of the first title record (T4) of this group. Otherwise leave blank.
1-10[4]			Fields 1 through 10 (Columns 5-80) may be used for identifying the stream segment, project date, or any other relevant information.

[4] Column 4 of the first title record (**T4**) is reserved for requesting an output option that echoes the input and should be left blank if a data echo is not required.

A2.2 I1 Record - Sediment Properties (required)

The I1 record contains sediment properties.

Field	Variable	Value	Description
0	ID	I1	Record identification.
1			Leave Blank.
2	SPI		Iterations of the Exner computations.
		+	Specify the number of exchange increments used during each time step to recalculate the composition of material in the bed.
			Note: More than any other input variable, SPI affects computation time. If too small of a value is used, calculations may display oscillations in the amount of sediment being transported and in the bed profile. The value can be increased to 20 or more, until the computed results are essentially the same as those calculated with SPI left blank or zero.
		0	HEC-6 calculates a value for SPI.
			Note: The value of SPI computed by HEC-6 (if the user does not specify a value) can be very large for some problems. We suggest that users avoid using values greater than SPI = 50. A message will appear in your output if the computed SPI value is greater than 50. If the user chooses to use the larger values, the desired SPI must be entered in Field 2 (I1.2) and HEC-6 re-executed. Refer to Section 2.3.4.1 and Training Document No. 13, "Guidelines for the Calibration and Application of Computer Program HEC-6" (HEC 1992), for further discussion.
3	IBG		Gradation Calculation Method. Instructs HEC-6 to calculate gradation in surface layer based upon transport capacity required to just transport the inflowing load with no scour or deposition if possible. Use this option only if bed material gradations are not available.
		0	HEC-6 uses gradation on PF records to calculate transport capacity.
		+IBG	HEC-6 calculates gradation of surface layer based on inflowing load and sediment transport theory. Iterative process performed in IBG iterations.
4			Leave Blank.

Field	Variable	Value	Description
5	SPGF	+	Specific Gravity of Fluid. It is used with density and acceleration of gravity to calculate unit weight.
		0	HEC-6 uses SPGF=1.0000 (fresh water at 39.2 degrees F).
6	ACGR	+	Acceleration Due to Gravity.
		0	HEC-6 uses G=32.174 ft/sec^2 (standard at 45 degrees latitude, sea level).
7	NFALL		Fall Velocity Computation Method. Refer to Section 2.3.7, for a discussion of the available methods.
		0	HEC-6 defaults to Method 2.
		1	Original Toffaleti (1966) method for computing fall velocities.
		2	Federal Interagency Sedimentation Project (ICWR 1957 & Williams 1980) method for computing fall velocities.
8	IBSHER		Bed Shear Stress Computation Method.
		0, 1	HEC-6 calculates bed shear stress as €DS for clay/silt erosion and deposition.
		2	HEC-6 uses U_Q from smooth wall law to calculate bed shear stress for clay/silt erosion and deposition.

A2.3 I2 Record - Parameters Required for Clay Transport (optional)

The presence of an I2 record instructs HEC-6 to calculate transport of clay. The data included on this record provides parameters and guidelines with which to structure the computations for clay transport.

Note: The clay transport relationships were derived from experiments where the suspended sediment concentrations were less than 300 mg/€ (Krone 1962). Applications to field situations where suspended sediment concentrations are greater than 300 mg/€ may exceed the intended range of applicability of the relationships. Also note, that the relationships for clay deposition were derived from one-dimensional channels where the velocity and sediment concentration profiles are reasonably uniform. Users may experience difficulty simulating clay deposition rates in deep reservoirs.

If the I2 record is used by itself, HEC-6 will only compute deposition of clay. However, if two Special I2 records are used in addition to the first I2, both deposition and erosion of cohesive sediment (clay and silt) will be computed.

Field	Variable	Value	Description
0	ID	I2	Record identification.
1		Comment	Any alphanumeric characters or comments.
2	MTCL		Clay Transport Method.
		0, 1	Deposition of clay using settling velocity is computed only. No clay erosion is computed.
		2	Deposition and erosion of cohesive sediments are computed. Deposition is computed by the Krone (1962) equation and erosion by the Ariathurai (1976) method. Note that this method requires the addition of two Special I2 records.
3	ICS	b, 1	Initial size class interval for clay - there is only one clay size available, so enter 1 or leave blank.
4	LCS	b, 1	Last size class interval for clay - there is only one clay size available, so enter 1 or leave blank.
5	SPGC	+	Specific gravity of clay particles.
		0	The default is 2.65.
6	DTCL	+	The shear threshold for clay deposition. This is the average bed shear stress in lbs/sq ft above which clay will not be deposited. This value is ignored when the Special I2 records are used.
		0	The default is 0.02 lb/sq ft.
7			Leave blank.

Field	Variable	Value	Description
8	PUCD	+	The unit of weight for fully compacted clay deposits, lb/cu ft.
		0	The default is 78 lb/cu ft.
9	UWCL	+	The initial (before compaction) unit weight for clay deposits, lb/cu ft.
		0	The default is 30 lb/cu ft.
10	CCCD	+	Compaction coefficient for clay deposits for the equation: $\gamma_{clay} = UWCL + [CCCD \cdot \log_{10}(Time)]$ where time is in years. See Section 2.3.6.3.
		0	The default is 16 lb/cu ft.

A2.4 Special I2 Records - Cohesive Sediment Transport Method 2 - Supplemental Parameters (optional)

The Special I2 records are used to prescribe the depositional and erosional shear stress thresholds for fine grained cohesive sediment (clay and silt) to be used by clay and silt transport Method 2 (MTCL - I2.2, MTSL - I3.2). Refer to Section 2.3.9. If used, two Special I2 records must be employed (in addition to the first I2 record described on the preceding pages): one to describe the active layer and one to describe the inactive layer.

Note: The clay transport algorithms were derived from experiments where the suspended sediment concentrations were less than 300 mg/€ (see Krone, 1962). Applications to field situations where suspended sediment concentrations may be greater than 300 mg/€ may exceed the intended range of applicability of the relationships. Also note, that the relationships for clay deposition were derived from one-dimensional channels where the velocity and sediment concentration profiles are reasonably uniform. Users may experience difficulty simulating clay deposition rates in deep reservoirs.

The erosion parameters defined on the Special I2 records apply to silt as well as clay sediments. If erosion of silt sizes is desired, then an I3 record must follow the Special I2 record.

Field	Variable	Value	Description
0	ID	I2	Record identification.
1		Comment	Any alphanumeric characters or comments.
2	J	1	Data on this record applies to the active layer (the first Special I2 record).
		2	Data on this record applies to the inactive layer (the second Special I2 record).
3	DTCL	+	The shear threshold for clay and silt deposition. This is the average bed shear stress in lbs/sq ft above which clay and silt will not be deposited.
		0	The default is 0.02 lb/sq ft.
4	STCD	+	Shear stress threshold for erosion of clay and silt particles, lb/sq ft. This is the shear stress above which clay and silt material will be scoured from the bed[5].
5	STME	+	Shear stress threshold for mass erosion, lb/sq ft.[5]
6	ERME	+	Erosion rate of clay and silt at STME, lb/sq ft/hr.[5]
7	ER2	+	Slope of the erosion rate curve for mass erosion, 1/hr.[5]

[5] There is no default, user must enter a value.

A2.5 I3 Record - Parameters Required for Silt Transport (optional)

The presence of an I3 record instructs HEC-6 that the mixture of sediment to be analyzed contains silt size particles. The data included on this record provides parameters and guidelines within which to structure the computations for silt transport. Do not attempt to include silt particles without also including clay. If no clay is present in the system, enter zero for clay on the LF and PF records.

When modeling erosion of silts, you must provide an I2 and two Special I2 records to define erosion parameters of silt grains.

Field	Variable	Value	Description
0	ID	I3	Record identification.
1		Comment	Any alphanumeric characters or comments.
2	MTSL		Silt Transport Method
		1	Settling velocity method for calculating deposition of silt.
		2	Method for computing scour and deposition of silt.
			Note: This method requires the use of an I2 record and two Special I2 records, as described on the preceding pages.
3	IASL	+	ID number of the smallest grain size classification of silt to be transported (see Table A2-1). IASL must always be less than LASL.
		0	Default IASL=1.
4	LASL	+	ID number of the largest grain size classification of silt to be transported (see Table A2-1).
		0	Default LASL=4.

Table A2-1
Grain Size Classes; Silts

ID Number	Classification	Grain Size (mm)	Geometric Mean (mm)
1	Very fine	.004 - .0080	.005
2	Fine	.008 - .0160	.011
3	Medium	.016 - .0310	.022
4	Coarse	.031 - .0625	.044

The data in Table A-2 is predefined in HEC-6; IASL and LASL must be selected from this table. HEC-6 automatically includes all sizes between IASL and LASL if the I3 record is present in the input. If transport of clay is to be computed as well as silts, IASL should equal one to provide a continuous representation of grain size classes from clay to silts. If transport of sands is to be computed as well as silts, LASL should equal four for the same reason. Grain sizes which are not found in the bed may be so noted (with zero values) in the bed material gradation specified on the PF records.

Field	Variable	Value	Description
5	SGSL	+	Specific gravity of silt particles.
		0	Default = 2.65
6	DTSL		Deposition threshold for silt.
		+	The average bed shear stress in lb/sq ft above which silt material will not be deposited. This value is ignored if Special I2 records are used.
		0	Default = 0.02 lb/sq ft (for lack of better data).
7			Leave blank.
8	PUSD	+	Unit weight of fully consolidated silt deposits in lb/cu ft.
		0	Default = 82 lb/cu ft.
9	UWSL	+	Unit weight of silt material at the moment it is deposited on the stream bed.
		0	Default = 65 lb/cu ft.
10	CCSD	+	Compaction coefficient for silt deposits for the equation $\epsilon_{silt} = UWSL + [CCSD \cdot (\log_{10}(Time)]$ where time is the accumulated simulation time expressed in years.
		0	Default = 5.7 lb/cu ft/yr.

A2.6 I4 Record - Parameters Required for Sand Transport (optional)

The presence of an I4 record indicates that sand sizes are present in the mixture of sediment to be analyzed. The data on this record provides parameters and guidelines within which to perform the computations for sand transport.

Field	Variable	Value	Description
0	ID	I4	Record identification.
1		Comment	Any alphanumeric characters or comments.
2	MTC		Transport capacity relationship[6] to be used by HEC-6 to compute sediment load for a given water discharge.
		0, 1	Toffaleti's (1966) transport function.
		2	User Specified Transport Function. User specification of transport coefficients based upon observed data. User must supply his own transport relationship in the form of DS vs. transport coefficients (on records J and K), where DS is depth times slope. See instructions for the J and K records for a more complete description.
		3	Madden's (1963) modification of Laursen's (1958) relationship
		4	Yang's (1973) stream power for sands
		5	DuBoys' transport function (Vanoni 1975)
		6	Not used
		7	Ackers-White (1973) transport function
		8	Colby (1964) transport function
		9	Toffaleti (1966) and Schoklitsch (1930) combination
		10	Meyer-Peter and Müller (1948)
		11	Not used
		12	Toffaleti and Meyer-Peter and Müller combination
		13	Madden's (1985, unpublished) modification of Laursen's (1958) relationship
		14	Copeland's (1990) modification of Laursen's relationship (Copeland and Thomas 1989)

[6] Users should refer to Chapter 2 of Vanoni's Sedimentation Engineering (1975), for information regarding the best transport function to use for specific types of rivers and bed material types.

Field	Variable	Value	Description
3	IASA	+	ID number of the smallest grain size classification of sand to be transported in the calculations (see Table A-3). IASA must always be less than LASA.
		0	Default IASA = 1.
4	LASA	+	ID number of the largest grain size classification of sand to be transported in the calculations (see Table A-3).
		0	Default LASA = 10.

The following table of grain sizes is predefined in HEC-6. IASA and LASA must be selected from this table. All sizes between, and including, IASA and LASA will be transported. If transport of silts is to be computed as well as sands, IASA should equal one to provide a continuous representation of grain size classes from silts to sands even if the very fine sand sizes are not found in the bed. Grain sizes which are not found in the bed may be so noted in the bed material gradation specified on the PF record.

Table A2-2
Grain Size Classes; Sands

ID Number	Classification	Grain Size (mm)	Geometric Mean (mm)
1	Very Fine Sand	.062 - .125	.088
2	Fine Sand	.125 - .250	.177
3	Medium Sand	.25 - .50	.354
4	Coarse Sand	.50 - 1.0	.707
5	Very Coarse Sand	1 - 2	1.414
6	Very Fine Gravel	2 - 4	2.828
7	Fine Gravel	4 - 8	5.657
8	Medium Gravel	8 - 16	11.31
9	Coarse Gravel	16 - 32	22.63
10	Very Coarse Gravel	32 - 64	45.26
11	Small Cobbles (SC)	64 - 128	90.51
12	Large Cobbles (LC)	128 - 256	181.0
13	Small Boulders (SB)	256 - 512	362.0
14	Medium Boulders (MB)	512 - 1024	724.1
15	Large Boulders (LB)	1024 - 2048	1446.2

Field	Variable	Value	Description
5	SPGS	+	Specific gravity of sand particles. (Not the unit weight of deposited material.)
		0	Default = 2.65.
6	GSF	+	Grain shape factor.
		0	Default = 0.667.
7	BSAE	+	Coefficient in surface area exposed function. Equation is as follows: $FSAE = ASAE(SAE^{BSAE}) + CSAE$
		0	Default = 0.5.
8	PSI	+	The parameter € from Einstein's (1950) method is used to approximate €* for calculating equilibrium bed elevation. See Section 2.3.2.1.
		0	Default = 30.
9	UWD	+	Unit weight of deposited sediment. Specify in lb/cu ft.
		0	Default UWD = 93 lb/cu ft, a reasonable value for sand. HEC-6 does not change this value with time.

A2.7 I5 Record - Weighting Factors for Numerical Integration Method (optional)

Use this record to enter hydraulic parameter weighting factors. Section 2.2.4 presents two sets or schemes of weighting factors for the numerical integration method used by HEC-6. If the I5 record is omitted, HEC-6 defaults to the Scheme 2 weighting factors. All values must be supplied.

Field	Variable	Value	Description
0	ID	I5	Record identification.
1		Comment	Any alphanumeric characters or comments.
2	DBI	+	Weight assigned to hydraulic properties at second cross section when calculating at downstream boundary.
3	DBN	+	Weight assigned to hydraulic properties at downstream boundary for downstream boundary calculations. Note: DBI + DBN must equal 1.0.
4	XID	+	Weight assigned to hydraulic properties at the downstream cross section - interior point calculations.
5	XIN	+	Weight assigned to hydraulic properties at cross section of interest - interior point calculations.
6	XIU	+	Weight assigned to hydraulic properties at the upstream cross section - interior point calculations. Note: XID + XIN + XIU must equal 1.0.
7	UBI	+	Weight assigned to hydraulic properties at next to last cross section for calculation at upstream boundary.
8	UBN	+	Weight assigned to hydraulic properties at upstream boundary. Note: UBI + UBN must equal 1.0.

A2.8 J Record[7] - User Specified Transport Function (optional)

Use the J record to define the coefficients of the User Specified Transport Function. This function is expressed by the equation:

$$GP_i \quad ((((EFD \quad SLO) \quad C_i) / A_i)^{B_i}) \quad EFW \quad STO$$

where: A_i, B_i, C_i=coefficients entered on the J records in units of tons/day/foot of width for each grain size
STO =correction factor computed from the coefficients on the K record
EFD =effective depth
EFW =
effective width
SLO =
energy slope
GP =
potential transport per grain size

A separate J record is required for each grain size fraction being evaluated. Enter data from fine to coarse. The data contained on the J and K records is relevant to HEC-6 only if the selected transport capacity relationship, MTC (I4.2), equals two. If MTC does not equal two, HEC-6 will simply ignore the data contained on these records. Section 3.3.4.1 contains a complete description of the user specified transport function option.

Field	Variable	Value	Description
0	ID	J	Record identification (Column 1).
1		Comment	Comment information such as the name of the grain size classification to which the data on this record relates.
2	A_i	+	Coefficient corresponding to A in above equation for grain size i.
3	B_i	+	Coefficient corresponding to B in above equation for grain size i.
4	C_i	+	Coefficient corresponding to C in above equation for grain size i.

[7] If the user decides to use the special transport function option, then **both** a set of **J** records and **K** record must be provided in order to specify the required information and coefficients to use this option.

A2.9 K Record - User Specified Transport Function (optional)

Use the K record to define the coefficients of the function which is used to correct the User Specified Transport Function for variation in n value. This correcting function is expressed by the equation:

$$STO = 10^{-6} \cdot D \cdot n^{E}$$

The data contained on the J and K records is relevant to HEC-6 only if the selected transport capacity relationship, MTC (I4.2), equals two. If MTC does not equal two, HEC-6 will simply ignore the data contained on these records. Section 3.3.4.1 provides a complete description of this transport function option.

Field	Variable	Value	Description
0	ID	K	Record identification (Column 1).
1		Comment	Comment information.
2	CNCO(1)		Coefficient corresponding to D in the above equation.
3	CNCO(2)		Coefficient corresponding to E in the above equation.

A2.10 LQ Record - Water Discharge for the Water Discharge-Sediment Load Relationship (required)

The inflowing sediment load is related to water discharge by prescribing the discharge in cfs on the LQ record, total sediment load in tons per day on the LT record and the fraction of the sediment load in each grain size class on LF records. Each LF record will describe one grain size fraction and they should be entered from fine to coarse. Enter the water discharge in cfs on the LQ record as follows.

Field	Variable	Value	Description
0	ID	LQ	Record identification.
1		Comment	Any alphanumeric characters or comments.
2	QWATER	+	Water discharge in cfs. Enter the first discharge value[8] for the water discharge vs. sediment load table. If the range of water discharges in the inflow hydrograph is beyond that specified in this table, the extreme values of sediment load from the table will be used (i.e., HEC-6 will not extrapolate beyond the ends of the table).
3	QWATER	+	The second water discharge for the water discharge vs. sediment load table. Each consecutive water discharge must be greater than the previous one.
4-10	QWATER	+	Continue to enter increasing water discharge values in Fields 4 through 10. A maximum of nine water discharge values is permitted.

[8] QWATER cannot be zero or negative.

A2.11 LT Record - Total Sediment Load for the Water Discharge-Sediment Load Relationship (required)

The inflowing sediment load is related to water discharge by prescribing the discharge in cfs on the LQ record, total sediment load in tons per day on the LT record and the fraction of the sediment load in each grain size class on LF records. Each LF record describes one grain size fraction; they should be entered from fine to coarse. Enter the total sediment load in tons per day on the LT record as follows.

Field	Variable	Value	Description
0	ID	LT	Record identification.
1		Comment	Any alphanumeric characters or comments.
2	QSED	+, 0	Total sediment load in tons per day. This value corresponds to the water discharge entered in Field 2 of the LQ record.
3	QSED	+, 0	Total sediment load in tons per day. This value corresponds to the water discharge entered in Field 3 of the LQ record.
4-10	QSED	+, 0	Continue to enter the total sediment load values for each subsequent water discharge entered on the LQ record. A maximum of nine values is permitted.

A2.12 LF Record - Fraction of Load for the Water Discharge-Sediment Load Relationship (required)

The inflowing sediment load is related to water discharge by prescribing the discharge in cfs on the LQ record, total sediment load in tons per day on the LT record and the fraction of the sediment load in each grain size class on LF records.

Each LF record describes the sediment load of one grain size fraction. There must be one LF record for each grain size classification selected on records I2 through I4 even if the fraction of the load for any grain size is zero. LF records should be entered from fine to coarse.

Field	Variable	Value	Description
0	ID	LF	Record identification.
1		Comment	Any alphanumeric characters or comments. (It is recommended that the name of the grain size class to which the data on this record relates be used in this field; i.e., CLAY, SILT1, SILT2, VFS, FS, ... VCG.)
2	QSF	+, 0	The fraction for this grain size of the total sediment load corresponding to the water discharge in Field 2 of the LQ record.
3	QSF	+, 0	The fraction for this grain size of the total sediment load corresponding to the water discharge in Field 3 of the LQ record.
4-10	QSF	+, 0	Continue to enter the fraction of the total sediment load corresponding to each subsequent water discharge entered on the LQ record. A maximum of nine values is permitted.

A2.13 PF Record - Bed Material Gradation - Percent Finer

The PF record defines the gradation of the bed sediment reservoir (in percent finer) at each cross section as a grain size distribution curve. The sediment computations require gradation information for each cross section; however, it is not necessary to enter PF records for every cross section. Specific rules are:

a. There must be at least one PF record for each stream segment in the network. If only one PF record is present, that gradation is used for all cross sections on that stream segment.

b. The cross section ID number (i.e., river mile) is coded in Field 2 to tell HEC-6 where the PF data applies. The cross section ID number on each PF record must correspond to one used previously on an X1 record. If more than one PF record is present, but not one for each cross section on the stream segment, a linear interpolation is made to fill in the missing data.

c. If the cross section ID number is omitted from a PF record, it will be assigned to the last cross section (i.e., the one most upstream), and values to the previous PF record will be interpolated.

d. The gradation for any cross sections after the final PF record will be assigned the values on that record.

e. Do not skip grain sizes when entering the I2 through I4 data (i.e., set LASL = 4 (I3.4) and IGS = 1 (I4.3) if silts as well as sands are being transported). It is not necessary to calculate all 20 grain sizes.

Field	Variable	Value	Description
0	ID	PF	Record identification.
		PFC	Record identification, continuation records.
1		Comment	Comment on PF record; data on PFC records.
2	SECID	-, 0, +	Cross section ID number (i.e., river mile). There is no default. Do not leave this field blank.
3	SAE	b, 0	The fraction of the bed surface that is exposed to erosion. That is, a portion of the bed may be armored or partially covered with bedrock. Usually SAE is left blank in which case, HEC-6 will use a default value of 1.0.
		.001-1.0	The normal range.
4	DMAX	+	The diameter of the maximum particle size. Code all diameters in millimeters. Always code a value. HEC-6 assigns a percent finer (PFXIS(1)=100) to correspond with DMAX. Although not required for execution, it is best if DMAX corresponds to a class interval boundary. DMAX is also known as DAXIS(1).

Field	Variable	Value	Description
5	DAXIS(2)	+	The grain size diameter in millimeters at the first coordinate point down the percent finer curve from DMAX. If DAXIS (1) or (2) particle size is larger than 2048 mm, choose a point that will approximate the PF-Curve with two straight line segments from DMAX to 2048 mm. Note: It is not necessary that this or any PF-coordinate correspond to a grain size class interval boundary - although they can. Semi-log interpolation is used to calculate the percent finer at each class interval boundary and these are subtracted to calculate the fraction of sediment in each size class.
	PFAXIS(2)	0, +	The percent finer corresponding to DAXIS(2). Code as a percent (e.g., enter 10 for 10%, 20 for 20%, etc.).
7-10	DAXIS-PFAXIS	0, +	Continue to code points from the percent finer curve in (grain size diameter, percent finer) pairs. Use up to 3 continuation PFC records to code a maximum of 16 points. Begin coding data in Field 1 of continuation records.

A2.14 $LOCAL Record - Local Inflow (optional)

This record indicates that a water-sediment discharge table for a local inflow or diversion follows. It is used to separate inflow/diversion data from other data in the data stream.

Place the $LOCAL record after the PF records in the sediment data to separate the sediment data for the current stream segment from the water-sediment discharge table information needed for the local inflow(s) on the same stream segment. Use only one $LOCAL record per branch of the network even though several sediment inflow/diversion data sets may be present on that stream segment.

A separate set of LQL, LTL and LFL records is required to specify each local inflow and/or diversion. Enter each set of LQL, LTL and LFL records in the same order as the local inflow points appear in the stream segment's geometry (downstream to upstream). The range of water discharges are specified on the LQL records, with corresponding sediment loads (for each water discharge) on the LTL records. Each LFL record specifies the sediment load fraction associated with each grain size defined by the I2 - I4 records.

Note: The $LOCAL record replaces the $TRIB record in old data sets.

Field	Variable	Value	Description
0	ID	$LOCAL	Record identification (Columns 1 through 6).

A2.15 LQL Record - Water Discharge for Local Inflows/Diversions Specification (optional)

A set of LQL, LTL, and LFL records are used to specify the water discharge and sediment load associated with a local inflow or diversion. The LQL record specifies the water discharge portion of the load curve associated with local inflows and diversions. If only local inflow occurs, the data values on the LQL record are all positive and have the same format as specified on the LQ record. If a diversion is to be modeled, two negative values must be entered that bracket the maximum and minimum diversion values in the hydrograph. These values are entered as negative numbers in Fields 2 and 3. Fields 4 through 10 are left blank. If the local flows are mixed with diversions and inflows at various times, then specify the range of the diversion flows with negative QWATER values in Fields 2 and 3 and enter positive QWATER values in Fields 4 through 10 to specify the flow curve for the positive inflows.

Note: No continuation record is permitted. If a flow value in the hydrograph is above the extreme discharges on the LQL record, HEC-6 will use the sediment load value associated with the extreme discharge. If diversions are entered, they must fall between LQL.2 and LQL.3.

Field	Variable	Value	Description
0	ID	LQL	Record identification (Columns 1 through 3).
1		Comment	Any alphanumeric character comment.
Inflows			
2	QWATER	+	Water Discharge - Enter a positive discharge whose value is less than the smallest inflow value in the local hydrograph.
3-10	QWATER	+	Water Discharge - Enter increasing water discharges for the local inflow curve.
Diversions			
2	QWATER	-	Water Discharge - Enter a number slightly larger in absolute value than the maximum diversion value here. For example, if the maximum diversion value was 10.0, then one might enter -10.1. Note: The values entered in Fields 2 and 3 must be negative to denote diversions.
3	QWATER	-	Enter a number slightly smaller in absolute value than the minimum diversion value. For example, if the minimum diversion value was 1.0, a user might enter -0.9.
4-10			Leave blank.

Field	Variable	Value	Description
Combined Diversions and Inflows			
2, 3	QWATER	-	Enter negative values that lie on either side of the maximum and minimum diversion discharges.
4	QWATER	+	Water Discharge - Enter a positive discharge whose value is less than the smallest inflow value in the local hydrograph (as in Inflows, above.)
5-10	QWATER	+	Water Discharge - Continue entering increasing water discharges for the local inflow curve. Note: A maximum of seven values may be entered.

A2.16 LTL Record - Total Sediment Load for Local Inflows/Diversions Specification (optional)

A set of LQL, LTL, and LFL records are used to specify the water discharge and sediment load associated with a local inflow or diversion. The total sediment load corresponding to the discharges entered on the LQL record is entered on the LTL record in units of tons/day.

Field	Variable	Value	Description
0	ID	LTL	Record identification (Columns 1 through 3).
1		Comment	Any alphanumeric characters or comments.
Inflows			
2-10	QSED	+	Total sediment load (tons/day) corresponding to each water discharge given on the LQL record, for the local flow-sediment load table. A maximum of nine values is permitted.
Diversions			
2, 3	QSED	1.0	If only diversions make up the local hydrograph, enter 1.0 in Fields 2 and 3 and leave Fields 4 through 10 blank.
4-10			Leave blank.
Combined Diversions and Inflows			
2, 3	QSED	1.0	If diversions are included in the local hydrograph, enter 1.0 in Fields 2 and 3.
4-10	QSED	+	Total sediment load (tons/day) corresponding to each water discharge given on the LQL record, for the local flow-sediment load table. A maximum of seven values is permitted.

A2.17 LFL Record - Sediment Grain Size Distribution for Local Inflows/Diversions (optional)

A set of LQL, LTL, and LFL records are used to specify the water discharge and sediment load associated with a local inflow or diversion. The LFL records specify the fraction of the total local sediment load per size class.

The LFL records should be entered from fine to coarse with one LFL record for each of the sediment size classes specified on the I2 - I4 records. If only inflows occur as this local point, then the LFL records have the same format and rules as the LF records. Diversion points and combination inflow-diversion points require a slight variation from the upstream inflowing sediment load table. All diversions are prescribed by a ratio of the concentration of sediment in diverted water to that in the main channel just upstream from the diversion point.

Field	Variable	Value	Description
0	ID	LFL	Record identification (Columns 1 through 3).
1		Comment	Any alphanumeric character comment. (It is recommended that the grain size class be entered in the comment field, i.e. CLAY, SILT1, SILT2, VFS, FS, ... VCG).
Inflows			
2-10	QSF	+, 0	Enter the fraction of the total sediment load for this sediment size class corresponding to each water discharge specified on the LQL record.
Diversions			
2, 3	QSF		Enter the diversion coefficient (ratio of diverted sediment concentration to the ambient channel concentration) for the corresponding diversion (negative) discharge specified on the LQL record.
		+	When field data is available, calculate the ratio of $C_{Diverted}/C_{Ambient}$ and use that value. Otherwise, a value of 1.0 may be appropriate for suspended load and possibly, >1.0 for bed load.
4-10			Leave blank.

Field	Variable	Value	Description
Combined Diversions and Inflows			
2, 3	QSF		Enter the diversion coefficient (ratio of diverted sediment concentration to the ambient channel concentration) for the corresponding diversion (negative) discharge specified on the LQL record.
		+	When field data is available, calculate the ratio of $D_{diverted}/C_{Ambient}$ and use that value. Otherwise, a value of 1.0 may be appropriate for suspended load and possibly, >1.0 for bed load.
4-10	QSF	+, 0	Enter the fraction of the total sediment load or this sediment size class corresponding to each water discharge specified on the LQL record.