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BASINS Technical Note 7

Matching STORET Parameters with HSPF Output

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INTRODUCTION

The Hydrological Simulation Program Fortran (HSPF) watershed model simulates the complete hydrology of a watershed including in-stream hydraulics, reach network routing, and watershed and in-stream fate and transport processes for a wide variety of pollutants and pollutant types. Using HSPF, a modeler can evaluate alternative pollutant control scenarios given that an accurate simulation of the baseline conditions of the watershed can be achieved. To reproduce the current condition of the watershed, however, the modeler must first calibrate modeled flow and pollutant concentrations against available gage flow and pollutant monitoring data.

Seen as an important source of information regarding the health status of the nations surface waters, the STOrage and RETrieval system serves as a repository of waterway parametric data, including information on ambient, intensive survey, effluent, and biological water quality. STORET is maintained by EPA and contributed to by a number of organizations including federal, state, interstate agencies, universities, contractors, individuals and water laboratories. Each provider of data is responsible for the data it submits to STORET, and data updates are performed regularly. The legacy STORET system, frozen as of the end of 1998, is currently archived under the name Legacy Data Center (LDC) . Since the start of 1999, all new data is entered into the modernized STORET, also known simply as STORET. A subset of the LDC data, included in BASINS as Water Quality Observation Data, was selected from the LDC based on their utility in water quality trend analysis and model calibration. BASINS users can export the water quality observation data set, or download other data sets from the STORET web site, for purposes of calibrating the hydrology and water quality simulations in HSPF.

The purpose of this technical note is to assist BASINS users in correlating HSPF output time series with parameters from the legacy and modernized STORET systems. While the legacy STORET (LDC) used parameter code descriptions based on unique combinations of parameter names, analytical methods, and units, the modernized version is a relational database with a separate table for the parameter or characteristics. In addition to the traditional date, location, and constituent name, the modernized STORET includes fields for sampling purpose, people and organizations involved, as well as for methods used in sampling, storage, transport, preparation, and analysis. Thus with analytical method and units maintained separate from the parameter name, the new STORET's *characteristics* table is greatly simplified in relation to the LDC parameter list, and is largely without duplication. Table 1 and Table 2 show how unique legacy STORET *parameters* and unique modernized STORET *characteristics*, respectively, match up with individual and aggregate HSPF output time series. More than one STORET *parameter* or *characteristic* may be comparable to a single HSPF output time series. Conversely, in some cases, a single STORET parameter or characteristic corresponds to the aggregate of two or more HSPF outputs.

Note: While some LDC parameter code descriptors were officially associated with particular analytical techniques, it's certain that not all STORET contributors were aware of the official code/technique associations. That is, the data within STORET cannot be said to be strictly organized by analytical technique. In addition, inter-comparison of data for LDC parameters with similar names is likely valid in some cases but should be done only with substantial professional judgement

Table 1 -- STORET Parameters versus HSPF Output

[* - Some constituents composed of multiple HSPF time series output; refer to USEPA STORET (USEPA, 2000) database and HSPF User's Manual (Bicknell, et al, 1996) for parameter name and variable definitions]

EPA STORET PARAMETER			HSPF OUTPUT*					
PARM_CODE	PARM_NAME	UNITS	CONSTITUENT	SECTION	NAME	UNITS[a]		Remark
						ENGLISH	METRIC	
00010	TEMPERATURE, WATER	deg C	Water Temperature	HTRCH	TW		DegC	
00011	TEMPERATURE, WATER	deg F	Water Temperature	HTRCH	TW	DegF		
00049	SURFACE AREA	sq. mi	Surface Area	HYDR	SAREA	ac	ha	1
00051	SURFACE AREA	sq. ft	Surface Area	HYDR	SAREA	ac	ha	1
00053	SURFACE AREA	acres	Surface Area	HYDR	SAREA	ac	ha	
00054	RESERVOIR STORAGE	ac-ft	Volume in RCHRES	HYDR	VOL	ac-ft	Mm^3	1
00055	STREAM VELOCITY	ft/s	Average velocity (discharge/ average cross-section)	HYDR	AVVEL	ft/s	m/s	
00056	FLOW RATE	GPD	Discharge	HYDR	RO, O	cfs	cms	1, 2
00058	FLOW RATE	GPM	Discharge	HYDR	RO, O	cfs	cms	1, 2
00059	FLOW , STREAM, INSTANTANEOUS	GPM	Discharge	HYDR	RO, O	cfs	cms	1, 2
00060	FLOW, STREAM, MEAN DAILY	cfs	Discharge	HYDR	RO, O	cfs	cms	2
00061	FLOW, STREAM, INSTANTANEOUS	cfs	Discharge	HYDR	RO, O	cfs	cms	2
00062	ELEVATION, RESERVOIR SURFACE	ft	Stage (depth + stage correction)	HYDR	STAGE	ft	m	3

Table 1 -- STORET Parameters versus HSPF Output (continued)

[* - Some constituents composed of multiple HSPF time series output; refer to USEPA STORET (USEPA, 2000) database and HSPF User's Manual (Bicknell, et al, 1996) for parameter name and variable definitions]

EPA STORET PARAMETER			HSPF OUTPUT*					
PARM_CODE	PARM_NAME	UNITS	CONSTITUENT	SECTION	NAME	UNITS[a]		Remark
						ENGLISH	METRIC	
00065	STAGE, STREAM	ft	Stage (depth + stage correction)	HYDR	STAGE	ft		3
00072	STAGE, STREAM	m	Stage (depth + stage correction)	HYDR	STAGE		m	3
00299	OXYGEN ,DISSOLVED, ANALYSIS BY PROBE	mg/L	Dissolved Oxygen	OXRX	DOX	mg/L	mg/L	
00300	OXYGEN, DISSOLVED	mg/L	Dissolved Oxygen	OXRX	DOX	mg/L	mg/L	
00310	BOD 5 DAY, 20 DEG C	mg/L	Ultimate Biochemical Oxygen Demand	OXRX	BOD	mg/L	mg/L	4
00314	BOD, NITROGEN INHIB., TOTAL, 5 DAY, 20 DEG	mg/L	Ultimate Biochemical Oxygen Demand	OXRX	BOD	mg/L	mg/L	4
00318	BOD, 5 DAY, 20 deg C	kg/1000 gal	Ultimate Biochemical Oxygen Demand	OXRX	BOD	mg/L	mg/L	1, 4
00320	BOD, ULTIMATE 1ST STAGE, 20 DEG C	mg/L	Ultimate Biochemical Oxygen Demand	OXRX	BOD	mg/L	mg/L	
00400	PH	SU	PH	PHCARB	PHST(3)	SU	SU	
00403	PH LAB	SU	PH	PHCARB	PHST(3)	SU	SU	
00406	PH FIELD	SU	PH	PHCARB	PHST(3)	SU	SU	
00600	NITROGEN, TOTAL	mg/L as N	Total Nitrogen	NUTRX, PLANK	DNUST (1-3) + RSNH4(4) + PKST3 (4)	mg/L as N	mg/L as N	5, 6

Table 1 -- STORET Parameters versus HSPF Output (continued)

[* - Some constituents composed of multiple HSPF time series output; refer to USEPA STORET (USEPA, 2000) database and HSPF User's Manual (Bicknell, et al, 1996) for parameter name and variable definitions]

EPA STORET PARAMETER			HSPF OUTPUT*					
PARM_CODE	PARM_NAME	UNITS	CONSTITUENT	SECTION	NAME	UNITS[a]		Remark
						ENGLISH	METRIC	
00604	NITROGEN, AMMONIA SUSPENDED IN WATER	mg/L as N	Total Ammonia (adsorbed/particulate)	NUTRX	RSNH4(4)	mg/L as N	mg/L as N	5
00605	NITROGEN, ORGANIC, TOTAL	mg/L as N	Total Organic Nitrogen	PLANK	PKST3 (4)	mg/L as N	mg/L as N	6
00608	NITROGEN, AMMONIA, DISSOLVED	mg/L as N	Total Ammonia (dissolved) (i.e. ionized plus unionized)	NUTRX	DNUST (2)	mg/L as N	mg/L as N	
00610	NITROGEN, AMMONIA, TOTAL	mg/L as N	Total Ammonia (dissolved + adsorbed/particulate)	NUTRX	DNUST (2) + RSNH4(4)	mg/L as N	mg/L as N	5
00613	NITRITE NITROGEN, DISSOLVED	mg/L as N	Dissolved Nitrite	NUTRX	DNUST (3)	mg/L as N	mg/L as N	7
00615	NITRITE NITROGEN, TOTAL	mg/L as N	Dissolved Nitrite	NUTRX	DNUST (3)	mg/L as N	mg/L as N	7
00618	NITRATE NITROGEN, DISSOLVED	mg/L as N	Dissolved Nitrate	NUTRX	DNUST (1)	mg/L as N	mg/L as N	7
00620	NITRATE NITROGEN, TOTAL	mg/L as N	Dissolved Nitrate	NUTRX	DNUST (1)	mg/L as N	mg/L as N	7
00625	NITROGEN, KJELDAHL, TOTAL	mg/L as N	Kjeldahl Nitrogen Total	NUTRX, PLANK	DNUST (2) + RSNH4(4) + PKST3 (4)	mg/L as N	mg/L as N	5, 6
00630	NITRITE PLUS NITRATE, TOTAL 1 DET.	mg/L as N	Nitrite plus Nitrate	NUTRX	DNUST (1) + DNUST(3)	mg/L as N	mg/L as N	7

Table 1 -- STORET Parameters versus HSPF Output (continued)

[* - Some constituents composed of multiple HSPF time series output; refer to USEPA STORET (USEPA, 2000) database and HSPF User's Manual (Bicknell, et al, 1996) for parameter name and variable definitions]

EPA STORET PARAMETER			HSPF OUTPUT*					
PARM_CODE	PARM_NAME	UNITS	CONSTITUENT	SECTION	NAME	UNITS[a]		Remark
						ENGLISH	METRIC	
00631	NITRITE PLUS NITRATE, DISS. 1 DET.	mg/L as N	Nitrite plus Nitrate	NUTRX	DNUST (1) + DNUST(3)	mg/L as N	mg/L as N	7
00635	NITROGEN, AMMONIA & ORG., TOTAL 1 DET	mg/L as N	Total Ammonia (dissolved _ adsorbed/particulate) + Total Organic Nitrogen	NUTRX, PLANK	DNUST(2) + RSNH4(4) + PKST3(4)	mg/L as N	mg/L as N	6
00640	NITROGEN, INORGANIC, TOTAL	mg/L as N	Total Inorganic Nitrogen	NUTRX	DNUST(1 - 3) + RSNH4(4)	mg/L as N	mg/L as N	5, 7
00651	PHOSPHOR US, DISSOLVED ORTHOPHOSPHATE WTM GF/F	mg/L as P	Dissolved Ortho-phosphate	NUTRX	DNUST(4)	mg/L as P	mg/L as P	
00665	PHOSPHORUS, TOTAL	mg/L as P	Total Phosphorus	NUTRX, PLANK	DNUST (4) + RSPO4(4) + PKST3 (5)	mg/L as P	mg/L as P	6, 8
00670	PHOSPHORUS, TOTAL ORGANIC	mg/L as P	Total Organic Phosphorous (TORP)	NUTRX	PKST3(5)	mg/L as P	mg/L as P	6
00671	PHOSPHORUS, DISSOLVED ORTHOPHOSPHATE	mg/L as P	Ortho-Phosphate (dissolved)	NUTRX	DNUST (4)	mg/L as P	mg/L as P	
00674	PHOSPHORUS, SUSPENDED ORTHOPHOSPHATE	mg/L as P	Particulate Ortho-phosphate	NUTRX	RSPO4(4)	mg/L as P	mg/L as P	
00680	CARBON, TOTAL ORGANIC	mg/L as C	Total Organic Carbon	PLANK	PKST3 (6)	mg/L as C	mg/L as C	6

Table 1 -- STORET Parameters versus HSPF Output (continued)

[* - Some constituents composed of multiple HSPF time series output; refer to USEPA STORET (USEPA, 2000) database and HSPF User's Manual (Bicknell, et al, 1996) for parameter name and variable definitions]

EPA STORET PARAMETER			HSPF OUTPUT*					
PARM_CODE	PARM_NAME	UNITS	CONSTITUENT	SECTION	NAME	UNITS[a]		Remark
						ENGLISH	METRIC	
00685	CARBON, TOTAL INORGANIC	mg/L as C	Total Inorganic Carbon (TIC)	PHCARB	PHST(1)	mg/L as C	mg/L as C	
00940	CHLORIDE, TOTAL IN WATER	mg/L	Conservative Substance	CONS	CON(1)	user defined	user defined	9
31501	COLIFORM,TOT,MEMBRANE FILTER, IMMED. —ENDO MED,35C	# / 100 mL	General Quality Constituent (Total Coliform)	GQUAL	DQAL (1, 2, or 3)	concu/L	concu/L	10
31613	FECAL COLIFORM, MEMBR FILTER,M-FC AGAR,44.5C,24HR	# / 100 mL	General Quality Constituent (Fecal Coliform)	GQUAL	DQAL (1, 2, or 3)	concu/L	concu/L	10
31615	FECAL COLIFORM,MPN,EC MED,44.5C (TUBE 31614)	# / 100 mL	General Quality Constituent (Fecal Coliform)	GQUAL	DQAL (1, 2, or 3)	concu/L	concu/L	10
31616	FECAL COLIFORM ,MEMBR FILTER,M-FC BROTH,44.5 C	# / 100 mL	General Quality Constituent (Fecal Coliform)	GQUAL	DQAL (1, 2, or 3)	concu/L	concu/L	10
31625	FECAL COLIFORM, MF,M-FC, 0.7 UM	# / 100 mL	General Quality Constituent (Fecal Coliform)	GQUAL	DQAL (1, 2, or 3)	concu/L	concu/L	10
31673	FECAL STREPTOCOCCI, MBR FILT,KF AGAR,35C,48HR	# / 100 mL	General Quality Constituent (Fecal Streptococci)	GQUAL	DQAL (1, 2, or 3)	concu/L	concu/L	10
32209	CHLOROPHYLL A FLUOROMETRIC CORRECTED	ug/L	Phytoplankton as Chlorophyll a	PLANK	PHYCLA	ug/L	ug/L	

Table 1 -- STORET Parameters versus HSPF Output (continued)

[* - Some constituents composed of multiple HSPF time series output; refer to USEPA STORET (USEPA, 2000) database and HSPF User's Manual (Bicknell, et al, 1996) for parameter name and variable definitions]

EPA STORET PARAMETER			HSPF OUTPUT*					
PARM_CODE	PARM_NAME	UNITS	CONSTITUENT	SECTION	NAME	UNITS[a]		Remark
						ENGLISH	METRIC	
32210	CHLOROPHYLL-A TRICHROMATIC UNCORRECTED	ug/L	Phytoplankton as Chlorophyll a	PLANK	PHYCLA	ug/L	ug/L	
32211	CHLOROPHYLL-A SPECTROPHOTOMETRIC ACID. METH.	ug/L	Phytoplankton as Chlorophyll a	PLANK	PHYCLA	ug/L	ug/L	
32217	CHLOROPHYLL A FLUOROMETRIC UNCORRECTED	ug/L	Phytoplankton as Chlorophyll a	PLANK	PHYCLA	ug/L	ug/L	
80154	SUSP. SEDIMENT CONCENTRATION-EVAP. AT 110C	mg/L	Total Suspended Sediment (TSS)	SEDTRN	SSED (4)	mg/L	mg/L	

REMARKS

a - HSPF uses mg/L ug/L, and concu/L for both English and metric systems.
1 - Units conversion required.
2 - RO is the total rate of outflow from RCHRES, O is the rate of outflow through an individual RCHRES exit; use LAST and AVER as PLTGEN transformations for instantaneous and mean daily flow, respectively.
3 - Make sure the same datum is used in STORET and HSPF (STCOR value in HYDR-PARM2).
4 - Requires BOD_5/ BOD_U relationship; i.e., the BOD_5 values from STORET must be converted to BOD_U for comparison to HSPF BOD concentrations. Note: there are roughly 25 other STORET codes for different number of reaction days (e.g. 00315, BOD - 7 day) each of which are valid but must be converted to BOD_U before comparison with HSPF output.
5 - If particulate NH4-N is simulated, the contribution from adsorbed ammonia can be accounted for by [[NUTRX(RSNH4 (4))] / HYDR(VOL)] * 0.368.
6 - HSPF does not distinguish between dissolved and particulate instream organics; corresponding STORET dissolved parameter (e.g. 00602 NITROGEN, DISSOLVED) could only be used if organic known to be largely in dissolved phase.
7 - Particulate nitrite and nitrate are not simulated in HSPF - they are assumed to be exclusively in the dissolved form (i.e. total NO2-NO3 is approximately equal to dissolved NO2-NO3). Thus, the comparison between measured (STORET) *total* nitrate (or nitrite) and modeled (HSPF) *dissolved* nitrate (or nitrite) is the most appropriate. Given the assumption that the total is largely dissolved, measured (STORET) *dissolved* nitrate (or nitrite) can be directly compared to modeled HSPF *dissolved* nitrate (nitrite).
8 - If particulate PO4-P is simulated, the contribution from adsorbed orthophosphate can be accounted for by [[NUTRX(RSPO4 (4))] / HYDR(VOL)] * 0.368.
9 - The CONS module can be used to simulate total dissolved solids, slowly degrading pesticides and herbicides, and other tracer substances as well.

10 - Module Section GQUAL simulates user defined generalized constituents with user-defined units. For fecal coliform – in the GQ-QALDATA use CONCID = '#/ 100 mL', CONV = 0.00353, & QTYID = '#ORG'.

Table 2 -- Modernized STORET Characteristics versus HSPF Output

[* - Some constituents composed of multiple HSPF time series output; refer to USEPA STORET (USEPA, 2000) database and HSPF User's Manual (Bicknell, et al, 1996) for parameter name and variable definitions]

Modernized STORET Characteristic		HSPF OUTPUT*					
Display Name	**SEARCH NAME**	**CONSTITUENT**	**SECTION**	**NAME**	**UNITS[1]**		**Remark**
					ENGLISH	**METRIC**	
Temperature, water	TEMPERATURE, WATER	Water Temperature	HTRCH	TW		DegC	
Temperature, water	TEMPERATURE, WATER	Water Temperature	HTRCH	TW	DegF		
Surface area	SURFACE AREA	Surface Area	HYDR	SAREA	ac	ha	
Reservoir volume	RESERVOIR VOLUME	Volume in RCHRES	HYDR	VOL	ac-ft	Mm^3	
Velocity - stream	VELOCITY - STREAM	Average velocity (discharge/ average cross-section)	HYDR	AVVEL	ft/s	m/s	
Flow	FLOW	Discharge	HYDR	RO, O	cfs	cms	2
Elevation, water surface, MSL	ELEVATION, WATER SURFACE, MSL	Stage (depth + stage correction)	HYDR	STAGE	ft	m	3
Stream stage	STREAM STAGE	Stage (depth + stage correction)	HYDR	STAGE	ft		3
Dissolved oxygen	DISSOLVED OXYGEN	Dissolved Oxygen	OXRX	DOX	mg/L	mg/L	
BOD, Biochemical oxygen demand	BOD	Ultimate Biochemical Oxygen Demand	OXRX	BOD	mg/L	mg/L	4
BOD, carbonaceous	BOD, CARBONACEOUS	Ultimate Biochemical Oxygen Demand	OXRX	BOD	mg/L	mg/L	

Table 2 -- Modernized STORET Characteristics versus HSPF Output (continued)

[* - Some constituents composed of multiple HSPF time series output; refer to USEPA STORET (USEPA, 2000) database and HSPF User's Manual (Bicknell, et al, 1996) for parameter name and variable definitions]

Modernized STORET Characteristic		HSPF OUTPUT*					
Display Name	SEARCH NAME	CONSTITUENT	SECTION	NAME	UNITS[1]		Remark
					ENGLISH	METRIC	
BOD, ultimate carbonaceous	BOD, ULTIMATE CARBONACEOUS	Ultimate Biochemical Oxygen Demand	OXRX	BOD	mg/L	mg/L	
BOD, ultimate first stage	BOD, ULTIMATE FIRST STAGE	Ultimate Biochemical Oxygen Demand	OXRX	BOD	mg/L	mg/L	
pH	PH	PH	PHCARB	PHST(3)	SU	SU	
Nitrogen, organic	NITROGEN, ORGANIC	Total Organic Nitrogen	PLANK	PKST3 (4)	mg/L as N	mg/L as N	6
Nitrogen, ammonia	NITROGEN, AMMONIA	Ammonia (dissolved, unionized)	NUTRX	DNUST (6)	mg/L as N	mg/L as N	
Nitrogen, ammonium	NITROGEN, AMMONIUM	Ammonium (dissolved + adsorbed/particulate)	NUTRX	DNUST (5) + RSNH4(4)	mg/L as N	mg/L as N	5
Nitrogen, ammonia + ammonium	NITROGEN, AMMONIA + AMMONIUM	Ammonia (dissolved) plus Ammonium (dissolved + adsorbed/particulate)	NUTRX	DNUST (2) + RSNH4(4)	mg/L as N	mg/L as N	5
Nitrogen, Nitrite	NITROGEN, NITRITE	Dissolved Nitrite	NUTRX	DNUST (3)	mg/L as N	mg/L as N	7
Nitrogen, Nitrate	NITROGEN, NITRATE	Dissolved Nitrate	NUTRX	DNUST (1)	mg/L as N	mg/L as N	7
Nitrogen, Kjeldahl	NITROGEN, KJELDAHL	Kjeldahl Nitrogen	NUTRX, PLANK	DNUST (2) + RSNH4(4) + PKST3 (4)	mg/L as N	mg/L as N	5, 6

Table 2 -- Modernized STORET Characteristics versus HSPF Output (continued)

[* - Some constituents composed of multiple HSPF time series output; refer to USEPA STORET (USEPA, 2000) database and HSPF User's Manual (Bicknell, et al, 1996) for parameter name and variable definitions]

Modernized STORET Characteristic		HSPF OUTPUT*					
Display Name	**SEARCH NAME**	**CONSTITUENT**	**SECTION**	**NAME**	**UNITS[1]**		**Remark**
					ENGLISH	**METRIC**	
Nitrogen, ammonia + organic	NITROGEN, AMMONIA + ORGANIC	Kjeldahl Nitrogen	NUTRX, PLANK	DNUST (2) + RSNH4(4) + PKST3 (4)	mg/L as N	mg/L as N	5, 6
Nitrogen, Nitrite + Nitrate	NITROGEN, NITRITE + NITRATE	Nitrite plus Nitrate	NUTRX	DNUST (1) + DNUST(3)	mg/L as N	mg/L as N	7
Nitrogen, inorganic	NITROGEN, INORGANIC	Inorganic Nitrogen	NUTRX	DNUST(1 - 3) + RSNH4(4)	mg/L as N	mg/L as N	5, 7
Phosphorus, orthophosphate as P	PHOSPHORUS, ORTHOPHOSPHATE AS P	Dissolved Ortho-phosphate	NUTRX	DNUST(4)	mg/L as P	mg/L as P	
Phosphorus, orthophosphate as P	PHOSPHORUS, ORTHOPHOSPHATE AS P	Particulate Ortho-phosphate	NUTRX	RSPO4(4)	mg/L as P	mg/L as P	8
Phosphorus	PHOSPHORUS	Total Phosphorus	NUTRX, PLANK	DNUST (4) + RSPO4(4) + PKST3 (5)	mg/L as P	mg/L as P	6, 8
Phosphorus as P	PHOSPHORUS AS P	Total Phosphorus	NUTRX, PLANK	DNUST (4) + RSPO4(4) + PKST3 (5)	mg/L as P	mg/L as P	6, 8
Phosphorus, organic as P	PHOSPHORUS, ORGANIC AS P	Total Organic Phosphorous (TORP)	NUTRX	PKST3(5)	mg/L as P	mg/L as P	6
Total Organic Carbon (TOC)	CARBON, TOTAL ORGANIC	Total Organic Carbon	PLANK	PKST3 (6)	mg/L as C	mg/L as C	6

Table 2 -- Modernized STORET Characteristics versus HSPF Output (continued)

[* - Some constituents composed of multiple HSPF time series output; refer to USEPA STORET (USEPA, 2000) database and HSPF User's Manual (Bicknell, et al, 1996) for parameter name and variable definitions]

Modernized STORET Characteristic		HSPF OUTPUT*					
Display Name	**SEARCH NAME**	**CONSTITUENT**	**SECTION**	**NAME**	**UNITS[1]**		**Remark**
					ENGLISH	**METRIC**	
Total Inorganic Carbon	CARBON, TOTAL INORGANIC	Total Inorganic Carbon (TIC)	PHCARB	PHST(1)	mg/L as C	mg/L as C	
Chloride	CHLORIDE	Conservative Substance	CONS	CON(1)	user defined	user defined	9
Total Fecal Coliform	COLIFORM, TOTAL FECAL	General Quality Constituent (Total Coliform)	GQUAL	DQAL (1, 2, or 3)	concu/L	concu/L	10
Streptococcus, fecal	STREPTOCOCCUS, FECAL	General Quality Constituent (Fecal Streptococci)	GQUAL	DQAL (1, 2, or 3)	concu/L	concu/L	10
Chlorophyll a (probe relative fluorescence)	CHLOROPHYLL A (PROBE RELATIVE FLUORESCENCE)	Phytoplankton as Chlorophyll a	PLANK	PHYCLA	ug/L	ug/L	
Chlorophyll a (probe)	CHLOROPHYLL A (PROBE)	Phytoplankton as Chlorophyll a	PLANK	PHYCLA	ug/L	ug/L	
Chlorophyll a, corrected for pheophytin	CHLOROPHYLL A, CORRECTED FOR PHEOPHYTIN	Phytoplankton as Chlorophyll a	PLANK	PHYCLA	ug/L	ug/L	
Chlorophyll a, uncorrected for pheophytin	CHLOROPHYLL A, UNCORRECTED FOR PHEOPHYTIN	Phytoplankton as Chlorophyll a	PLANK	PHYCLA	ug/L	ug/L	
Total Suspended Solids (TSS)	SOLIDS, TOTAL SUSPENDED	Total Suspended Sediment (TSS)	SEDTRN	SSED (4)	mg/L	mg/L	

REMARKS

a - HSPF uses mg/L ug/L, and concu/L for both English and metric systems.
1 - Units conversion may be required. STORET (modernized) characteristics are units independent; units are reported separately.
2 - RO is the total rate of outflow from a RCHRES, O is the rate of outflow through an individual RCHRES exit; use LAST and AVER as PLTGEN transformations for instantaneous and mean daily flow, respectively.
3 - Make sure the same datum (e.g. Mean Sea Level [MSL]) is used in STORET and HSPF (STCOR value in HYDR-PARM2).
4 - Check method used to obtain BOD value. If BOD refers to other than ultimate BOD (BOD_U), a BOD_t/ BOD_U relationship is required. The BOD_t values from STORET must be converted to BOD_U for comparison to HSPF BOD concentrations.
5 - If particulate NH4-N is simulated, the contribution from adsorbed ammonia is accounted for by [[NUTRX(RSNH4 (4))] / HYDR(VOL)] * 0.368.
6 - HSPF does not distinguish between dissolved and particulate instream organics.
7 - Particulate nitrite and nitrate are not simulated in HSPF - they are assumed to be exclusively in the dissolved form (i.e. total NO2-NO3 is approximately equal to dissolved NO2-NO3). Thus, the comparison between measured (STORET) *total* nitrate (or nitrite) and modeled (HSPF) *dissolved* nitrate (or nitrite) is the most appropriate. Given the assumption that the total is largely dissolved, measured (STORET) *dissolved* nitrate (or nitrite) can be directly compared to modeled HSPF *dissolved* nitrate (nitrite).
8 - If particulate PO4-P is simulated, the contribution from adsorbed orthophosphate is accounted for by [[NUTRX(RSPO4 (4))] / HYDR(VOL)] * 0.368.
9 - The CONS module can be used to simulate total dissolved solids, slowly degrading pesticides and herbicides, and other tracer substances as well.
10 - Module Section GQUAL simulates user defined generalized constituents with user-defined units. For fecal coliform – in the GQ-QALDATA use
CONCID = '#/ 100 mL', CONV = 0.00353, & QTYID = '#ORG'.

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