

HY-8 Analysis Results

Culvert Summary Table - Sm culv

Culvert Crossing: D/S smaller 1D culv

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth(ft)	Outlet Control Depth(ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	216.95	0.00	0.0	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
100.00	100.00	220.23	3.28	0.98	1-S2n	2.12	2.47	2.14	1.28	9.23	5.78
200.00	200.00	221.85	4.90	2.39	1-S2n	3.06	3.54	3.06	1.92	11.32	7.41
300.00	300.00	223.19	6.24	3.78	1-S2n	3.84	4.37	3.87	2.45	12.45	8.51
400.00	400.00	224.35	7.40	5.28	1-S2n	4.57	5.08	4.60	2.93	13.38	9.37
500.00	500.00	225.51	8.56	6.91	5-S2n	5.31	5.70	5.32	3.37	14.10	10.07
600.00	600.00	226.78	9.83	9.56	5-S2n	6.15	6.23	6.15	3.79	14.51	10.66
695.00	695.00	228.13	11.18~	11.16	7-M2c	8.00	6.66	6.66	4.17	15.54	11.16
800.00	799.64	230.02	12.85	13.07	7-M2c	8.00	7.04	7.04	4.57	17.06	11.64
900.00	831.14	230.69	13.39	13.74	7-M2c	8.00	7.14	7.14	4.94	17.55	12.05
1000.00	852.87	231.14	13.78	14.19	7-M2c	8.00	7.20	7.20	5.30	17.89	12.42

HY-8 Analysis Results

Culvert Summary Table - Lrg culv

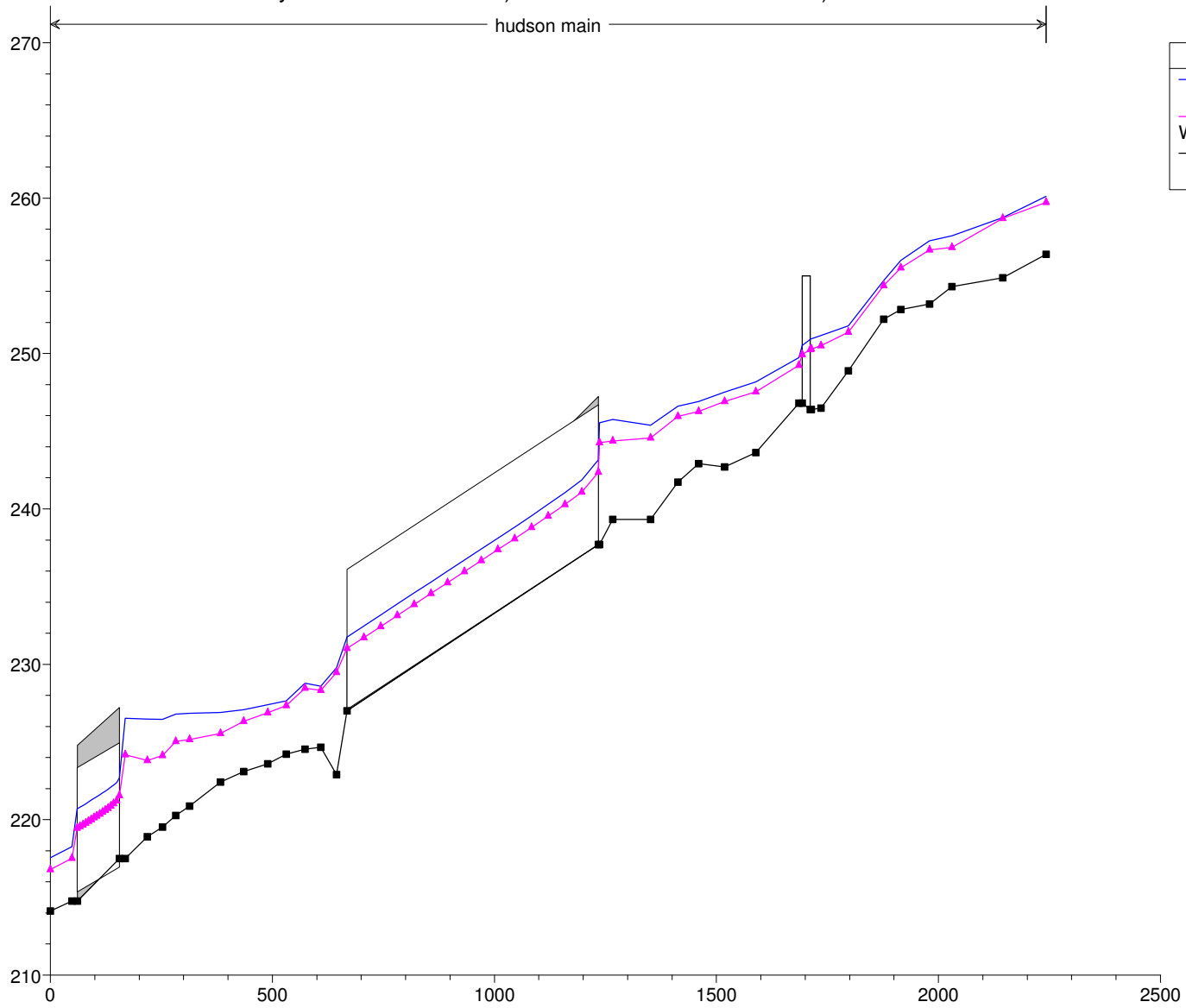
Culvert Crossing: U/S Lrg 1D culv

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth(ft)	Outlet Control Depth(ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	237.70	0.00	0.0	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
100.00	100.00	241.13	3.43	0.0*	1-S2n	2.16	2.56	2.19	1.87	9.68	4.99
200.00	200.00	242.93	5.23	0.0*	1-S2n	3.17	3.68	3.17	2.33	11.81	6.45
300.00	300.00	244.36	6.66	0.0*	1-S2n	4.04	4.55	4.04	2.71	13.05	7.47
400.00	400.00	245.82	8.12	5.07	5-S2n	4.93	5.27	4.93	3.03	13.81	8.27
480.00	480.00	247.19	9.45	9.49	7-M2c	5.84	5.74	5.74	3.27	14.22	8.81
600.00	516.08	248.17	10.12	10.47	7-M2c	7.00	5.92	5.92	3.59	14.87	9.52
700.00	518.40	248.63	10.16	10.93	7-M2c	7.00	5.93	5.93	3.85	14.91	10.03
800.00	521.14	249.00	10.21	11.30	7-M2c	7.00	5.94	5.94	4.09	14.96	10.48
900.00	523.99	249.33	10.27	11.63	7-M2c	7.00	5.96	5.96	4.31	15.02	10.90
1000.00	526.91	249.62	10.33	11.92	7-M2c	7.00	5.97	5.97	4.53	15.07	11.27

Ecity-9ftculv Plan: 1) LOFLOW9-5 9/18/2013 2) 9-5 SWM-SD low 9/18/2013

hudson main

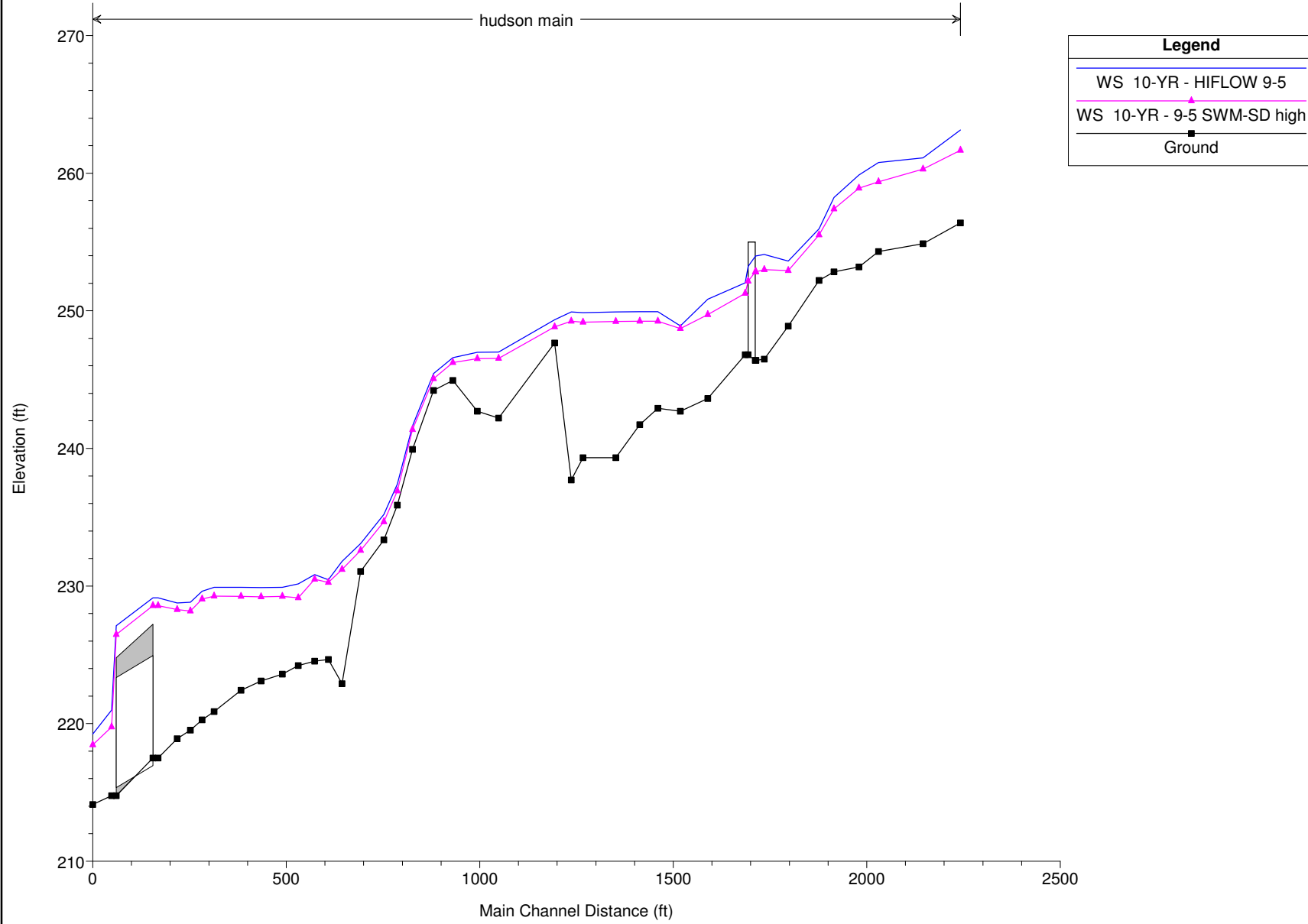
Elevation (ft)



Legend	
WS 2-YR - LOFLOW9-5	(Blue line)
WS 2-YR - 9-5 SWM-SD low	(Magenta line with triangle)
Ground	(Black line with square)

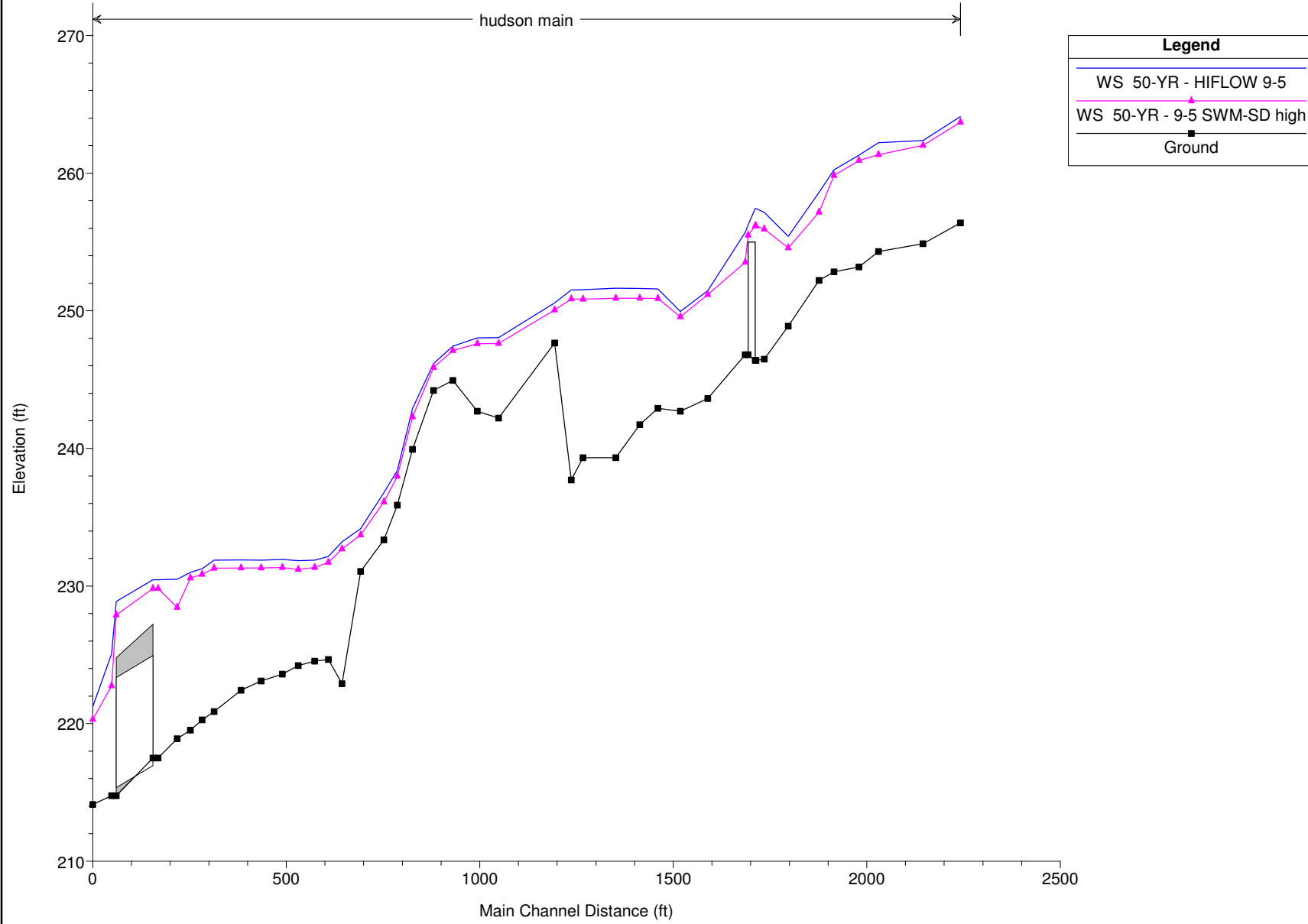
Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

← hudson main →



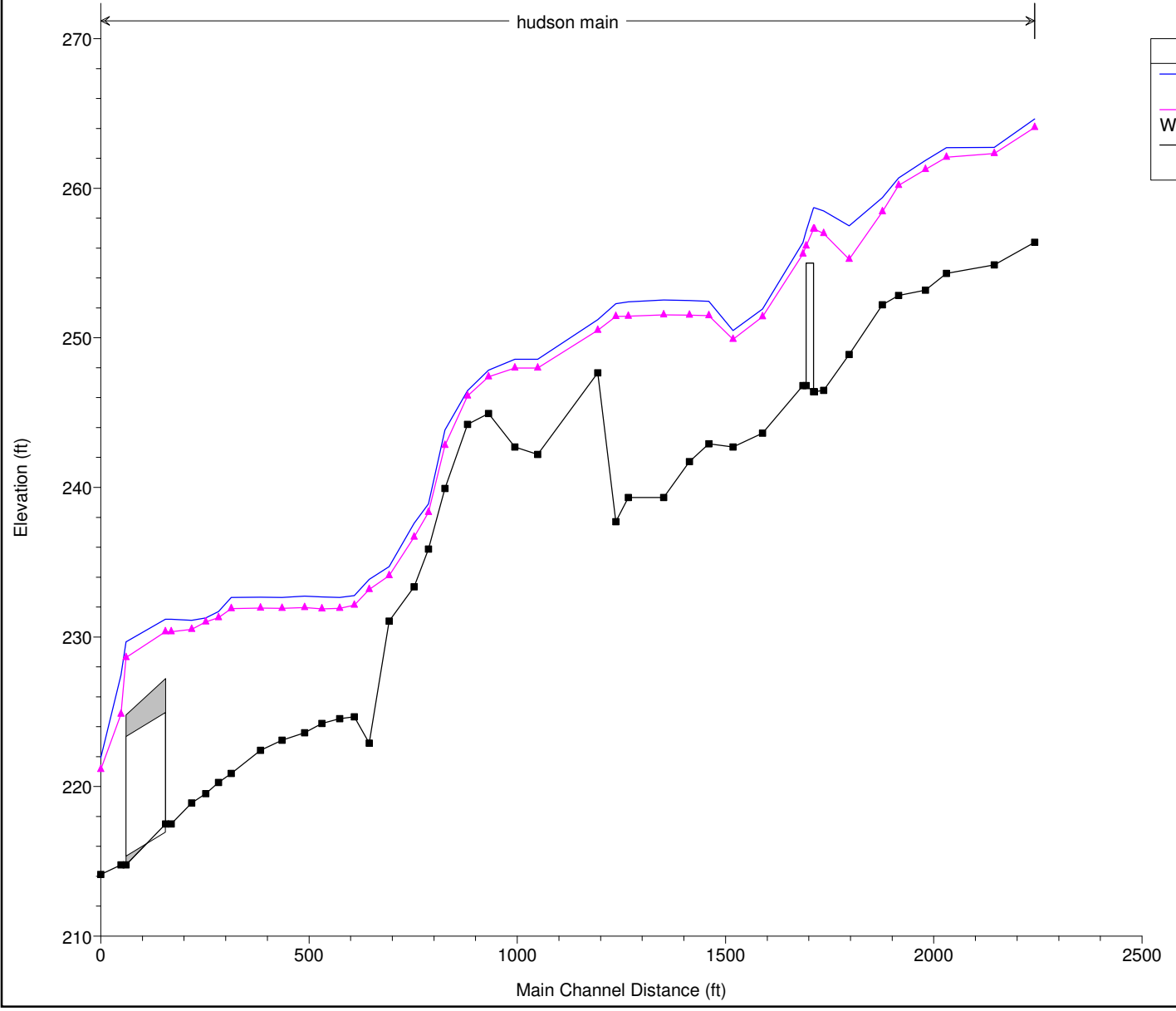
Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

← hudson main →



Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

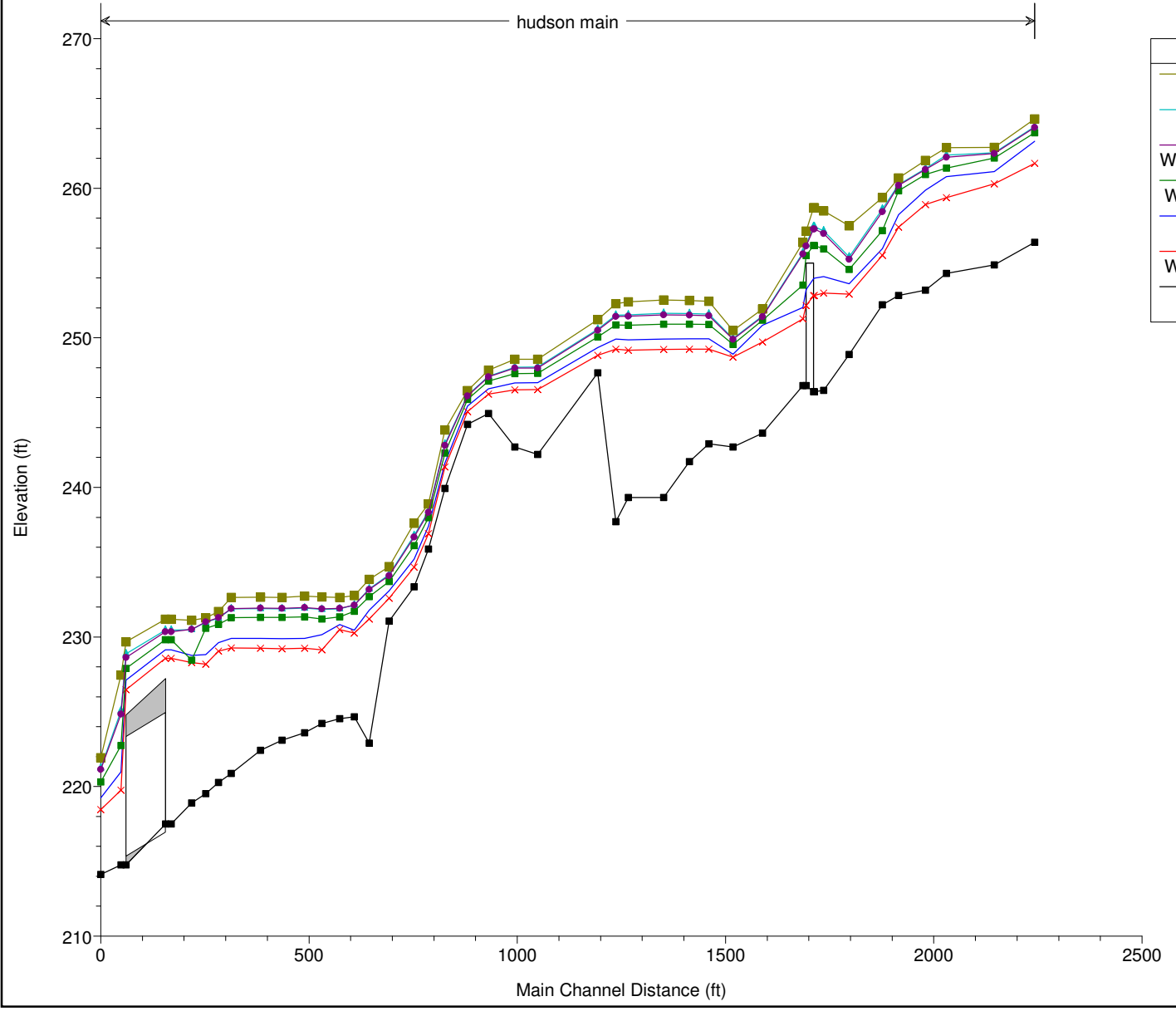
hudson main



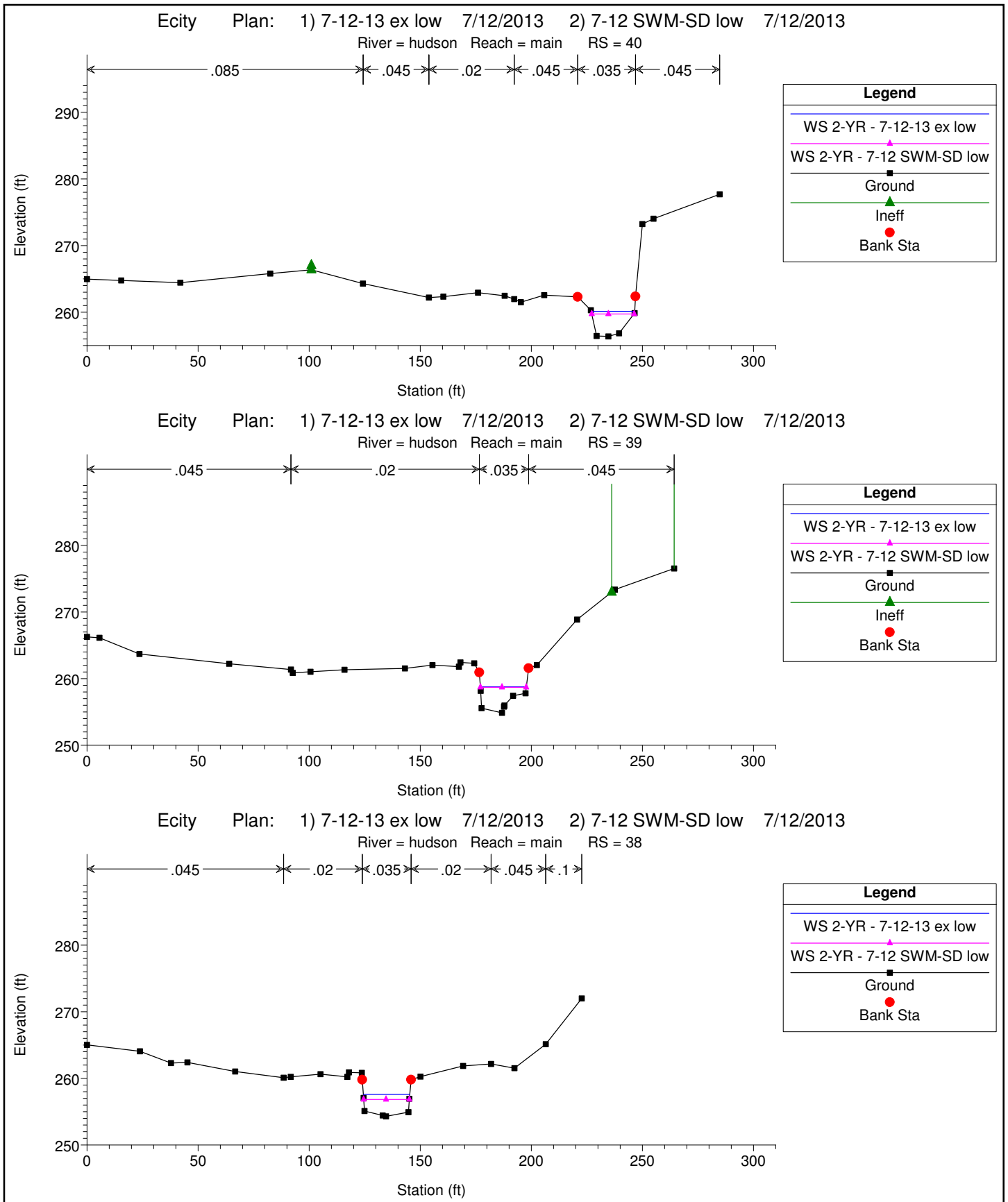
Legend	
WS 100-YR - HIFLOW 9-5	(Blue line)
WS 100-YR - 9-5 SWM-SD high	(Magenta line with triangles)
Ground	(Black line with squares)

Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

hudson main

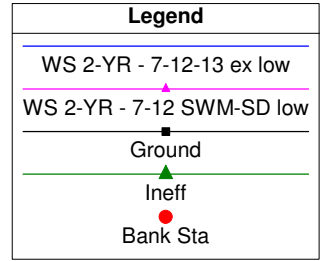
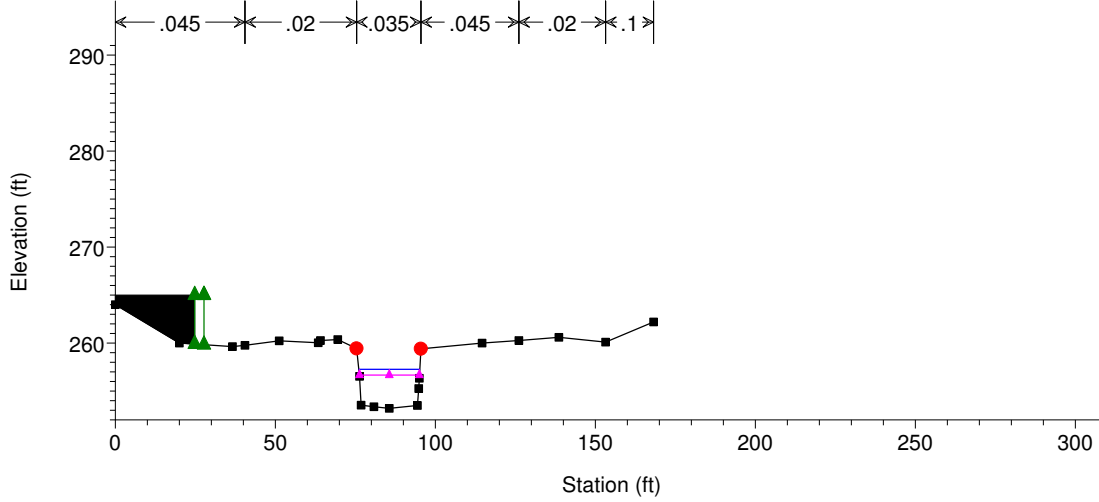


Legend	
WS 100-YR - HIFLOW 9-5	■
WS 50-YR - HIFLOW 9-5	▲
WS 100-YR - 9-5 SWM-SD high	◆
WS 50-YR - 9-5 SWM-SD high	■
WS 10-YR - HIFLOW 9-5	■
WS 10-YR - 9-5 SWM-SD high	×
Ground	■



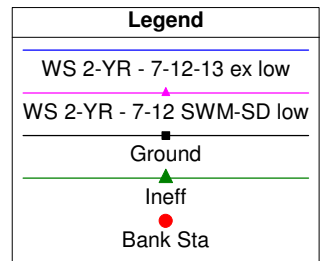
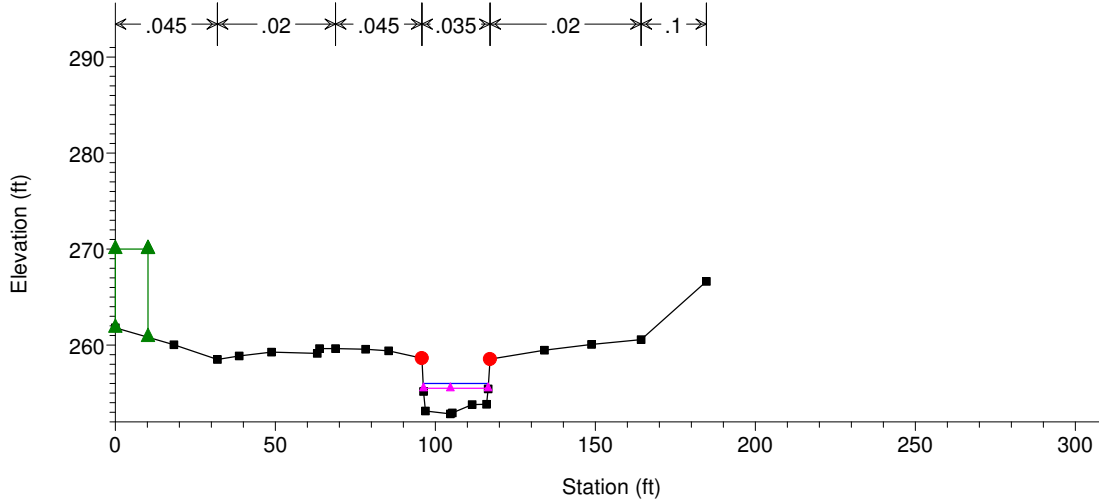
Ecity Plan: 1) 7-12-13 ex low 7/12/2013 2) 7-12 SWM-SD low 7/12/2013

River = hudson Reach = main RS = 37



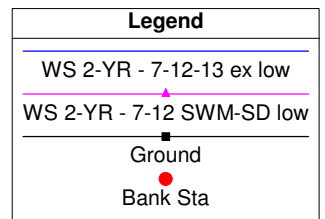
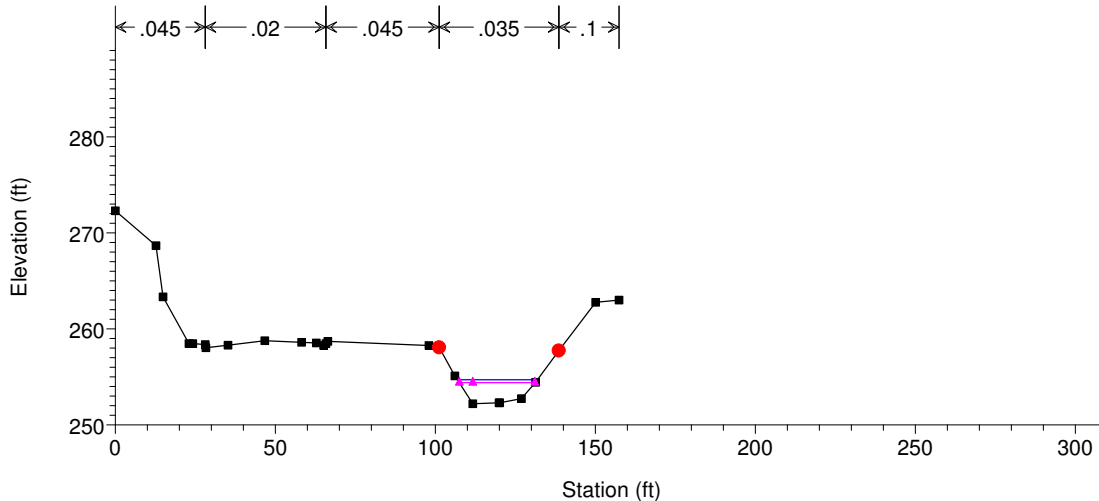
Ecity Plan: 1) 7-12-13 ex low 7/12/2013 2) 7-12 SWM-SD low 7/12/2013

River = hudson Reach = main RS = 36



Ecity Plan: 1) 7-12-13 ex low 7/12/2013 2) 7-12 SWM-SD low 7/12/2013

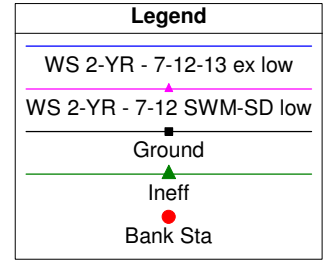
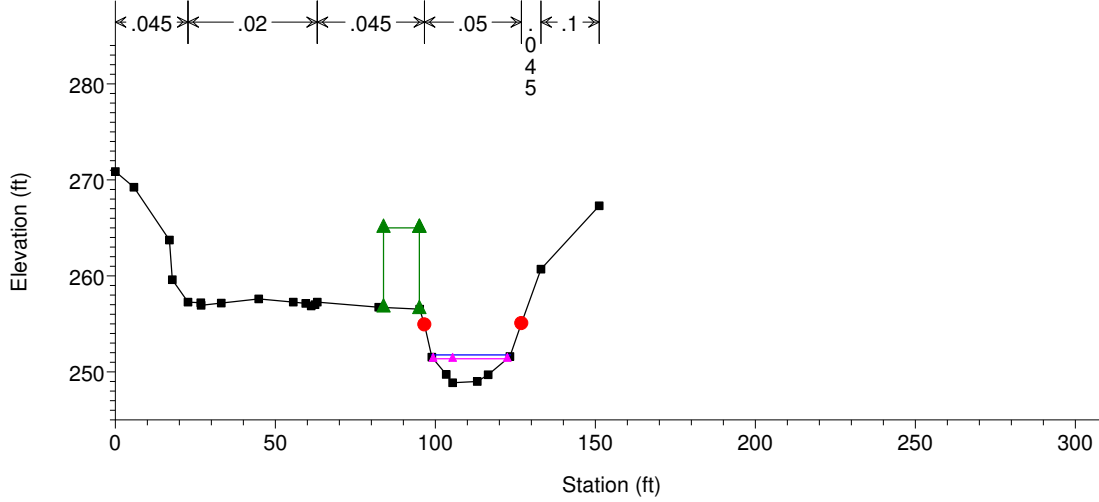
River = hudson Reach = main RS = 35



1 in Horiz. = 60 ft 1 in Vert. = 20 ft

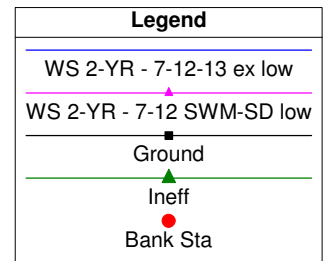
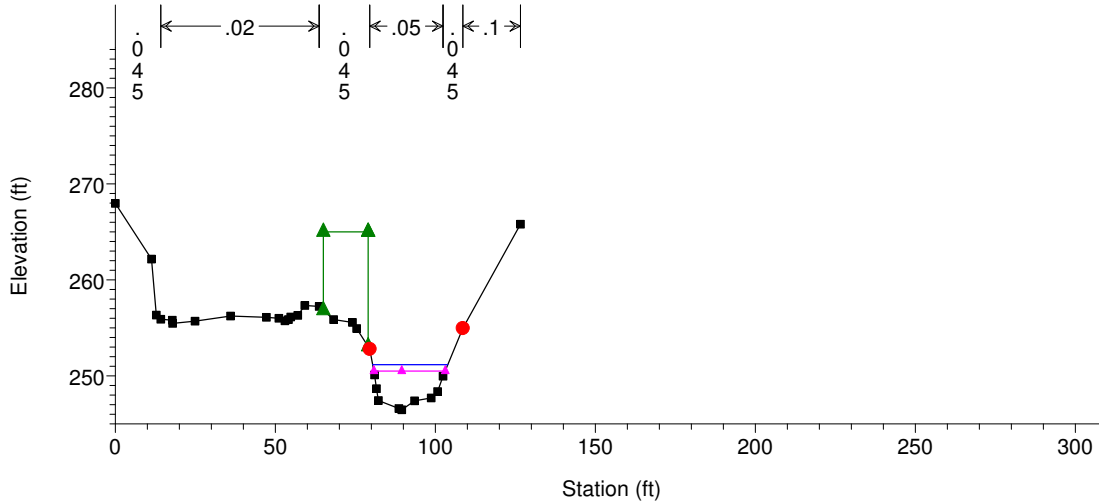
Ecity Plan: 1) 7-12-13 ex low 7/12/2013 2) 7-12 SWM-SD low 7/12/2013

River = hudson Reach = main RS = 34



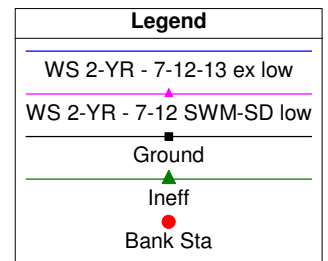
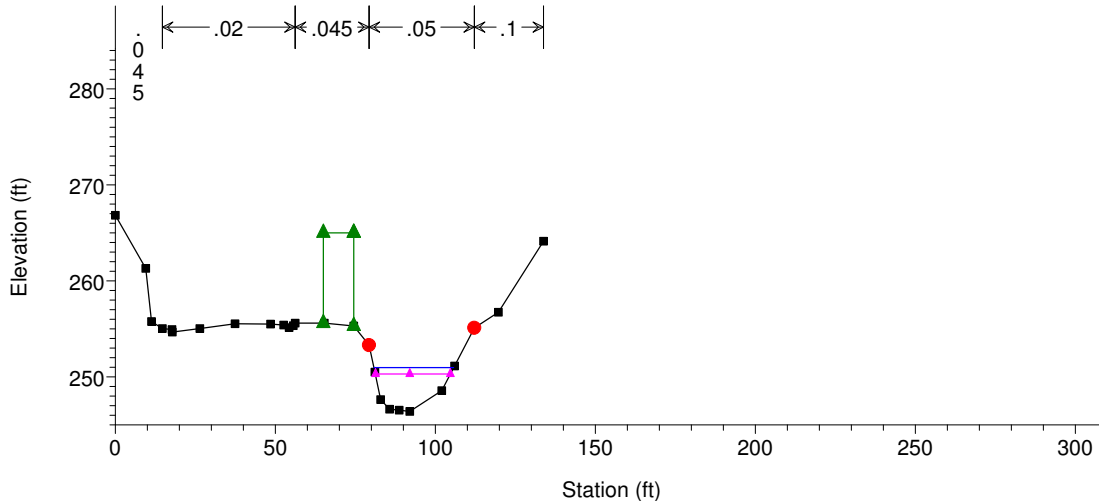
Ecity Plan: 1) 7-12-13 ex low 7/12/2013 2) 7-12 SWM-SD low 7/12/2013

River = hudson Reach = main RS = 33



Ecity Plan: 1) 7-12-13 ex low 7/12/2013 2) 7-12 SWM-SD low 7/12/2013

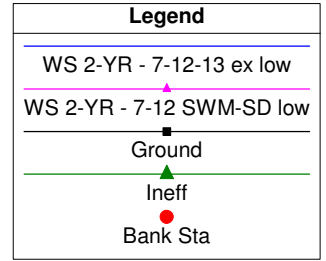
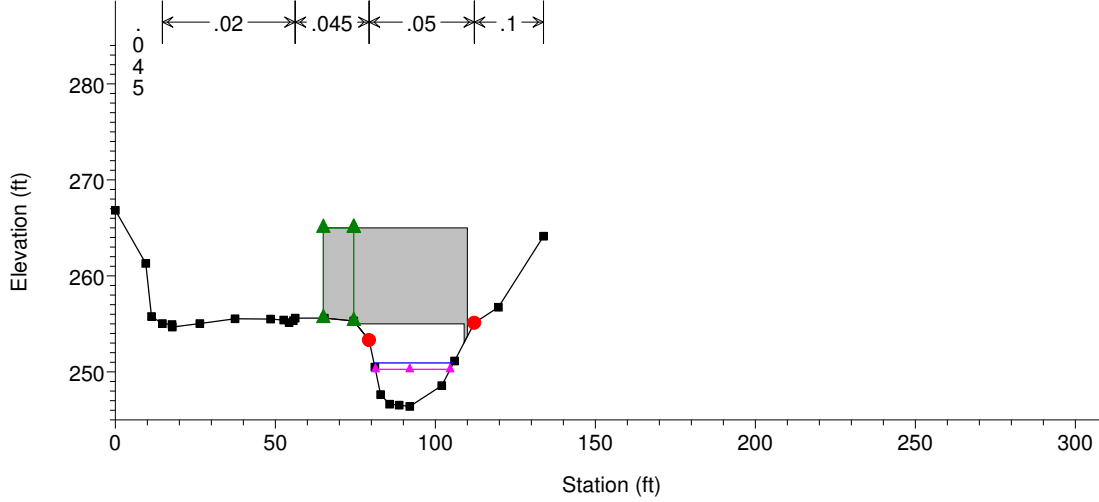
River = hudson Reach = main RS = 32



1 in Horiz. = 60 ft 1 in Vert. = 20 ft

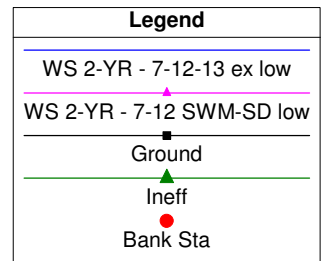
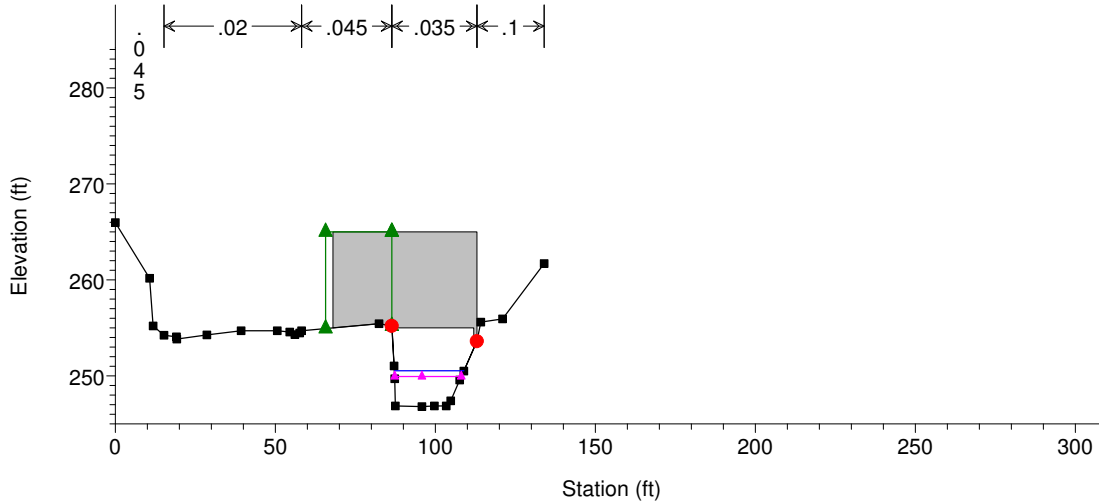
Ecity Plan: 1) 7-12-13 ex low 7/12/2013 2) 7-12 SWM-SD low 7/12/2013

River = hudson Reach = main RS = 31.5 BR



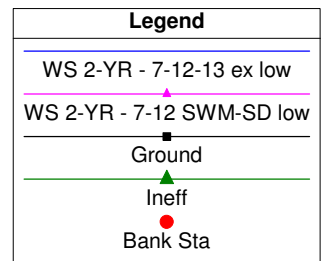
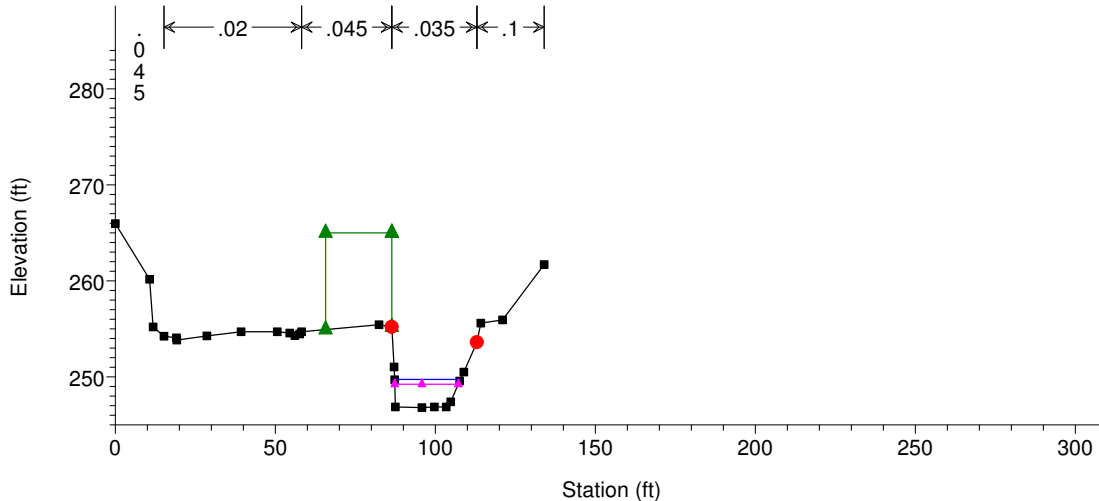
Ecity Plan: 1) 7-12-13 ex low 7/12/2013 2) 7-12 SWM-SD low 7/12/2013

River = hudson Reach = main RS = 31.5 BR



Ecity Plan: 1) 7-12-13 ex low 7/12/2013 2) 7-12 SWM-SD low 7/12/2013

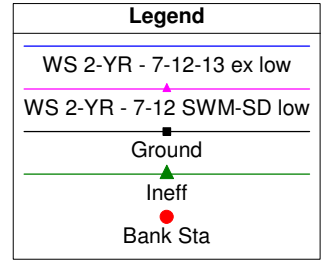
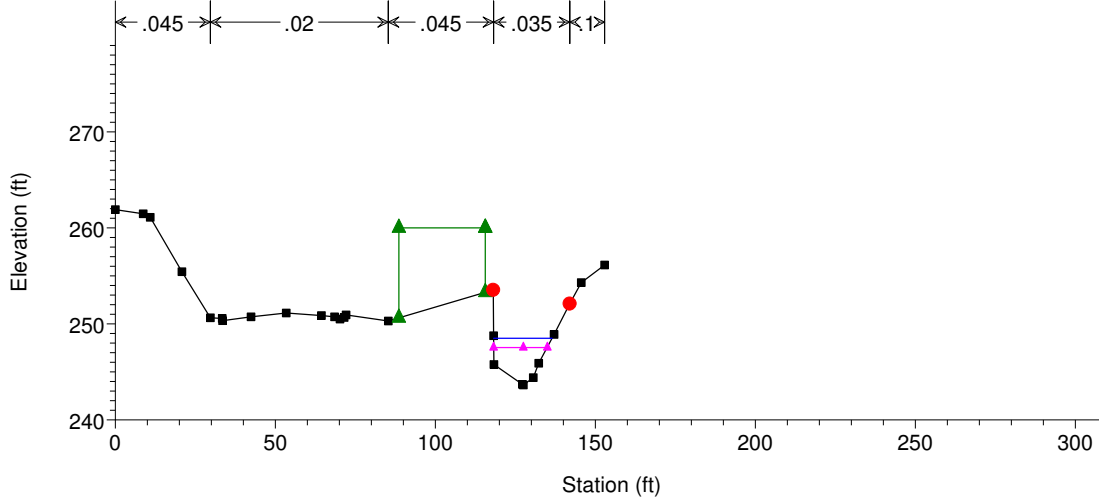
River = hudson Reach = main RS = 31



1 in Horiz. = 60 ft 1 in Vert. = 20 ft

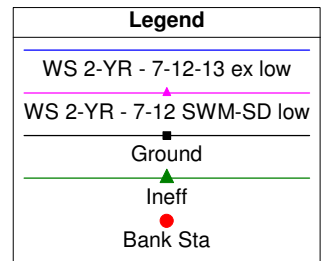
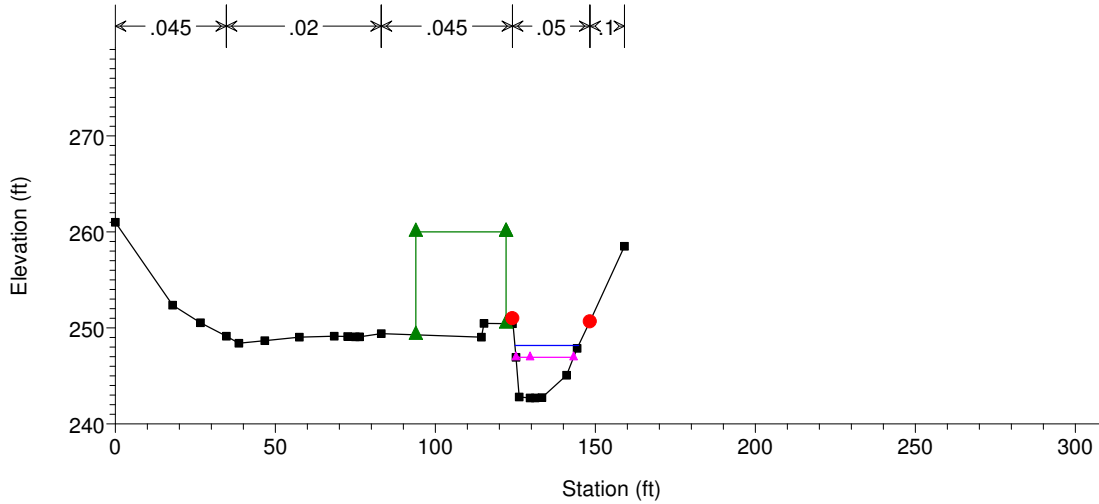
Ecity Plan: 1) 7-12-13 ex low 7/12/2013 2) 7-12 SWM-SD low 7/12/2013

River = hudson Reach = main RS = 30



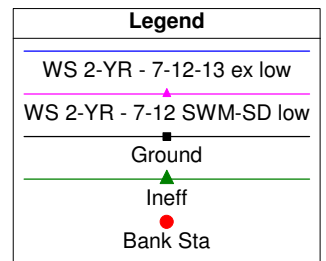
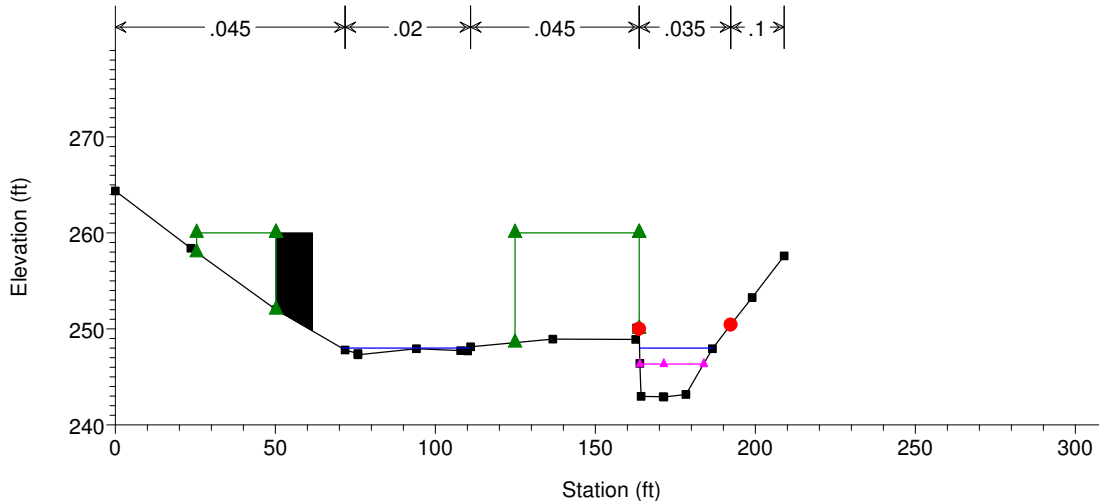
Ecity Plan: 1) 7-12-13 ex low 7/12/2013 2) 7-12 SWM-SD low 7/12/2013

River = hudson Reach = main RS = 29



Ecity Plan: 1) 7-12-13 ex low 7/12/2013 2) 7-12 SWM-SD low 7/12/2013

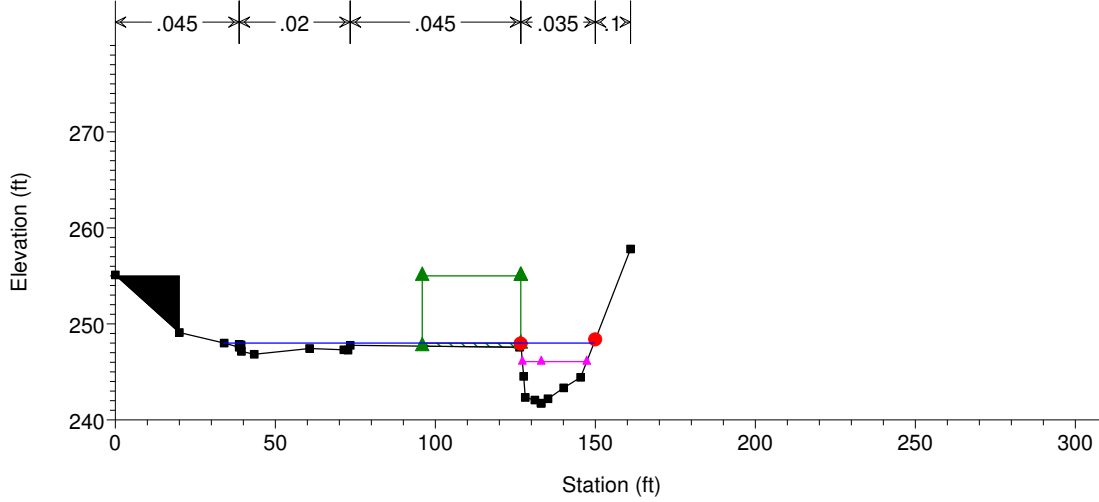
River = hudson Reach = main RS = 28



1 in Horiz. = 60 ft 1 in Vert. = 20 ft

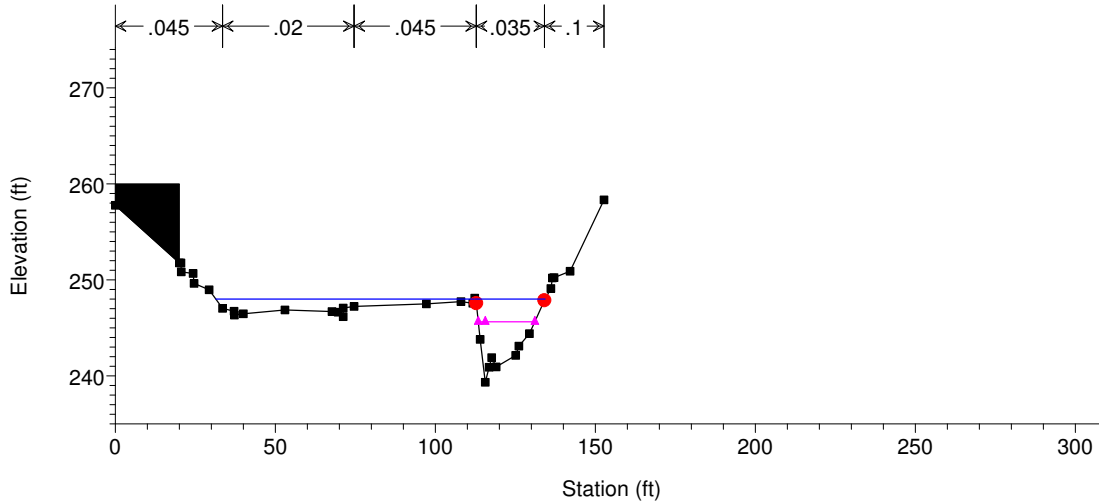
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River = hudson Reach = main RS = 27



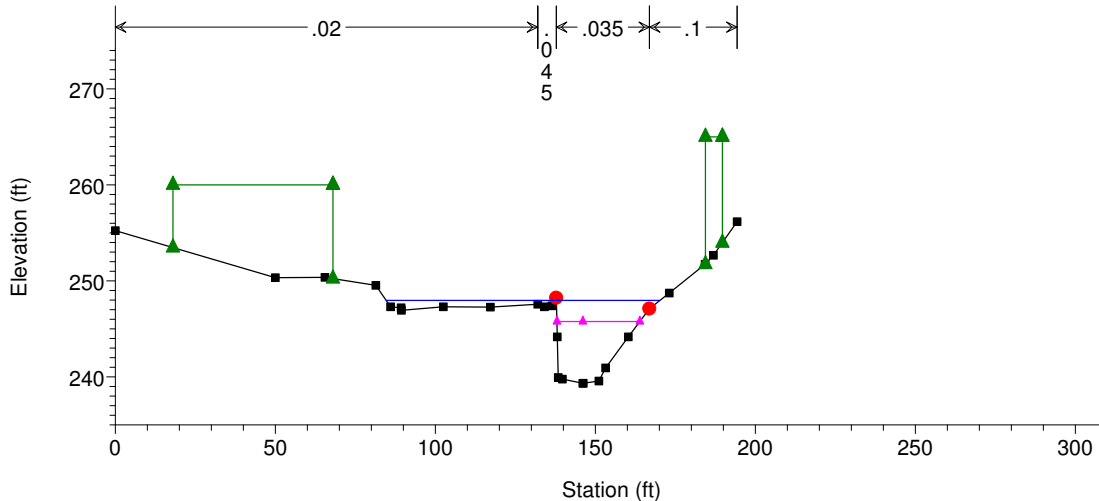
Ecity Plan: 1) 7-12-13 ex low 7/12/2013 2) 7-12 SWM-SD low 7/12/2013

River = hudson Reach = main RS = 26



Ecity Plan: 1) 7-12-13 ex low 7/12/2013 2) 7-12 SWM-SD low 7/12/2013

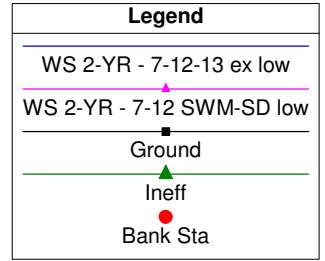
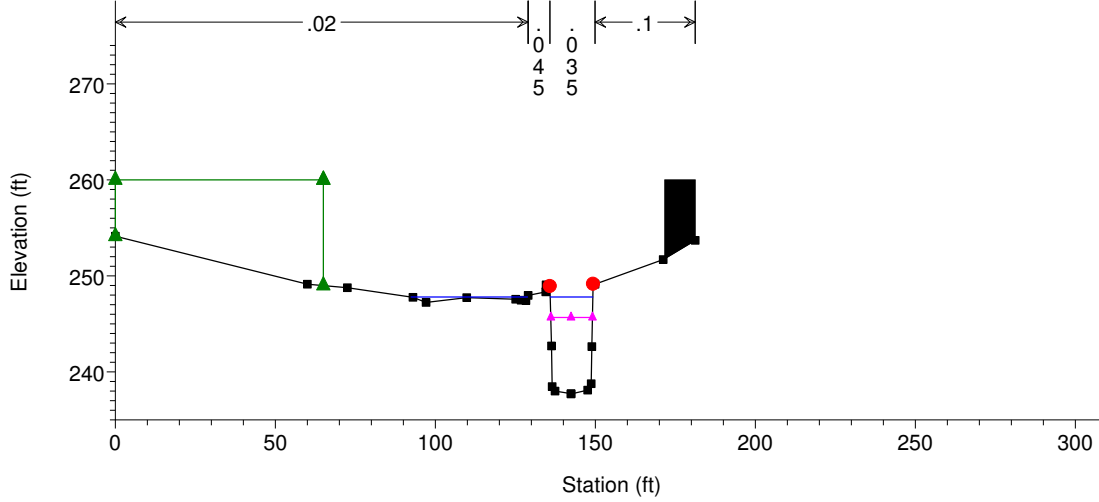
River = hudson Reach = main RS = 25



1 in Horiz. = 60 ft 1 in Vert. = 20 ft

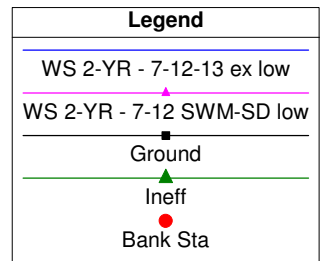
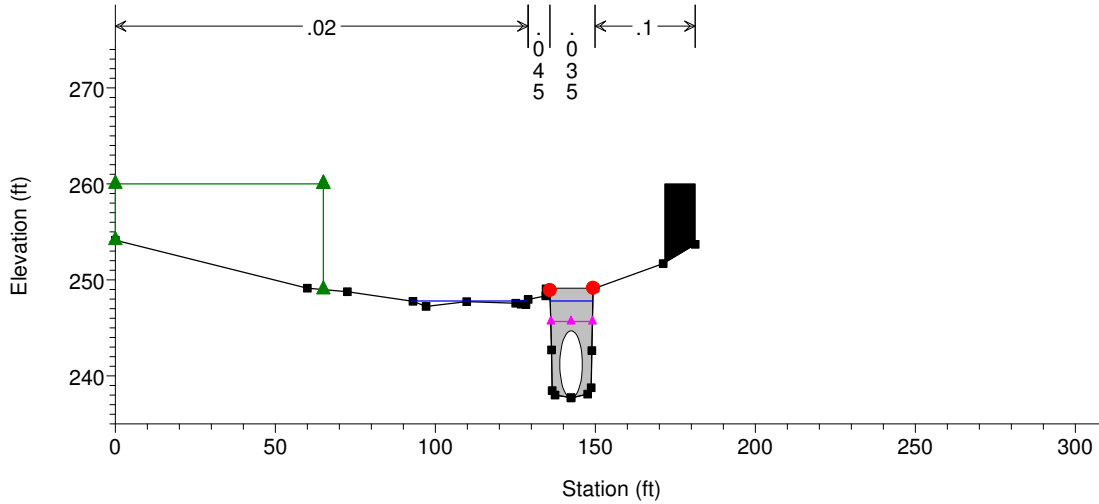
Ecity Plan: 1) 7-12-13 ex low 7/12/2013 2) 7-12 SWM-SD low 7/12/2013

River = hudson Reach = main RS = 24



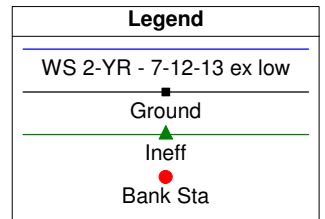
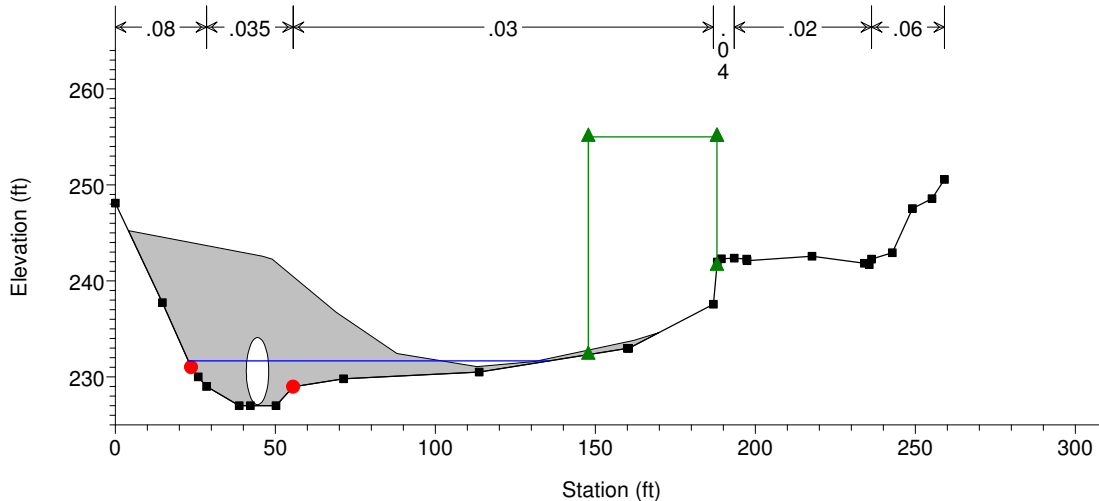
Ecity Plan: 1) 7-12-13 ex low 7/12/2013 2) 7-12 SWM-SD low 7/12/2013

River = hudson Reach = main RS = 20 Culv

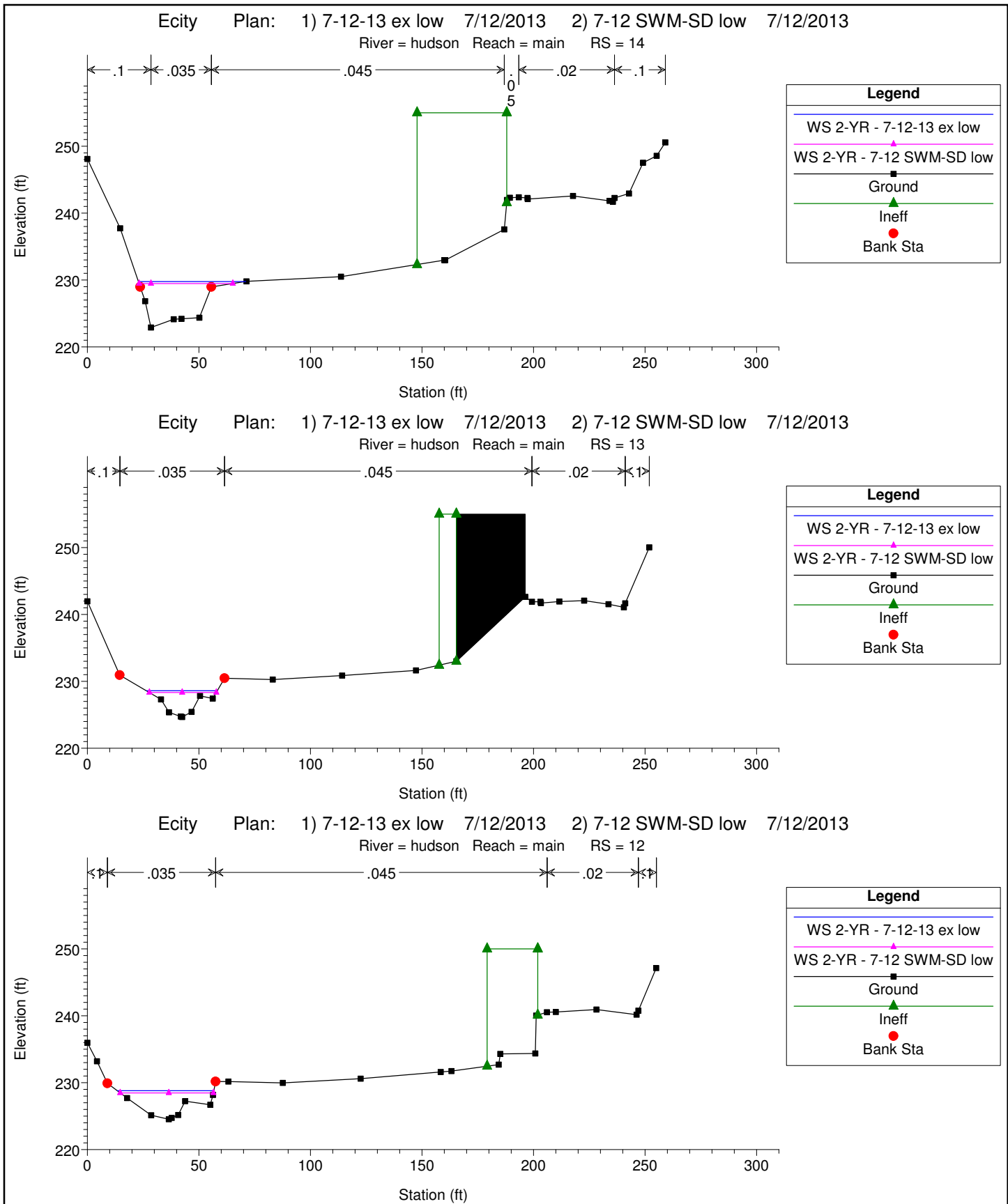


Ecity Plan: 1) 7-12-13 ex low 7/12/2013 2) 7-12 SWM-SD low 7/12/2013

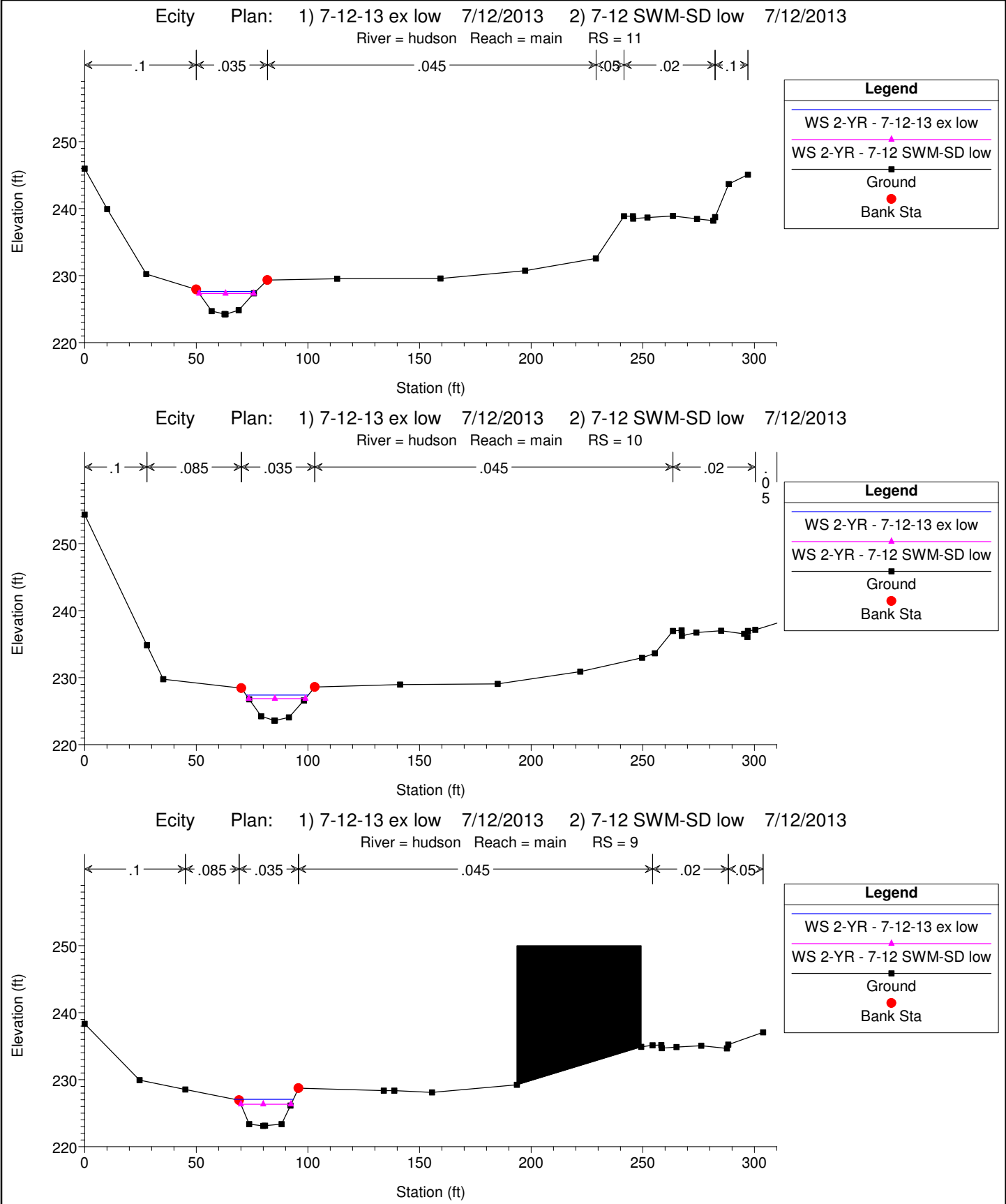
River = hudson Reach = main RS = 20 Culv



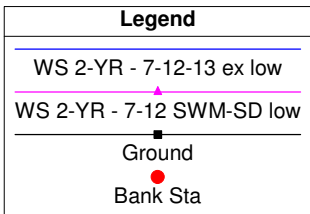
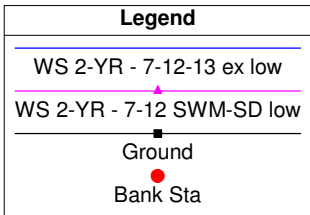
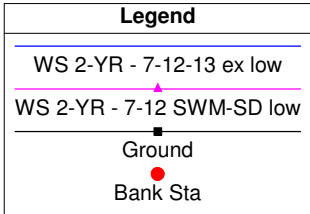
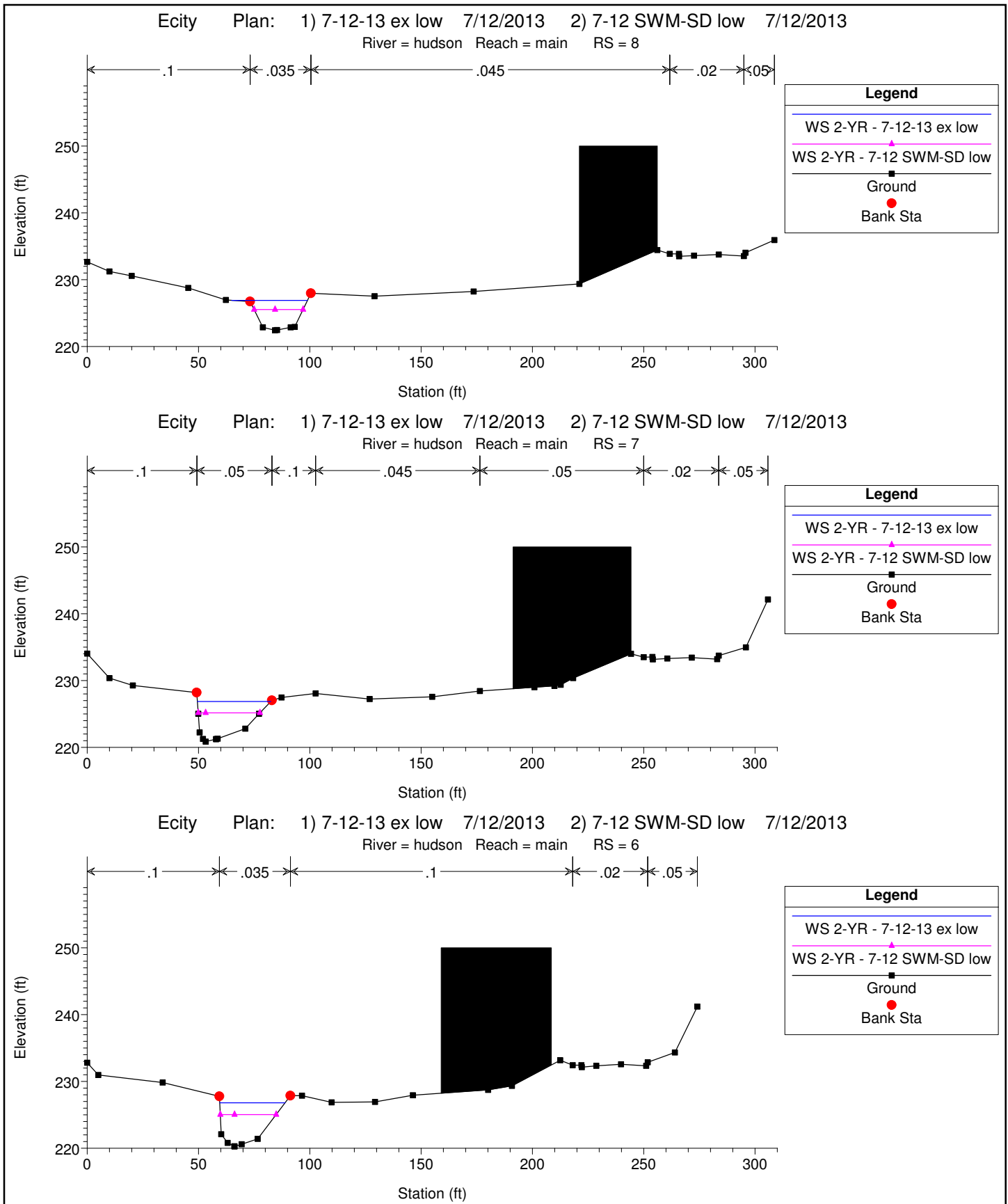
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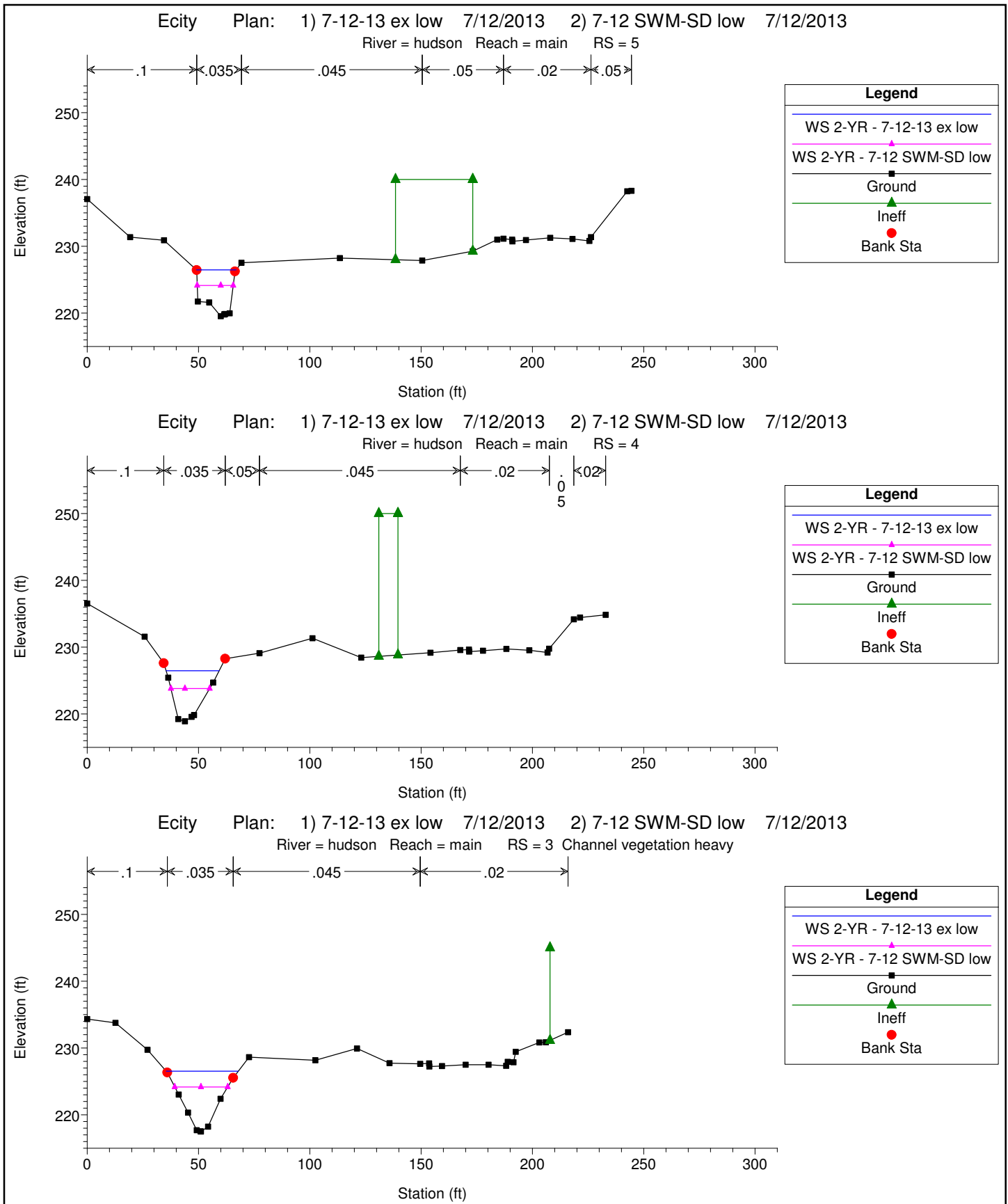


1 in Horiz. = 60 ft 1 in Vert. = 20 ft



1 in Horiz. = 60 ft 1 in Vert. = 20 ft

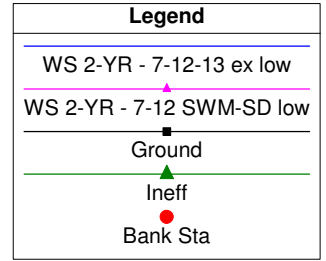
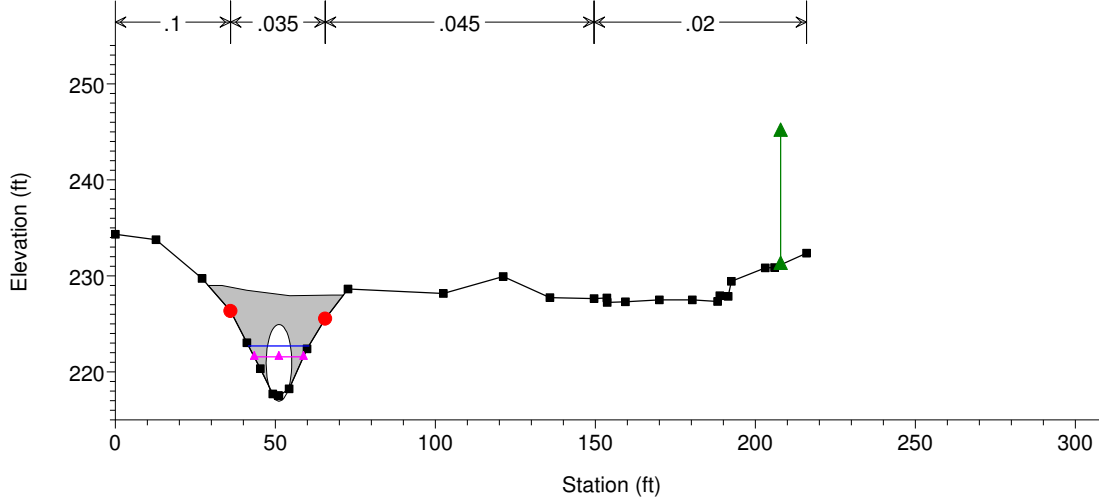




1 in Horiz. = 60 ft 1 in Vert. = 20 ft

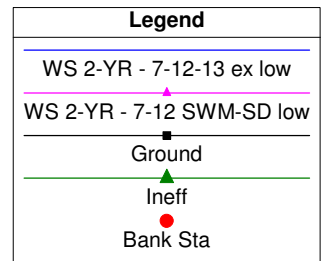
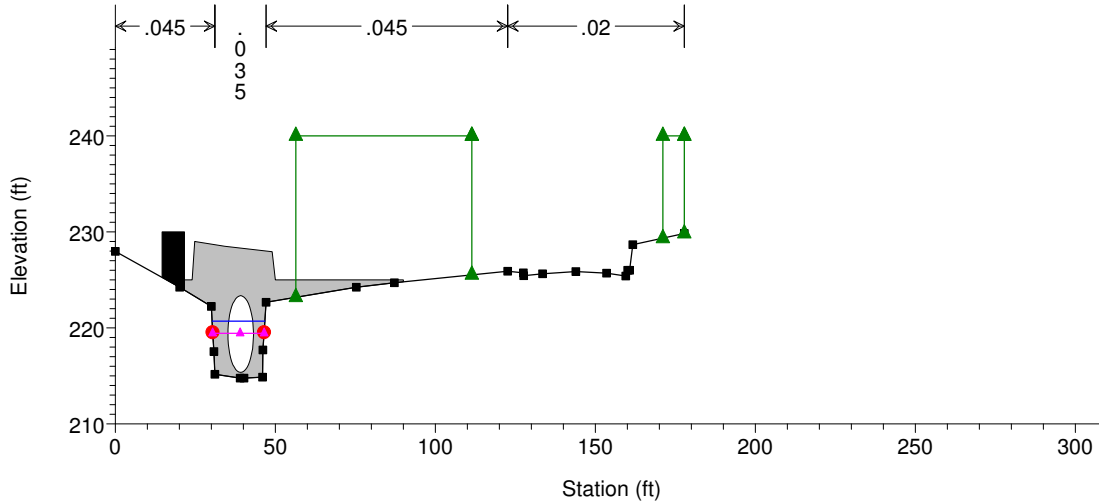
Ecity Plan: 1) 7-12-13 ex low 7/12/2013 2) 7-12 SWM-SD low 7/12/2013

River = hudson Reach = main RS = 2.5 Culv



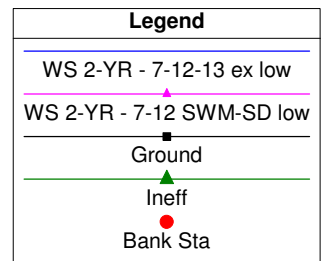
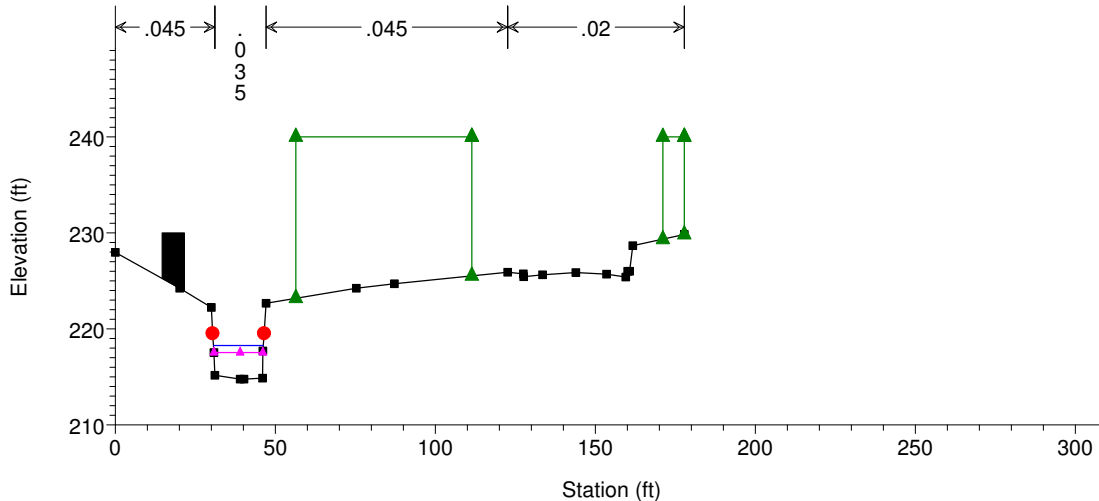
Ecity Plan: 1) 7-12-13 ex low 7/12/2013 2) 7-12 SWM-SD low 7/12/2013

River = hudson Reach = main RS = 2.5 Culv



Ecity Plan: 1) 7-12-13 ex low 7/12/2013 2) 7-12 SWM-SD low 7/12/2013

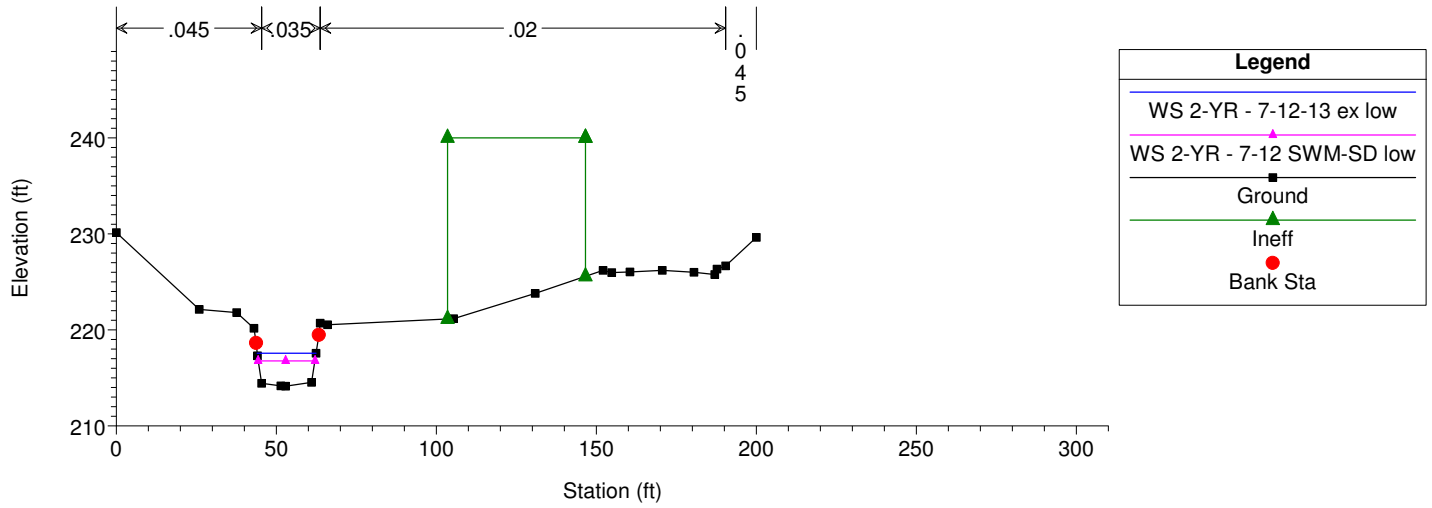
River = hudson Reach = main RS = 2



1 in Horiz. = 60 ft 1 in Vert. = 20 ft

Ecity Plan: 1) 7-12-13 ex low 7/12/2013 2) 7-12 SWM-SD low 7/12/2013

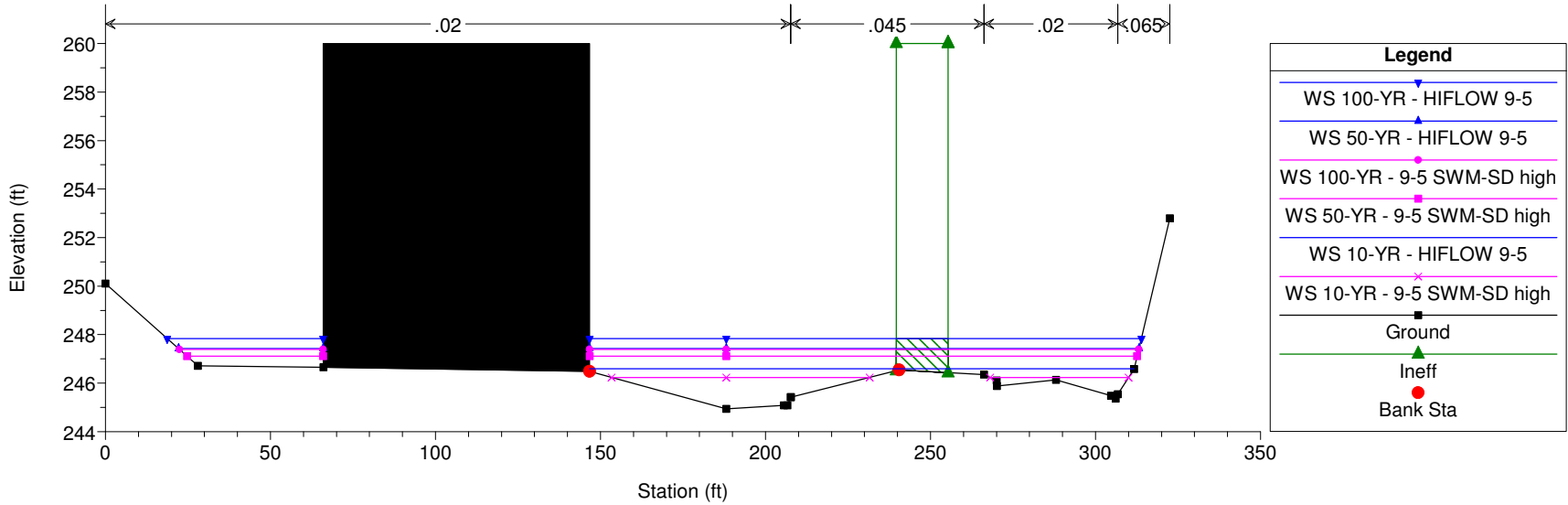
River = hudson Reach = main RS = 1



1 in Horiz. = 60 ft 1 in Vert. = 20 ft

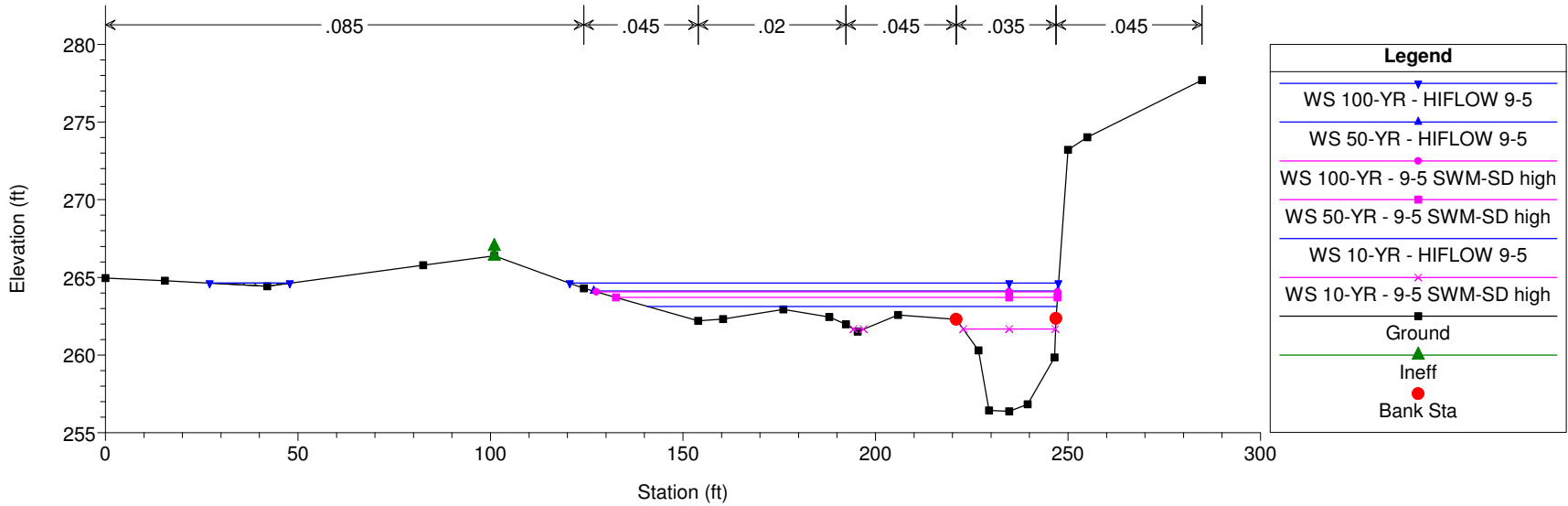
Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 20



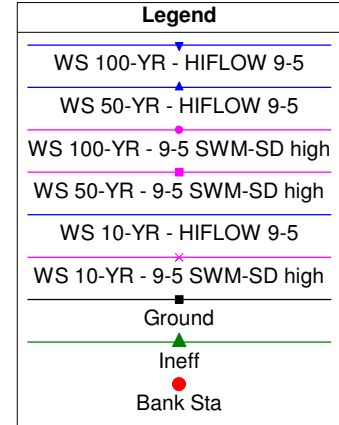
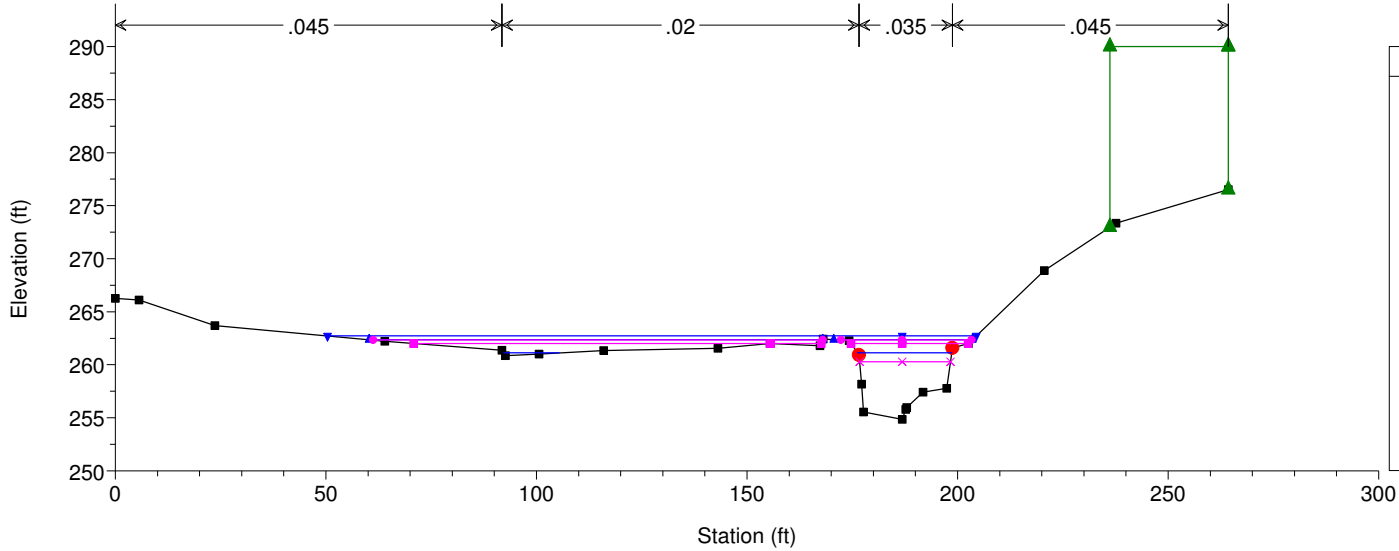
Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 40



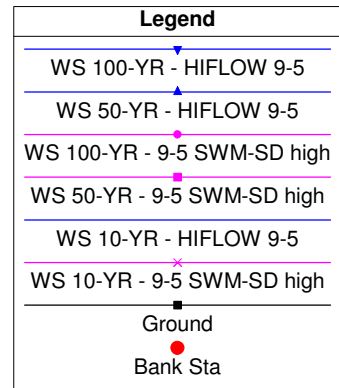
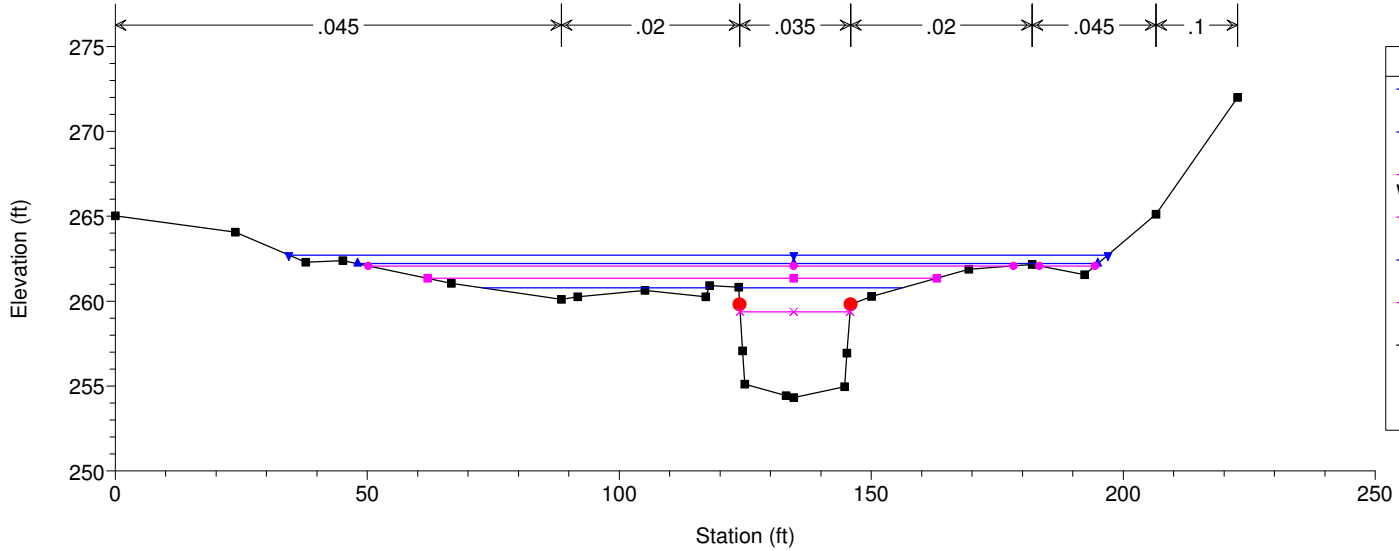
Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 39



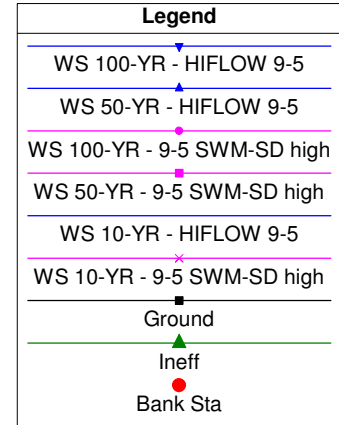
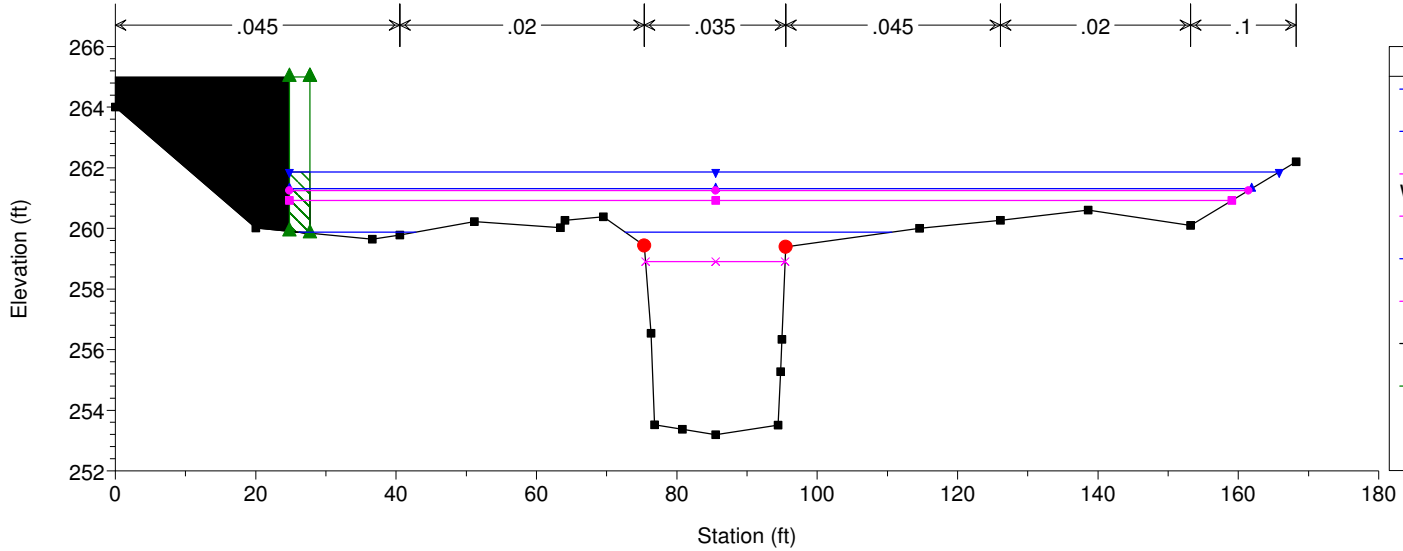
Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 38



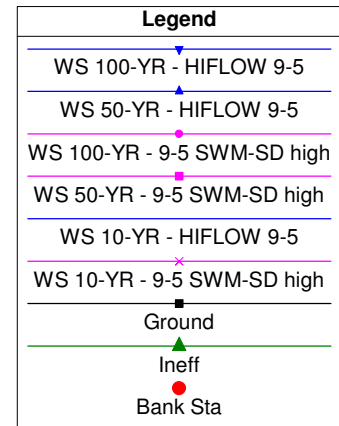
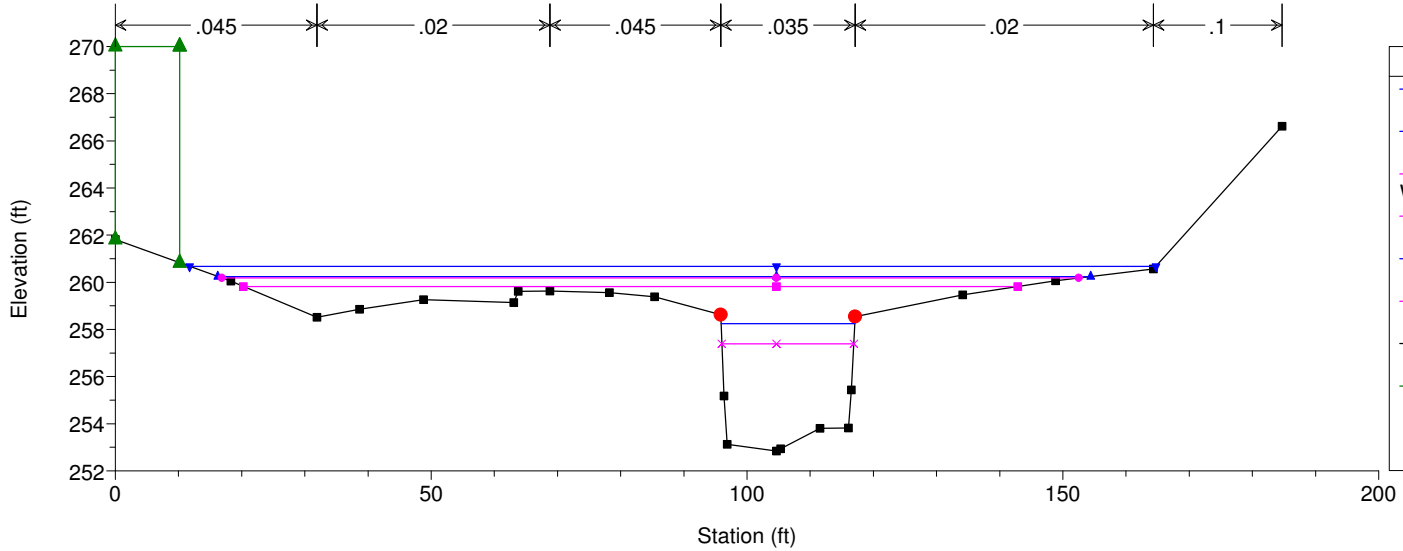
Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 37



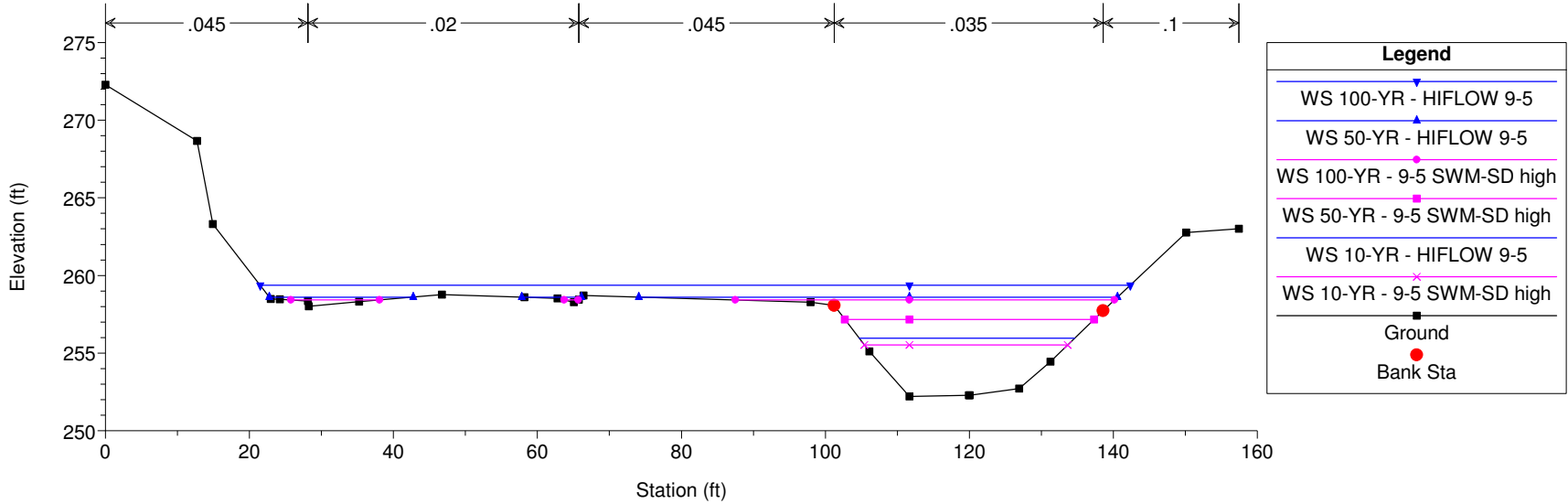
Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 36



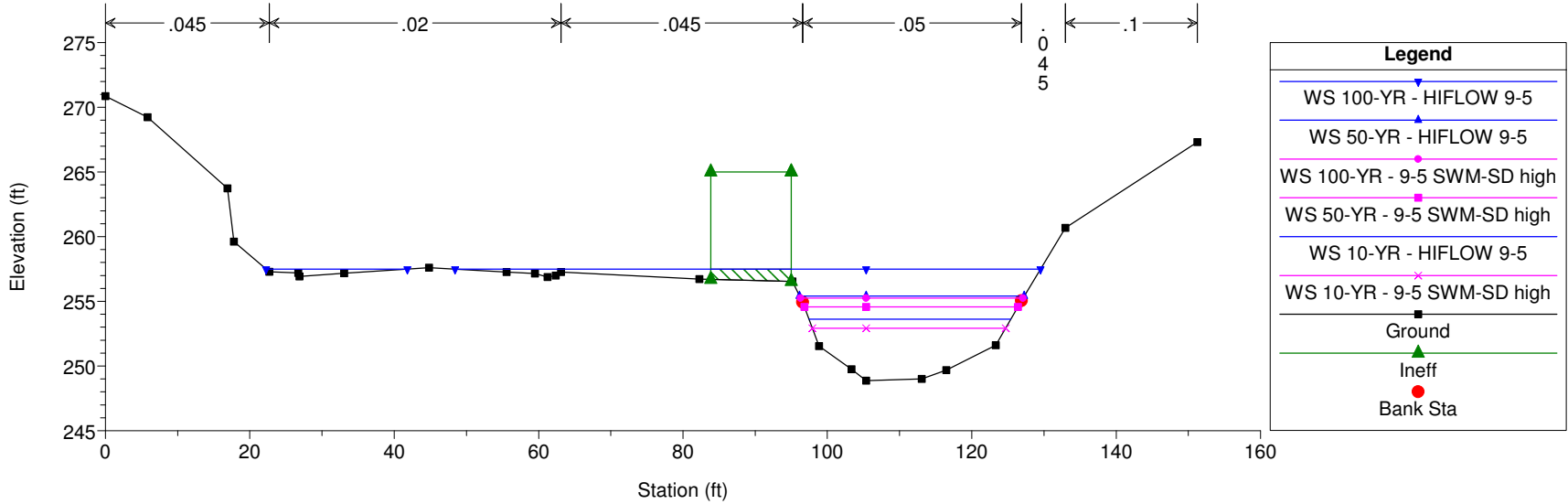
Ecicity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 35



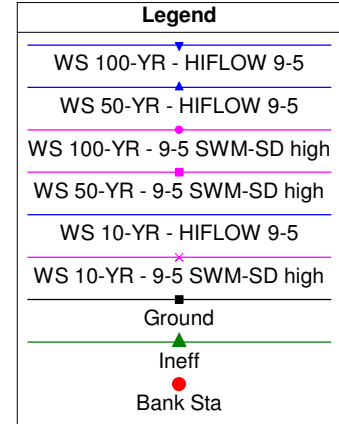
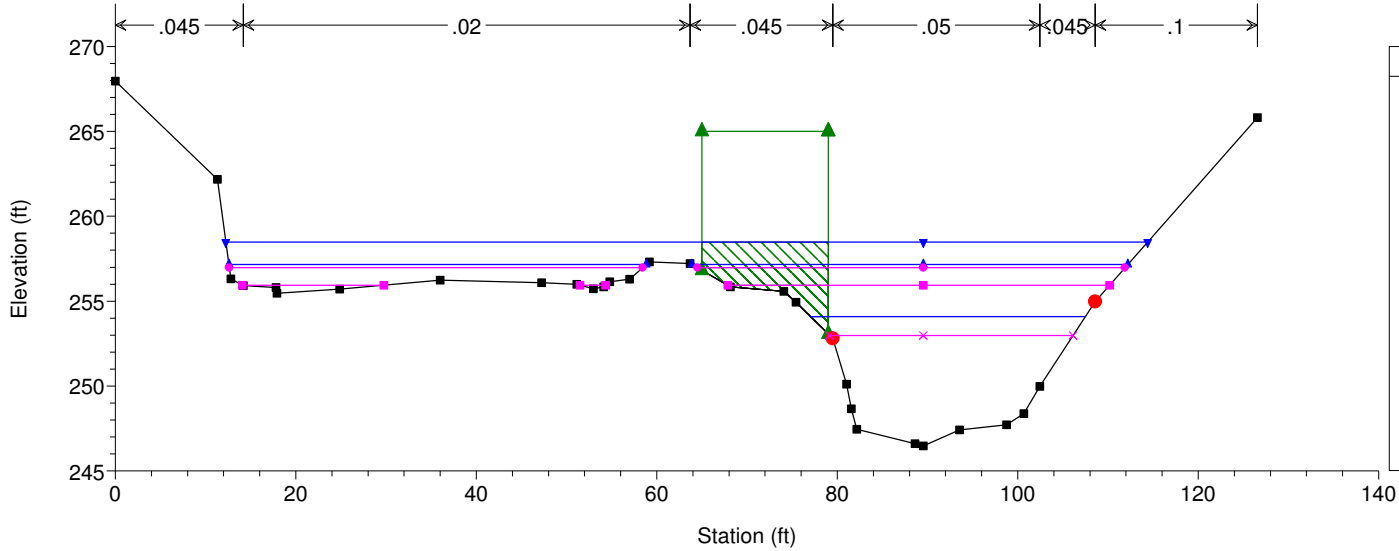
Ecicity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 34



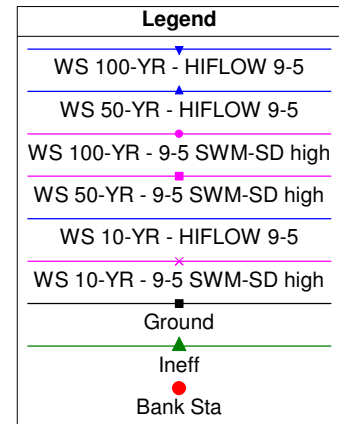
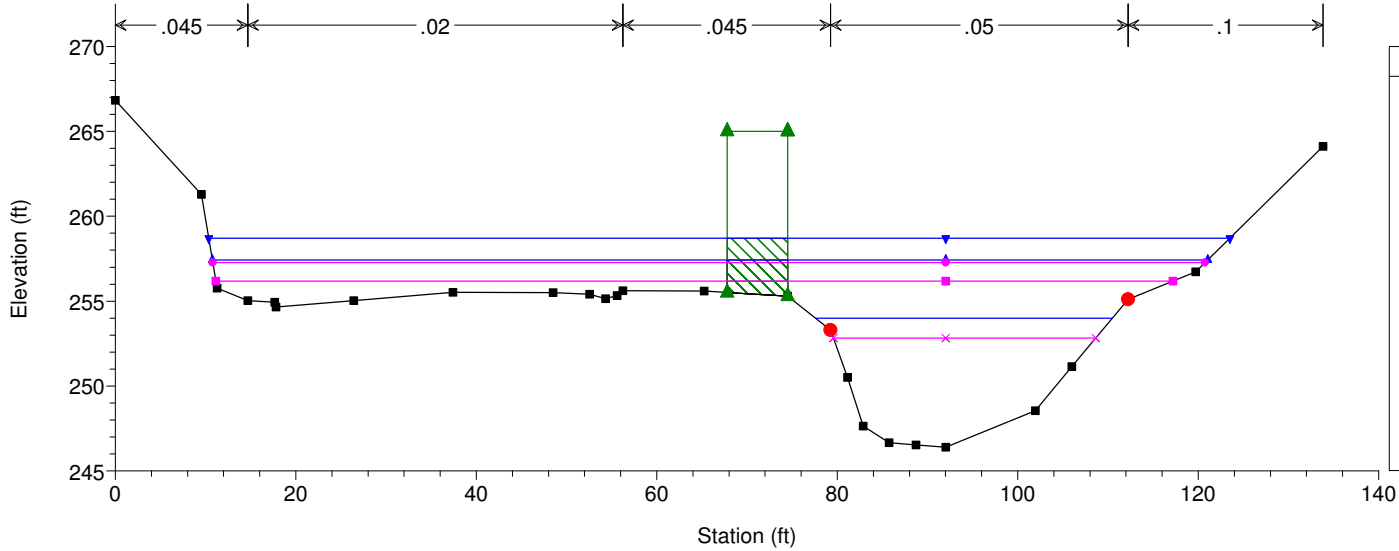
Eciry-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 33



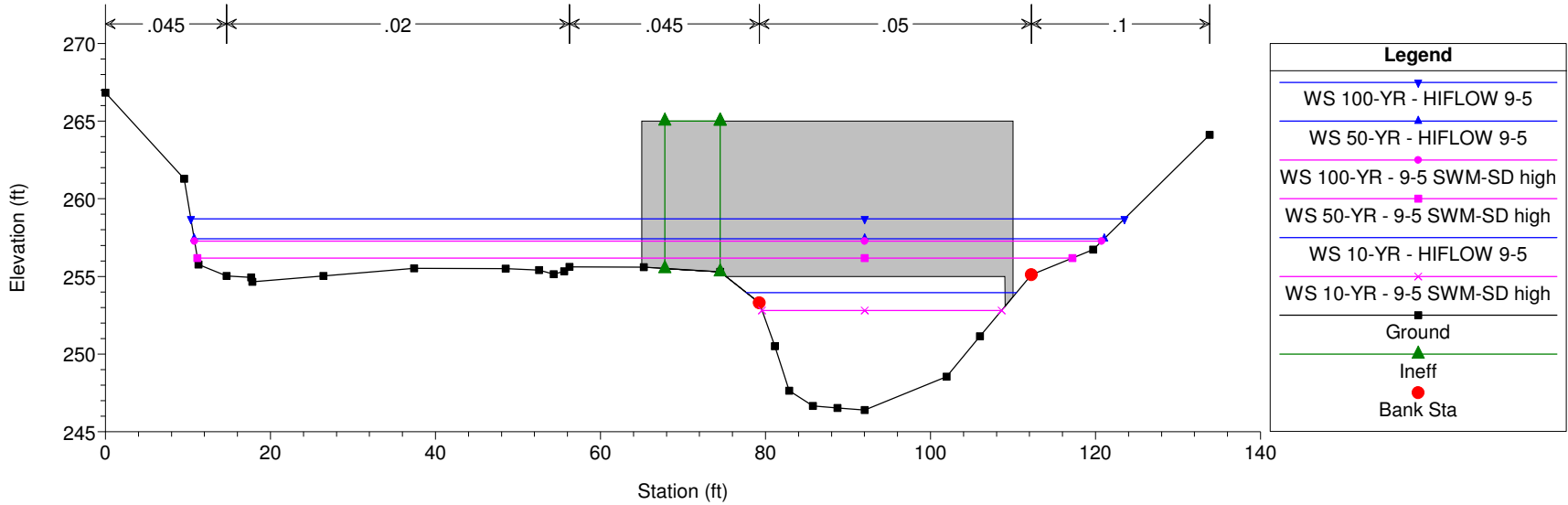
Eciry-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 32



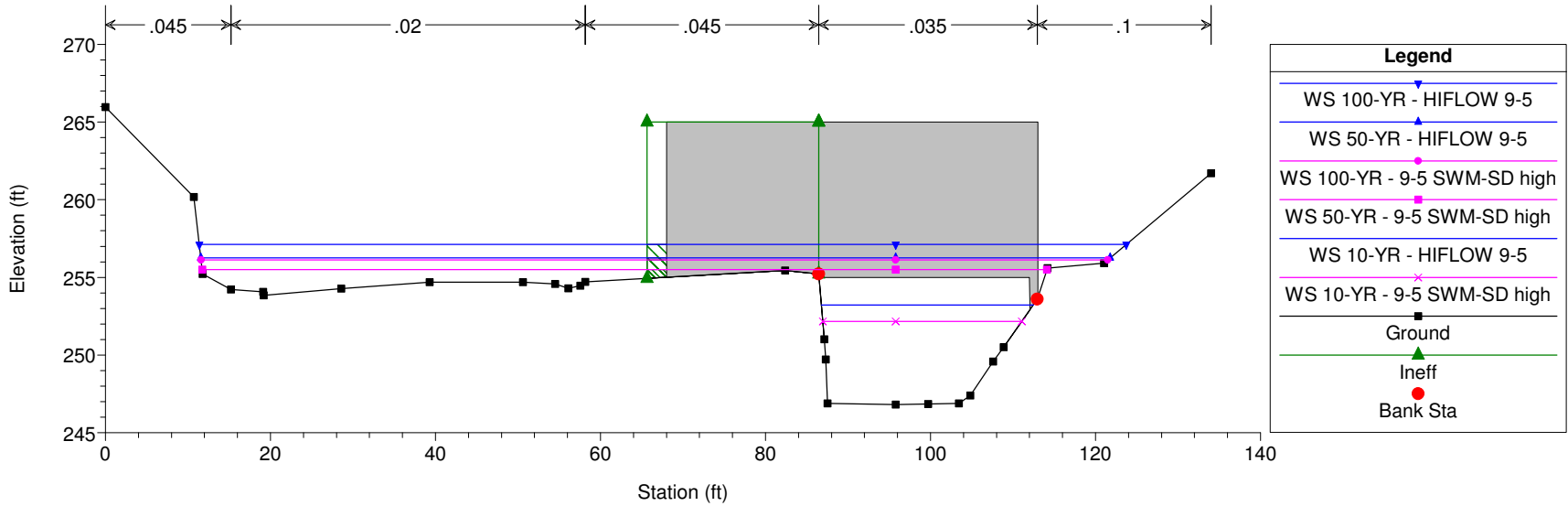
Eciry-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 31.5 BR



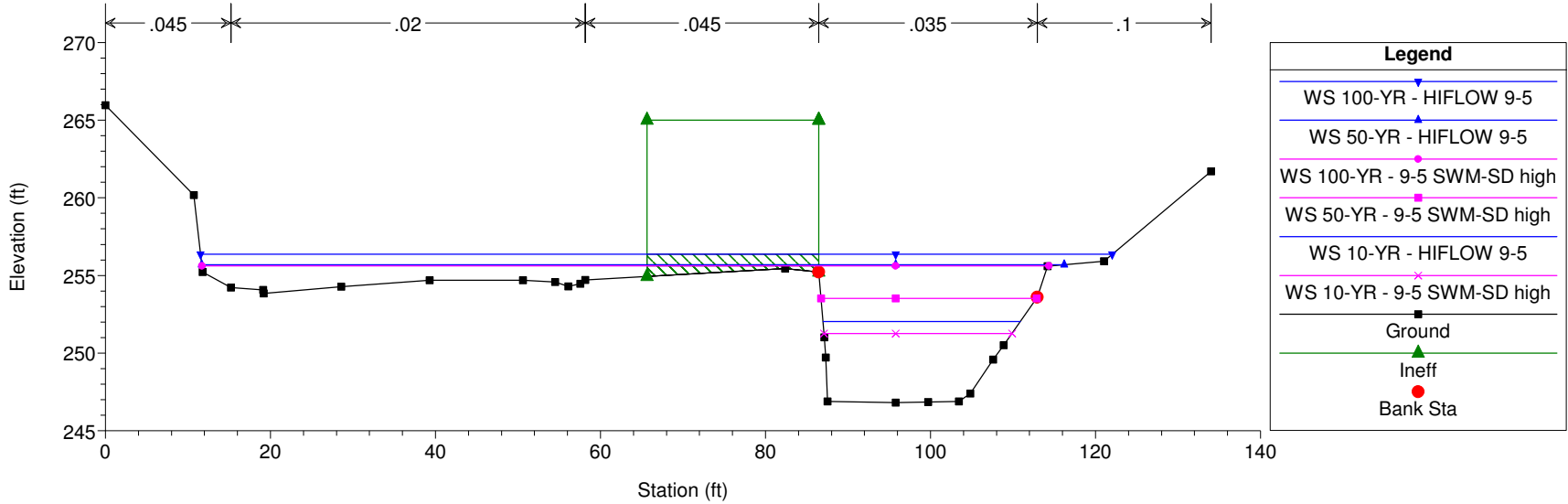
Eciry-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 31.5 BR



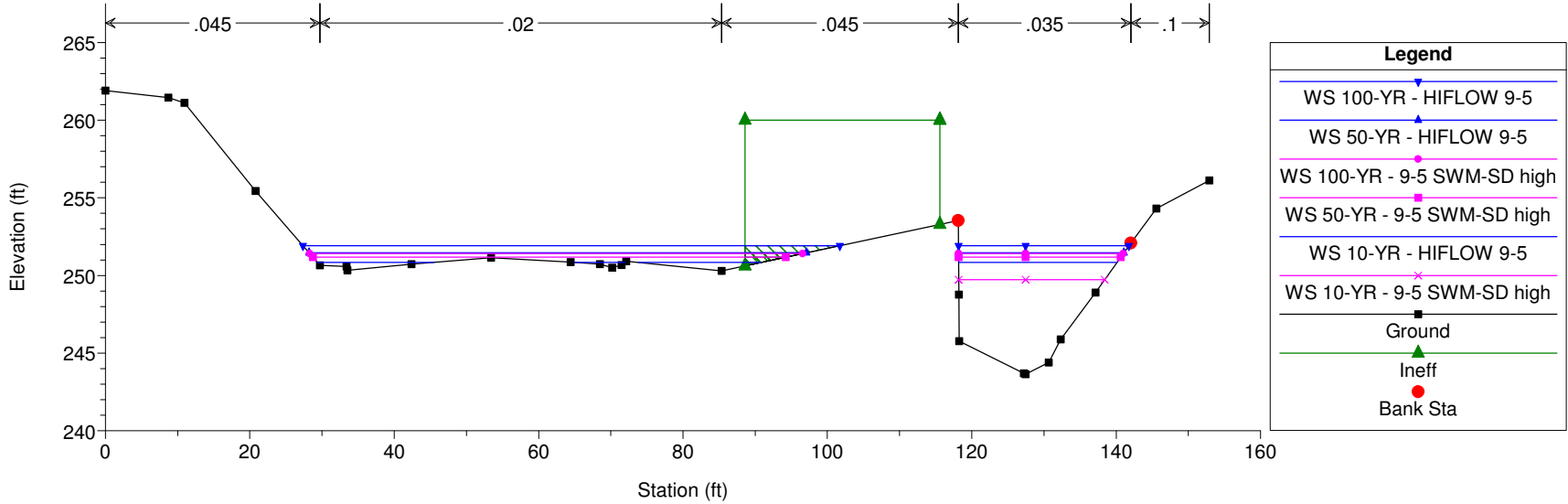
Eciry-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 31



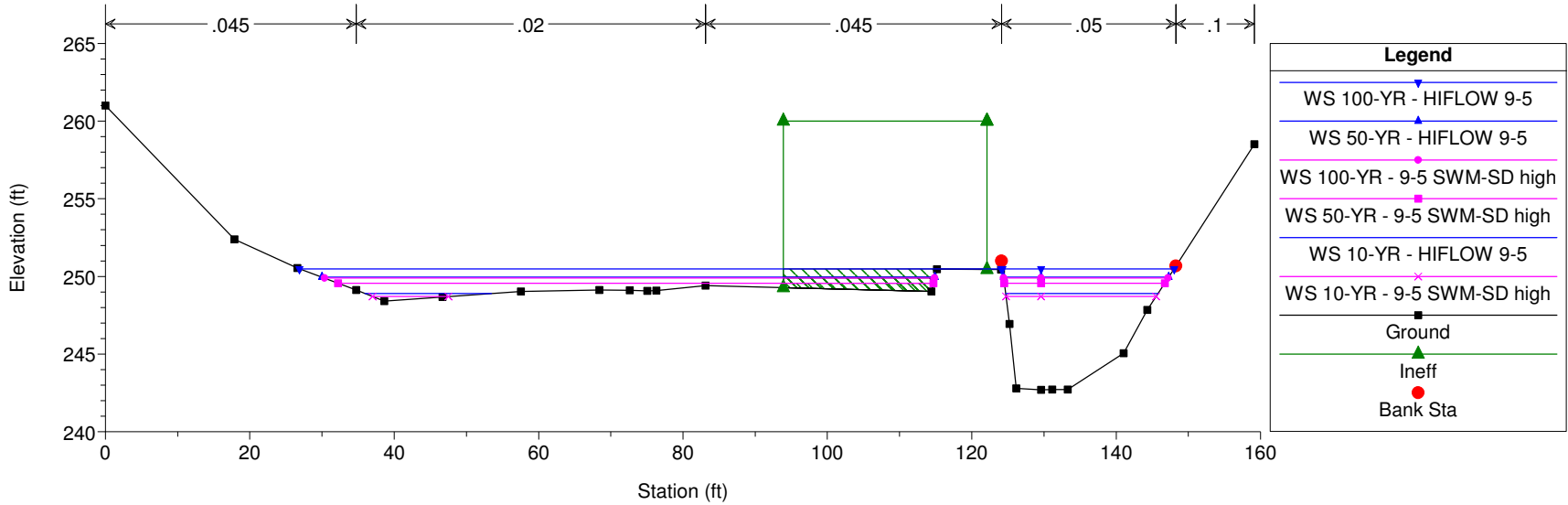
Eciry-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 30



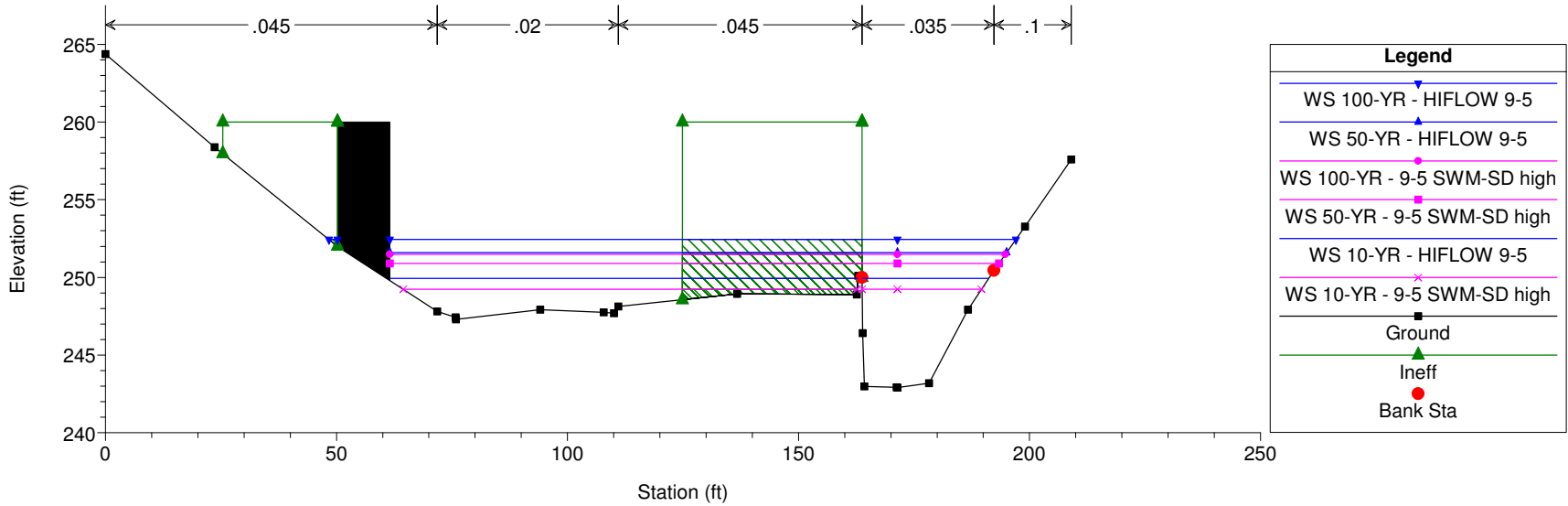
Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 29



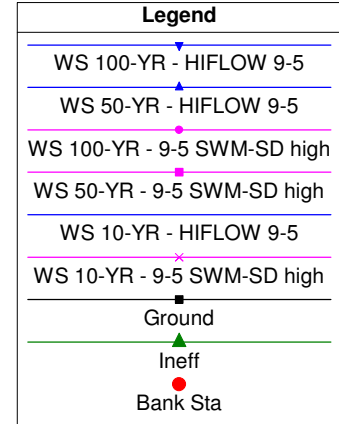
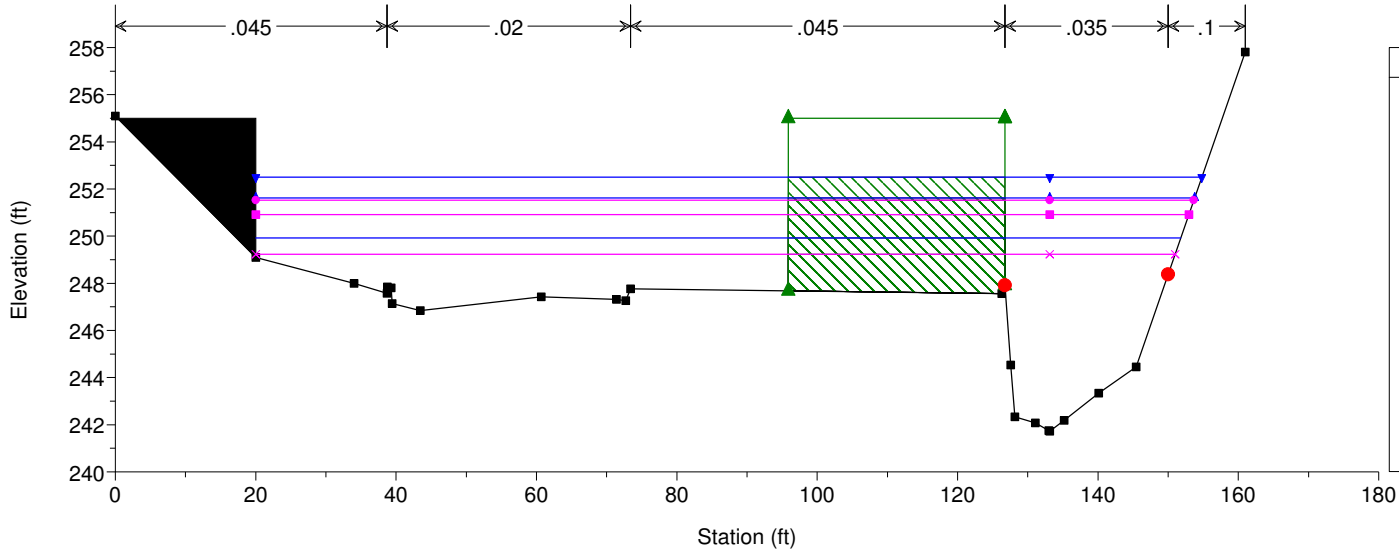
Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 28



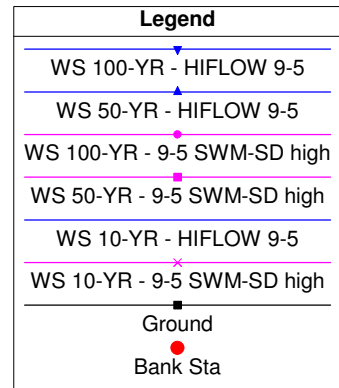
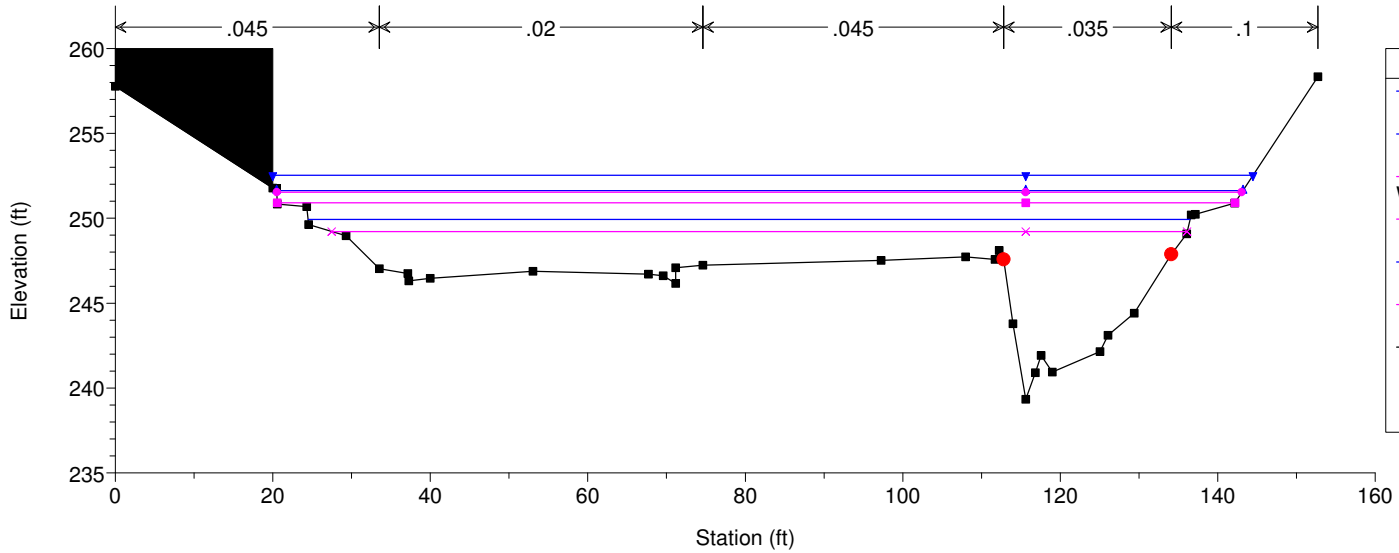
Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 27



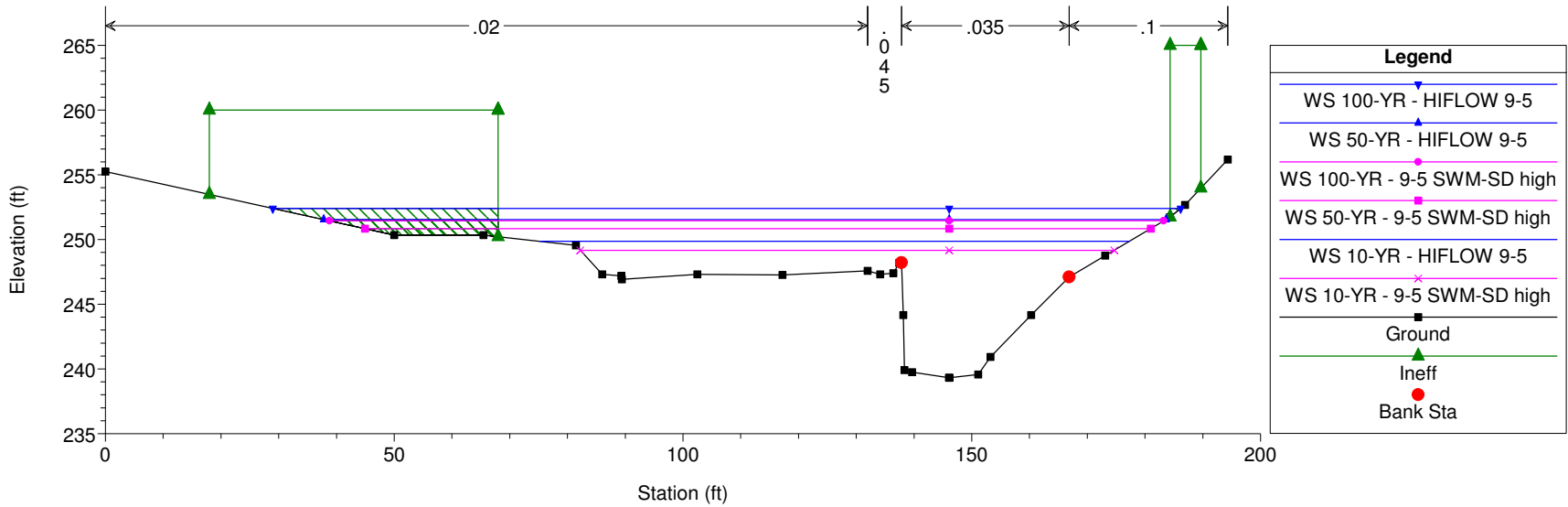
Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 26



Ecicity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

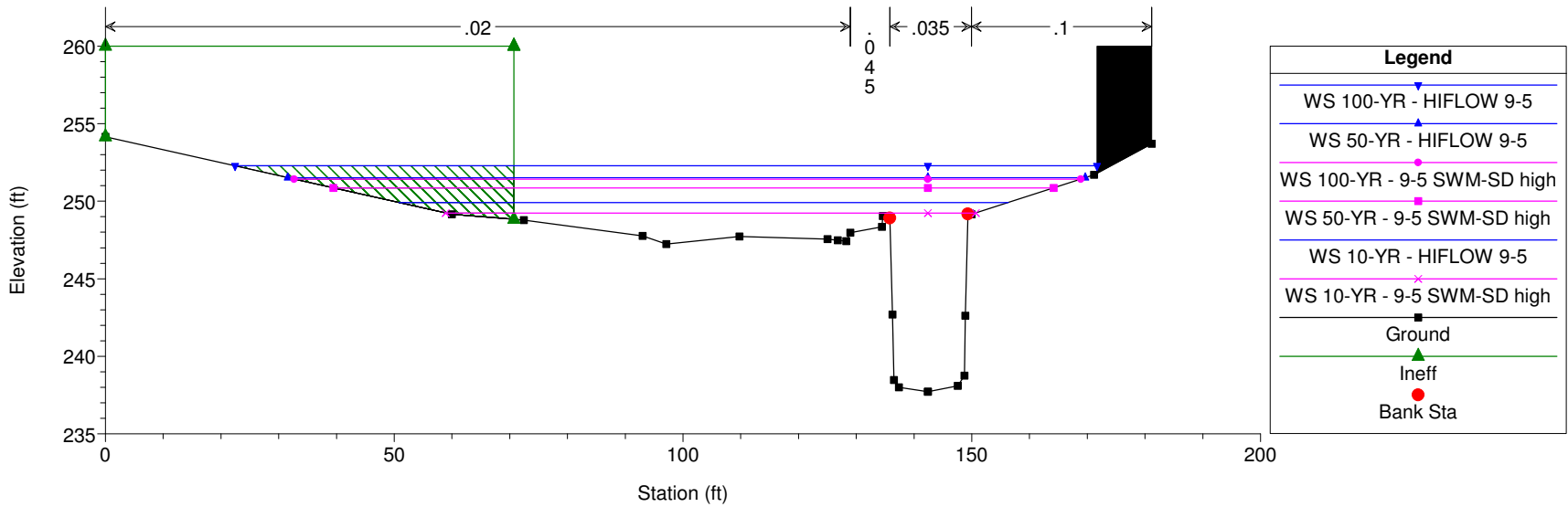
River = hudson Reach = main RS = 25



Legend	
WS 100-YR - HIFLOW 9-5	Blue line with downward triangle
WS 50-YR - HIFLOW 9-5	Blue line with upward triangle
WS 100-YR - 9-5 SWM-SD high	Magenta line with square
WS 50-YR - 9-5 SWM-SD high	Magenta line with square
WS 10-YR - HIFLOW 9-5	Blue line with 'x'
WS 10-YR - 9-5 SWM-SD high	Magenta line with 'x'
Ground	Black line with square
Ineff	Green line with upward triangle
Bank Sta	Red circle

Ecicity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

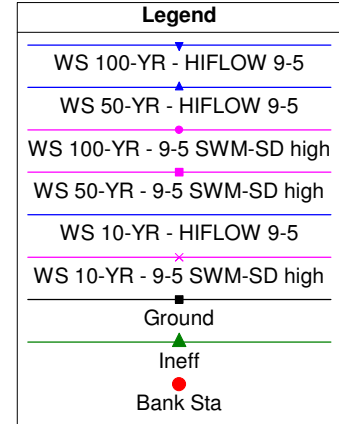
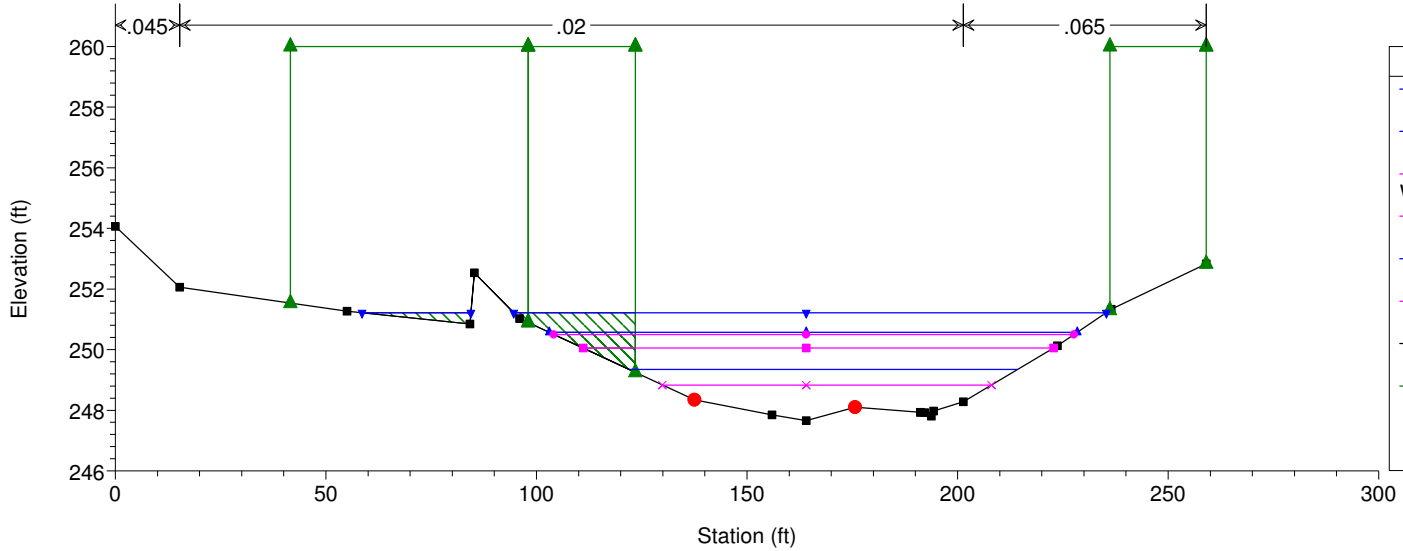
River = hudson Reach = main RS = 24



Legend	
WS 100-YR - HIFLOW 9-5	Blue line with downward triangle
WS 50-YR - HIFLOW 9-5	Blue line with upward triangle
WS 100-YR - 9-5 SWM-SD high	Magenta line with square
WS 50-YR - 9-5 SWM-SD high	Magenta line with square
WS 10-YR - HIFLOW 9-5	Blue line with 'x'
WS 10-YR - 9-5 SWM-SD high	Magenta line with 'x'
Ground	Black line with square
Ineff	Green line with upward triangle
Bank Sta	Red circle

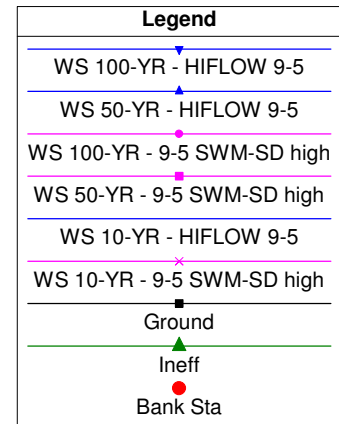
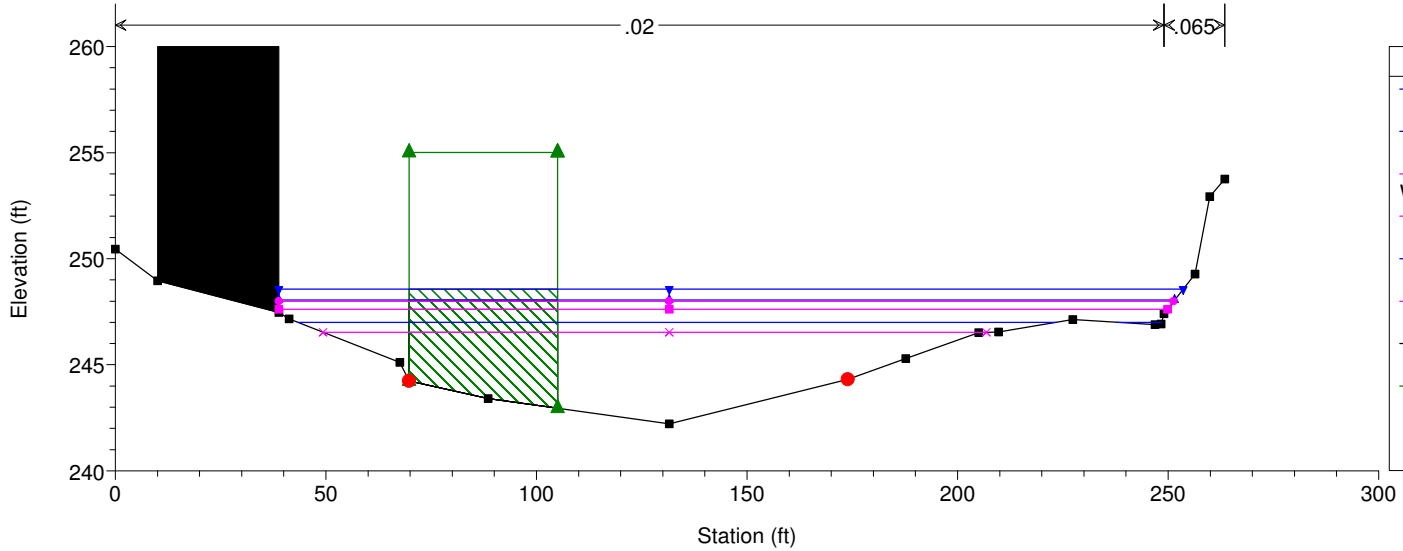
Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 23



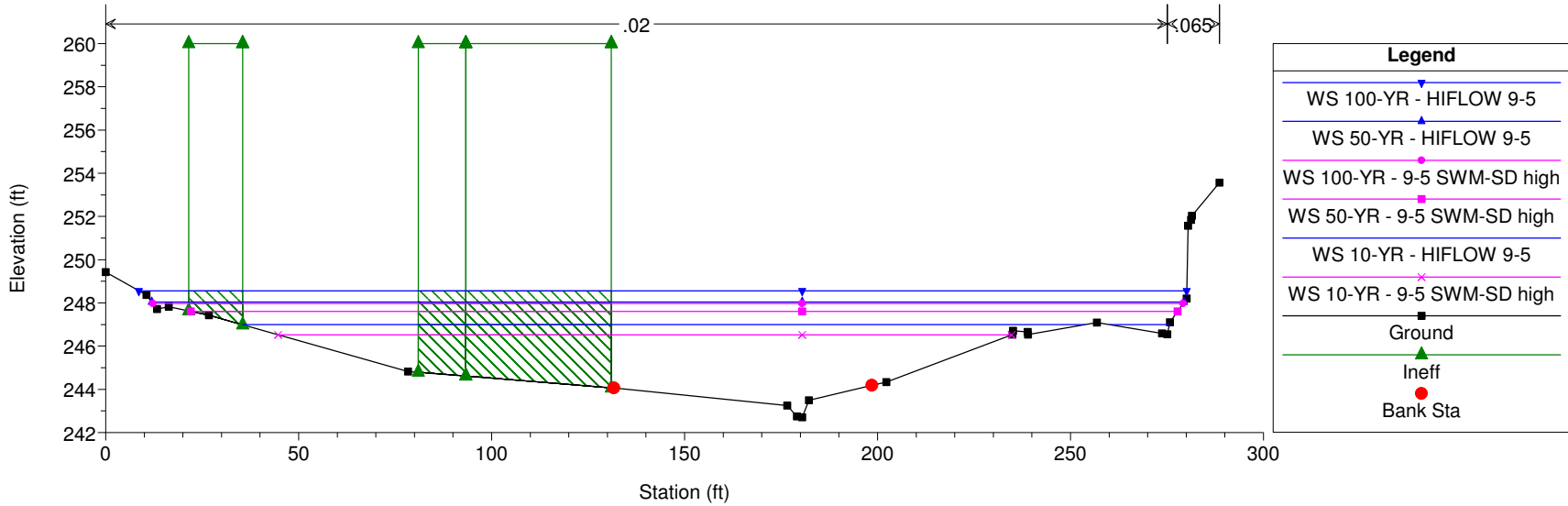
Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 22



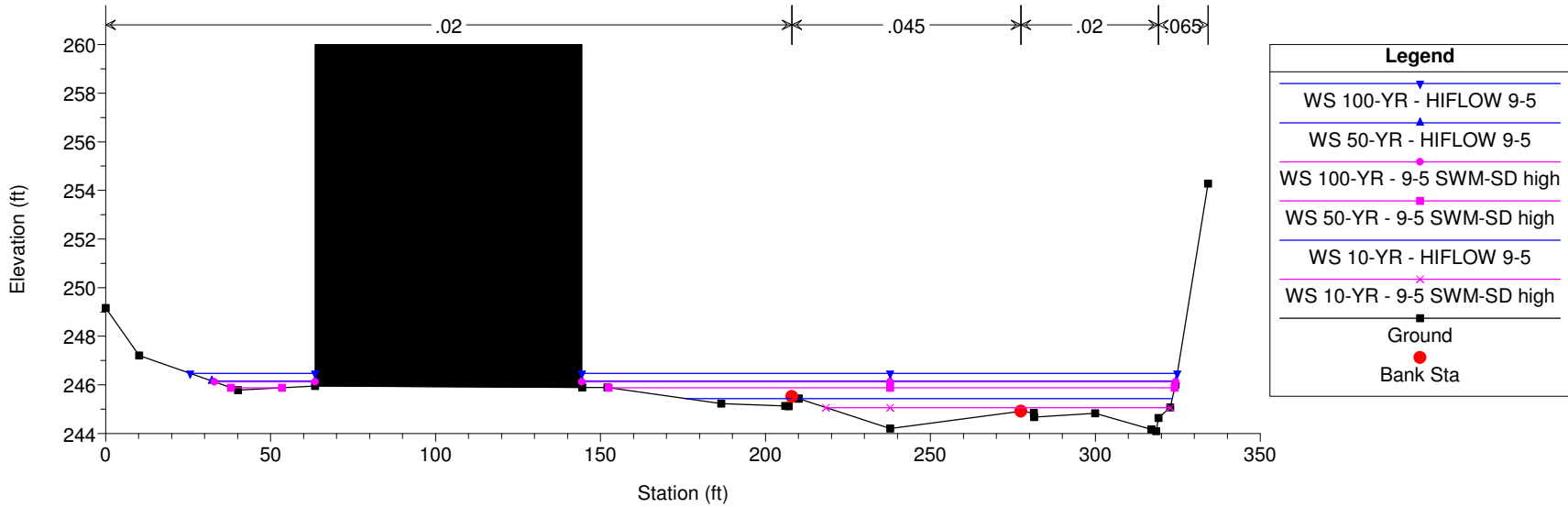
Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 21



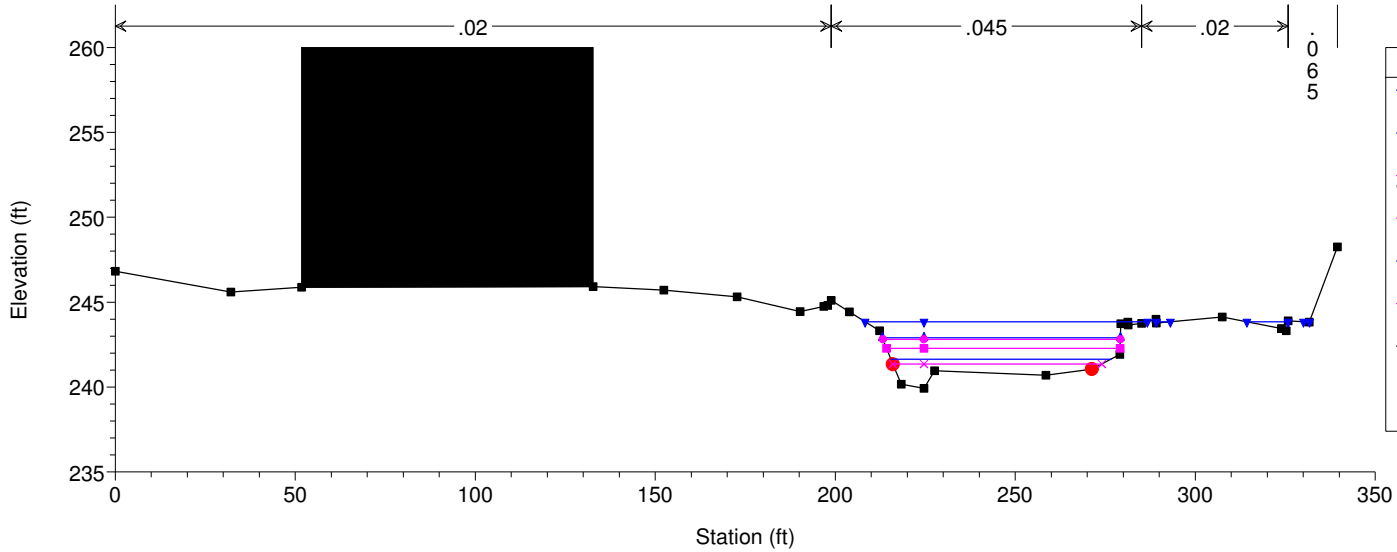
Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 19



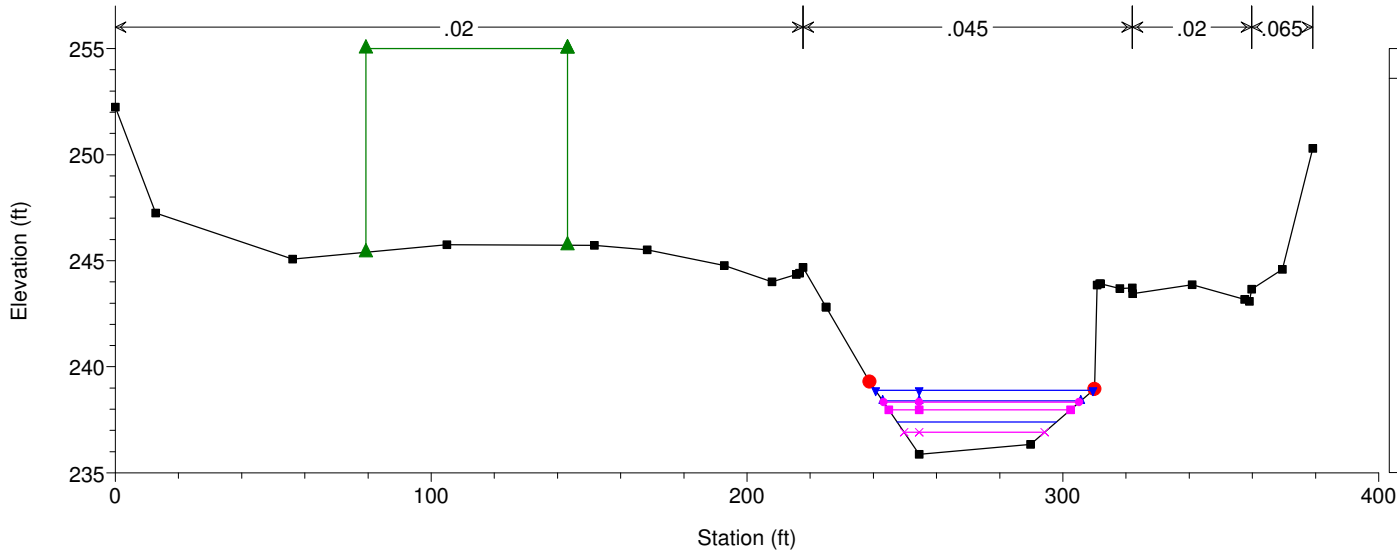
Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 18



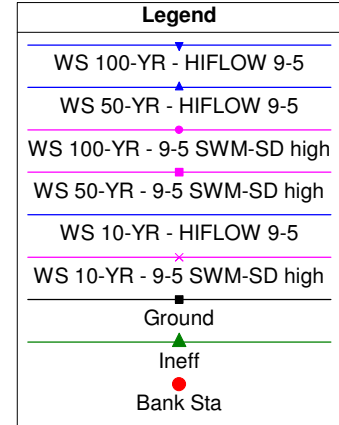
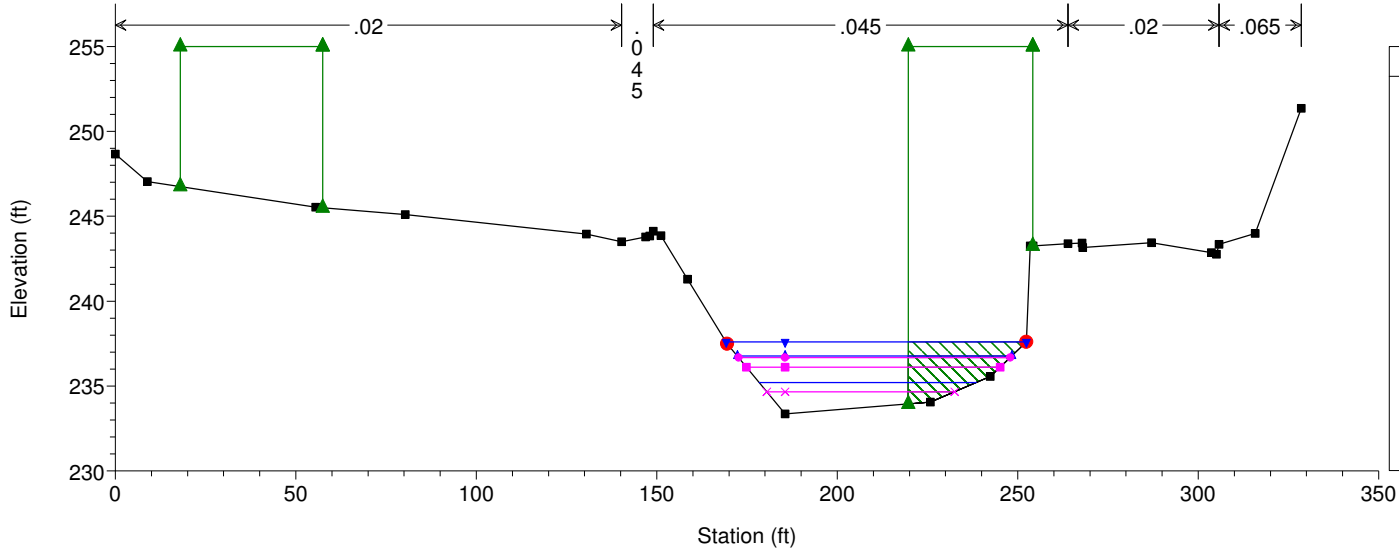
Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 17



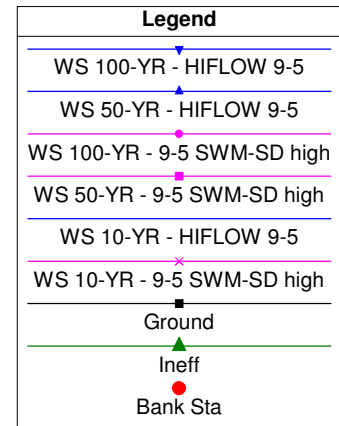
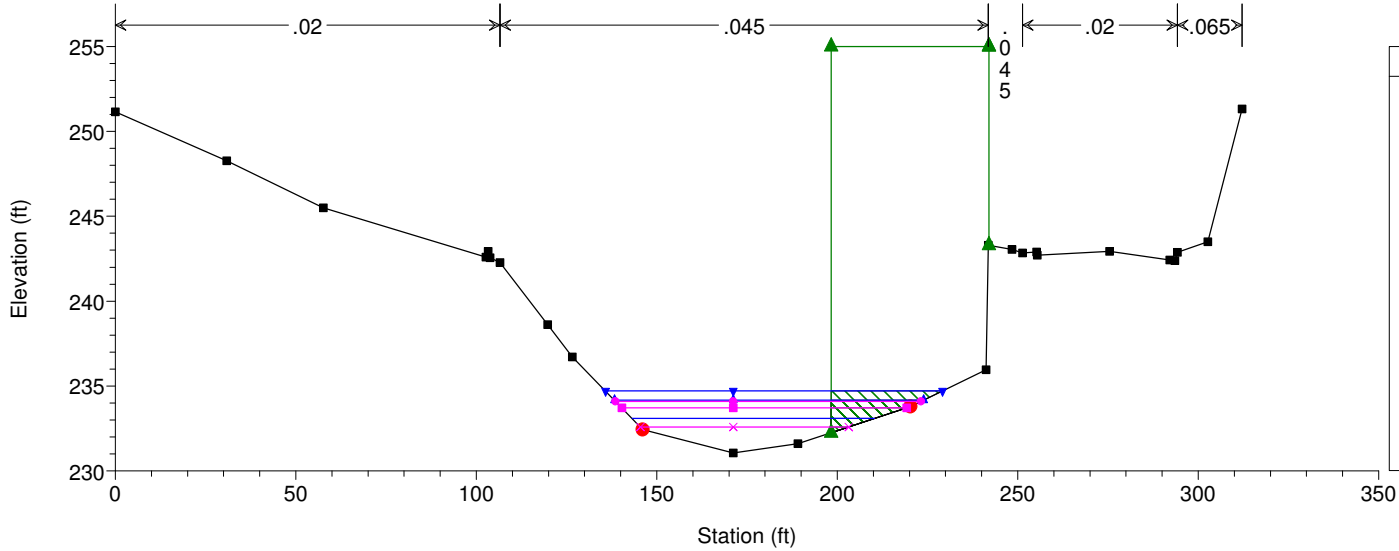
Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 16



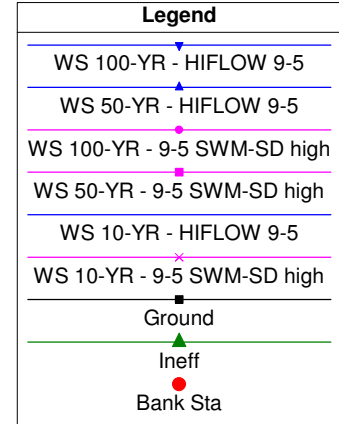
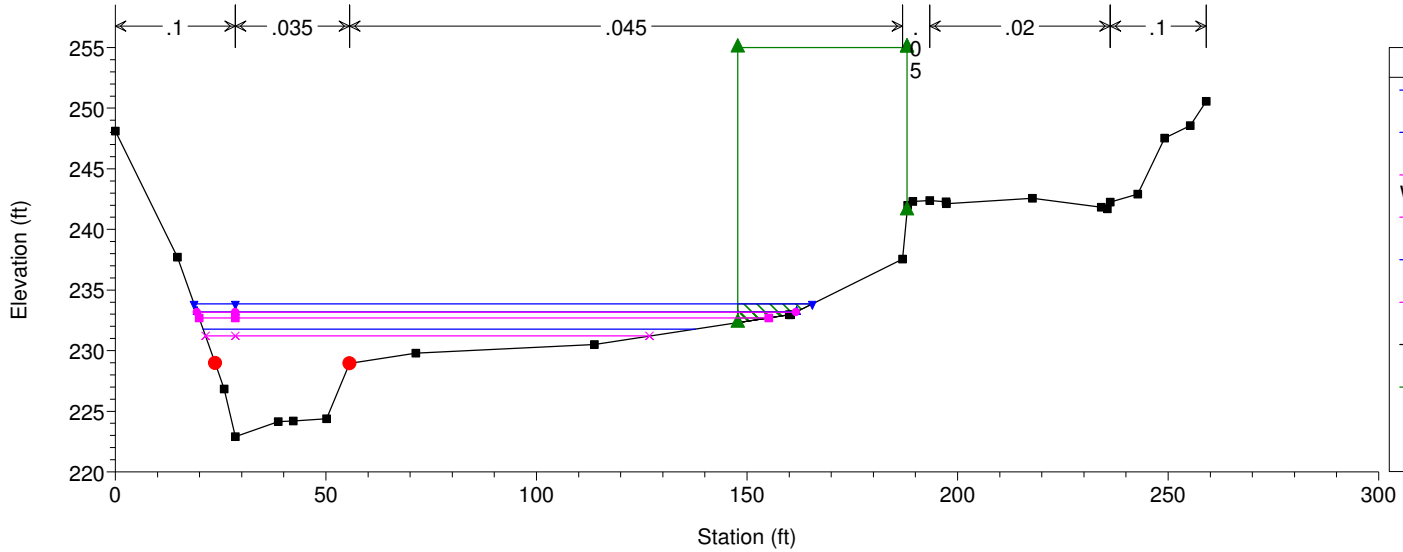
Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 15



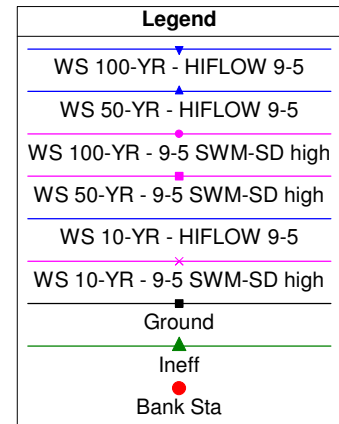
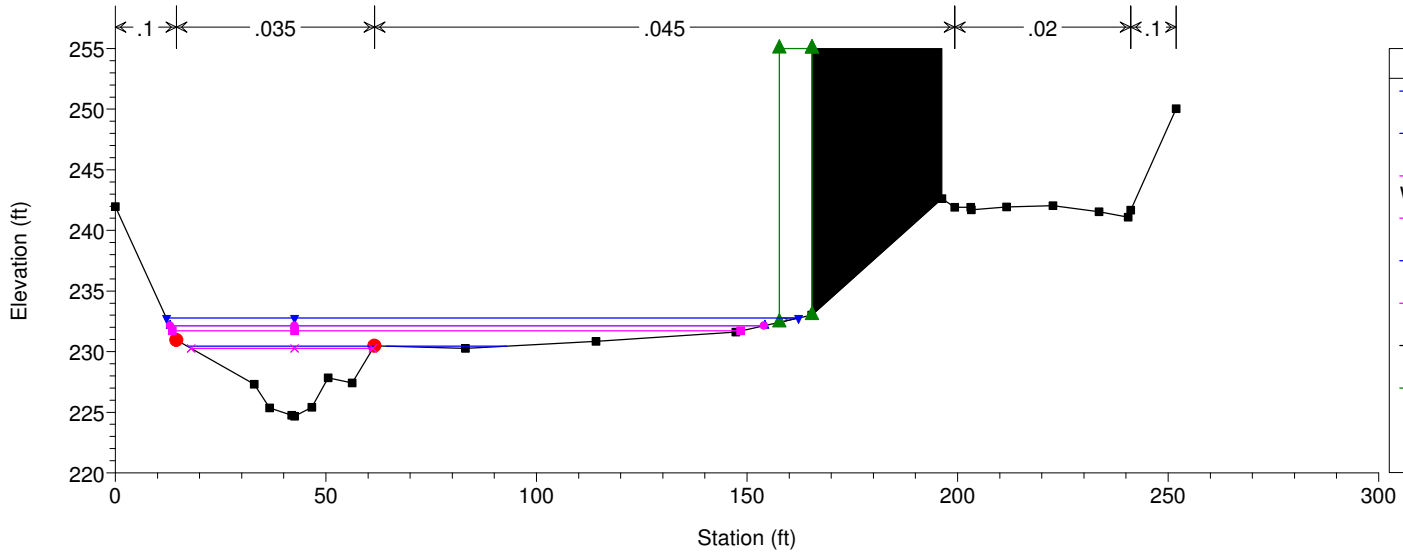
Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 14



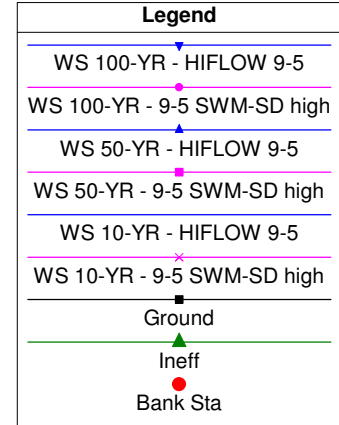
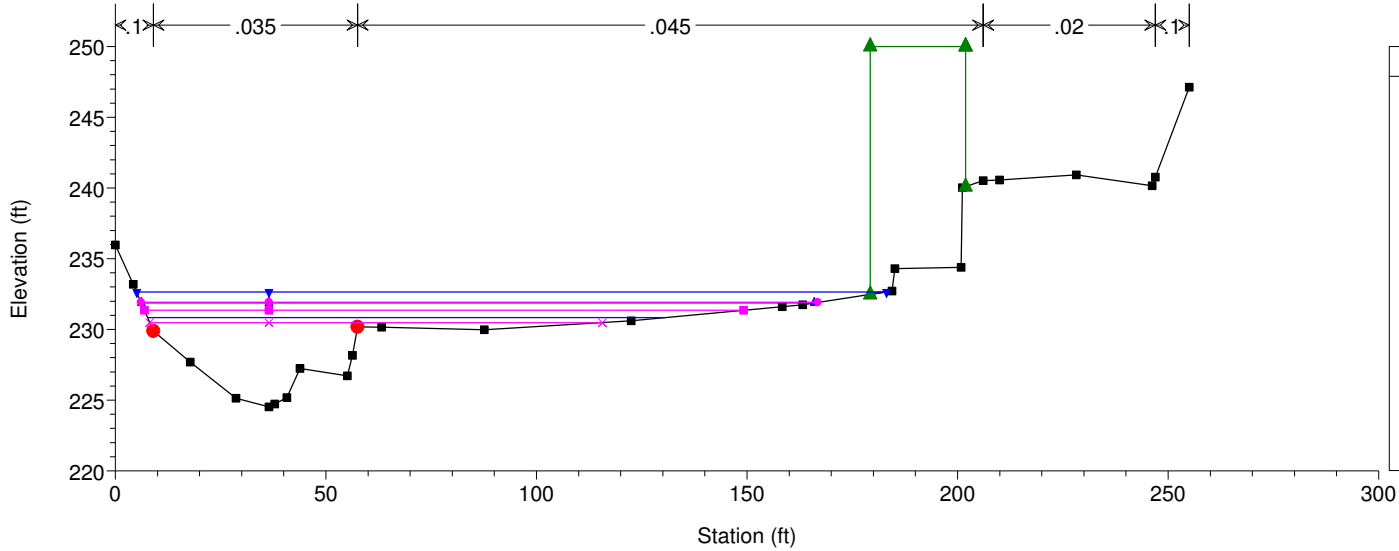
Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 13



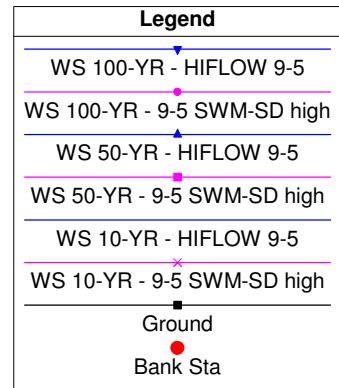
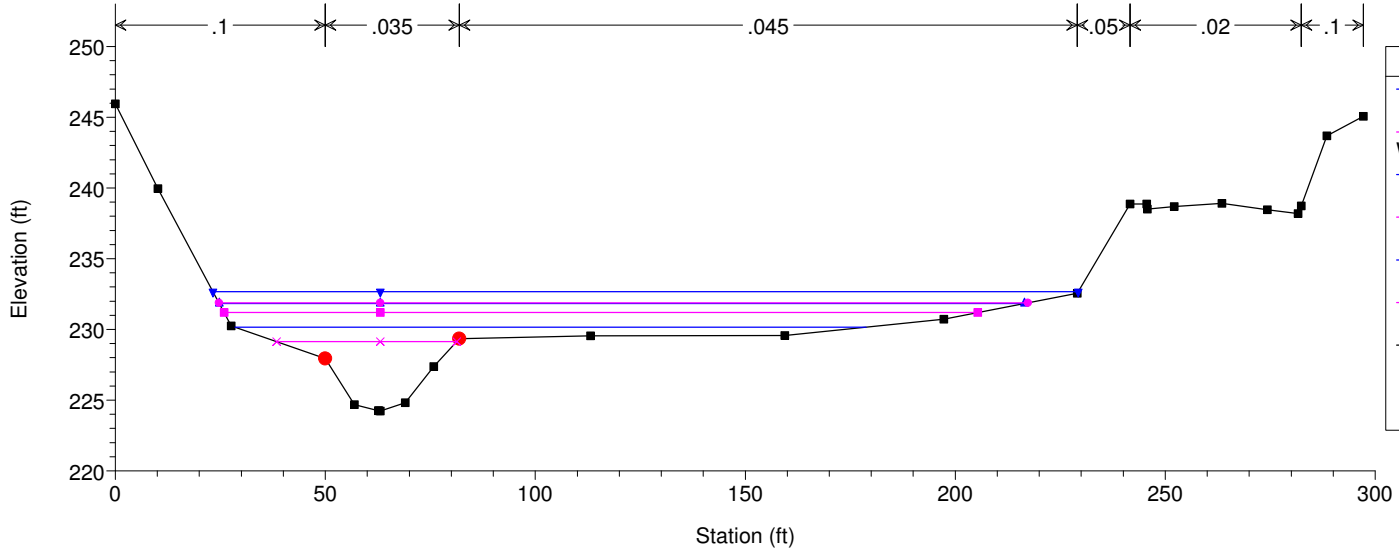
Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 12



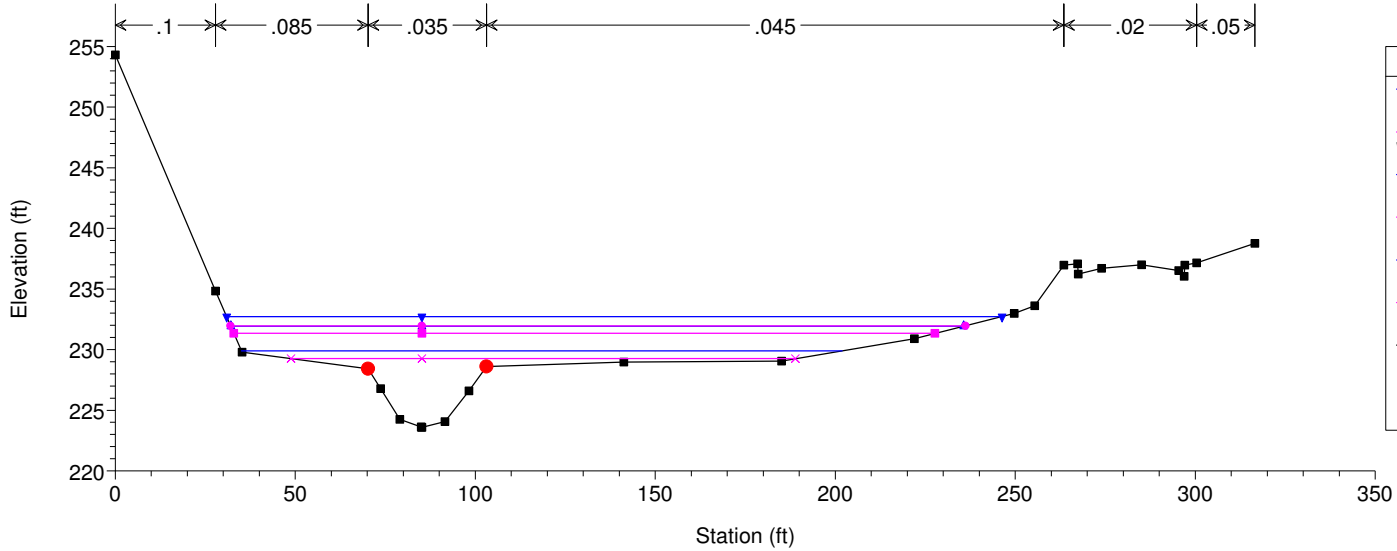
Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 11



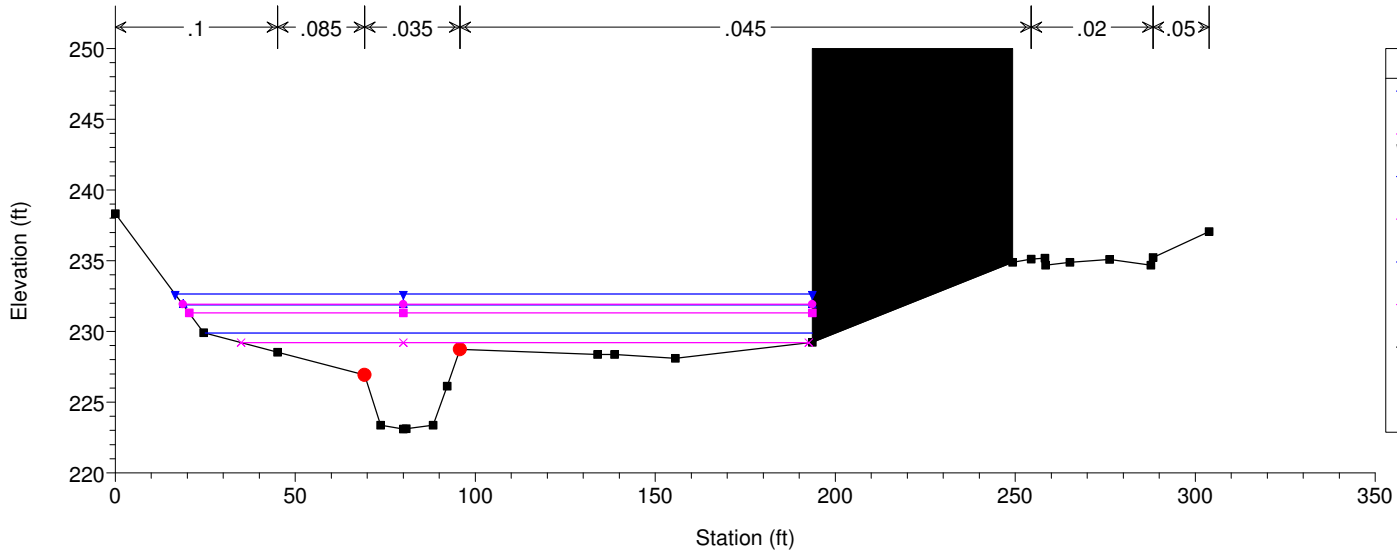
Ecicy-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 10



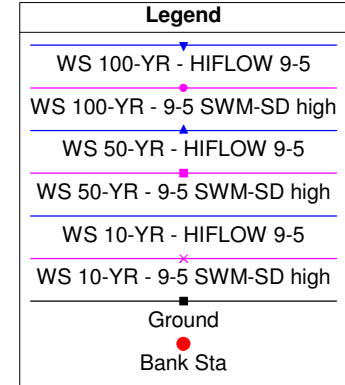
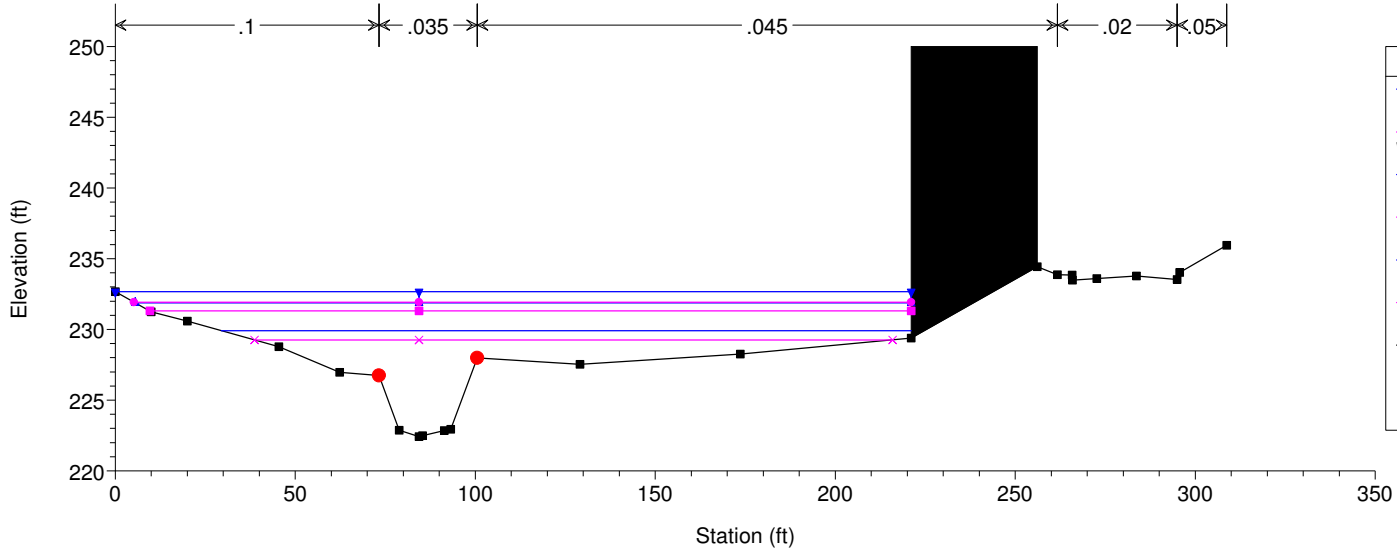
Ecicy-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 9



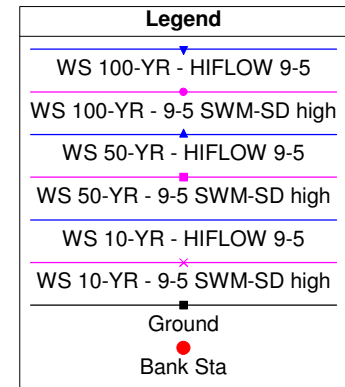
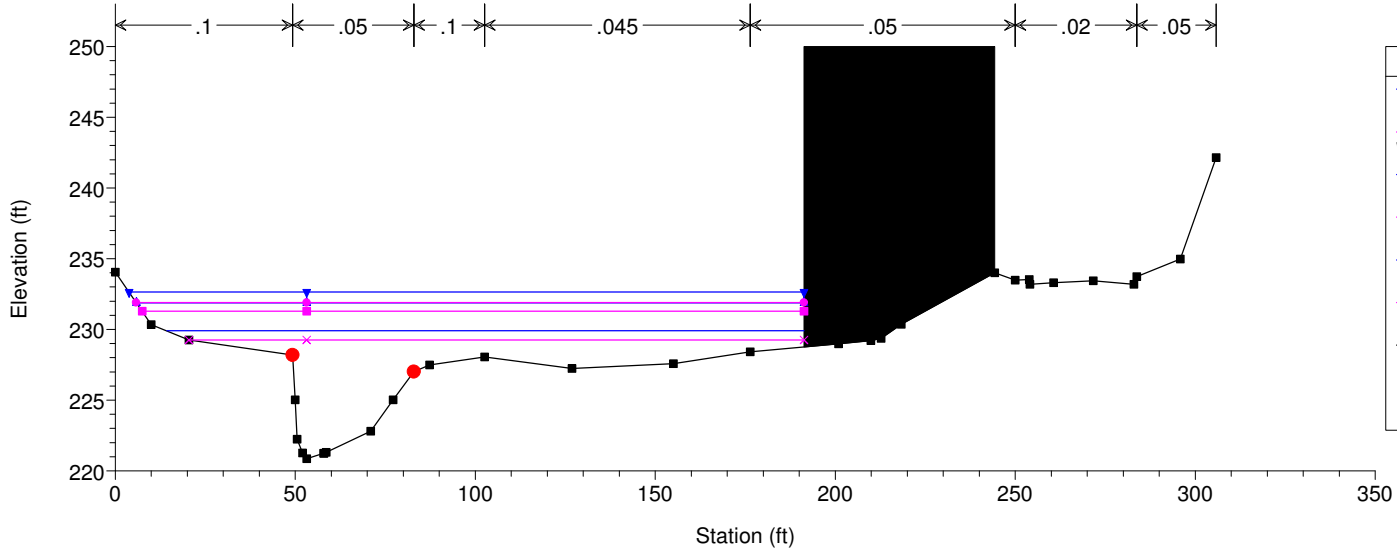
Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 8



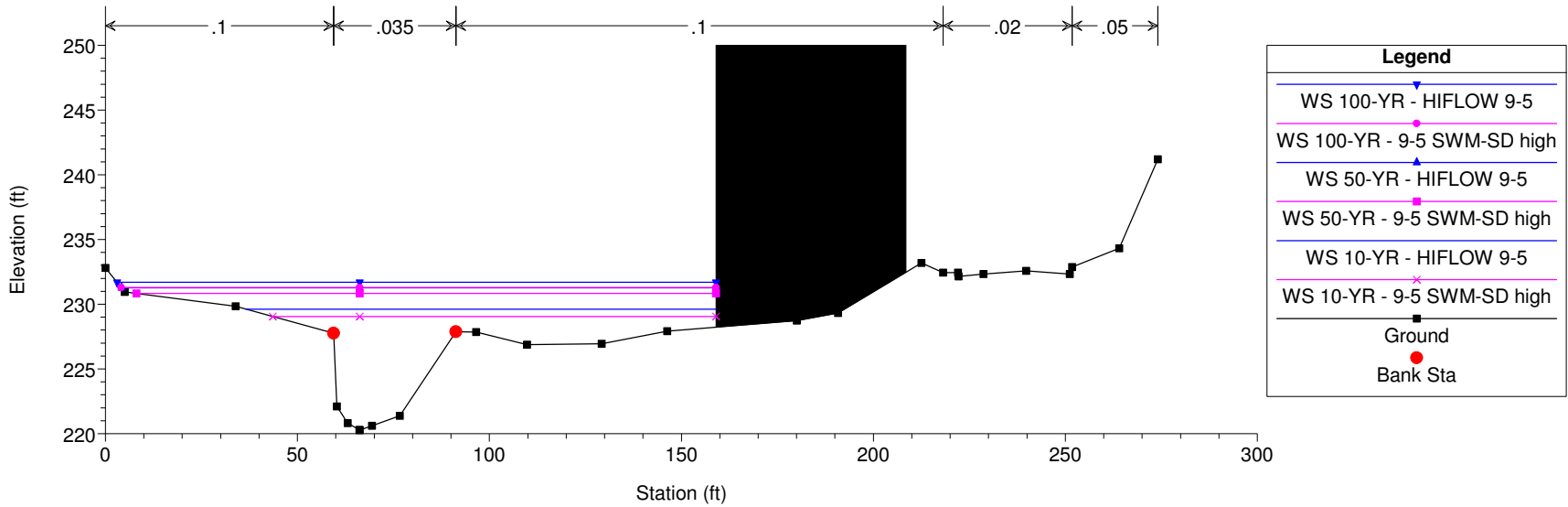
Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 7



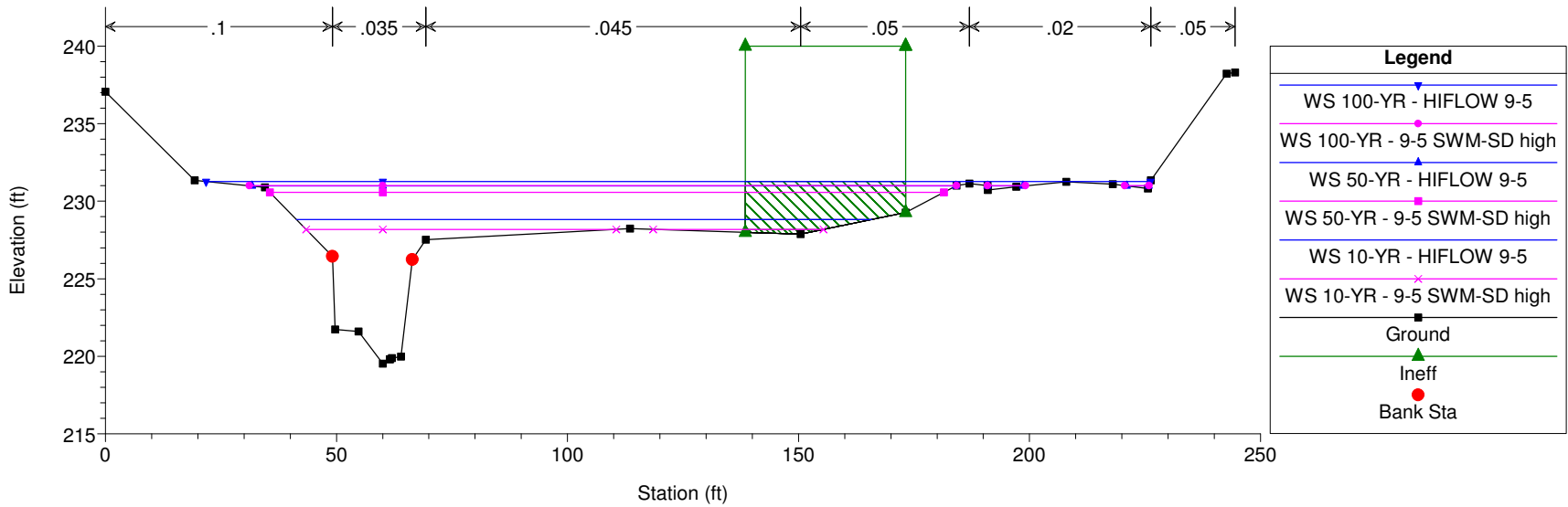
Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 6



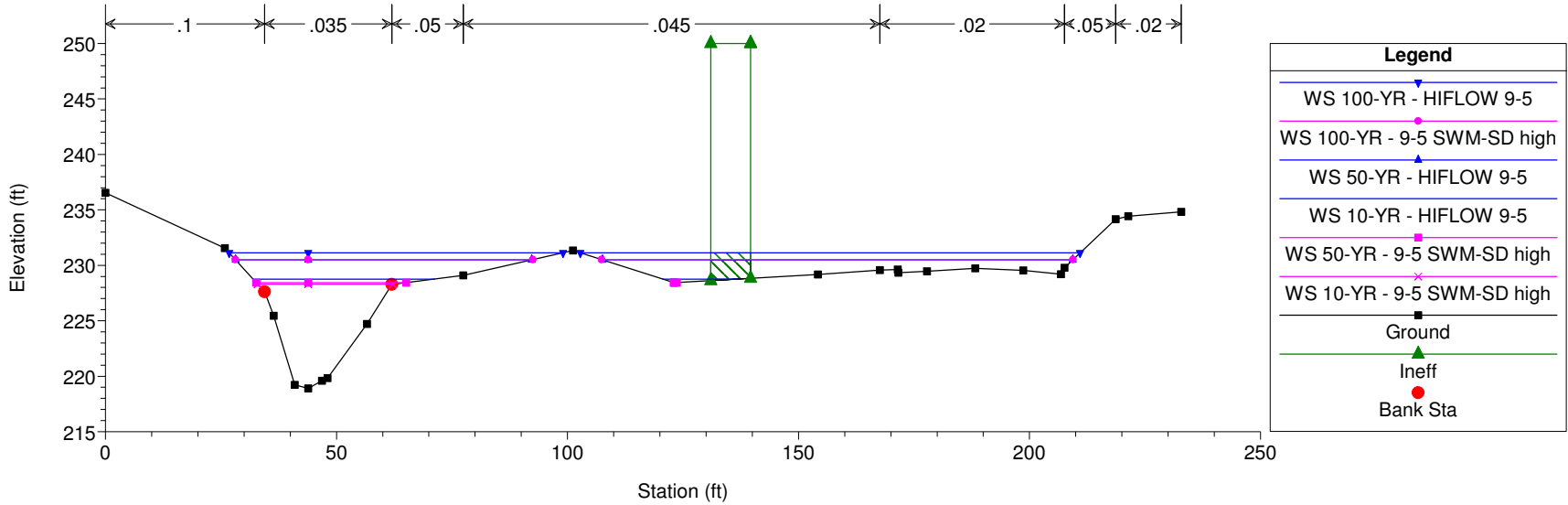
Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 5



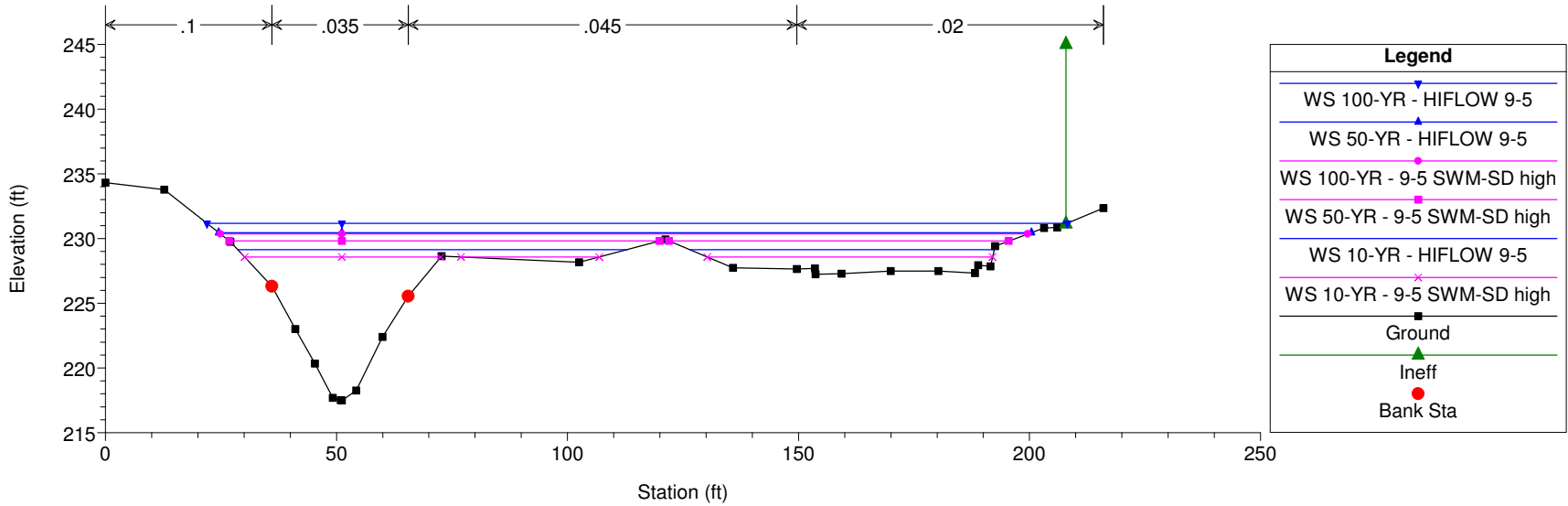
Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 4



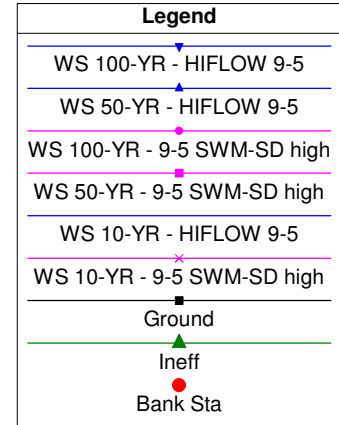
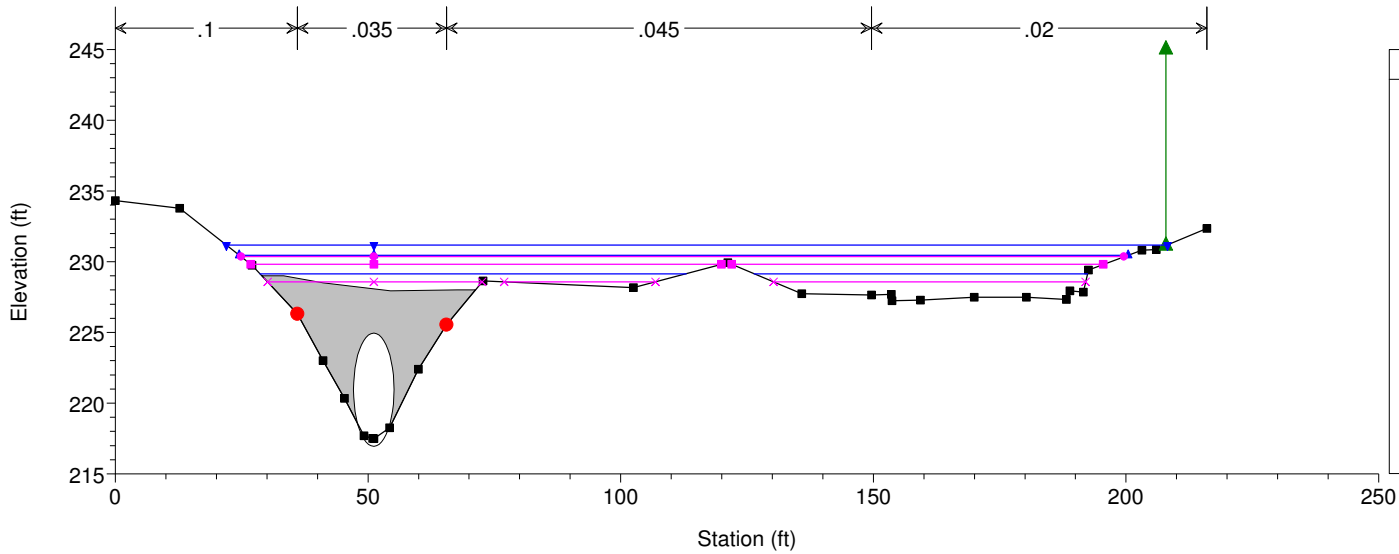
Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 3



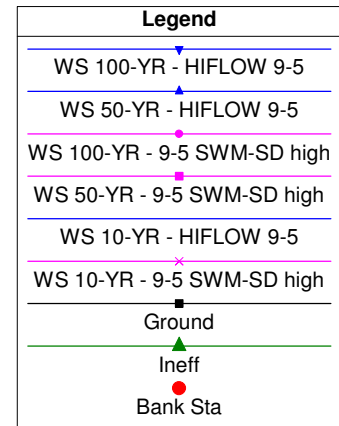
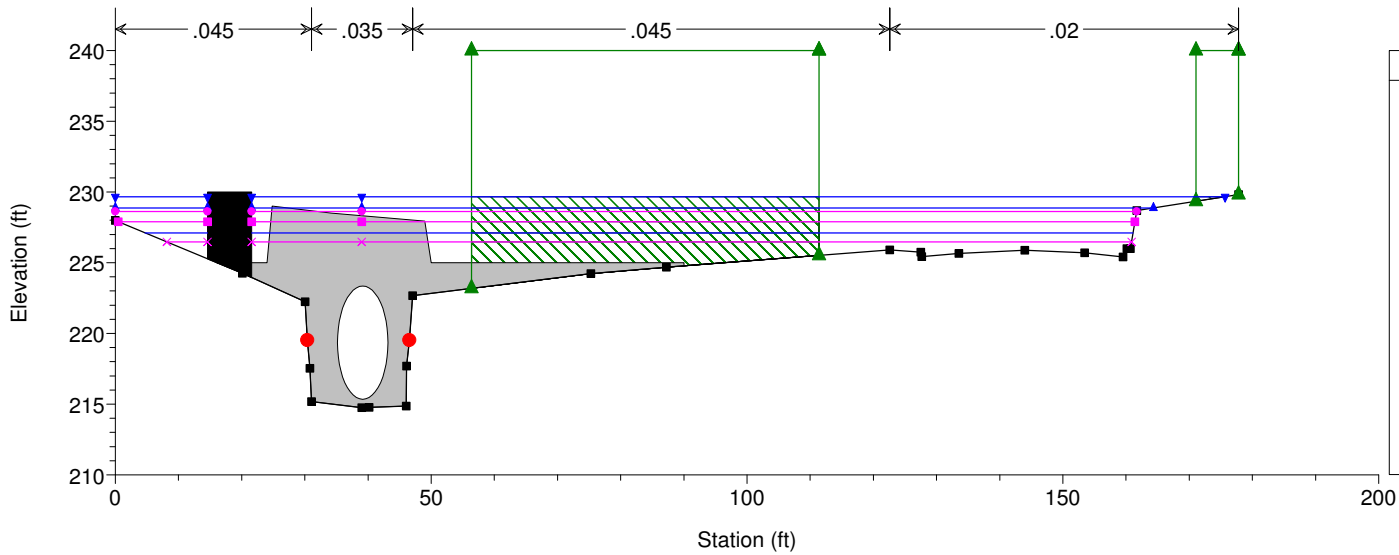
Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 2.5 Culv



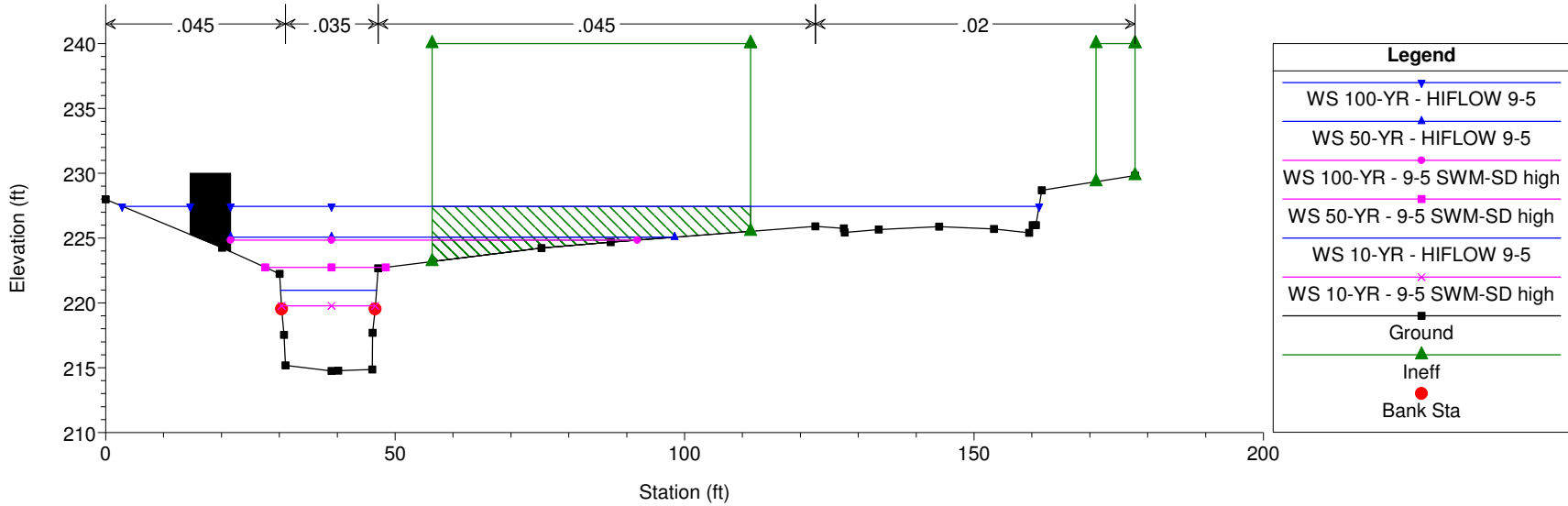
Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 2.5 Culv



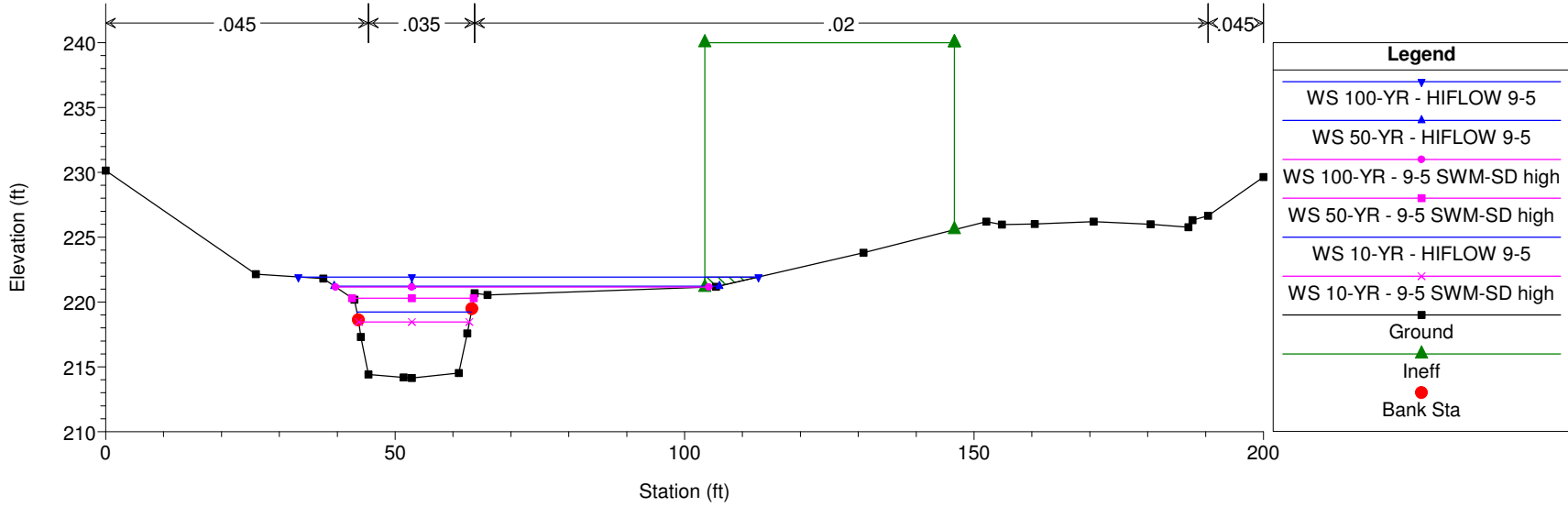
Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 2



Ecity-9ftculv Plan: 1) HIFLOW 9-5 9/18/2013 2) 9-5 SWM-SD high 9/18/2013

River = hudson Reach = main RS = 1



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X   X  XXXXXX   XXXX       XXXX       XX       XXXX
X   X  X  X     X  X       X  X       X  X       X
X   X  X        X         X  X       X  X       X
XXXXXXXX XXXX   X         XXX XXXX   XXXXXX   XXXX
X   X  X        X         X  X       X  X         X
X   X  X        X  X       X  X       X  X       X
X   X  XXXXXX   XXXX       X  X       X  X       XXXXX
  
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PROJECT DATA

Project Title: Ecity
 Project File : Ecity.prj
 Run Date and Time: 7/12/2013 3:37:39 PM

Project in English units

PLAN DATA

Plan Title: LOFLOW_7_12_FLOW
 Plan File : i:\5493 - Howard County\01 - Ellicott City Flood Study\H&H\HEC-RAS\Ecity.p17

Geometry Title: 7-12-13LOFLOW
 Geometry File : i:\5493 - Howard County\01 - Ellicott City Flood Study\H&H\HEC-RAS\Ecity.g05

Flow Title : 7-12-13LowFlows
 Flow File : i:\5493 - Howard County\01 - Ellicott City Flood Study\H&H\HEC-RAS\Ecity.f11

Plan Summary Information:

Number of:	Cross Sections =	31	Multiple Openings =	0
	Culverts =	2	Inline Structures =	0
	Bridges =	1	Lateral Structures =	0

Computational Information

Water surface calculation tolerance =	0.01
Critical depth calculation tolerance =	0.01
Maximum number of iterations =	20
Maximum difference tolerance =	0.3
Flow tolerance factor =	0.001

Computation Options

Critical depth computed only where necessary
 Conveyance Calculation Method: At breaks in n values only
 Friction Slope Method: Average Conveyance
 Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: 7-12-13LowFlows
 Flow File : i:\5493 - Howard County\01 - Ellicott City Flood Study\H&H\HEC-RAS\Ecity.f11

Flow Data (cfs)

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*****
*****
* River      Reach      RS      *      2-YR      10-YR      50-YR      100-YR
6HR OBS     24HR OBS *
* hudson    main      40      *      436      1121      2176      2936
1169        1598 *
* hudson    main      37      *      491      1237      2442      3270
1318        1815 *
* hudson    main      7       *      506      1297      2530      3396
1441        1923 *
*****
*****
  
```

Boundary Conditions

```

*****
* River          Reach          Profile          *          Upstream          Downstream          *
*****
* hudson         main          2-YR          *          Critical          Normal S = 0.0154 *
*****

```

GEOMETRY DATA

Geometry Title: 7-12-13LOFLOW

Geometry File : i:\5493 - Howard County\01 - Ellicott City Flood Study\H&H\HEC-RAS\Ecity.g05

CROSS SECTION

RIVER: hudson
 REACH: main RS: 40

INPUT

Description:

Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	264.96	15.41	264.78	42.02	264.43	82.53	265.79	100.98	266.38		
124.25	264.3	153.94	262.2	160.39	262.32	176.03	262.94	188	262.45		
192.31	261.98	195.33	261.51	205.84	262.58	220.94	262.3	226.78	260.3		
229.45	256.44	234.7	256.38	239.49	256.83	246.53	259.85	246.86	262.35		
250	273.22	254.98	274.03	284.82	277.7						

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.085	124.25	.045	153.94	.02	192.31	.045	220.94	.035
246.86	.045								

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 220.94 246.86 93.6 97.1 92.95 .1 .3

Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 0 101 267 F

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft)          * 261.15 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 1.03  * Wt. n-Val.       *          * 0.035 *          *
* W.S. Elev (ft)          * 260.12 * Reach Len. (ft)  * 93.60 * 97.10 * 92.95 *
* Crit W.S. (ft)          * 259.87 * Flow Area (sq ft) *          * 53.49 *          *
* E.G. Slope (ft/ft)      * 0.011595 * Area (sq ft)     *          * 53.49 *          *
* Q Total (cfs)           * 436.00 * Flow (cfs)        *          * 436.00 *          *
* Top Width (ft)          * 19.66  * Top Width (ft)    *          * 19.66 *          *
* Vel Total (ft/s)        * 8.15   * Avg. Vel. (ft/s)  *          * 8.15  *          *
* Max Chl Dpth (ft)      * 3.74   * Hydr. Depth (ft)  *          * 2.72  *          *
* Conv. Total (cfs)       * 4049.0 * Conv. (cfs)       *          * 4049.0 *          *
* Length Wtd. (ft)       * 97.10  * Wetted Per. (ft)  *          * 22.46 *          *
* Min Ch El (ft)         * 256.38 * Shear (lb/sq ft)  *          * 1.72  *          *
* Alpha                   * 1.00   * Stream Power (lb/ft s) * 284.82 * 0.00 * 0.00 *
* Frctn Loss (ft)        * 1.28   * Cum Volume (acre-ft) * 0.24 * 3.64 * 0.01 *
* C & E Loss (ft)        * 0.01   * Cum SA (acres)     * 0.66 * 1.20 * 0.12 *
*****

```

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)          * 263.96 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.83  * Wt. n-Val.       * 0.031 * 0.035 * 0.045 *
* W.S. Elev (ft)          * 263.13 * Reach Len. (ft)  * 93.60 * 97.10 * 92.95 *
* Crit W.S. (ft)          * 263.13 * Flow Area (sq ft) * 54.85 * 124.37 * 0.09 *
* E.G. Slope (ft/ft)      * 0.005290 * Area (sq ft)     * 54.85 * 124.37 * 0.09 *
* Q Total (cfs)           * 1121.00 * Flow (cfs)        * 153.58 * 967.37 * 0.05 *
* Top Width (ft)          * 106.32 * Top Width (ft)    * 80.18 * 25.92 * 0.23 *
* Vel Total (ft/s)        * 6.25   * Avg. Vel. (ft/s)  * 2.80 * 7.78 * 0.55 *
* Max Chl Dpth (ft)      * 6.75   * Hydr. Depth (ft)  * 0.68 * 4.80 * 0.39 *
* Conv. Total (cfs)       * 15412.7 * Conv. (cfs)       * 2111.6 * 13300.4 * 0.7 *
* Length Wtd. (ft)       * 96.85  * Wetted Per. (ft)  * 80.35 * 31.11 * 0.81 *
*****

```

* Min Ch El (ft)	* 256.38	* Shear (lb/sq ft)	* 0.23	* 1.32	* 0.04
* Alpha	* 1.36	* Stream Power (lb/ft s)	* 284.82	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.76	* Cum Volume (acre-ft)	* 1.72	* 8.55	* 1.14
* C & E Loss (ft)	* 0.10	* Cum SA (acres)	* 1.75	* 1.29	* 1.75

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid

subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 265.18	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 1.06	* Wt. n-Val.	* 0.029	* 0.035	* 0.045
* W.S. Elev (ft)	* 264.12	* Reach Len. (ft)	* 93.60	* 97.10	* 92.95
* Crit W.S. (ft)	* 264.12	* Flow Area (sq ft)	* 140.87	* 149.95	* 0.45
* E.G. Slope (ft/ft)	* 0.006110	* Area (sq ft)	* 140.87	* 149.95	* 0.45
* Q Total (cfs)	* 2176.00	* Flow (cfs)	* 755.53	* 1420.01	* 0.46
* Top Width (ft)	* 120.56	* Top Width (ft)	* 94.13	* 25.92	* 0.51
* Vel Total (ft/s)	* 7.47	* Avg. Vel. (ft/s)	* 5.36	* 9.47	* 1.01
* Max Chl Dpth (ft)	* 7.74	* Hydr. Depth (ft)	* 1.50	* 5.79	* 0.88
* Conv. Total (cfs)	* 27836.9	* Conv. (cfs)	* 9665.3	* 18165.8	* 5.8
* Length Wtd. (ft)	* 96.03	* Wetted Per. (ft)	* 94.34	* 31.11	* 1.84
* Min Ch El (ft)	* 256.38	* Shear (lb/sq ft)	* 0.57	* 1.84	* 0.09
* Alpha	* 1.23	* Stream Power (lb/ft s)	* 284.82	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.53	* Cum Volume (acre-ft)	* 4.37	* 13.42	* 3.33
* C & E Loss (ft)	* 0.06	* Cum SA (acres)	* 2.92	* 1.31	* 2.70

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid

subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 265.87	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 1.24	* Wt. n-Val.	* 0.029	* 0.035	* 0.045
* W.S. Elev (ft)	* 264.63	* Reach Len. (ft)	* 93.60	* 97.10	* 92.95
* Crit W.S. (ft)	* 264.63	* Flow Area (sq ft)	* 190.34	* 163.12	* 0.75
* E.G. Slope (ft/ft)	* 0.006524	* Area (sq ft)	* 192.39	* 163.12	* 0.75
* Q Total (cfs)	* 2936.00	* Flow (cfs)	* 1246.92	* 1688.15	* 0.93
* Top Width (ft)	* 147.75	* Top Width (ft)	* 121.17	* 25.92	* 0.66
* Vel Total (ft/s)	* 8.29	* Avg. Vel. (ft/s)	* 6.55	* 10.35	* 1.24
* Max Chl Dpth (ft)	* 8.25	* Hydr. Depth (ft)	* 1.90	* 6.29	* 1.14
* Conv. Total (cfs)	* 36350.7	* Conv. (cfs)	* 15438.2	* 20901.1	* 11.5
* Length Wtd. (ft)	* 95.72	* Wetted Per. (ft)	* 100.58	* 31.11	* 2.37
* Min Ch El (ft)	* 256.38	* Shear (lb/sq ft)	* 0.77	* 2.14	* 0.13
* Alpha	* 1.16	* Stream Power (lb/ft s)	* 284.82	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.57	* Cum Volume (acre-ft)	* 6.27	* 16.03	* 4.55
* C & E Loss (ft)	* 0.07	* Cum SA (acres)	* 3.33	* 1.31	* 3.03

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

```
*****
* E.G. Elev (ft)      * 264.03 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.83  * Wt. n-Val.      * 0.031  * 0.035  * 0.045  *
* W.S. Elev (ft)     * 263.20 * Reach Len. (ft) * 93.60  * 97.10  * 92.95  *
* Crit W.S. (ft)     * 263.20 * Flow Area (sq ft) * 60.06  * 126.04 * 0.10  *
* E.G. Slope (ft/ft) * 0.005300 * Area (sq ft)    * 60.06  * 126.04 * 0.10  *
* Q Total (cfs)      * 1169.00 * Flow (cfs)      * 178.83 * 990.11 * 0.06  *
* Top Width (ft)     * 107.25 * Top Width (ft)  * 81.09  * 25.92  * 0.24  *
* Vel Total (ft/s)   * 6.28  * Avg. Vel. (ft/s) * 2.98   * 7.86   * 0.58  *
* Max Chl Dpth (ft)  * 6.82  * Hydr. Depth (ft) * 0.74   * 4.86   * 0.42  *
* Conv. Total (cfs)  * 16057.1 * Conv. (cfs)     * 2456.4 * 13599.9 * 0.8   *
* Length Wtd. (ft)  * 96.82 * Wetted Per. (ft) * 81.27  * 31.11  * 0.88  *
* Min Ch El (ft)    * 256.38 * Shear (lb/sq ft) * 0.24   * 1.34   * 0.04  *
* Alpha              * 1.36  * Stream Power (lb/ft s) * 284.82 * 0.00   * 0.00  *
* Frctn Loss (ft)   * 0.46  * Cum Volume (acre-ft) * 1.95  * 9.15   * 1.36  *
* C & E Loss (ft)   * 0.04  * Cum SA (acres)   * 1.91  * 1.29   * 1.86  *
*****
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```
*****
* E.G. Elev (ft)      * 264.57 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.92  * Wt. n-Val.      * 0.030  * 0.035  * 0.045  *
* W.S. Elev (ft)     * 263.66 * Reach Len. (ft) * 93.60  * 97.10  * 92.95  *
* Crit W.S. (ft)     * 263.66 * Flow Area (sq ft) * 98.88  * 137.98 * 0.25  *
* E.G. Slope (ft/ft) * 0.005600 * Area (sq ft)    * 98.88  * 137.98 * 0.25  *
* Q Total (cfs)      * 1598.00 * Flow (cfs)      * 414.50 * 1183.31 * 0.20  *
* Top Width (ft)     * 113.89 * Top Width (ft)  * 87.60  * 25.92  * 0.38  *
* Vel Total (ft/s)   * 6.74  * Avg. Vel. (ft/s) * 4.19   * 8.58   * 0.79  *
* Max Chl Dpth (ft)  * 7.28  * Hydr. Depth (ft) * 1.13   * 5.32   * 0.65  *
* Conv. Total (cfs)  * 21354.0 * Conv. (cfs)     * 5538.9 * 15812.5 * 2.6   *
* Length Wtd. (ft)  * 96.40 * Wetted Per. (ft) * 87.79  * 31.11  * 1.36  *
* Min Ch El (ft)    * 256.38 * Shear (lb/sq ft) * 0.39   * 1.55   * 0.06  *
* Alpha              * 1.30  * Stream Power (lb/ft s) * 284.82 * 0.00   * 0.00  *
* Frctn Loss (ft)   * 0.49  * Cum Volume (acre-ft) * 2.99  * 11.08  * 2.23  *
* C & E Loss (ft)   * 0.05  * Cum SA (acres)   * 2.51  * 1.30   * 2.21  *
*****
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main

RS: 39

INPUT

Description:

Station Elevation Data		num= 26							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	266.26	5.63	266.12	23.64	263.71	63.98	262.23	91.83	261.37
92.63	260.85	100.64	261.02	115.95	261.34	143.09	261.55	155.5	262.02
167.36	261.79	168.09	262.42	174.27	262.29	176.57	260.93	177.24	258.17
177.64	255.56	186.83	254.87	187.72	255.8	187.9	255.97	191.83	257.42
197.4	257.79	198.77	261.58	202.55	262.02	220.58	268.88	237.64	273.36
264.28	276.53								

Manning's n Values		num= 4					
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	91.83	.02	176.57	.035	198.77	.045

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	176.57	198.77		113.96	114.57	114.59	.1	.3

Ineffective Flow		num= 1	
Sta L	Sta R	Elev	Permanent
236.2	264.28	290	F

CROSS SECTION OUTPUT Profile #2-YR

* E.G. Elev (ft)	* 259.86	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 1.11	* Wt. n-Val.	* 0.020	* 0.035	*
* W.S. Elev (ft)	* 258.75	* Reach Len. (ft)	* 113.96	* 114.57	* 114.59
* Crit W.S. (ft)	* 258.66	* Flow Area (sq ft)	*	* 51.47	*
* E.G. Slope (ft/ft)	* 0.015022	* Area (sq ft)	*	* 51.47	*
* Q Total (cfs)	* 436.00	* Flow (cfs)	*	* 436.00	*
* Top Width (ft)	* 20.65	* Top Width (ft)	*	* 20.65	*
* Vel Total (ft/s)	* 8.47	* Avg. Vel. (ft/s)	*	* 8.47	*
* Max Chl Dpth (ft)	* 3.88	* Hydr. Depth (ft)	*	* 2.49	*
* Conv. Total (cfs)	* 3557.3	* Conv. (cfs)	*	* 3557.3	*
* Length Wtd. (ft)	* 114.57	* Wetted Per. (ft)	*	* 24.78	*
* Min Ch El (ft)	* 254.87	* Shear (lb/sq ft)	*	* 1.95	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 264.28	* 0.00	* 0.00
* Frctn Loss (ft)	* 1.36	* Cum Volume (acre-ft)	* 0.24	* 3.52	* 0.01
* C & E Loss (ft)	* 0.08	* Cum SA (acres)	* 0.66	* 1.15	* 0.12

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 262.97	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 1.85	* Wt. n-Val.	* 0.020	* 0.035	*
* W.S. Elev (ft)	* 261.12	* Reach Len. (ft)	* 113.96	* 114.57	* 114.59
* Crit W.S. (ft)	* 260.79	* Flow Area (sq ft)	* 1.80	* 102.08	*
* E.G. Slope (ft/ft)	* 0.012720	* Area (sq ft)	* 1.80	* 102.08	*
* Q Total (cfs)	* 1121.00	* Flow (cfs)	* 3.93	* 1117.07	*
* Top Width (ft)	* 35.55	* Top Width (ft)	* 13.51	* 22.03	*
* Vel Total (ft/s)	* 10.79	* Avg. Vel. (ft/s)	* 2.18	* 10.94	*
* Max Chl Dpth (ft)	* 6.25	* Hydr. Depth (ft)	* 0.13	* 4.63	*
* Conv. Total (cfs)	* 9939.3	* Conv. (cfs)	* 34.8	* 9904.5	*
* Length Wtd. (ft)	* 114.56	* Wetted Per. (ft)	* 13.65	* 29.54	*
* Min Ch El (ft)	* 254.87	* Shear (lb/sq ft)	* 0.10	* 2.74	*
* Alpha	* 1.02	* Stream Power (lb/ft s)	* 264.28	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.92	* Cum Volume (acre-ft)	* 1.66	* 8.30	* 1.14
* C & E Loss (ft)	* 0.24	* Cum SA (acres)	* 1.65	* 1.24	* 1.75

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)      * 264.30 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.93  * Wt. n-Val.      * 0.022  * 0.035  * 0.045  *
* W.S. Elev (ft)     * 262.37 * Reach Len. (ft) * 113.96 * 114.57 * 114.59 *
* Crit W.S. (ft)     * 263.00 * Flow Area (sq ft) * 86.56  * 129.74 * 2.30  *
* E.G. Slope (ft/ft) * 0.012085 * Area (sq ft)    * 86.56  * 129.74 * 2.30  *
* Q Total (cfs)      * 2176.00 * Flow (cfs)      * 564.72 * 1606.14 * 5.14  *
* Top Width (ft)     * 140.68 * Top Width (ft)  * 113.78 * 22.20  * 4.69  *
* Vel Total (ft/s)   * 9.95  * Avg. Vel. (ft/s) * 6.52   * 12.38  * 2.23  *
* Max Chl Dpth (ft) * 7.50  * Hydr. Depth (ft) * 0.76   * 5.84   * 0.49  *
* Conv. Total (cfs)  * 19794.4 * Conv. (cfs)     * 5137.1 * 14610.6 * 46.8  *
* Length Wtd. (ft)  * 114.36 * Wetted Per. (ft) * 114.56 * 30.03  * 4.78  *
* Min Ch El (ft)    * 254.87 * Shear (lb/sq ft) * 0.57   * 3.26   * 0.36  *
* Alpha             * 1.25  * Stream Power (lb/ft s) * 264.28 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 0.80  * Cum Volume (acre-ft) * 4.12  * 13.11  * 3.33  *
* C & E Loss (ft)   * 0.09  * Cum SA (acres)   * 2.70  * 1.25  * 2.70  *
*****

```

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)      * 264.91 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 2.18  * Wt. n-Val.      * 0.022  * 0.035  * 0.045  *
* W.S. Elev (ft)     * 262.73 * Reach Len. (ft) * 113.96 * 114.57 * 114.59 *
* Crit W.S. (ft)     * 263.41 * Flow Area (sq ft) * 130.36 * 137.77 * 4.17  *
* E.G. Slope (ft/ft) * 0.013339 * Area (sq ft)    * 130.36 * 137.77 * 4.17  *
* Q Total (cfs)      * 2936.00 * Flow (cfs)      * 1058.15 * 1865.07 * 12.78 *
* Top Width (ft)     * 154.04 * Top Width (ft)  * 126.20 * 22.20  * 5.64  *
* Vel Total (ft/s)   * 10.78 * Avg. Vel. (ft/s) * 8.12   * 13.54  * 3.06  *
* Max Chl Dpth (ft) * 7.86  * Hydr. Depth (ft) * 1.03   * 6.21   * 0.74  *
* Conv. Total (cfs)  * 25421.5 * Conv. (cfs)     * 9162.1 * 16148.8 * 110.7 *
* Length Wtd. (ft)  * 114.32 * Wetted Per. (ft) * 127.00 * 30.03  * 5.80  *
* Min Ch El (ft)    * 254.87 * Shear (lb/sq ft) * 0.85   * 3.82   * 0.60  *
* Alpha             * 1.21  * Stream Power (lb/ft s) * 264.28 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 0.86  * Cum Volume (acre-ft) * 5.93  * 15.70  * 4.55  *
* C & E Loss (ft)   * 0.09  * Cum SA (acres)   * 3.07  * 1.26  * 3.02  *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

```

*****
* E.G. Elev (ft)      * 263.13 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.99  * Wt. n-Val.      * 0.020  * 0.035  * 0.045  *
* W.S. Elev (ft)     * 261.14 * Reach Len. (ft) * 113.96 * 114.57 * 114.59 *
* Crit W.S. (ft)     * 262.20 * Flow Area (sq ft) * 2.12   * 102.58 * 2.30  *
* E.G. Slope (ft/ft) * 0.013601 * Area (sq ft)    * 2.12   * 102.58 * 2.30  *
* Q Total (cfs)      * 1169.00 * Flow (cfs)      * 5.05   * 1163.95 * 5.14  *
* Top Width (ft)     * 36.72 * Top Width (ft)  * 14.68  * 22.04  * 4.69  *
* Vel Total (ft/s)   * 11.17 * Avg. Vel. (ft/s) * 2.38   * 11.35  * 2.23  *
* Max Chl Dpth (ft) * 6.27  * Hydr. Depth (ft) * 0.14   * 4.65   * 0.49  *
* Conv. Total (cfs)  * 10023.6 * Conv. (cfs)     * 43.3   * 9980.3 * 46.8  *
* Length Wtd. (ft)  * 114.47 * Wetted Per. (ft) * 14.82  * 29.57  * 4.78  *
* Min Ch El (ft)    * 254.87 * Shear (lb/sq ft) * 0.12   * 2.95   * 0.36  *
* Alpha             * 1.03  * Stream Power (lb/ft s) * 264.28 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 0.78  * Cum Volume (acre-ft) * 1.88  * 8.90  * 3.33  *
* C & E Loss (ft)   * 0.12  * Cum SA (acres)   * 1.81  * 1.24  * 2.70  *
*****

```

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

```
CROSS SECTION OUTPUT Profile #24HR OBS
*****
* E.G. Elev (ft)      * 263.75 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.79  * Wt. n-Val.      * 0.021  * 0.035  * 0.045  *
* W.S. Elev (ft)     * 261.96 * Reach Len. (ft) * 113.96 * 114.57 * 114.59 *
* Crit W.S. (ft)     * 262.62 * Flow Area (sq ft) * 44.62 * 120.76 * 0.63 *
* E.G. Slope (ft/ft) * 0.011249 * Area (sq ft) * 44.62 * 120.76 * 0.63 *
* Q Total (cfs)      * 1598.00 * Flow (cfs) * 222.24 * 1375.03 * 0.73 *
* Top Width (ft)     * 117.75 * Top Width (ft) * 92.26 * 22.20 * 3.29 *
* Vel Total (ft/s)   * 9.63  * Avg. Vel. (ft/s) * 4.98 * 11.39 * 1.16 *
* Max Chl Dpth (ft) * 7.09  * Hydr. Depth (ft) * 0.48 * 5.44 * 0.19 *
* Conv. Total (cfs)  * 15067.1 * Conv. (cfs) * 2095.4 * 12964.8 * 6.9 *
* Length Wtd. (ft)  * 114.50 * Wetted Per. (ft) * 92.78 * 30.03 * 3.31 *
* Min Ch El (ft)    * 254.87 * Shear (lb/sq ft) * 0.34 * 2.82 * 0.13 *
* Alpha              * 1.24  * Stream Power (lb/ft s) * 264.28 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 0.74  * Cum Volume (acre-ft) * 2.84 * 10.79 * 2.22 *
* C & E Loss (ft)   * 0.09  * Cum SA (acres) * 2.31 * 1.24 * 2.21 *
*****
```

Warning: Divided flow computed for this cross-section.
 Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
 REACH: main RS: 38

INPUT

Description:

Station Elevation Data		num= 25	
Sta	Elev	Sta	Elev
0	265.02	23.79	264.07
88.5	260.1	91.74	260.25
123.72	260.82	123.88	259.81
134.62	254.31	144.72	254.95
169.33	261.87	181.94	262.16

Manning's n Values		num= 6	
Sta	n Val	Sta	n Val
0	.045	88.5	.02
206.48	.1	123.88	.035
		145.95	.02
		181.94	.045

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	123.88	145.95		50.64	50.85	51.22	.1	.3

```
CROSS SECTION OUTPUT Profile #2-YR
*****
* E.G. Elev (ft)      * 258.43 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.84  * Wt. n-Val.      * * * 0.035 * *
* W.S. Elev (ft)     * 257.59 * Reach Len. (ft) * 50.64 * 50.85 * 51.22 *
* Crit W.S. (ft)     * * * Flow Area (sq ft) * * * 59.24 * *
* E.G. Slope (ft/ft) * 0.009579 * Area (sq ft) * * * 59.24 * *
* Q Total (cfs)      * 436.00 * Flow (cfs) * * * 436.00 * *
* Top Width (ft)     * 20.95 * Top Width (ft) * * * 20.95 * *
* Vel Total (ft/s)   * 7.36  * Avg. Vel. (ft/s) * * * 7.36 * *
* Max Chl Dpth (ft) * 3.28  * Hydr. Depth (ft) * * * 2.83 * *
* Conv. Total (cfs)  * 4454.8 * Conv. (cfs) * * * 4454.8 * *
* Length Wtd. (ft)  * 50.85 * Wetted Per. (ft) * * * 25.13 * *
* Min Ch El (ft)    * 254.31 * Shear (lb/sq ft) * * * 1.41 * *
* Alpha              * 1.00  * Stream Power (lb/ft s) * 222.68 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 0.40  * Cum Volume (acre-ft) * 0.24 * 3.38 * 0.01 *
* C & E Loss (ft)   * 0.03  * Cum SA (acres) * 0.66 * 1.10 * 0.12 *
*****
```

```
CROSS SECTION OUTPUT Profile #10-YR
*****
* E.G. Elev (ft)      * 261.81 * Element          * Left OB * Channel * Right OB *
```

```

* Vel Head (ft) * 1.04 * Wt. n-Val. * 0.024 * 0.035 * 0.020 *
* W.S. Elev (ft) * 260.78 * Reach Len. (ft) * 50.64 * 50.85 * 51.22 *
* Crit W.S. (ft) * 259.26 * Flow Area (sq ft) * 15.82 * 128.40 * 4.56 *
* E.G. Slope (ft/ft) *0.005484 * Area (sq ft) * 15.82 * 128.40 * 4.56 *
* Q Total (cfs) * 1121.00 * Flow (cfs) * 35.34 * 1071.03 * 14.63 *
* Top Width (ft) * 77.21 * Top Width (ft) * 44.94 * 22.07 * 10.20 *
* Vel Total (ft/s) * 7.53 * Avg. Vel. (ft/s) * 2.23 * 8.34 * 3.21 *
* Max Chl Dpth (ft) * 6.47 * Hydr. Depth (ft) * 0.35 * 5.82 * 0.45 *
* Conv. Total (cfs) * 15137.3 * Conv. (cfs) * 477.1 * 14462.6 * 197.6 *
* Length Wtd. (ft) * 50.85 * Wetted Per. (ft) * 45.99 * 29.71 * 10.24 *
* Min Ch El (ft) * 254.31 * Shear (lb/sq ft) * 0.12 * 1.48 * 0.15 *
* Alpha * 1.18 * Stream Power (lb/ft s) * 222.68 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.34 * Cum Volume (acre-ft) * 1.63 * 7.99 * 1.13 *
* C & E Loss (ft) * 0.05 * Cum SA (acres) * 1.57 * 1.18 * 1.74 *
*****

```

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft) * 263.19 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.98 * Wt. n-Val. * 0.025 * 0.035 * 0.021 *
* W.S. Elev (ft) * 262.21 * Reach Len. (ft) * 50.64 * 50.85 * 51.22 *
* Crit W.S. (ft) * 262.21 * Flow Area (sq ft) * 107.23 * 160.05 * 37.87 *
* E.G. Slope (ft/ft) *0.004826 * Area (sq ft) * 107.23 * 160.05 * 37.87 *
* Q Total (cfs) * 2176.00 * Flow (cfs) * 557.41 * 1450.39 * 168.20 *
* Top Width (ft) * 146.89 * Top Width (ft) * 75.80 * 22.07 * 49.02 *
* Vel Total (ft/s) * 7.13 * Avg. Vel. (ft/s) * 5.20 * 9.06 * 4.44 *
* Max Chl Dpth (ft) * 7.90 * Hydr. Depth (ft) * 1.41 * 7.25 * 0.77 *
* Conv. Total (cfs) * 31323.5 * Conv. (cfs) * 8023.9 * 20878.3 * 2421.3 *
* Length Wtd. (ft) * 50.85 * Wetted Per. (ft) * 76.98 * 29.71 * 49.21 *
* Min Ch El (ft) * 254.31 * Shear (lb/sq ft) * 0.42 * 1.62 * 0.23 *
* Alpha * 1.24 * Stream Power (lb/ft s) * 222.68 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.26 * Cum Volume (acre-ft) * 3.87 * 12.73 * 3.28 *
* C & E Loss (ft) * 0.01 * Cum SA (acres) * 2.45 * 1.19 * 2.62 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft) * 263.79 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 1.07 * Wt. n-Val. * 0.026 * 0.035 * 0.022 *
* W.S. Elev (ft) * 262.72 * Reach Len. (ft) * 50.64 * 50.85 * 51.22 *
* Crit W.S. (ft) * 262.72 * Flow Area (sq ft) * 150.34 * 171.23 * 63.22 *
* E.G. Slope (ft/ft) *0.005089 * Area (sq ft) * 150.34 * 171.23 * 63.22 *
* Q Total (cfs) * 2936.00 * Flow (cfs) * 899.50 * 1666.85 * 369.65 *
* Top Width (ft) * 162.53 * Top Width (ft) * 89.44 * 22.07 * 51.02 *
* Vel Total (ft/s) * 7.63 * Avg. Vel. (ft/s) * 5.98 * 9.73 * 5.85 *
* Max Chl Dpth (ft) * 8.41 * Hydr. Depth (ft) * 1.68 * 7.76 * 1.24 *
* Conv. Total (cfs) * 41157.3 * Conv. (cfs) * 12609.3 * 23366.2 * 5181.8 *
* Length Wtd. (ft) * 50.85 * Wetted Per. (ft) * 90.66 * 29.71 * 51.28 *
* Min Ch El (ft) * 254.31 * Shear (lb/sq ft) * 0.53 * 1.83 * 0.39 *
* Alpha * 1.19 * Stream Power (lb/ft s) * 222.68 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.28 * Cum Volume (acre-ft) * 5.56 * 15.29 * 4.46 *
* C & E Loss (ft) * 0.02 * Cum SA (acres) * 2.79 * 1.20 * 2.95 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

CROSS SECTION OUTPUT Profile #6HR OBS

```

*****
* E.G. Elev (ft) * 261.99 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.71 * Wt. n-Val. * 0.024 * 0.035 * 0.020 *

```

```

* W.S. Elev (ft)          * 261.28 * Reach Len. (ft)          * 50.64 * 50.85 * 51.22 *
* Crit W.S. (ft)         * 259.36 * Flow Area (sq ft)       * 43.45 * 139.44 * 11.17 *
* E.G. Slope (ft/ft)     * 0.003657 * Area (sq ft)           * 43.45 * 139.44 * 11.17 *
* Q Total (cfs)          * 1169.00 * Flow (cfs)              * 126.52 * 1003.46 * 39.02 *
* Top Width (ft)         * 99.12 * Top Width (ft)          * 60.83 * 22.07 * 16.22 *
* Vel Total (ft/s)       * 6.02 * Avg. Vel. (ft/s)        * 2.91 * 7.20 * 3.49 *
* Max Chl Dpth (ft)      * 6.97 * Hydr. Depth (ft)        * 0.71 * 6.32 * 0.69 *
* Conv. Total (cfs)      * 19331.1 * Conv. (cfs)             * 2092.2 * 16593.7 * 645.2 *
* Length Wtd. (ft)       * 50.85 * Wetted Per. (ft)        * 61.98 * 29.71 * 16.29 *
* Min Ch El (ft)         * 254.31 * Shear (lb/sq ft)        * 0.16 * 1.07 * 0.16 *
* Alpha                  * 1.26 * Stream Power (lb/ft s) * 222.68 * 0.00 * 0.00 *
* Frctn Loss (ft)        * 0.25 * Cum Volume (acre-ft)    * 1.82 * 8.58 * 1.34 *
* C & E Loss (ft)        * 0.06 * Cum SA (acres)          * 1.71 * 1.18 * 1.84 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft)          * 262.61 * Element                  * Left OB * Channel * Right OB *
* Vel Head (ft)          * 1.36 * Wt. n-Val.               * 0.024 * 0.035 * 0.020 *
* W.S. Elev (ft)         * 261.25 * Reach Len. (ft)          * 50.64 * 50.85 * 51.22 *
* Crit W.S. (ft)         * 261.56 * Flow Area (sq ft)        * 42.03 * 138.93 * 10.79 *
* E.G. Slope (ft/ft)     * 0.007002 * Area (sq ft)            * 42.03 * 138.93 * 10.79 *
* Q Total (cfs)          * 1598.00 * Flow (cfs)               * 166.37 * 1380.03 * 51.60 *
* Top Width (ft)         * 98.46 * Top Width (ft)          * 60.45 * 22.07 * 15.94 *
* Vel Total (ft/s)       * 8.33 * Avg. Vel. (ft/s)        * 3.96 * 9.93 * 4.78 *
* Max Chl Dpth (ft)      * 6.94 * Hydr. Depth (ft)        * 0.70 * 6.29 * 0.68 *
* Conv. Total (cfs)      * 19096.4 * Conv. (cfs)              * 1988.2 * 16491.6 * 616.6 *
* Length Wtd. (ft)       * 50.85 * Wetted Per. (ft)        * 61.61 * 29.71 * 16.01 *
* Min Ch El (ft)         * 254.31 * Shear (lb/sq ft)        * 0.30 * 2.04 * 0.29 *
* Alpha                  * 1.26 * Stream Power (lb/ft s) * 222.68 * 0.00 * 0.00 *
* Frctn Loss (ft)        * 1.00 * Cum Volume (acre-ft)    * 2.72 * 10.45 * 2.21 *
* C & E Loss (ft)        * 0.13 * Cum SA (acres)          * 2.11 * 1.19 * 2.18 *
*****

```

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: hudson

REACH: main RS: 37

INPUT

Description:

Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	264	20	260.01	36.61	259.64	40.55	259.78	51.16	260.22
63.4	260.02	64.06	260.27	69.53	260.38	75.38	259.43	76.33	256.54
76.82	253.52	80.8	253.37	85.55	253.19	94.42	253.51	94.78	255.27
94.97	256.342	95.51	259.39	114.56	260	126.13	260.27	138.62	260.6
153.18	260.1	168.22	262.2						

Manning's n Values

num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	40.55	.02	75.38	.035	95.51	.045	126.13	.02
153.18	.1								

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
75.38 95.51 63.51 64.27 60.78 .1 .3

Ineffective Flow num= 1
Sta L Sta R Elev Permanent
24.82 27.7 265 F

Blocked Obstructions num= 1
Sta L Sta R Elev
0 24.82 265

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft)          * 258.00 * Element                  * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.74 * Wt. n-Val.               * * * 0.035 * *
* W.S. Elev (ft)         * 257.26 * Reach Len. (ft)          * 63.51 * 64.27 * 60.78 *
*****

```

* Crit W.S. (ft)	* 256.22	* Flow Area (sq ft)	*	* 71.37	*	*
* E.G. Slope (ft/ft)	* 0.006572	* Area (sq ft)	*	* 71.37	*	*
* Q Total (cfs)	* 491.00	* Flow (cfs)	*	* 491.00	*	*
* Top Width (ft)	* 19.04	* Top Width (ft)	*	* 19.04	*	*
* Vel Total (ft/s)	* 6.88	* Avg. Vel. (ft/s)	*	* 6.88	*	*
* Max Chl Dpth (ft)	* 4.07	* Hydr. Depth (ft)	*	* 3.75	*	*
* Conv. Total (cfs)	* 6056.6	* Conv. (cfs)	*	* 6056.6	*	*
* Length Wtd. (ft)	* 64.27	* Wetted Per. (ft)	*	* 25.25	*	*
* Min Ch El (ft)	* 253.19	* Shear (lb/sq ft)	*	* 1.16	*	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 168.22	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.63	* Cum Volume (acre-ft)	* 0.24	* 3.30	* 0.01	*
* C & E Loss (ft)	* 0.06	* Cum SA (acres)	* 0.66	* 1.08	* 0.12	*

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 261.42	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 1.55	* Wt. n-Val.	* 0.032	* 0.035	* 0.045	*
* W.S. Elev (ft)	* 259.87	* Reach Len. (ft)	* 63.51	* 64.27	* 60.78	*
* Crit W.S. (ft)	* 258.64	* Flow Area (sq ft)	* 2.54	* 122.76	* 3.64	*
* E.G. Slope (ft/ft)	* 0.008390	* Area (sq ft)	* 2.57	* 122.76	* 3.64	*
* Q Total (cfs)	* 1237.00	* Flow (cfs)	* 3.10	* 1229.63	* 4.27	*
* Top Width (ft)	* 54.59	* Top Width (ft)	* 19.37	* 20.13	* 15.08	*
* Vel Total (ft/s)	* 9.59	* Avg. Vel. (ft/s)	* 1.22	* 10.02	* 1.17	*
* Max Chl Dpth (ft)	* 6.68	* Hydr. Depth (ft)	* 0.14	* 6.10	* 0.24	*
* Conv. Total (cfs)	* 13504.6	* Conv. (cfs)	* 33.8	* 13424.2	* 46.6	*
* Length Wtd. (ft)	* 64.26	* Wetted Per. (ft)	* 17.86	* 29.69	* 15.09	*
* Min Ch El (ft)	* 253.19	* Shear (lb/sq ft)	* 0.07	* 2.17	* 0.13	*
* Alpha	* 1.08	* Stream Power (lb/ft s)	* 168.22	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.73	* Cum Volume (acre-ft)	* 1.62	* 7.85	* 1.12	*
* C & E Loss (ft)	* 0.08	* Cum SA (acres)	* 1.53	* 1.16	* 1.72	*

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 262.83	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 1.51	* Wt. n-Val.	* 0.025	* 0.035	* 0.034	*
* W.S. Elev (ft)	* 261.32	* Reach Len. (ft)	* 63.51	* 64.27	* 60.78	*
* Crit W.S. (ft)	* 261.68	* Flow Area (sq ft)	* 63.41	* 151.80	* 74.88	*
* E.G. Slope (ft/ft)	* 0.007930	* Area (sq ft)	* 67.57	* 151.80	* 74.88	*
* Q Total (cfs)	* 2442.00	* Flow (cfs)	* 408.44	* 1703.04	* 330.52	*
* Top Width (ft)	* 137.07	* Top Width (ft)	* 50.56	* 20.13	* 66.38	*
* Vel Total (ft/s)	* 8.42	* Avg. Vel. (ft/s)	* 6.44	* 11.22	* 4.41	*
* Max Chl Dpth (ft)	* 8.13	* Hydr. Depth (ft)	* 1.33	* 7.54	* 1.13	*
* Conv. Total (cfs)	* 27421.9	* Conv. (cfs)	* 4586.5	* 19123.9	* 3711.5	*
* Length Wtd. (ft)	* 63.77	* Wetted Per. (ft)	* 47.82	* 29.69	* 66.49	*
* Min Ch El (ft)	* 253.19	* Shear (lb/sq ft)	* 0.66	* 2.53	* 0.56	*
* Alpha	* 1.37	* Stream Power (lb/ft s)	* 168.22	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.31	* Cum Volume (acre-ft)	* 3.77	* 12.55	* 3.21	*
* C & E Loss (ft)	* 0.05	* Cum SA (acres)	* 2.38	* 1.17	* 2.56	*

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 263.42	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 1.56	* Wt. n-Val.	* 0.025	* 0.035	* 0.033	*
* W.S. Elev (ft)	* 261.86	* Reach Len. (ft)	* 63.51	* 64.27	* 60.78	*
* Crit W.S. (ft)	* 262.14	* Flow Area (sq ft)	* 89.55	* 162.83	* 112.36	*
* E.G. Slope (ft/ft)	* 0.007820	* Area (sq ft)	* 95.30	* 162.83	* 112.36	*
* Q Total (cfs)	* 3270.00	* Flow (cfs)	* 731.63	* 1901.09	* 637.28	*
* Top Width (ft)	* 140.99	* Top Width (ft)	* 50.56	* 20.13	* 70.30	*

```

* Vel Total (ft/s)      * 8.97 * Avg. Vel. (ft/s)      * 8.17 * 11.67 * 5.67 *
* Max Chl Dpth (ft)    * 8.67 * Hydr. Depth (ft)     * 1.88 * 8.09 * 1.60 *
* Conv. Total (cfs)    * 36977.3 * Conv. (cfs)         * 8273.3 * 21497.6 * 7206.4 *
* Length Wtd. (ft)     * 63.55 * Wetted Per. (ft)     * 47.82 * 29.69 * 70.45 *
* Min Ch El (ft)       * 253.19 * Shear (lb/sq ft)     * 0.91 * 2.68 * 0.78 *
* Alpha                * 1.25 * Stream Power (lb/ft s) * 168.22 * 0.00 * 0.00 *
* Frctn Loss (ft)     * 0.32 * Cum Volume (acre-ft) * 5.42 * 15.10 * 4.36 *
* C & E Loss (ft)      * 0.05 * Cum SA (acres)       * 2.71 * 1.17 * 2.88 *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

```

*****
* E.G. Elev (ft)      * 261.67 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)       * 1.33 * Wt. n-Val.           * 0.030 * 0.035 * 0.044 *
* W.S. Elev (ft)      * 260.34 * Reach Len. (ft)      * 63.51 * 64.27 * 60.78 *
* Crit W.S. (ft)      * 258.86 * Flow Area (sq ft)    * 16.88 * 132.13 * 15.74 *
* E.G. Slope (ft/ft)  * 0.006810 * Area (sq ft)         * 18.23 * 132.13 * 15.74 *
* Q Total (cfs)       * 1318.00 * Flow (cfs)           * 39.92 * 1252.40 * 25.68 *
* Top Width (ft)      * 110.26 * Top Width (ft)       * 48.25 * 20.13 * 41.88 *
* Vel Total (ft/s)    * 8.00 * Avg. Vel. (ft/s)     * 2.37 * 9.48 * 1.63 *
* Max Chl Dpth (ft)   * 7.15 * Hydr. Depth (ft)     * 0.37 * 6.56 * 0.38 *
* Conv. Total (cfs)   * 15970.8 * Conv. (cfs)          * 483.7 * 15175.9 * 311.2 *
* Length Wtd. (ft)   * 64.22 * Wetted Per. (ft)     * 45.51 * 29.69 * 41.92 *
* Min Ch El (ft)     * 253.19 * Shear (lb/sq ft)     * 0.16 * 1.89 * 0.16 *
* Alpha              * 1.34 * Stream Power (lb/ft s) * 168.22 * 0.00 * 0.00 *
* Frctn Loss (ft)    * 0.64 * Cum Volume (acre-ft) * 1.79 * 8.42 * 1.33 *
* C & E Loss (ft)     * 0.11 * Cum SA (acres)       * 1.64 * 1.15 * 1.81 *
*****

```

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft)      * 262.26 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)       * 1.36 * Wt. n-Val.           * 0.026 * 0.035 * 0.036 *
* W.S. Elev (ft)      * 260.90 * Reach Len. (ft)      * 63.51 * 64.27 * 60.78 *
* Crit W.S. (ft)      * 261.26 * Flow Area (sq ft)    * 43.62 * 143.44 * 47.95 *
* E.G. Slope (ft/ft)  * 0.007085 * Area (sq ft)         * 46.58 * 143.44 * 47.95 *
* Q Total (cfs)       * 1815.00 * Flow (cfs)           * 202.65 * 1464.79 * 147.56 *
* Top Width (ft)      * 134.09 * Top Width (ft)       * 50.56 * 20.13 * 63.40 *
* Vel Total (ft/s)    * 7.72 * Avg. Vel. (ft/s)     * 4.65 * 10.21 * 3.08 *
* Max Chl Dpth (ft)   * 7.71 * Hydr. Depth (ft)     * 0.91 * 7.13 * 0.76 *
* Conv. Total (cfs)   * 21562.6 * Conv. (cfs)          * 2407.6 * 17402.0 * 1753.1 *
* Length Wtd. (ft)   * 63.97 * Wetted Per. (ft)     * 47.82 * 29.69 * 63.48 *
* Min Ch El (ft)     * 253.19 * Shear (lb/sq ft)     * 0.40 * 2.14 * 0.33 *
* Alpha              * 1.46 * Stream Power (lb/ft s) * 168.22 * 0.00 * 0.00 *
* Frctn Loss (ft)    * 0.36 * Cum Volume (acre-ft) * 2.67 * 10.29 * 2.18 *
* C & E Loss (ft)     * 0.00 * Cum SA (acres)       * 2.05 * 1.16 * 2.13 *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main RS: 36

INPUT

Description:

Station Elevation Data		num= 23									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	261.81	18.27	260.05	31.92	258.51	38.67	258.86	48.77	259.26		
63.07	259.14	63.8	259.62	68.79	259.63	78.21	259.56	85.38	259.39		
95.85	258.62	96.33	255.18	96.88	253.12	104.68	252.84	105.34	252.93		
111.53	253.8	116.04	253.82	116.53	255.43	117.13	258.54	134.15	259.47		
148.83	260.07	164.32	260.56	184.71	266.62						

```

Manning's n Values          num=          6
Sta n Val          Sta n Val          Sta n Val          Sta n Val          Sta n Val
*****
0          .045          31.92          .02          68.79          .045          95.85          .035          117.13          .02
164.32          .1

```

```

Bank Sta: Left   Right   Lengths: Left Channel   Right   Coeff Contr.   Expan.
          95.85  117.13          34   38.78   43.34          .1          .3
Ineffective Flow          num=          1
          Sta L   Sta R   Elev   Permanent
          0   10.17   270   F

```

```

CROSS SECTION OUTPUT Profile #2-YR
*****
* E.G. Elev (ft)          * 257.30 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 1.31 * Wt. n-Val.          *          * 0.035 *          *
* W.S. Elev (ft)          * 256.00 * Reach Len. (ft)          * 34.00 * 38.78 * 43.34 *
* Crit W.S. (ft)          * 256.00 * Flow Area (sq ft)          *          * 53.48 *          *
* E.G. Slope (ft/ft)          * 0.016465 * Area (sq ft)          *          * 53.48 *          *
* Q Total (cfs)          * 491.00 * Flow (cfs)          *          * 491.00 *          *
* Top Width (ft)          * 20.42 * Top Width (ft)          *          * 20.42 *          *
* Vel Total (ft/s)          * 9.18 * Avg. Vel. (ft/s)          *          * 9.18 *          *
* Max Chl Dpth (ft)          * 3.16 * Hydr. Depth (ft)          *          * 2.62 *          *
* Conv. Total (cfs)          * 3826.4 * Conv. (cfs)          *          * 3826.4 *          *
* Length Wtd. (ft)          * 38.78 * Wetted Per. (ft)          *          * 24.45 *          *
* Min Ch El (ft)          * 252.84 * Shear (lb/sq ft)          *          * 2.25 *          *
* Alpha          * 1.00 * Stream Power (lb/ft s) * 184.71 * 0.00 * 0.00 *
* Frctn Loss (ft)          * 0.61 * Cum Volume (acre-ft)          * 0.24 * 3.21 * 0.01 *
* C & E Loss (ft)          * 0.06 * Cum SA (acres)          * 0.66 * 1.05 * 0.12 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

```

CROSS SECTION OUTPUT Profile #10-YR
*****
* E.G. Elev (ft)          * 260.61 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 2.37 * Wt. n-Val.          *          * 0.035 *          *
* W.S. Elev (ft)          * 258.24 * Reach Len. (ft)          * 34.00 * 38.78 * 43.34 *
* Crit W.S. (ft)          * 258.24 * Flow Area (sq ft)          *          * 100.18 *          *
* E.G. Slope (ft/ft)          * 0.016200 * Area (sq ft)          *          * 100.18 *          *
* Q Total (cfs)          * 1237.00 * Flow (cfs)          *          * 1237.00 *          *
* Top Width (ft)          * 21.17 * Top Width (ft)          *          * 21.17 *          *
* Vel Total (ft/s)          * 12.35 * Avg. Vel. (ft/s)          *          * 12.35 *          *
* Max Chl Dpth (ft)          * 5.40 * Hydr. Depth (ft)          *          * 4.73 *          *
* Conv. Total (cfs)          * 9718.7 * Conv. (cfs)          *          * 9718.7 *          *
* Length Wtd. (ft)          * 38.78 * Wetted Per. (ft)          *          * 29.00 *          *
* Min Ch El (ft)          * 252.84 * Shear (lb/sq ft)          *          * 3.49 *          *
* Alpha          * 1.00 * Stream Power (lb/ft s) * 184.71 * 0.00 * 0.00 *
* Frctn Loss (ft)          * 0.56 * Cum Volume (acre-ft)          * 1.62 * 7.68 * 1.12 *
* C & E Loss (ft)          * 0.19 * Cum SA (acres)          * 1.52 * 1.13 * 1.71 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```
*****
* E.G. Elev (ft)      * 262.20 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.95  * Wt. n-Val.      * 0.027  * 0.035  * 0.020  *
* W.S. Elev (ft)     * 260.25 * Reach Len. (ft) * 34.00  * 38.78  * 43.34  *
* Crit W.S. (ft)     * 260.89 * Flow Area (sq ft) * 79.26  * 142.83 * 28.60  *
* E.G. Slope (ft/ft) * 0.010790 * Area (sq ft)    * 79.26  * 142.83 * 28.60  *
* Q Total (cfs)      * 2442.00 * Flow (cfs)      * 462.11 * 1794.97 * 184.92 *
* Top Width (ft)     * 138.16 * Top Width (ft)  * 79.62  * 21.28  * 37.27  *
* Vel Total (ft/s)   * 9.74  * Avg. Vel. (ft/s) * 5.83   * 12.57  * 6.46   *
* Max Chl Dpth (ft) * 7.41  * Hydr. Depth (ft) * 1.00   * 6.71   * 0.77   *
* Conv. Total (cfs)  * 23509.4 * Conv. (cfs)     * 4448.8 * 17280.4 * 1780.3 *
* Length Wtd. (ft)  * 38.47  * Wetted Per. (ft) * 79.90  * 29.69  * 37.31  *
* Min Ch El (ft)    * 252.84 * Shear (lb/sq ft) * 0.67   * 3.24   * 0.52   *
* Alpha             * 1.32  * Stream Power (lb/ft s) * 184.71 * 0.00   * 0.00   *
* Frctn Loss (ft)   * 0.59  * Cum Volume (acre-ft) * 3.66   * 12.33  * 3.14   *
* C & E Loss (ft)   * 0.04  * Cum SA (acres)   * 2.28   * 1.14   * 2.48   *
*****
```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```
*****
* E.G. Elev (ft)      * 262.78 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 2.10  * Wt. n-Val.      * 0.027  * 0.035  * 0.020  *
* W.S. Elev (ft)     * 260.68 * Reach Len. (ft) * 34.00  * 38.78  * 43.34  *
* Crit W.S. (ft)     * 261.29 * Flow Area (sq ft) * 114.72 * 152.05 * 47.52  *
* E.G. Slope (ft/ft) * 0.011437 * Area (sq ft)    * 114.72 * 152.05 * 47.52  *
* Q Total (cfs)      * 3270.00 * Flow (cfs)      * 840.20 * 2051.07 * 378.73 *
* Top Width (ft)     * 152.99 * Top Width (ft)  * 84.11  * 21.28  * 47.59  *
* Vel Total (ft/s)   * 10.40 * Avg. Vel. (ft/s) * 7.32   * 13.49  * 7.97   *
* Max Chl Dpth (ft) * 7.84  * Hydr. Depth (ft) * 1.36   * 7.15   * 1.00   *
* Conv. Total (cfs)  * 30577.2 * Conv. (cfs)     * 7856.5 * 19179.3 * 3541.4 *
* Length Wtd. (ft)  * 38.15  * Wetted Per. (ft) * 84.42  * 29.69  * 47.65  *
* Min Ch El (ft)    * 252.84 * Shear (lb/sq ft) * 0.97   * 3.66   * 0.71   *
* Alpha             * 1.25  * Stream Power (lb/ft s) * 184.71 * 0.00   * 0.00   *
* Frctn Loss (ft)   * 0.60  * Cum Volume (acre-ft) * 5.26   * 14.86  * 4.25   *
* C & E Loss (ft)   * 0.05  * Cum SA (acres)   * 2.61   * 1.14   * 2.79   *
*****
```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

```
*****
* E.G. Elev (ft)      * 260.92 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 2.47  * Wt. n-Val.      * 0.027  * 0.035  * 0.020  *
* W.S. Elev (ft)     * 258.45 * Reach Len. (ft) * 34.00  * 38.78  * 43.34  *
* Crit W.S. (ft)     * 258.45 * Flow Area (sq ft) * 104.54 * 104.54 * 43.34  *
* E.G. Slope (ft/ft) * 0.016264 * Area (sq ft)    * 104.54 * 104.54 * 43.34  *
* Q Total (cfs)      * 1318.00 * Flow (cfs)      * 1318.00 * 1318.00 * 43.34  *
* Top Width (ft)     * 21.24 * Top Width (ft)  * 21.24  * 21.24  * 21.24  *
* Vel Total (ft/s)   * 12.61 * Avg. Vel. (ft/s) * 12.61  * 12.61  * 12.61  *
* Max Chl Dpth (ft) * 5.61  * Hydr. Depth (ft) * 4.92   * 4.92   * 4.92   *
* Conv. Total (cfs)  * 10334.7 * Conv. (cfs)     * 10334.7 * 10334.7 * 10334.7 *
* Length Wtd. (ft)  * 38.78  * Wetted Per. (ft) * 38.78  * 29.42  * 29.42  *
* Min Ch El (ft)    * 252.84 * Shear (lb/sq ft) * 3.61   * 3.61   * 3.61   *
* Alpha             * 1.00  * Stream Power (lb/ft s) * 184.71 * 0.00   * 0.00   *
* Frctn Loss (ft)   * 0.56  * Cum Volume (acre-ft) * 1.78   * 8.25   * 1.32   *
* C & E Loss (ft)   * 0.21  * Cum SA (acres)   * 1.61   * 1.12   * 1.78   *
*****
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft)      * 261.66 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.88  * Wt. n-Val.      * 0.026  * 0.035  * 0.020  *
* W.S. Elev (ft)     * 259.78 * Reach Len. (ft) * 34.00  * 38.78  * 43.34  *
* Crit W.S. (ft)     * 260.44 * Flow Area (sq ft) * 43.57  * 133.01 * 14.48  *
* E.G. Slope (ft/ft) * 0.010324 * Area (sq ft)    * 43.57  * 133.01 * 14.48  *
* Q Total (cfs)      * 1815.00 * Flow (cfs)      * 179.29 * 1559.24 * 76.47  *
* Top Width (ft)     * 121.23 * Top Width (ft)  * 75.23  * 21.28  * 24.72  *
* Vel Total (ft/s)   * 9.50  * Avg. Vel. (ft/s) * 4.12   * 11.72  * 5.28   *
* Max Chl Dpth (ft)  * 6.94  * Hydr. Depth (ft) * 0.58   * 6.25   * 0.59   *
* Conv. Total (cfs)  * 17863.0 * Conv. (cfs)     * 1764.5 * 15345.9 * 752.6  *
* Length Wtd. (ft)   * 38.64 * Wetted Per. (ft) * 75.49  * 29.69  * 24.75  *
* Min Ch El (ft)     * 252.84 * Shear (lb/sq ft) * 0.37   * 2.89   * 0.38   *
* Alpha              * 1.34  * Stream Power (lb/ft s) * 184.71 * 0.00   * 0.00   *
* Frctn Loss (ft)    * 0.54  * Cum Volume (acre-ft) * 2.61   * 10.08  * 2.13   *
* C & E Loss (ft)    * 0.05  * Cum SA (acres)   * 1.96   * 1.13   * 2.07   *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
 REACH: main RS: 35

INPUT

Description:

Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	272.29	12.72	268.66	14.93	263.32	22.97	258.48	24.24	258.47
28.13	258.35	28.26	258.02	35.22	258.31	46.72	258.76	58.21	258.6
62.8	258.53	65.06	258.27	65.77	258.45	66.39	258.71	97.96	258.28
101.22	258.07	106.12	255.1	111.68	252.21	119.94	252.29	120.05	252.29
126.93	252.72	131.27	254.45	138.58	257.73	150.13	262.76	157.42	263.01

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	28.13	.02	65.77	.045	101.22	.035	138.58	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 101.22 138.58 69.27 79.77 85.15 .1 .3

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft)      * 256.43 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.73  * Wt. n-Val.      *          * 0.035  *          *
* W.S. Elev (ft)     * 254.70 * Reach Len. (ft) * 69.27  * 79.77  * 85.15  *
* Crit W.S. (ft)     * 255.16 * Flow Area (sq ft) *          * 46.52  *          *
* E.G. Slope (ft/ft) * 0.028382 * Area (sq ft)    *          * 46.52  *          *
* Q Total (cfs)      * 491.00 * Flow (cfs)      *          * 491.00 *          *
* Top Width (ft)     * 24.95 * Top Width (ft)  *          * 24.95  *          *
* Vel Total (ft/s)   * 10.55 * Avg. Vel. (ft/s) *          * 10.55  *          *
* Max Chl Dpth (ft)  * 2.49  * Hydr. Depth (ft) *          * 1.86   *          *
* Conv. Total (cfs)  * 2914.5 * Conv. (cfs)     *          * 2914.5 *          *
* Length Wtd. (ft)   * 79.77 * Wetted Per. (ft) *          * 25.95  *          *
* Min Ch El (ft)     * 252.21 * Shear (lb/sq ft) *          * 3.18   *          *
* Alpha              * 1.00  * Stream Power (lb/ft s) * 157.42 * 0.00   * 0.00   *
* Frctn Loss (ft)    * 0.82  * Cum Volume (acre-ft) * 0.24   * 3.16   * 0.01   *
* C & E Loss (ft)    * 0.04  * Cum SA (acres)   * 0.66   * 1.03   * 0.12   *
*****

```

Note: Program found supercritical flow starting at this cross section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)      * 259.58 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 3.62  * Wt. n-Val.      *          * 0.035  *          *
* W.S. Elev (ft)     * 255.96 * Reach Len. (ft) * 69.27  * 79.77  * 85.15  *
* Crit W.S. (ft)     * 257.08 * Flow Area (sq ft) *          * 81.04  *          *
* E.G. Slope (ft/ft) * 0.036731 * Area (sq ft)    *          * 81.04  *          *
*****

```

* Q Total (cfs)	* 1237.00	* Flow (cfs)	*	* 1237.00	*	*
* Top Width (ft)	* 29.93	* Top Width (ft)	*	* 29.93	*	*
* Vel Total (ft/s)	* 15.26	* Avg. Vel. (ft/s)	*	* 15.26	*	*
* Max Chl Dpth (ft)	* 3.75	* Hydr. Depth (ft)	*	* 2.71	*	*
* Conv. Total (cfs)	* 6454.3	* Conv. (cfs)	*	* 6454.3	*	*
* Length Wtd. (ft)	* 79.77	* Wetted Per. (ft)	*	* 31.54	*	*
* Min Ch El (ft)	* 252.21	* Shear (lb/sq ft)	*	* 5.89	*	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 157.42	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.91	* Cum Volume (acre-ft)	* 1.62	* 7.60	* 1.12	*
* C & E Loss (ft)	* 0.13	* Cum SA (acres)	* 1.52	* 1.11	* 1.71	*

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Program found supercritical flow starting at this cross section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 261.60	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 3.00	* Wt. n-Val.	* 0.028	* 0.035	* 0.100	*
* W.S. Elev (ft)	* 258.61	* Reach Len. (ft)	* 69.27	* 79.77	* 85.15	*
* Crit W.S. (ft)	* 259.68	* Flow Area (sq ft)	* 11.30	* 172.75	* 0.88	*
* E.G. Slope (ft/ft)	* 0.015377	* Area (sq ft)	* 11.30	* 172.75	* 0.88	*
* Q Total (cfs)	* 2442.00	* Flow (cfs)	* 27.01	* 2414.11	* 0.88	*
* Top Width (ft)	* 94.80	* Top Width (ft)	* 55.43	* 37.36	* 2.01	*
* Vel Total (ft/s)	* 13.20	* Avg. Vel. (ft/s)	* 2.39	* 13.97	* 1.00	*
* Max Chl Dpth (ft)	* 6.40	* Hydr. Depth (ft)	* 0.20	* 4.62	* 0.44	*
* Conv. Total (cfs)	* 19693.2	* Conv. (cfs)	* 217.8	* 19468.3	* 7.1	*
* Length Wtd. (ft)	* 79.71	* Wetted Per. (ft)	* 55.78	* 39.94	* 2.19	*
* Min Ch El (ft)	* 252.21	* Shear (lb/sq ft)	* 0.19	* 4.15	* 0.39	*
* Alpha	* 1.11	* Stream Power (lb/ft s)	* 157.42	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.49	* Cum Volume (acre-ft)	* 3.62	* 12.19	* 3.13	*
* C & E Loss (ft)	* 0.10	* Cum SA (acres)	* 2.23	* 1.11	* 2.46	*

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 262.23	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 2.86	* Wt. n-Val.	* 0.029	* 0.035	* 0.100	*
* W.S. Elev (ft)	* 259.37	* Reach Len. (ft)	* 69.27	* 79.77	* 85.15	*
* Crit W.S. (ft)	* 260.27	* Flow Area (sq ft)	* 70.17	* 201.31	* 3.09	*
* E.G. Slope (ft/ft)	* 0.013165	* Area (sq ft)	* 70.17	* 201.31	* 3.09	*
* Q Total (cfs)	* 3270.00	* Flow (cfs)	* 383.14	* 2882.51	* 4.35	*
* Top Width (ft)	* 120.85	* Top Width (ft)	* 79.73	* 37.36	* 3.76	*
* Vel Total (ft/s)	* 11.91	* Avg. Vel. (ft/s)	* 5.46	* 14.32	* 1.41	*
* Max Chl Dpth (ft)	* 7.16	* Hydr. Depth (ft)	* 0.88	* 5.39	* 0.82	*
* Conv. Total (cfs)	* 28499.5	* Conv. (cfs)	* 3339.2	* 25122.4	* 37.9	*
* Length Wtd. (ft)	* 79.03	* Wetted Per. (ft)	* 80.32	* 39.94	* 4.11	*
* Min Ch El (ft)	* 252.21	* Shear (lb/sq ft)	* 0.72	* 4.14	* 0.62	*
* Alpha	* 1.30	* Stream Power (lb/ft s)	* 157.42	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.47	* Cum Volume (acre-ft)	* 5.19	* 14.71	* 4.22	*
* C & E Loss (ft)	* 0.08	* Cum SA (acres)	* 2.54	* 1.12	* 2.77	*

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #6HR OBS

* E.G. Elev (ft)	* 259.86	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 3.80	* Wt. n-Val.	*	* 0.035	*	*
* W.S. Elev (ft)	* 256.06	* Reach Len. (ft)	* 69.27	* 79.77	* 85.15	*
* Crit W.S. (ft)	* 257.25	* Flow Area (sq ft)	*	* 84.25	*	*
* E.G. Slope (ft/ft)	* 0.037356	* Area (sq ft)	*	* 84.25	*	*
* Q Total (cfs)	* 1318.00	* Flow (cfs)	*	* 1318.00	*	*
* Top Width (ft)	* 30.34	* Top Width (ft)	*	* 30.34	*	*
* Vel Total (ft/s)	* 15.64	* Avg. Vel. (ft/s)	*	* 15.64	*	*
* Max Chl Dpth (ft)	* 3.85	* Hydr. Depth (ft)	*	* 2.78	*	*

```

* Conv. Total (cfs)      * 6819.2 * Conv. (cfs)      *      * 6819.2 *      *
* Length Wtd. (ft)     * 79.77 * Wetted Per. (ft) *      * 32.01 *      *
* Min Ch El (ft)      * 252.21 * Shear (lb/sq ft) *      * 6.14 *      *
* Alpha                * 1.00 * Stream Power (lb/ft s) * 157.42 * 0.00 * 0.00 *
* Frctn Loss (ft)     * 0.92 * Cum Volume (acre-ft) * 1.78 * 8.16 * 1.32 *
* C & E Loss (ft)     * 0.13 * Cum SA (acres)    * 1.61 * 1.10 * 1.78 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Program found supercritical flow starting at this cross section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

```

CROSS SECTION OUTPUT Profile #24HR OBS
*****
* E.G. Elev (ft)      * 260.84 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 3.78 * Wt. n-Val.      *      * 0.035 *      *
* W.S. Elev (ft)     * 257.06 * Reach Len. (ft) * 69.27 * 79.77 * 85.15 *
* Crit W.S. (ft)     * 258.24 * Flow Area (sq ft) *      * 116.30 *      *
* E.G. Slope (ft/ft) * 0.028665 * Area (sq ft)    *      * 116.30 *      *
* Q Total (cfs)      * 1815.00 * Flow (cfs)      *      * 1815.00 *      *
* Top Width (ft)     * 34.19 * Top Width (ft)  *      * 34.19 *      *
* Vel Total (ft/s)   * 15.61 * Avg. Vel. (ft/s) *      * 15.61 *      *
* Max Chl Dpth (ft) * 4.85 * Hydr. Depth (ft) *      * 3.40 *      *
* Conv. Total (cfs) * 10720.2 * Conv. (cfs)     *      * 10720.2 *      *
* Length Wtd. (ft)  * 79.77 * Wetted Per. (ft) *      * 36.35 *      *
* Min Ch El (ft)    * 252.21 * Shear (lb/sq ft) *      * 5.73 *      *
* Alpha             * 1.00 * Stream Power (lb/ft s) * 157.42 * 0.00 * 0.00 *
* Frctn Loss (ft)  * 0.62 * Cum Volume (acre-ft) * 2.59 * 9.97 * 2.12 *
* C & E Loss (ft)  * 0.19 * Cum SA (acres)  * 1.93 * 1.11 * 2.06 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: hudson
 REACH: main RS: 34

INPUT

Description:

Station Elevation Data num= 26

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	270.86	5.82	269.22	16.88	263.73	17.79	259.61	22.7	257.28
26.7	257.19	26.85	256.92	33.08	257.17	44.84	257.6	55.58	257.27
59.49	257.15	61.23	256.88	62.36	256.99	63.12	257.26	82.27	256.72
95.14	256.54	96.56	254.93	98.86	251.53	103.36	249.74	105.37	248.88
113.05	249	116.46	249.69	123.31	251.6	126.88	255.05	132.96	260.69
151.23	267.31								

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	22.7	.02	63.12	.045	96.56	.05	126.88	.045
132.96	.1								

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	96.56	126.88		59.8	61.46	61.27		.1	.3
Ineffective Flow	num= 1								
Sta L	Sta R	Elev	Permanent						
83.83	95	265	F						

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CROSS SECTION OUTPUT Profile #2-YR
*****
* E.G. Elev (ft)      * 253.40 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.63 * Wt. n-Val.      *      * 0.050 *      *
* W.S. Elev (ft)     * 251.78 * Reach Len. (ft) * 59.80 * 61.46 * 61.27 *

```

* Crit W.S. (ft)	* 252.16	* Flow Area (sq ft)	*	* 47.97	*	*
* E.G. Slope (ft/ft)	* 0.052015	* Area (sq ft)	*	* 47.97	*	*
* Q Total (cfs)	* 491.00	* Flow (cfs)	*	* 491.00	*	*
* Top Width (ft)	* 24.80	* Top Width (ft)	*	* 24.80	*	*
* Vel Total (ft/s)	* 10.23	* Avg. Vel. (ft/s)	*	* 10.23	*	*
* Max Chl Dpth (ft)	* 2.90	* Hydr. Depth (ft)	*	* 1.93	*	*
* Conv. Total (cfs)	* 2152.9	* Conv. (cfs)	*	* 2152.9	*	*
* Length Wtd. (ft)	* 61.46	* Wetted Per. (ft)	*	* 25.85	*	*
* Min Ch El (ft)	* 248.88	* Shear (lb/sq ft)	*	* 6.03	*	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 151.23	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 3.00	* Cum Volume (acre-ft)	* 0.24	* 3.08	* 0.01	*
* C & E Loss (ft)	* 0.03	* Cum SA (acres)	* 0.66	* 0.98	* 0.12	*

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 256.17	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 2.56	* Wt. n-Val.	*	* 0.050	*	*
* W.S. Elev (ft)	* 253.61	* Reach Len. (ft)	* 59.80	* 61.46	* 61.27	*
* Crit W.S. (ft)	* 254.13	* Flow Area (sq ft)	*	* 96.34	*	*
* E.G. Slope (ft/ft)	* 0.040640	* Area (sq ft)	*	* 96.34	*	*
* Q Total (cfs)	* 1237.00	* Flow (cfs)	*	* 1237.00	*	*
* Top Width (ft)	* 27.94	* Top Width (ft)	*	* 27.94	*	*
* Vel Total (ft/s)	* 12.84	* Avg. Vel. (ft/s)	*	* 12.84	*	*
* Max Chl Dpth (ft)	* 4.73	* Hydr. Depth (ft)	*	* 3.45	*	*
* Conv. Total (cfs)	* 6136.1	* Conv. (cfs)	*	* 6136.1	*	*
* Length Wtd. (ft)	* 61.46	* Wetted Per. (ft)	*	* 30.71	*	*
* Min Ch El (ft)	* 248.88	* Shear (lb/sq ft)	*	* 7.96	*	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 151.23	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 3.08	* Cum Volume (acre-ft)	* 1.62	* 7.44	* 1.12	*
* C & E Loss (ft)	* 0.32	* Cum SA (acres)	* 1.52	* 1.05	* 1.71	*

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 259.57	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 4.15	* Wt. n-Val.	* 0.045	* 0.050	* 0.045	*
* W.S. Elev (ft)	* 255.41	* Reach Len. (ft)	* 59.80	* 61.46	* 61.27	*
* Crit W.S. (ft)	* 256.40	* Flow Area (sq ft)	* 0.10	* 149.27	* 0.07	*
* E.G. Slope (ft/ft)	* 0.042759	* Area (sq ft)	* 0.10	* 149.27	* 0.07	*
* Q Total (cfs)	* 2442.00	* Flow (cfs)	* 0.21	* 2441.67	* 0.13	*
* Top Width (ft)	* 31.13	* Top Width (ft)	* 0.42	* 30.32	* 0.39	*
* Vel Total (ft/s)	* 16.34	* Avg. Vel. (ft/s)	* 2.01	* 16.36	* 1.78	*
* Max Chl Dpth (ft)	* 6.53	* Hydr. Depth (ft)	* 0.24	* 4.92	* 0.18	*
* Conv. Total (cfs)	* 11809.5	* Conv. (cfs)	* 1.0	* 11807.9	* 0.6	*
* Length Wtd. (ft)	* 61.34	* Wetted Per. (ft)	* 0.64	* 34.37	* 0.53	*
* Min Ch El (ft)	* 248.88	* Shear (lb/sq ft)	* 0.43	* 11.59	* 0.35	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 151.23	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 1.92	* Cum Volume (acre-ft)	* 3.62	* 11.89	* 3.12	*
* C & E Loss (ft)	* 0.12	* Cum SA (acres)	* 2.18	* 1.05	* 2.46	*

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 260.85	* Element	* Left OB	* Channel	* Right OB	*
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* Vel Head (ft)	* 3.36	* Wt. n-Val.	* 0.033	* 0.050	* 0.045	*
* W.S. Elev (ft)	* 257.49	* Reach Len. (ft)	* 59.80	* 61.46	* 61.27	*
* Crit W.S. (ft)	* 258.63	* Flow Area (sq ft)	* 22.34	* 212.29	* 3.21	*
* E.G. Slope (ft/ft)	* 0.022264	* Area (sq ft)	* 32.06	* 212.29	* 3.21	*
* Q Total (cfs)	* 3270.00	* Flow (cfs)	* 86.39	* 3168.93	* 14.68	*
* Top Width (ft)	* 100.67	* Top Width (ft)	* 67.72	* 30.32	* 2.63	*
* Vel Total (ft/s)	* 13.75	* Avg. Vel. (ft/s)	* 3.87	* 14.93	* 4.57	*
* Max Chl Dpth (ft)	* 8.61	* Hydr. Depth (ft)	* 0.40	* 7.00	* 1.22	*
* Conv. Total (cfs)	* 21915.1	* Conv. (cfs)	* 579.0	* 21237.8	* 98.4	*
* Length Wtd. (ft)	* 61.04	* Wetted Per. (ft)	* 57.58	* 34.37	* 3.59	*
* Min Ch El (ft)	* 248.88	* Shear (lb/sq ft)	* 0.54	* 8.59	* 1.24	*
* Alpha	* 1.14	* Stream Power (lb/ft s)	* 151.23	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 1.33	* Cum Volume (acre-ft)	* 5.11	* 14.33	* 4.21	*
* C & E Loss (ft)	* 0.05	* Cum SA (acres)	* 2.43	* 1.05	* 2.76	*

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

* E.G. Elev (ft)	* 256.78	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 1.08	* Wt. n-Val.	* 0.045	* 0.050	* 0.045	*
* W.S. Elev (ft)	* 255.70	* Reach Len. (ft)	* 59.80	* 61.46	* 61.27	*
* Crit W.S. (ft)	* 254.31	* Flow Area (sq ft)	* 0.26	* 158.00	* 0.23	*
* E.G. Slope (ft/ft)	* 0.010299	* Area (sq ft)	* 0.26	* 158.00	* 0.23	*
* Q Total (cfs)	* 1318.00	* Flow (cfs)	* 0.35	* 1317.36	* 0.29	*
* Top Width (ft)	* 31.70	* Top Width (ft)	* 0.68	* 30.32	* 0.70	*
* Vel Total (ft/s)	* 8.32	* Avg. Vel. (ft/s)	* 1.35	* 8.34	* 1.29	*
* Max Chl Dpth (ft)	* 6.82	* Hydr. Depth (ft)	* 0.38	* 5.21	* 0.32	*
* Conv. Total (cfs)	* 12987.5	* Conv. (cfs)	* 3.5	* 12981.2	* 2.9	*
* Length Wtd. (ft)	* 61.46	* Wetted Per. (ft)	* 1.03	* 34.37	* 0.96	*
* Min Ch El (ft)	* 248.88	* Shear (lb/sq ft)	* 0.16	* 2.96	* 0.15	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 151.23	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.41	* Cum Volume (acre-ft)	* 1.77	* 7.94	* 1.32	*
* C & E Loss (ft)	* 0.12	* Cum SA (acres)	* 1.61	* 1.04	* 1.78	*

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

* E.G. Elev (ft)	* 257.94	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 3.42	* Wt. n-Val.	* *	* 0.050	* *	*
* W.S. Elev (ft)	* 254.51	* Reach Len. (ft)	* 59.80	* 61.46	* 61.27	*
* Crit W.S. (ft)	* 255.30	* Flow Area (sq ft)	* *	* 122.23	* *	*
* E.G. Slope (ft/ft)	* 0.043729	* Area (sq ft)	* *	* 122.23	* *	*
* Q Total (cfs)	* 1815.00	* Flow (cfs)	* *	* 1815.00	* *	*
* Top Width (ft)	* 29.48	* Top Width (ft)	* *	* 29.48	* *	*
* Vel Total (ft/s)	* 14.85	* Avg. Vel. (ft/s)	* *	* 14.85	* *	*
* Max Chl Dpth (ft)	* 5.63	* Hydr. Depth (ft)	* *	* 4.15	* *	*
* Conv. Total (cfs)	* 8679.4	* Conv. (cfs)	* *	* 8679.4	* *	*
* Length Wtd. (ft)	* 61.45	* Wetted Per. (ft)	* *	* 33.09	* *	*
* Min Ch El (ft)	* 248.88	* Shear (lb/sq ft)	* *	* 10.08	* *	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 151.23	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 2.79	* Cum Volume (acre-ft)	* 2.59	* 9.75	* 2.12	*
* C & E Loss (ft)	* 0.11	* Cum SA (acres)	* 1.93	* 1.05	* 2.06	*

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

INPUT

Description:

Station Elevation Data num= 31

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	267.97	11.3	262.18	12.79	256.32	14.18	255.91	17.8	255.8
17.92	255.46	24.87	255.71	35.98	256.23	47.24	256.09	51.14	255.99
52.99	255.73	54.13	255.85	54.77	256.14	56.99	256.29	59.17	257.32
63.7	257.22	68.17	255.85	74.07	255.58	75.41	254.94	79.49	252.81
81.03	250.1	81.57	248.66	82.17	247.45	88.62	246.6	89.54	246.48
93.53	247.41	98.75	247.71	100.67	248.38	102.43	249.97	108.59	254.98
126.55	265.81								

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	14.18	.02	63.7	.045	79.49	.05	102.43	.045
108.59	.1								

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

79.49	108.59	21.85	21.89	21.7	.1	.3
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Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
65	79	265	F

CROSS SECTION OUTPUT Profile #2-YR

* E.G. Elev (ft)	* 251.75	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.58	* Wt. n-Val.	* 0.045	* 0.050	* 0.045
* W.S. Elev (ft)	* 251.16	* Reach Len. (ft)	* 21.85	* 21.89	* 21.70
* Crit W.S. (ft)	* 250.02	* Flow Area (sq ft)	* 80.07	* 80.07	* 80.07
* E.G. Slope (ft/ft)	* 0.009938	* Area (sq ft)	* 80.07	* 80.07	* 80.07
* Q Total (cfs)	* 491.00	* Flow (cfs)	* 491.00	* 491.00	* 491.00
* Top Width (ft)	* 23.47	* Top Width (ft)	* 23.47	* 23.47	* 23.47
* Vel Total (ft/s)	* 6.13	* Avg. Vel. (ft/s)	* 6.13	* 6.13	* 6.13
* Max Chl Dpth (ft)	* 4.68	* Hydr. Depth (ft)	* 3.41	* 3.41	* 3.41
* Conv. Total (cfs)	* 4925.4	* Conv. (cfs)	* 4925.4	* 4925.4	* 4925.4
* Length Wtd. (ft)	* 21.89	* Wetted Per. (ft)	* 27.16	* 27.16	* 27.16
* Min Ch El (ft)	* 246.48	* Shear (lb/sq ft)	* 1.83	* 1.83	* 1.83
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 126.55	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.22	* Cum Volume (acre-ft)	* 0.24	* 2.99	* 0.01
* C & E Loss (ft)	* 0.01	* Cum SA (acres)	* 0.66	* 0.95	* 0.12

Note: Manning's n values were composited to a single value in the main channel.
 Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 255.06	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.97	* Wt. n-Val.	* 0.045	* 0.049	* 0.045
* W.S. Elev (ft)	* 254.09	* Reach Len. (ft)	* 21.85	* 21.89	* 21.70
* Crit W.S. (ft)	* 252.24	* Flow Area (sq ft)	* 0.57	* 156.12	* 156.12
* E.G. Slope (ft/ft)	* 0.008834	* Area (sq ft)	* 1.58	* 156.12	* 156.12
* Q Total (cfs)	* 1237.00	* Flow (cfs)	* 1.79	* 1235.21	* 1235.21
* Top Width (ft)	* 30.47	* Top Width (ft)	* 2.46	* 28.01	* 28.01
* Vel Total (ft/s)	* 7.89	* Avg. Vel. (ft/s)	* 3.15	* 7.91	* 7.91
* Max Chl Dpth (ft)	* 7.61	* Hydr. Depth (ft)	* 1.16	* 5.57	* 5.57
* Conv. Total (cfs)	* 13161.2	* Conv. (cfs)	* 19.0	* 13142.2	* 13142.2
* Length Wtd. (ft)	* 21.89	* Wetted Per. (ft)	* 0.55	* 33.71	* 33.71
* Min Ch El (ft)	* 246.48	* Shear (lb/sq ft)	* 0.56	* 2.55	* 2.55
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 126.55	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.19	* Cum Volume (acre-ft)	* 1.62	* 7.26	* 1.12
* C & E Loss (ft)	* 0.04	* Cum SA (acres)	* 1.52	* 1.01	* 1.71

Note: Manning's n values were composited to a single value in the main channel.
 Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 258.21	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 1.07	* Wt. n-Val.	* 0.021	* 0.049	* 0.100
* W.S. Elev (ft)	* 257.15	* Reach Len. (ft)	* 21.85	* 21.89	* 21.70

* Crit W.S. (ft)	* 254.77	* Flow Area (sq ft)	* 55.45	* 244.47	* 3.89	*
* E.G. Slope (ft/ft)	* 0.006018	* Area (sq ft)	* 80.28	* 244.47	* 3.89	*
* Q Total (cfs)	* 2442.00	* Flow (cfs)	* 335.98	* 2101.76	* 4.27	*
* Top Width (ft)	* 94.46	* Top Width (ft)	* 61.77	* 29.10	* 3.59	*
* Vel Total (ft/s)	* 8.04	* Avg. Vel. (ft/s)	* 6.06	* 8.60	* 1.10	*
* Max Chl Dpth (ft)	* 10.67	* Hydr. Depth (ft)	* 1.16	* 8.40	* 1.08	*
* Conv. Total (cfs)	* 31479.1	* Conv. (cfs)	* 4331.0	* 27093.1	* 55.0	*
* Length Wtd. (ft)	* 21.88	* Wetted Per. (ft)	* 49.13	* 35.11	* 4.19	*
* Min Ch El (ft)	* 246.48	* Shear (lb/sq ft)	* 0.42	* 2.62	* 0.35	*
* Alpha	* 1.06	* Stream Power (lb/ft s)	* 126.55	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.09	* Cum Volume (acre-ft)	* 3.56	* 11.61	* 3.12	*
* C & E Loss (ft)	* 0.15	* Cum SA (acres)	* 2.14	* 1.01	* 2.46	*

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Note: Manning's n values were composited to a single value in the main channel.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 259.46	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 0.98	* Wt. n-Val.	* 0.021	* 0.049	* 0.100	*
* W.S. Elev (ft)	* 258.47	* Reach Len. (ft)	* 21.85	* 21.89	* 21.70	*
* Crit W.S. (ft)	* 257.37	* Flow Area (sq ft)	* 125.37	* 283.14	* 10.13	*
* E.G. Slope (ft/ft)	* 0.004196	* Area (sq ft)	* 168.80	* 283.14	* 10.13	*
* Q Total (cfs)	* 3270.00	* Flow (cfs)	* 1015.82	* 2241.43	* 12.75	*
* Top Width (ft)	* 102.14	* Top Width (ft)	* 67.25	* 29.10	* 5.80	*
* Vel Total (ft/s)	* 7.81	* Avg. Vel. (ft/s)	* 8.10	* 7.92	* 1.26	*
* Max Chl Dpth (ft)	* 11.99	* Hydr. Depth (ft)	* 2.35	* 9.73	* 1.75	*
* Conv. Total (cfs)	* 50483.6	* Conv. (cfs)	* 15682.7	* 34604.1	* 196.9	*
* Length Wtd. (ft)	* 21.87	* Wetted Per. (ft)	* 55.69	* 35.11	* 6.77	*
* Min Ch El (ft)	* 246.48	* Shear (lb/sq ft)	* 0.59	* 2.11	* 0.39	*
* Alpha	* 1.04	* Stream Power (lb/ft s)	* 126.55	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.07	* Cum Volume (acre-ft)	* 4.97	* 13.98	* 4.21	*
* C & E Loss (ft)	* 0.12	* Cum SA (acres)	* 2.33	* 1.01	* 2.76	*

Note: Manning's n values were composited to a single value in the main channel.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

* E.G. Elev (ft)	* 256.25	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 0.68	* Wt. n-Val.	* 0.044	* 0.049	* 0.100	*
* W.S. Elev (ft)	* 255.57	* Reach Len. (ft)	* 21.85	* 21.89	* 21.70	*
* Crit W.S. (ft)	* 252.45	* Flow Area (sq ft)	* 1.47	* 198.65	* 0.29	*
* E.G. Slope (ft/ft)	* 0.004689	* Area (sq ft)	* 7.51	* 198.65	* 0.29	*
* Q Total (cfs)	* 1318.00	* Flow (cfs)	* 5.26	* 1312.62	* 0.12	*
* Top Width (ft)	* 38.62	* Top Width (ft)	* 8.54	* 29.10	* 0.98	*
* Vel Total (ft/s)	* 6.58	* Avg. Vel. (ft/s)	* 3.59	* 6.61	* 0.41	*
* Max Chl Dpth (ft)	* 9.09	* Hydr. Depth (ft)	* 0.40	* 6.83	* 0.30	*
* Conv. Total (cfs)	* 19248.1	* Conv. (cfs)	* 76.9	* 19169.5	* 1.7	*
* Length Wtd. (ft)	* 21.89	* Wetted Per. (ft)	* 3.77	* 35.11	* 1.15	*
* Min Ch El (ft)	* 246.48	* Shear (lb/sq ft)	* 0.11	* 1.66	* 0.07	*
* Alpha	* 1.01	* Stream Power (lb/ft s)	* 126.55	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.09	* Cum Volume (acre-ft)	* 1.77	* 7.69	* 1.31	*
* C & E Loss (ft)	* 0.05	* Cum SA (acres)	* 1.60	* 1.00	* 1.78	*

Warning: Divided flow computed for this cross-section.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

* E.G. Elev (ft)	* 257.06	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 1.15	* Wt. n-Val.	* 0.034	* 0.049	* 0.100	*
* W.S. Elev (ft)	* 255.91	* Reach Len. (ft)	* 21.85	* 21.89	* 21.70	*
* Crit W.S. (ft)	* 253.56	* Flow Area (sq ft)	* 4.62	* 208.48	* 0.72	*
* E.G. Slope (ft/ft)	* 0.007505	* Area (sq ft)	* 13.49	* 208.48	* 0.72	*
* Q Total (cfs)	* 1815.00	* Flow (cfs)	* 14.52	* 1799.98	* 0.50	*
* Top Width (ft)	* 59.63	* Top Width (ft)	* 28.99	* 29.10	* 1.54	*
* Vel Total (ft/s)	* 8.49	* Avg. Vel. (ft/s)	* 3.14	* 8.63	* 0.70	*

```

* Max Chl Dpth (ft)      * 9.43 * Hydr. Depth (ft)      * 0.26 * 7.16 * 0.46 *
* Conv. Total (cfs)     * 20950.3 * Conv. (cfs)         * 167.6 * 20777.0 * 5.8 *
* Length Wtd. (ft)     * 21.89 * Wetted Per. (ft)   * 18.31 * 35.11 * 1.80 *
* Min Ch El (ft)       * 246.48 * Shear (lb/sq ft)   * 0.12 * 2.78 * 0.19 *
* Alpha                 * 1.03 * Stream Power (lb/ft s) * 126.55 * 0.00 * 0.00 *
* Frctn Loss (ft)     * 0.13 * Cum Volume (acre-ft) * 2.58 * 9.52 * 2.12 *
* C & E Loss (ft)      * 0.14 * Cum SA (acres)     * 1.91 * 1.01 * 2.06 *
*****

```

Warning: Divided flow computed for this cross-section.

Note: Manning's n values were composited to a single value in the main channel.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main

RS: 32

INPUT

Description:

```

Station Elevation Data      num=      26
  Sta  Elev    Sta  Elev    Sta  Elev    Sta  Elev    Sta  Elev
*****
  0  266.84   9.53  261.29  11.26  255.77  14.67  255.03  17.66  254.94
 17.8  254.66  26.41  255.03  37.4  255.52  48.5  255.51  52.57  255.4
 54.31  255.14  55.62  255.34  56.23  255.61  65.26  255.59  74.5  255.3
 79.26  253.29  81.14  250.5  82.86  247.64  85.73  246.65  88.71  246.53
 92.02  246.39  101.96  248.55  106  251.15  112.23  255.1  119.71  256.72
133.84  264.12

```

```

Manning's n Values          num=      5
  Sta  n Val    Sta  n Val    Sta  n Val    Sta  n Val    Sta  n Val
*****
  0  .045  14.67  .02  56.23  .045  79.26  .05  112.23  .1

```

```

Bank Sta: Left  Right  Lengths: Left Channel  Right  Coeff Contr.  Expan.
          79.26 112.23          24.44  27.61  26.31          .3          .5

```

```

Ineffective Flow          num=      1
  Sta L  Sta R  Elev  Permanent
  65    74.5  265    F

```

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft)      * 251.52 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.57  * Wt. n-Val.      * 0.045  * 0.050  *
* W.S. Elev (ft)     * 250.96 * Reach Len. (ft) * 2.00   * 2.00   * 2.00   *
* Crit W.S. (ft)     * 249.85 * Flow Area (sq ft) * 81.31  * 81.31  *
* E.G. Slope (ft/ft) * 0.009888 * Area (sq ft)   * 81.31  * 81.31  *
* Q Total (cfs)      * 491.00 * Flow (cfs)     * 491.00 * 491.00 *
* Top Width (ft)     * 24.87 * Top Width (ft) * 24.87  * 24.87  *
* Vel Total (ft/s)   * 6.04  * Avg. Vel. (ft/s) * 6.04   * 6.04   *
* Max Chl Dpth (ft) * 4.57  * Hydr. Depth (ft) * 3.27   * 3.27   *
* Conv. Total (cfs)  * 4937.6 * Conv. (cfs)    * 4937.6 * 4937.6 *
* Length Wtd. (ft)  * 2.00  * Wetted Per. (ft) * 27.84  * 27.84  *
* Min Ch El (ft)    * 246.39 * Shear (lb/sq ft) * 1.80   * 1.80   *
* Alpha              * 1.00  * Stream Power (lb/ft s) * 133.84 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 0.02  * Cum Volume (acre-ft) * 0.24  * 2.95  * 0.01  *
* C & E Loss (ft)   * 0.00  * Cum SA (acres)   * 0.66  * 0.94  * 0.12  *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)      * 254.84 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.85  * Wt. n-Val.      * 0.045  * 0.050  *
* W.S. Elev (ft)     * 254.00 * Reach Len. (ft) * 2.00   * 2.00   * 2.00   *
* Crit W.S. (ft)     * 252.02 * Flow Area (sq ft) * 167.07 * 167.07 *
* E.G. Slope (ft/ft) * 0.008103 * Area (sq ft)   * 167.07 * 167.07 *
* Q Total (cfs)      * 1237.00 * Flow (cfs)     * 0.83  * 1236.17 *
* Top Width (ft)     * 32.90 * Top Width (ft) * 1.67   * 31.23  *
* Vel Total (ft/s)   * 7.38  * Avg. Vel. (ft/s) * 1.40   * 7.40   *
* Max Chl Dpth (ft) * 7.61  * Hydr. Depth (ft) * 0.35   * 5.35   *
* Conv. Total (cfs)  * 13741.9 * Conv. (cfs)    * 9.2    * 13732.7 *
* Length Wtd. (ft)  * 2.00  * Wetted Per. (ft) * 1.81   * 36.32  *
* Min Ch El (ft)    * 246.39 * Shear (lb/sq ft) * 0.16   * 2.33   *

```



```

* Alpha                *      1.01 * Stream Power (lb/ft s) * 133.84 *      0.00 *      0.00 *
* Frctn Loss (ft)     *      0.02 * Cum Volume (acre-ft)  *      1.62 *      7.18 *      1.12 *
* C & E Loss (ft)     *      0.01 * Cum SA (acres)        *      1.52 *      1.00 *      1.71 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)      * 257.97 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)       * 0.55  * Wt. n-Val.             * 0.024 * 0.050 * 0.100 *
* W.S. Elev (ft)     * 257.41 * Reach Len. (ft)        * 2.00 * 2.00 * 2.00 *
* Crit W.S. (ft)     * 254.50 * Flow Area (sq ft)      * 128.04 * 278.80 * 11.70 *
* E.G. Slope (ft/ft) * 0.003019 * Area (sq ft)           * 146.70 * 278.80 * 11.70 *
* Q Total (cfs)       * 2442.00 * Flow (cfs)             * 723.41 * 1707.34 * 11.26 *
* Top Width (ft)     * 110.29 * Top Width (ft)         * 68.51 * 32.97 * 8.80 *
* Vel Total (ft/s)   * 5.83  * Avg. Vel. (ft/s)       * 5.65 * 6.12 * 0.96 *
* Max Chl Dpth (ft) * 11.02 * Hydr. Depth (ft)       * 2.17 * 8.46 * 1.33 *
* Conv. Total (cfs) * 44444.3 * Conv. (cfs)            * 13165.9 * 31073.5 * 204.8 *
* Length Wtd. (ft)  * 2.00  * Wetted Per. (ft)       * 60.99 * 38.39 * 9.15 *
* Min Ch El (ft)     * 246.39 * Shear (lb/sq ft)       * 0.40 * 1.37 * 0.24 *
* Alpha              * 1.05  * Stream Power (lb/ft s) * 133.84 * 0.00 * 0.00 *
* Frctn Loss (ft)   *      * Cum Volume (acre-ft)   * 3.50 * 11.48 * 3.12 *
* C & E Loss (ft)   *      * Cum SA (acres)         * 2.11 * 0.99 * 2.46 *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)      * 259.28 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)       * 0.60  * Wt. n-Val.             * 0.024 * 0.050 * 0.100 *
* W.S. Elev (ft)     * 258.68 * Reach Len. (ft)        * 2.00 * 2.00 * 2.00 *
* Crit W.S. (ft)     * 256.61 * Flow Area (sq ft)      * 202.92 * 320.49 * 24.36 *
* E.G. Slope (ft/ft) * 0.002313 * Area (sq ft)           * 233.58 * 320.49 * 24.36 *
* Q Total (cfs)       * 3270.00 * Flow (cfs)             * 1356.86 * 1885.04 * 28.10 *
* Top Width (ft)     * 113.10 * Top Width (ft)         * 68.91 * 32.97 * 11.22 *
* Vel Total (ft/s)   * 5.97  * Avg. Vel. (ft/s)       * 6.69 * 5.88 * 1.15 *
* Max Chl Dpth (ft) * 12.29 * Hydr. Depth (ft)       * 3.42 * 9.72 * 2.17 *
* Conv. Total (cfs) * 67996.2 * Conv. (cfs)            * 28214.5 * 39197.4 * 584.3 *
* Length Wtd. (ft)  * 2.00  * Wetted Per. (ft)       * 62.32 * 38.39 * 11.87 *
* Min Ch El (ft)     * 246.39 * Shear (lb/sq ft)       * 0.47 * 1.21 * 0.30 *
* Alpha              * 1.08  * Stream Power (lb/ft s) * 133.84 * 0.00 * 0.00 *
* Frctn Loss (ft)   *      * Cum Volume (acre-ft)   * 4.87 * 13.83 * 4.20 *
* C & E Loss (ft)   *      * Cum SA (acres)         * 2.30 * 1.00 * 2.75 *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #6HR OBS

```

*****
* E.G. Elev (ft)      * 256.11 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)       * 0.51  * Wt. n-Val.             * 0.027 * 0.050 * 0.100 *
* W.S. Elev (ft)     * 255.60 * Reach Len. (ft)        * 2.00 * 2.00 * 2.00 *
* Crit W.S. (ft)     * 252.22 * Flow Area (sq ft)      * 21.45 * 218.89 * 0.57 *
* E.G. Slope (ft/ft) * 0.003762 * Area (sq ft)           * 22.84 * 218.89 * 0.57 *
* Q Total (cfs)       * 1318.00 * Flow (cfs)             * 44.26 * 1273.54 * 0.20 *
* Top Width (ft)     * 96.08 * Top Width (ft)         * 60.82 * 32.97 * 2.29 *
* Vel Total (ft/s)   * 5.47  * Avg. Vel. (ft/s)       * 2.06 * 5.82 * 0.35 *
* Max Chl Dpth (ft) * 9.21  * Hydr. Depth (ft)       * 0.42 * 6.64 * 0.25 *
* Conv. Total (cfs) * 21488.3 * Conv. (cfs)            * 721.6 * 20763.5 * 3.3 *
* Length Wtd. (ft)  * 2.00  * Wetted Per. (ft)       * 52.07 * 38.39 * 2.34 *
* Min Ch El (ft)     * 246.39 * Shear (lb/sq ft)       * 0.10 * 1.34 * 0.06 *
* Alpha              * 1.10  * Stream Power (lb/ft s) * 133.84 * 0.00 * 0.00 *
* Frctn Loss (ft)   *      * Cum Volume (acre-ft)   * 1.76 * 7.58 * 1.31 *
* C & E Loss (ft)   *      * Cum SA (acres)         * 1.59 * 0.99 * 1.77 *
*****

```

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```
*****
* E.G. Elev (ft)          * 256.79 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.67  * Wt. n-Val.      * 0.024  * 0.050  * 0.100  *
* W.S. Elev (ft)         * 256.12 * Reach Len. (ft) * 2.00   * 2.00   * 2.00   *
* Crit W.S. (ft)         * 253.28 * Flow Area (sq ft) * 51.79  * 236.05 * 2.38   *
* E.G. Slope (ft/ft)     * 0.004697 * Area (sq ft)    * 58.13  * 236.05 * 2.38   *
* Q Total (cfs)          * 1815.00 * Flow (cfs)      * 199.76 * 1613.72 * 1.52   *
* Top Width (ft)         * 105.77 * Top Width (ft)  * 68.11  * 32.97  * 4.69   *
* Vel Total (ft/s)       * 6.25   * Avg. Vel. (ft/s) * 3.86   * 6.84   * 0.64   *
* Max Chl Dpth (ft)     * 9.73   * Hydr. Depth (ft) * 0.88   * 7.16   * 0.51   *
* Conv. Total (cfs)      * 26482.6 * Conv. (cfs)     * 2914.7 * 23545.7 * 22.2   *
* Length Wtd. (ft)      * 2.00   * Wetted Per. (ft) * 59.64  * 38.39  * 4.80   *
* Min Ch El (ft)        * 246.39 * Shear (lb/sq ft) * 0.25   * 1.80   * 0.15   *
* Alpha                  * 1.10   * Stream Power (lb/ft s) * 133.84 * 0.00   * 0.00   *
* Frctn Loss (ft)       *         * Cum Volume (acre-ft) * 2.56   * 9.41   * 2.12   *
* C & E Loss (ft)       *         * Cum SA (acres)   * 1.88   * 0.99   * 2.06   *
*****
```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

BRIDGE

RIVER: hudson
REACH: main RS: 31.5

INPUT

Description:
Distance from Upstream XS = 2
Deck/Roadway Width = 18
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates

```
num= 4
Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord
*****
65 265 255 109 265 255 109.1 265 250
110 265 250
```

Upstream Bridge Cross Section Data

```
Station Elevation Data num= 26
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
*****
0 266.84 9.53 261.29 11.26 255.77 14.67 255.03 17.66 254.94
17.8 254.66 26.41 255.03 37.4 255.52 48.5 255.51 52.57 255.4
54.31 255.14 55.62 255.34 56.23 255.61 65.26 255.59 74.5 255.3
79.26 253.29 81.14 250.5 82.86 247.64 85.73 246.65 88.71 246.53
92.02 246.39 101.96 248.55 106 251.15 112.23 255.1 119.71 256.72
133.84 264.12
```

Manning's n Values

```
num= 5
Sta n Val Sta n Val Sta n Val Sta n Val Sta n Val
*****
0 .045 14.67 .02 56.23 .045 79.26 .05 112.23 .1
```

Bank Sta: Left Right Coeff Contr. Expan.
79.26 112.23 .3 .5

Ineffective Flow num= 1
Sta L Sta R Elev Permanent
65 74.5 265 F

Downstream Deck/Roadway Coordinates

```
num= 4
Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord
*****
68 265 255 112 265 255 112.1 265 250
113 265 250
```

Downstream Bridge Cross Section Data

```
Station Elevation Data num= 28
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
*****
0 265.97 10.7 260.17 11.79 255.21 15.21 254.22 19.1 254.07
```

19.19	253.84	28.59	254.27	39.3	254.7	50.59	254.7	54.49	254.58
56.09	254.29	57.57	254.47	58.16	254.71	82.38	255.45	86.44	255.21
87.14	251.02	87.29	249.71	87.53	246.88	95.77	246.81	99.73	246.85
103.43	246.88	104.83	247.39	107.58	249.58	108.86	250.5	112.96	253.59
114.18	255.6	121.03	255.92	134	261.71				

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	15.21	.02	58.16	.045	86.44	.035	112.96	.1

Bank Sta: Left Right Coeff Contr. Expan.
86.44 112.96 .3 .5

Ineffective Flow num= 1
Sta L Sta R Elev Permanent
65.65 86.44 265 F

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
Energy
Selected Low Flow Methods = Energy

High Flow Method
Pressure and Weir flow
Submerged Inlet Cd =
Submerged Inlet + Outlet Cd = .8
Max Low Cord =

Additional Bridge Parameters
Add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth
inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream energy grade line

BRIDGE OUTPUT Profile #2-YR

* E.G. US. (ft)	* 251.52	* Element	* Inside BR US	* Inside BR DS
* W.S. US. (ft)	* 250.96	* E.G. Elev (ft)	* 251.50	* 251.29
* Q Total (cfs)	* 491.00	* W.S. Elev (ft)	* 250.93	* 250.53
* Q Bridge (cfs)	* 491.00	* Crit W.S. (ft)	* 249.85	* 249.74
* Q Weir (cfs)	*	* Max Chl Dpth (ft)	* 4.54	* 3.72
* Weir Sta Lft (ft)	*	* Vel Total (ft/s)	* 6.10	* 6.99
* Weir Sta Rgt (ft)	*	* Flow Area (sq ft)	* 80.53	* 70.20
* Weir Submerg	*	* Froude # Chl	* 0.60	* 0.69
* Weir Max Depth (ft)	*	* Specif Force (cu ft)	* 242.90	* 229.97
* Min El Weir Flow (ft)	* 253.70	* Hydr Depth (ft)	* 3.25	* 3.23
* Min El Prs (ft)	* 255.00	* W.P. Total (ft)	* 27.74	* 26.20
* Delta EG (ft)	* 0.47	* Conv. Total (cfs)	* 4870.1	* 5749.1
* Delta WS (ft)	* 1.21	* Top Width (ft)	* 24.80	* 21.71
* BR Open Area (sq ft)	* 179.01	* Frctn Loss (ft)	* 0.15	* 0.08
* BR Open Vel (ft/s)	* 6.99	* C & E Loss (ft)	* 0.05	* 0.16
* Coef of Q	*	* Shear Total (lb/sq ft)	* 1.84	* 1.22
* Br Sel Method	*Energy only	* Power Total (lb/ft s)	* 0.00	* 0.00

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

BRIDGE OUTPUT Profile #10-YR

* E.G. US. (ft)	* 254.84	* Element	* Inside BR US	* Inside BR DS
* W.S. US. (ft)	* 254.00	* E.G. Elev (ft)	* 254.83	* 254.55
* Q Total (cfs)	* 1237.00	* W.S. Elev (ft)	* 253.96	* 253.22

* Q Bridge (cfs)	* 1236.97	* Crit W.S. (ft)	* 252.01	* 252.03	*
* Q Weir (cfs)	*	* Max Chl Dpth (ft)	* 7.57	* 6.41	*
* Weir Sta Lft (ft)	*	* Vel Total (ft/s)	* 7.45	* 9.24	*
* Weir Sta Rgt (ft)	*	* Flow Area (sq ft)	* 165.93	* 133.88	*
* Weir Submerg	*	* Froude # Chl	* 0.48	* 0.64	*
* Weir Max Depth (ft)	*	* Specif Force (cu ft)	* 805.80	* 750.50	*
* Min El Weir Flow (ft)	* 253.70	* Hydr Depth (ft)	* 5.22	* 5.30	*
* Min El Prs (ft)	* 255.00	* W.P. Total (ft)	* 37.99	* 33.18	*
* Delta EG (ft)	* 0.63	* Conv. Total (cfs)	* 13523.4	* 14404.6	*
* Delta WS (ft)	* 1.97	* Top Width (ft)	* 31.78	* 25.26	*
* BR Open Area (sq ft)	* 179.01	* Frctn Loss (ft)	* 0.14	* 0.08	*
* BR Open Vel (ft/s)	* 9.24	* C & E Loss (ft)	* 0.14	* 0.26	*
* Coef of Q	*	* Shear Total (lb/sq ft)	* 2.28	* 1.86	*
* Br Sel Method	*Energy only	* Power Total (lb/ft s)	* 0.00	* 0.00	*

Warning: The pure energy/weir calculations did not converge within the given number of iterations.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
 Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
 This may indicate the need for additional cross sections.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

BRIDGE OUTPUT Profile #50-YR

* E.G. US. (ft)	* 257.97	* Element	*Inside BR US	*Inside BR DS	*
* W.S. US. (ft)	* 257.41	* E.G. Elev (ft)	* 257.97	* 257.24	*
* Q Total (cfs)	* 2442.00	* W.S. Elev (ft)	* 257.41	* 256.25	*
* Q Bridge (cfs)	* 1733.21	* Crit W.S. (ft)	* 254.47	* 255.46	*
* Q Weir (cfs)	* 708.79	* Max Chl Dpth (ft)	* 11.02	* 9.44	*
* Weir Sta Lft (ft)	* 10.57	* Vel Total (ft/s)	* 6.64	* 6.26	*
* Weir Sta Rgt (ft)	* 122.09	* Flow Area (sq ft)	* 367.91	* 390.36	*
* Weir Submerg	* 0.15	* Froude # Chl	* 0.45	* 0.51	*
* Weir Max Depth (ft)	* 4.28	* Specif Force (cu ft)	* 1949.80	* 1663.02	*
* Min El Weir Flow (ft)	* 253.70	* Hydr Depth (ft)	* 5.64	* 6.21	*
* Min El Prs (ft)	* 255.00	* W.P. Total (ft)	* 147.88	* 130.17	*
* Delta EG (ft)	* 0.80	* Conv. Total (cfs)	*	*	*
* Delta WS (ft)	* 1.72	* Top Width (ft)	* 65.29	* 65.21	*
* BR Open Area (sq ft)	* 179.01	* Frctn Loss (ft)	*	*	*
* BR Open Vel (ft/s)	* 9.68	* C & E Loss (ft)	*	*	*
* Coef of Q	*	* Shear Total (lb/sq ft)	*	*	*
* Br Sel Method	* Press/Weir	* Power Total (lb/ft s)	* 0.00	* 0.00	*

Note: The downstream water surface is above the minimum elevation required for orifice flow. The orifice flow equation was used for pressure flow.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
 Note: For the cross section inside the bridge at the upstream end, the water surface and energy have been projected from the upstream cross section. The selected bridge modeling method does not compute answers inside the bridge.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
 Note: For the cross section inside the bridge at the downstream end, the water surface and energy are based on critical depth over the weir.

BRIDGE OUTPUT Profile #100-YR

* E.G. US. (ft)	* 259.28	* Element	*Inside BR US	*Inside BR DS	*
* W.S. US. (ft)	* 258.68	* E.G. Elev (ft)	* 259.28	* 258.45	*
* Q Total (cfs)	* 3270.00	* W.S. Elev (ft)	* 258.68	* 257.13	*
* Q Bridge (cfs)	* 1959.08	* Crit W.S. (ft)	* 256.28	* 255.99	*
* Q Weir (cfs)	* 1310.93	* Max Chl Dpth (ft)	* 12.29	* 10.32	*
* Weir Sta Lft (ft)	* 10.16	* Vel Total (ft/s)	* 7.16	* 6.81	*
* Weir Sta Rgt (ft)	* 124.59	* Flow Area (sq ft)	* 456.84	* 480.23	*
* Weir Submerg	* 0.26	* Froude # Chl	* 0.51	* 0.59	*
* Weir Max Depth (ft)	* 5.59	* Specif Force (cu ft)	* 2775.04	* 2317.73	*
* Min El Weir Flow (ft)	* 253.70	* Hydr Depth (ft)	* 6.71	* 7.39	*
* Min El Prs (ft)	* 255.00	* W.P. Total (ft)	* 154.46	* 134.10	*
* Delta EG (ft)	* 1.18	* Conv. Total (cfs)	*	*	*
* Delta WS (ft)	* 2.31	* Top Width (ft)	* 68.10	* 67.37	*
* BR Open Area (sq ft)	* 179.01	* Frctn Loss (ft)	*	*	*
* BR Open Vel (ft/s)	* 10.94	* C & E Loss (ft)	*	*	*

```

* Coef of Q * Shear Total (lb/sq ft) * *
* Br Sel Method * Press/Weir * Power Total (lb/ft s) * 0.00 * 0.00 *
*****

```

Note: The downstream water surface is above the minimum elevation required for orifice flow. The orifice flow equation was used for pressure flow.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: For the cross section inside the bridge at the upstream end, the water surface and energy have been projected from the upstream cross section. The selected bridge modeling method does not compute answers inside the bridge.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: For the cross section inside the bridge at the downstream end, the water surface and energy are based on critical depth over the weir.

BRIDGE OUTPUT Profile #6HR OBS

```

*****
* E.G. US. (ft) * 256.11 * Element *Inside BR US *Inside BR DS *
* W.S. US. (ft) * 255.60 * E.G. Elev (ft) * 256.11 * 255.30 *
* Q Total (cfs) * 1318.00 * W.S. Elev (ft) * 255.60 * 255.03 *
* Q Bridge (cfs) * 1197.66 * Crit W.S. (ft) * 252.21 * 252.24 *
* Q Weir (cfs) * 120.34 * Max Chl Dpth (ft) * 9.21 * 8.22 *
* Weir Sta Lft (ft) * 11.15 * Vel Total (ft/s) * 5.30 * 4.89 *
* Weir Sta Rgt (ft) * 116.88 * Flow Area (sq ft) * 248.49 * 269.79 *
* Weir Submerg * 0.00 * Froude # Chl * 0.36 * 0.40 *
* Weir Max Depth (ft) * 2.42 * Specif Force (cu ft) * 1085.89 * 955.35 *
* Min El Weir Flow (ft) * 253.70 * Hydr Depth (ft) * 4.87 * 4.99 *
* Min El Prs (ft) * 255.00 * W.P. Total (ft) * 128.51 * 118.90 *
* Delta EG (ft) * 1.61 * Conv. Total (cfs) * * *
* Delta WS (ft) * 3.36 * Top Width (ft) * 51.07 * 56.43 *
* BR Open Area (sq ft) * 179.01 * Frctn Loss (ft) * * *
* BR Open Vel (ft/s) * 6.69 * C & E Loss (ft) * * *
* Coef of Q * * Shear Total (lb/sq ft) * * *
* Br Sel Method * Press/Weir * Power Total (lb/ft s) * 0.00 * 0.00 *
*****

```

Warning: The pure energy/weir calculations did not converge within the given number of iterations.

Note: The downstream water surface is below the minimum elevation for pressure flow. The sluice gate equations were used for pressure flow.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: For the cross section inside the bridge at the upstream end, the water surface and energy have been projected from the upstream cross section. The selected bridge modeling method does not compute answers inside the bridge.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: For the cross section inside the bridge at the downstream end, the water surface and energy are based on critical depth over the weir.

BRIDGE OUTPUT Profile #24HR OBS

```

*****
* E.G. US. (ft) * 256.79 * Element *Inside BR US *Inside BR DS *
* W.S. US. (ft) * 256.12 * E.G. Elev (ft) * 256.79 * 256.07 *
* Q Total (cfs) * 1815.00 * W.S. Elev (ft) * 256.12 * 255.46 *
* Q Bridge (cfs) * 1526.34 * Crit W.S. (ft) * 253.28 * 253.36 *
* Q Weir (cfs) * 288.66 * Max Chl Dpth (ft) * 9.73 * 8.65 *
* Weir Sta Lft (ft) * 10.94 * Vel Total (ft/s) * 6.24 * 5.80 *
* Weir Sta Rgt (ft) * 119.84 * Flow Area (sq ft) * 290.97 * 312.91 *
* Weir Submerg * 0.00 * Froude # Chl * 0.41 * 0.48 *
* Weir Max Depth (ft) * 3.10 * Specif Force (cu ft) * 1368.96 * 1230.09 *
* Min El Weir Flow (ft) * 253.70 * Hydr Depth (ft) * 4.79 * 5.69 *
* Min El Prs (ft) * 255.00 * W.P. Total (ft) * 139.58 * 120.73 *
* Delta EG (ft) * 0.72 * Conv. Total (cfs) * * *
* Delta WS (ft) * 2.72 * Top Width (ft) * 60.77 * 57.36 *
* BR Open Area (sq ft) * 179.01 * Frctn Loss (ft) * * *
* BR Open Vel (ft/s) * 8.53 * C & E Loss (ft) * * *
* Coef of Q * * Shear Total (lb/sq ft) * * *
* Br Sel Method * Press/Weir * Power Total (lb/ft s) * 0.00 * 0.00 *

```

Note: The downstream water surface is below the minimum elevation for pressure flow. The sluice gate equations were used for pressure flow.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: For the cross section inside the bridge at the upstream end, the water surface and energy have been projected from the upstream cross section. The selected bridge modeling method does not compute answers inside the bridge.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: For the cross section inside the bridge at the downstream end, the water surface and energy are based on critical depth over the weir.

CROSS SECTION

RIVER: hudson
REACH: main RS: 31

INPUT

Description:

Station Elevation Data num= 28
Table with 10 columns: Sta, Elev, Sta, Elev, Sta, Elev, Sta, Elev, Sta, Elev

Manning's n Values num= 5
Table with 10 columns: Sta, n Val, Sta, n Val, Sta, n Val, Sta, n Val, Sta, n Val

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
Ineffective Flow num= 1
Table with 7 columns: Sta L, Sta R, Elev, Permanent, F

CROSS SECTION OUTPUT Profile #2-YR

Table with 7 columns: E.G. Elev (ft), Vel Head (ft), W.S. Elev (ft), Crit W.S. (ft), E.G. Slope (ft/ft), Q Total (cfs), Top Width (ft), Vel Total (ft/s), Max Chl Dpth (ft), Conv. Total (cfs), Length Wtd. (ft), Min Ch El (ft), Alpha, Frctn Loss (ft), C & E Loss (ft)

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #10-YR

```
*****
* E.G. Elev (ft)      * 254.21 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 2.18  * Wt. n-Val.      *          * 0.035  *          *
* W.S. Elev (ft)     * 252.03 * Reach Len. (ft) * 95.55  * 97.06  * 99.00  *
* Crit W.S. (ft)     * 252.03 * Flow Area (sq ft) *          * 104.33 *          *
* E.G. Slope (ft/ft) * 0.014936 * Area (sq ft)    *          * 104.33 *          *
* Q Total (cfs)      * 1237.00 * Flow (cfs)      *          * 1237.00 *          *
* Top Width (ft)     * 23.92  * Top Width (ft)  *          * 23.92  *          *
* Vel Total (ft/s)   * 11.86  * Avg. Vel. (ft/s) *          * 11.86  *          *
* Max Chl Dpth (ft)  * 5.22   * Hydr. Depth (ft) *          * 4.36   *          *
* Conv. Total (cfs)  * 10121.7 * Conv. (cfs)     *          * 10121.7 *          *
* Length Wtd. (ft)   * 97.04  * Wetted Per. (ft) *          * 30.20  *          *
* Min Ch El (ft)     * 246.81 * Shear (lb/sq ft) *          * 3.22   *          *
* Alpha              * 1.00   * Stream Power (lb/ft s) * 134.00 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 0.85   * Cum Volume (acre-ft) * 1.62  * 7.09  * 1.12  *
* C & E Loss (ft)   * 0.65   * Cum SA (acres)    * 1.51  * 0.98  * 1.71  *
*****
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid

subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50-YR

```
*****
* E.G. Elev (ft)      * 257.17 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.47   * Wt. n-Val.      *          * 0.021  *          *
* W.S. Elev (ft)     * 255.70 * Reach Len. (ft) * 95.55  * 97.06  * 99.00  *
* Crit W.S. (ft)     * 255.70 * Flow Area (sq ft) *          * 64.44  *          *
* E.G. Slope (ft/ft) * 0.006024 * Area (sq ft)    *          * 74.31  *          *
* Q Total (cfs)      * 2442.00 * Flow (cfs)      *          * 390.23 *          *
* Top Width (ft)     * 104.54 * Top Width (ft)  *          * 74.76  *          *
* Vel Total (ft/s)   * 9.22   * Avg. Vel. (ft/s) *          * 6.06   *          *
* Max Chl Dpth (ft)  * 8.89   * Hydr. Depth (ft) *          * 1.19   *          *
* Conv. Total (cfs)  * 31463.3 * Conv. (cfs)     *          * 5027.8 *          *
* Length Wtd. (ft)   * 96.82  * Wetted Per. (ft) *          * 54.77  *          *
* Min Ch El (ft)     * 246.81 * Shear (lb/sq ft) *          * 0.44   *          *
* Alpha              * 1.12   * Stream Power (lb/ft s) * 134.00 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 0.65   * Cum Volume (acre-ft) * 3.44  * 11.36 * 3.11  *
* C & E Loss (ft)   * 0.03   * Cum SA (acres)    * 2.07  * 0.99  * 2.45  *
*****
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid

subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100-YR

```
*****
* E.G. Elev (ft)      * 258.09 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.73   * Wt. n-Val.      *          * 0.022  *          *
* W.S. Elev (ft)     * 256.37 * Reach Len. (ft) * 95.55  * 97.06  * 99.00  *
* Crit W.S. (ft)     * 256.37 * Flow Area (sq ft) *          * 100.69 *          *
* E.G. Slope (ft/ft) * 0.006402 * Area (sq ft)    *          * 124.50 *          *
* Q Total (cfs)      * 3270.00 * Flow (cfs)      *          * 825.88 *          *
*****
```

* Top Width (ft)	* 110.49	* Top Width (ft)	* 74.90	* 26.52	* 9.07
* Vel Total (ft/s)	* 10.09	* Avg. Vel. (ft/s)	* 8.20	* 11.24	* 0.88
* Max Chl Dpth (ft)	* 9.56	* Hydr. Depth (ft)	* 1.86	* 8.18	* 0.72
* Conv. Total (cfs)	* 40869.6	* Conv. (cfs)	* 10322.2	* 30475.7	* 71.7
* Length Wtd. (ft)	* 96.66	* Wetted Per. (ft)	* 55.45	* 36.02	* 10.30
* Min Ch El (ft)	* 246.81	* Shear (lb/sq ft)	* 0.73	* 2.41	* 0.25
* Alpha	* 1.09	* Stream Power (lb/ft s)	* 134.00	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.68	* Cum Volume (acre-ft)	* 4.77	* 13.70	* 4.19
* C & E Loss (ft)	* 0.01	* Cum SA (acres)	* 2.26	* 0.99	* 2.75

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #6HR OBS

* E.G. Elev (ft)	* 254.49	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 2.26	* Wt. n-Val.	*	* 0.035	*
* W.S. Elev (ft)	* 252.23	* Reach Len. (ft)	* 95.55	* 97.06	* 99.00
* Crit W.S. (ft)	* 252.23	* Flow Area (sq ft)	*	* 109.26	*
* E.G. Slope (ft/ft)	* 0.014891	* Area (sq ft)	*	* 109.26	*
* Q Total (cfs)	* 1318.00	* Flow (cfs)	*	* 1318.00	*
* Top Width (ft)	* 24.22	* Top Width (ft)	*	* 24.22	*
* Vel Total (ft/s)	* 12.06	* Avg. Vel. (ft/s)	*	* 12.06	*
* Max Chl Dpth (ft)	* 5.42	* Hydr. Depth (ft)	*	* 4.51	*
* Conv. Total (cfs)	* 10800.6	* Conv. (cfs)	*	* 10800.6	*
* Length Wtd. (ft)	* 97.05	* Wetted Per. (ft)	*	* 30.75	*
* Min Ch El (ft)	* 246.81	* Shear (lb/sq ft)	*	* 3.30	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 134.00	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.86	* Cum Volume (acre-ft)	* 1.75	* 7.47	* 1.31
* C & E Loss (ft)	* 0.68	* Cum SA (acres)	* 1.56	* 0.98	* 1.77

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #24HR OBS

* E.G. Elev (ft)	* 256.07	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 2.66	* Wt. n-Val.	*	* 0.035	*
* W.S. Elev (ft)	* 253.40	* Reach Len. (ft)	* 95.55	* 97.06	* 99.00
* Crit W.S. (ft)	* 253.40	* Flow Area (sq ft)	*	* 138.54	*
* E.G. Slope (ft/ft)	* 0.014558	* Area (sq ft)	*	* 138.54	*
* Q Total (cfs)	* 1815.00	* Flow (cfs)	*	* 1815.00	*
* Top Width (ft)	* 25.97	* Top Width (ft)	*	* 25.97	*
* Vel Total (ft/s)	* 13.10	* Avg. Vel. (ft/s)	*	* 13.10	*
* Max Chl Dpth (ft)	* 6.59	* Hydr. Depth (ft)	*	* 5.34	*
* Conv. Total (cfs)	* 15042.9	* Conv. (cfs)	*	* 15042.9	*
* Length Wtd. (ft)	* 97.00	* Wetted Per. (ft)	*	* 33.87	*
* Min Ch El (ft)	* 246.81	* Shear (lb/sq ft)	*	* 3.72	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 134.00	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.93	* Cum Volume (acre-ft)	* 2.54	* 9.29	* 2.12
* C & E Loss (ft)	* 0.77	* Cum SA (acres)	* 1.85	* 0.99	* 2.06

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: hudson

REACH: main RS: 30

INPUT

Description:

Station Elevation Data		num= 26	
Sta	Elev	Sta	Elev
0	261.9	8.71	261.46
33.4	250.57	33.51	250.33
68.5	250.72	70.19	250.5
118.15	253.54	118.2	248.77
130.64	244.4	132.33	245.89
152.9	256.12		

Manning's n Values		num= 5	
Sta	n Val	Sta	n Val
0	.045	29.7	.02
85.33	.045	118.15	.035
142.04	.1		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	118.15	142.04	69.42	70.58	71.76	.1	.3

Ineffective Flow		num= 1	
Sta L	Sta R	Elev	Permanent
88.6	115.6	260	F

CROSS SECTION OUTPUT Profile #2-YR

* E.G. Elev (ft)	* 249.53	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 1.02	* Wt. n-Val.	* 0.035		
* W.S. Elev (ft)	* 248.51	* Reach Len. (ft)	* 69.42	* 70.58	* 71.76
* Crit W.S. (ft)	* 247.96	* Flow Area (sq ft)		* 60.63	
* E.G. Slope (ft/ft)	* 0.009797	* Area (sq ft)		* 60.63	
* Q Total (cfs)	* 491.00	* Flow (cfs)		* 491.00	
* Top Width (ft)	* 18.32	* Top Width (ft)		* 18.32	
* Vel Total (ft/s)	* 8.10	* Avg. Vel. (ft/s)		* 8.10	
* Max Chl Dpth (ft)	* 4.88	* Hydr. Depth (ft)		* 3.31	
* Conv. Total (cfs)	* 4960.5	* Conv. (cfs)		* 4960.5	
* Length Wtd. (ft)	* 70.58	* Wetted Per. (ft)		* 22.66	
* Min Ch El (ft)	* 243.63	* Shear (lb/sq ft)		* 1.64	
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 152.90	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.66	* Cum Volume (acre-ft)	* 0.24	* 2.77	* 0.01
* C & E Loss (ft)	* 0.13	* Cum SA (acres)	* 0.66	* 0.88	* 0.12

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 252.76	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 1.92	* Wt. n-Val.	* 0.022	* 0.035	
* W.S. Elev (ft)	* 250.84	* Reach Len. (ft)	* 69.42	* 70.58	* 71.76
* Crit W.S. (ft)	* 251.58	* Flow Area (sq ft)	* 9.28	* 107.53	
* E.G. Slope (ft/ft)	* 0.012379	* Area (sq ft)	* 9.52	* 107.53	

* Q Total (cfs)	* 1237.00	* Flow (cfs)	* 27.97	* 1209.03	* *	* *
* Top Width (ft)	* 62.10	* Top Width (ft)	* 40.16	* 21.94	* *	* *
* Vel Total (ft/s)	* 10.59	* Avg. Vel. (ft/s)	* 3.02	* 11.24	* *	* *
* Max Chl Dpth (ft)	* 7.21	* Hydr. Depth (ft)	* 0.24	* 4.90	* *	* *
* Conv. Total (cfs)	* 11118.2	* Conv. (cfs)	* 251.4	* 10866.7	* *	* *
* Length Wtd. (ft)	* 70.56	* Wetted Per. (ft)	* 38.24	* 29.28	* *	* *
* Min Ch El (ft)	* 243.63	* Shear (lb/sq ft)	* 0.19	* 2.84	* *	* *
* Alpha	* 1.10	* Stream Power (lb/ft s)	* 152.90	* 0.00	* 0.00	* *
* Frctn Loss (ft)	* 1.32	* Cum Volume (acre-ft)	* 1.61	* 6.85	* 1.12	* *
* C & E Loss (ft)	* 0.13	* Cum SA (acres)	* 1.47	* 0.93	* 1.71	* *

Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 255.38	* Element	* Left OB	* Channel	* Right OB	* *
* Vel Head (ft)	* 3.92	* Wt. n-Val.	* 0.021	* 0.035	* *	* *
* W.S. Elev (ft)	* 251.46	* Reach Len. (ft)	* 69.42	* 70.58	* 71.76	* *
* Crit W.S. (ft)	* 252.55	* Flow Area (sq ft)	* 43.35	* 121.46	* *	* *
* E.G. Slope (ft/ft)	* 0.025650	* Area (sq ft)	* 46.93	* 121.46	* *	* *
* Q Total (cfs)	* 2442.00	* Flow (cfs)	* 391.23	* 2050.77	* *	* *
* Top Width (ft)	* 91.83	* Top Width (ft)	* 68.92	* 22.91	* *	* *
* Vel Total (ft/s)	* 14.82	* Avg. Vel. (ft/s)	* 9.02	* 16.89	* *	* *
* Max Chl Dpth (ft)	* 7.83	* Hydr. Depth (ft)	* 0.72	* 5.30	* *	* *
* Conv. Total (cfs)	* 15247.6	* Conv. (cfs)	* 2442.8	* 12804.8	* *	* *
* Length Wtd. (ft)	* 70.31	* Wetted Per. (ft)	* 60.89	* 31.04	* *	* *
* Min Ch El (ft)	* 243.63	* Shear (lb/sq ft)	* 1.14	* 6.27	* *	* *
* Alpha	* 1.15	* Stream Power (lb/ft s)	* 152.90	* 0.00	* 0.00	* *
* Frctn Loss (ft)	* 1.06	* Cum Volume (acre-ft)	* 3.31	* 11.00	* 3.11	* *
* C & E Loss (ft)	* 0.73	* Cum SA (acres)	* 1.91	* 0.94	* 2.45	* *

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 256.20	* Element	* Left OB	* Channel	* Right OB	* *
* Vel Head (ft)	* 4.29	* Wt. n-Val.	* 0.021	* 0.035	* *	* *
* W.S. Elev (ft)	* 251.92	* Reach Len. (ft)	* 69.42	* 70.58	* 71.76	* *
* Crit W.S. (ft)	* 253.11	* Flow Area (sq ft)	* 70.99	* 132.02	* *	* *
* E.G. Slope (ft/ft)	* 0.027111	* Area (sq ft)	* 79.47	* 132.02	* *	* *
* Q Total (cfs)	* 3270.00	* Flow (cfs)	* 911.96	* 2358.04	* *	* *
* Top Width (ft)	* 97.98	* Top Width (ft)	* 74.37	* 23.61	* *	* *
* Vel Total (ft/s)	* 16.11	* Avg. Vel. (ft/s)	* 12.85	* 17.86	* *	* *
* Max Chl Dpth (ft)	* 8.29	* Hydr. Depth (ft)	* 1.16	* 5.59	* *	* *
* Conv. Total (cfs)	* 19860.0	* Conv. (cfs)	* 5538.7	* 14321.3	* *	* *
* Length Wtd. (ft)	* 69.90	* Wetted Per. (ft)	* 61.85	* 32.32	* *	* *
* Min Ch El (ft)	* 243.63	* Shear (lb/sq ft)	* 1.94	* 6.91	* *	* *
* Alpha	* 1.06	* Stream Power (lb/ft s)	* 152.90	* 0.00	* 0.00	* *
* Frctn Loss (ft)	* 1.12	* Cum Volume (acre-ft)	* 4.55	* 13.31	* 4.18	* *
* C & E Loss (ft)	* 0.77	* Cum SA (acres)	* 2.10	* 0.94	* 2.74	* *

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

```
*****
* E.G. Elev (ft)      * 253.06 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 2.27  * Wt. n-Val.      * 0.022  * 0.035  *         *
* W.S. Elev (ft)     * 250.79 * Reach Len. (ft) * 69.42  * 70.58  * 71.76  *
* Crit W.S. (ft)     * 251.67 * Flow Area (sq ft) * 7.38  * 106.37 *         *
* E.G. Slope (ft/ft) * 0.014640 * Area (sq ft)    * 7.52  * 106.37 *         *
* Q Total (cfs)      * 1318.00 * Flow (cfs)      * 22.31 * 1295.69 *         *
* Top Width (ft)     * 57.21  * Top Width (ft)  * 35.35 * 21.86  *         *
* Vel Total (ft/s)   * 11.59  * Avg. Vel. (ft/s) * 3.02  * 12.18  *         *
* Max Chl Dpth (ft)  * 7.16   * Hydr. Depth (ft) * 0.22  * 4.87   *         *
* Conv. Total (cfs)  * 10893.0 * Conv. (cfs)     * 184.4 * 10708.6 *         *
* Length Wtd. (ft)  * 70.55  * Wetted Per. (ft) * 33.94 * 29.13  *         *
* Min Ch El (ft)     * 243.63 * Shear (lb/sq ft) * 0.20  * 3.34   *         *
* Alpha              * 1.09   * Stream Power (lb/ft s) * 152.90 * 0.00  * 0.00  *
* Frctn Loss (ft)    * 1.43   * Cum Volume (acre-ft) * 1.74  * 7.23  * 1.31  *
* C & E Loss (ft)    * 0.00   * Cum SA (acres)    * 1.52  * 0.93  * 1.77  *
*****
```

Warning: Divided flow computed for this cross-section.
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```
*****
* E.G. Elev (ft)      * 254.28 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 3.12  * Wt. n-Val.      * 0.022  * 0.035  *         *
* W.S. Elev (ft)     * 251.15 * Reach Len. (ft) * 69.42  * 70.58  * 71.76  *
* Crit W.S. (ft)     * 252.09 * Flow Area (sq ft) * 24.82 * 114.47 *         *
* E.G. Slope (ft/ft) * 0.020158 * Area (sq ft)    * 26.25 * 114.47 *         *
* Q Total (cfs)      * 1815.00 * Flow (cfs)      * 136.31 * 1678.69 *         *
* Top Width (ft)     * 87.66  * Top Width (ft)  * 65.23 * 22.43  *         *
* Vel Total (ft/s)   * 13.03  * Avg. Vel. (ft/s) * 5.49  * 14.67  *         *
* Max Chl Dpth (ft)  * 7.52   * Hydr. Depth (ft) * 0.41  * 5.10   *         *
* Conv. Total (cfs)  * 12783.7 * Conv. (cfs)     * 960.1 * 11823.6 *         *
* Length Wtd. (ft)  * 70.44  * Wetted Per. (ft) * 60.24 * 30.16  *         *
* Min Ch El (ft)     * 243.63 * Shear (lb/sq ft) * 0.52  * 4.78   *         *
* Alpha              * 1.18   * Stream Power (lb/ft s) * 152.90 * 0.00  * 0.00  *
* Frctn Loss (ft)    * 1.65   * Cum Volume (acre-ft) * 2.51  * 9.01  * 2.12  *
* C & E Loss (ft)    * 0.14   * Cum SA (acres)    * 1.78  * 0.93  * 2.06  *
*****
```

Warning: Divided flow computed for this cross-section.
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
 REACH: main RS: 29

INPUT

Description:

Station Elevation Data		num= 25		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	261	17.86	252.38	26.6	250.54	34.72	249.13	38.62	248.41
46.69	248.68	57.55	249.04	68.41	249.12	72.61	249.1	75.04	249.07
76.3	249.08	83.12	249.4	114.42	249.03	115.16	250.46	124.07	250.44
124.13	251	125.22	246.94	126.17	242.79	129.62	242.7	131.16	242.71
133.3	242.72	141.03	245.06	144.33	247.85	148.3	250.68	159.15	258.51

Manning's n Values num= 5
 Sta n Val Sta n Val Sta n Val Sta n Val Sta n Val

 0 .045 34.72 .02 83.12 .045 124.13 .05 148.3 .1
 Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 124.13 148.3 57 58.22 61.16 .1 .3
 Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 93.91 122.11 260 F

CROSS SECTION OUTPUT Profile #2-YR

 * E.G. Elev (ft) * 248.73 * Element * Left OB * Channel * Right OB *
 * Vel Head (ft) * 0.57 * Wt. n-Val. * * 0.050 * *
 * W.S. Elev (ft) * 248.16 * Reach Len. (ft) * 57.00 * 58.22 * 61.16 *
 * Crit W.S. (ft) * 246.55 * Flow Area (sq ft) * * 80.74 * *
 * E.G. Slope (ft/ft) * 0.009042 * Area (sq ft) * * 80.74 * *
 * Q Total (cfs) * 491.00 * Flow (cfs) * * 491.00 * *
 * Top Width (ft) * 19.87 * Top Width (ft) * * 19.87 * *
 * Vel Total (ft/s) * 6.08 * Avg. Vel. (ft/s) * * 6.08 * *
 * Max Chl Dpth (ft) * 5.46 * Hydr. Depth (ft) * * 4.06 * *
 * Conv. Total (cfs) * 5163.5 * Conv. (cfs) * * 5163.5 * *
 * Length Wtd. (ft) * 58.19 * Wetted Per. (ft) * * 25.58 * *
 * Min Ch El (ft) * 242.70 * Shear (lb/sq ft) * * 1.78 * *
 * Alpha * 1.00 * Stream Power (lb/ft s) * 159.15 * 0.00 * 0.00 *
 * Frctn Loss (ft) * 0.28 * Cum Volume (acre-ft) * 0.24 * 2.66 * 0.01 *
 * C & E Loss (ft) * 0.06 * Cum SA (acres) * 0.66 * 0.85 * 0.12 *

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
 This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

 * E.G. Elev (ft) * 251.35 * Element * Left OB * Channel * Right OB *
 * Vel Head (ft) * 2.44 * Wt. n-Val. * 0.020 * 0.050 * *
 * W.S. Elev (ft) * 248.90 * Reach Len. (ft) * 57.00 * 58.22 * 61.16 *
 * Crit W.S. (ft) * 249.82 * Flow Area (sq ft) * 4.31 * 96.01 * *
 * E.G. Slope (ft/ft) * 0.034384 * Area (sq ft) * 4.31 * 96.01 * *
 * Q Total (cfs) * 1237.00 * Flow (cfs) * 23.32 * 1213.68 * *
 * Top Width (ft) * 38.62 * Top Width (ft) * 17.50 * 21.12 * *
 * Vel Total (ft/s) * 12.33 * Avg. Vel. (ft/s) * 5.41 * 12.64 * *
 * Max Chl Dpth (ft) * 6.20 * Hydr. Depth (ft) * 0.25 * 4.55 * *
 * Conv. Total (cfs) * 6671.1 * Conv. (cfs) * 125.8 * 6545.3 * *
 * Length Wtd. (ft) * 57.70 * Wetted Per. (ft) * 17.56 * 27.64 * *
 * Min Ch El (ft) * 242.70 * Shear (lb/sq ft) * 0.53 * 7.46 * *
 * Alpha * 1.03 * Stream Power (lb/ft s) * 159.15 * 0.00 * 0.00 *
 * Frctn Loss (ft) * 1.36 * Cum Volume (acre-ft) * 1.60 * 6.69 * 1.12 *
 * C & E Loss (ft) * 0.05 * Cum SA (acres) * 1.42 * 0.89 * 1.71 *

Warning: Divided flow computed for this cross-section.
 Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
 This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

 * E.G. Elev (ft) * 252.95 * Element * Left OB * Channel * Right OB *
 * Vel Head (ft) * 3.00 * Wt. n-Val. * 0.021 * 0.050 * *
 * W.S. Elev (ft) * 249.95 * Reach Len. (ft) * 57.00 * 58.22 * 61.16 *
 * Crit W.S. (ft) * 250.81 * Flow Area (sq ft) * 57.28 * 118.99 * *
 * E.G. Slope (ft/ft) * 0.037646 * Area (sq ft) * 73.86 * 118.99 * *
 * Q Total (cfs) * 2442.00 * Flow (cfs) * 742.38 * 1699.62 * *
 * Top Width (ft) * 107.75 * Top Width (ft) * 84.89 * 22.86 * *
 * Vel Total (ft/s) * 13.85 * Avg. Vel. (ft/s) * 12.96 * 14.28 * *
 * Max Chl Dpth (ft) * 7.25 * Hydr. Depth (ft) * 0.90 * 5.20 * *
 * Conv. Total (cfs) * 12585.9 * Conv. (cfs) * 3826.2 * 8759.7 * *

* Length Wtd. (ft)	* 57.48	* Wetted Per. (ft)	* 64.06	* 30.52	* *
* Min Ch El (ft)	* 242.70	* Shear (lb/sq ft)	* 2.10	* 9.16	* *
* Alpha	* 1.01	* Stream Power (lb/ft s)	* 159.15	* 0.00	* 0.00 *
* Frctn Loss (ft)	* 2.16	* Cum Volume (acre-ft)	* 3.21	* 10.81	* 3.11 *
* C & E Loss (ft)	* 0.28	* Cum SA (acres)	* 1.79	* 0.90	* 2.45 *

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 253.68	* Element	* Left OB	* Channel	* Right OB	* *
* Vel Head (ft)	* 0.93	* Wt. n-Val.	* 0.023	* 0.050	* 0.100	* *
* W.S. Elev (ft)	* 252.74	* Reach Len. (ft)	* 57.00	* 58.22	* 61.16	* *
* Crit W.S. (ft)	* 251.47	* Flow Area (sq ft)	* 260.19	* 185.96	* 2.94	* *
* E.G. Slope (ft/ft)	* 0.003469	* Area (sq ft)	* 351.95	* 185.96	* 2.94	* *
* Q Total (cfs)	* 3270.00	* Flow (cfs)	* 2234.16	* 1033.56	* 2.29	* *
* Top Width (ft)	* 134.04	* Top Width (ft)	* 107.02	* 24.17	* 2.86	* *
* Vel Total (ft/s)	* 7.28	* Avg. Vel. (ft/s)	* 8.59	* 5.56	* 0.78	* *
* Max Chl Dpth (ft)	* 10.04	* Hydr. Depth (ft)	* 3.30	* 7.69	* 1.03	* *
* Conv. Total (cfs)	* 55517.1	* Conv. (cfs)	* 37930.8	* 17547.4	* 38.8	* *
* Length Wtd. (ft)	* 57.42	* Wetted Per. (ft)	* 79.80	* 32.87	* 3.52	* *
* Min Ch El (ft)	* 242.70	* Shear (lb/sq ft)	* 0.71	* 1.23	* 0.18	* *
* Alpha	* 1.13	* Stream Power (lb/ft s)	* 159.15	* 0.00	* 0.00	* *
* Frctn Loss (ft)	* 0.12	* Cum Volume (acre-ft)	* 4.20	* 13.05	* 4.18	* *
* C & E Loss (ft)	* 0.10	* Cum SA (acres)	* 1.95	* 0.90	* 2.73	* *

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

* E.G. Elev (ft)	* 251.53	* Element	* Left OB	* Channel	* Right OB	* *
* Vel Head (ft)	* 2.45	* Wt. n-Val.	* 0.020	* 0.050	* *	* *
* W.S. Elev (ft)	* 249.08	* Reach Len. (ft)	* 57.00	* 58.22	* 61.16	* *
* Crit W.S. (ft)	* 249.90	* Flow Area (sq ft)	* 7.99	* 99.72	* *	* *
* E.G. Slope (ft/ft)	* 0.033978	* Area (sq ft)	* 8.09	* 99.72	* *	* *
* Q Total (cfs)	* 1318.00	* Flow (cfs)	* 47.57	* 1270.43	* *	* *
* Top Width (ft)	* 55.00	* Top Width (ft)	* 33.59	* 21.41	* *	* *
* Vel Total (ft/s)	* 12.24	* Avg. Vel. (ft/s)	* 5.95	* 12.74	* *	* *
* Max Chl Dpth (ft)	* 6.38	* Hydr. Depth (ft)	* 0.27	* 4.66	* *	* *
* Conv. Total (cfs)	* 7150.2	* Conv. (cfs)	* 258.1	* 6892.1	* *	* *
* Length Wtd. (ft)	* 57.67	* Wetted Per. (ft)	* 29.55	* 28.12	* *	* *
* Min Ch El (ft)	* 242.70	* Shear (lb/sq ft)	* 0.57	* 7.52	* *	* *
* Alpha	* 1.05	* Stream Power (lb/ft s)	* 159.15	* 0.00	* 0.00	* *
* Frctn Loss (ft)	* 1.51	* Cum Volume (acre-ft)	* 1.73	* 7.06	* 1.31	* *
* C & E Loss (ft)	* 0.02	* Cum SA (acres)	* 1.46	* 0.90	* 1.77	* *

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

* E.G. Elev (ft)	* 252.27	* Element	* Left OB	* Channel	* Right OB	* *
* Vel Head (ft)	* 2.74	* Wt. n-Val.	* 0.020	* 0.050	* *	* *
* W.S. Elev (ft)	* 249.53	* Reach Len. (ft)	* 57.00	* 58.22	* 61.16	* *
* Crit W.S. (ft)	* 250.30	* Flow Area (sq ft)	* 31.01	* 109.55	* *	* *
* E.G. Slope (ft/ft)	* 0.037738	* Area (sq ft)	* 38.84	* 109.55	* *	* *
* Q Total (cfs)	* 1815.00	* Flow (cfs)	* 293.48	* 1521.52	* *	* *
* Top Width (ft)	* 104.42	* Top Width (ft)	* 82.26	* 22.16	* *	* *

```

* Vel Total (ft/s)      * 12.91 * Avg. Vel. (ft/s)      * 9.46 * 13.89 *
* Max Chl Dpth (ft)    * 6.83 * Hydr. Depth (ft)     * 0.50 * 4.94 *
* Conv. Total (cfs)    * 9343.0 * Conv. (cfs)          * 1510.7 * 7832.3 *
* Length Wtd. (ft)     * 57.55 * Wetted Per. (ft)     * 61.61 * 29.36 *
* Min Ch El (ft)       * 242.70 * Shear (lb/sq ft)     * 1.19 * 8.79 *
* Alpha                 * 1.06 * Stream Power (lb/ft s) * 159.15 * 0.00 *
* Frctn Loss (ft)      * 1.90 * Cum Volume (acre-ft) * 2.46 * 8.83 *
* C & E Loss (ft)      * 0.12 * Cum SA (acres)       * 1.67 * 0.90 *
*****

```

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main RS: 28

INPUT

Description:

```

Station Elevation Data num= 23
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
*****
0 264.37 23.62 258.39 50.23 252 71.83 247.8 75.82 247.43
75.84 247.3 94.09 247.92 107.87 247.74 110.08 247.7 111.03 248.12
136.72 248.93 162.62 248.9 162.9 250.11 163.74 249.99 163.88 246.41
164.27 242.97 171.24 242.92 171.44 242.91 178.26 243.18 186.65 247.92
192.33 250.44 199.04 253.27 209.04 257.59

```

```

Manning's n Values num= 5
Sta n Val Sta n Val Sta n Val Sta n Val Sta n Val
*****
0 .045 71.83 .02 111.03 .045 163.74 .035 192.33 .1

```

```

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
163.74 192.33 46 46.77 46.35 .1 .3

```

```

Ineffective Flow num= 2
Sta L Sta R Elev Permanent
25.38 50.22 260 F
124.9 163.74 260 F

```

```

Blocked Obstructions num= 1
Sta L Sta R Elev
*****
50.22 61.56 260

```

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft) * 248.39 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.39 * Wt. n-Val. * 0.020 * 0.035 *
* W.S. Elev (ft) * 248.01 * Reach Len. (ft) * 46.00 * 46.77 * 46.35 *
* Crit W.S. (ft) * 246.16 * Flow Area (sq ft) * 12.10 * 92.10 *
* E.G. Slope (ft/ft) * 0.003062 * Area (sq ft) * 12.10 * 92.10 *
* Q Total (cfs) * 491.00 * Flow (cfs) * 22.46 * 468.54 *
* Top Width (ft) * 63.04 * Top Width (ft) * 40.01 * 23.03 *
* Vel Total (ft/s) * 4.71 * Avg. Vel. (ft/s) * 1.86 * 5.09 *
* Max Chl Dpth (ft) * 5.10 * Hydr. Depth (ft) * 0.30 * 4.00 *
* Conv. Total (cfs) * 8872.7 * Conv. (cfs) * 405.8 * 8466.9 *
* Length Wtd. (ft) * 46.69 * Wetted Per. (ft) * 40.23 * 28.91 *
* Min Ch El (ft) * 242.91 * Shear (lb/sq ft) * 0.06 * 0.61 *
* Alpha * 1.12 * Stream Power (lb/ft s) * 209.04 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.11 * Cum Volume (acre-ft) * 0.23 * 2.54 * 0.01 *
* C & E Loss (ft) * 0.05 * Cum SA (acres) * 0.63 * 0.82 * 0.12 *
*****

```

Warning: Divided flow computed for this cross-section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft) * 250.52 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.28 * Wt. n-Val. * 0.023 * 0.035 *
* W.S. Elev (ft) * 250.24 * Reach Len. (ft) * 46.00 * 46.77 * 46.35 *
* Crit W.S. (ft) * 248.85 * Flow Area (sq ft) * 140.46 * 149.14 *
* E.G. Slope (ft/ft) * 0.001512 * Area (sq ft) * 192.68 * 149.14 *

```

* Q Total (cfs)	* 1237.00	* Flow (cfs)	* 606.55	* 630.45	* *	* *
* Top Width (ft)	* 130.31	* Top Width (ft)	* 102.18	* 28.13	* *	* *
* Vel Total (ft/s)	* 4.27	* Avg. Vel. (ft/s)	* 4.32	* 4.23	* *	* *
* Max Chl Dpth (ft)	* 7.33	* Hydr. Depth (ft)	* 2.22	* 5.30	* *	* *
* Conv. Total (cfs)	* 31817.0	* Conv. (cfs)	* 15601.2	* 16215.8	* *	* *
* Length Wtd. (ft)	* 46.38	* Wetted Per. (ft)	* 64.21	* 36.39	* *	* *
* Min Ch El (ft)	* 242.91	* Shear (lb/sq ft)	* 0.21	* 0.39	* *	* *
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 209.04	* 0.00	* 0.00	* *
* Frctn Loss (ft)	* 0.05	* Cum Volume (acre-ft)	* 1.47	* 6.53	* 1.12	* *
* C & E Loss (ft)	* 0.03	* Cum SA (acres)	* 1.35	* 0.86	* 1.71	* *

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 252.43	* Element	* Left OB	* Channel	* Right OB	* *
* Vel Head (ft)	* 0.47	* Wt. n-Val.	* 0.024	* 0.035	* 0.100	* *
* W.S. Elev (ft)	* 251.96	* Reach Len. (ft)	* 46.00	* 46.77	* 46.35	* *
* Crit W.S. (ft)	* 249.89	* Flow Area (sq ft)	* 249.44	* 198.29	* 2.73	* *
* E.G. Slope (ft/ft)	* 0.001447	* Area (sq ft)	* 368.49	* 198.29	* 2.73	* *
* Q Total (cfs)	* 2442.00	* Flow (cfs)	* 1458.23	* 982.56	* 1.21	* *
* Top Width (ft)	* 134.37	* Top Width (ft)	* 102.18	* 28.59	* 3.60	* *
* Vel Total (ft/s)	* 5.42	* Avg. Vel. (ft/s)	* 5.85	* 4.96	* 0.45	* *
* Max Chl Dpth (ft)	* 9.05	* Hydr. Depth (ft)	* 3.94	* 6.94	* 0.76	* *
* Conv. Total (cfs)	* 64197.8	* Conv. (cfs)	* 38335.4	* 25830.5	* 31.9	* *
* Length Wtd. (ft)	* 46.30	* Wetted Per. (ft)	* 65.93	* 36.89	* 3.90	* *
* Min Ch El (ft)	* 242.91	* Shear (lb/sq ft)	* 0.34	* 0.49	* 0.06	* *
* Alpha	* 1.03	* Stream Power (lb/ft s)	* 209.04	* 0.00	* 0.00	* *
* Frctn Loss (ft)	* 0.06	* Cum Volume (acre-ft)	* 2.92	* 10.60	* 3.11	* *
* C & E Loss (ft)	* 0.04	* Cum SA (acres)	* 1.67	* 0.86	* 2.45	* *

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 253.45	* Element	* Left OB	* Channel	* Right OB	* *
* Vel Head (ft)	* 0.61	* Wt. n-Val.	* 0.024	* 0.035	* 0.100	* *
* W.S. Elev (ft)	* 252.84	* Reach Len. (ft)	* 46.00	* 46.77	* 46.35	* *
* Crit W.S. (ft)	* 250.47	* Flow Area (sq ft)	* 305.64	* 223.65	* 6.85	* *
* E.G. Slope (ft/ft)	* 0.001492	* Area (sq ft)	* 460.63	* 223.65	* 6.85	* *
* Q Total (cfs)	* 3270.00	* Flow (cfs)	* 2046.43	* 1219.36	* 4.21	* *
* Top Width (ft)	* 139.98	* Top Width (ft)	* 105.69	* 28.59	* 5.70	* *
* Vel Total (ft/s)	* 6.10	* Avg. Vel. (ft/s)	* 6.70	* 5.45	* 0.61	* *
* Max Chl Dpth (ft)	* 9.93	* Hydr. Depth (ft)	* 4.83	* 7.82	* 1.20	* *
* Conv. Total (cfs)	* 84662.1	* Conv. (cfs)	* 52983.2	* 31570.0	* 109.0	* *
* Length Wtd. (ft)	* 46.28	* Wetted Per. (ft)	* 66.82	* 36.89	* 6.19	* *
* Min Ch El (ft)	* 242.91	* Shear (lb/sq ft)	* 0.43	* 0.56	* 0.10	* *
* Alpha	* 1.05	* Stream Power (lb/ft s)	* 209.04	* 0.00	* 0.00	* *
* Frctn Loss (ft)	* 0.06	* Cum Volume (acre-ft)	* 3.67	* 12.78	* 4.17	* *
* C & E Loss (ft)	* 0.05	* Cum SA (acres)	* 1.81	* 0.86	* 2.73	* *

Warning: Divided flow computed for this cross-section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

* E.G. Elev (ft)	* 250.65	* Element	* Left OB	* Channel	* Right OB	* *
* Vel Head (ft)	* 0.30	* Wt. n-Val.	* 0.023	* 0.035	* *	* *
* W.S. Elev (ft)	* 250.35	* Reach Len. (ft)	* 46.00	* 46.77	* 46.35	* *
* Crit W.S. (ft)	* 248.93	* Flow Area (sq ft)	* 147.61	* 152.33	* *	* *
* E.G. Slope (ft/ft)	* 0.001543	* Area (sq ft)	* 204.22	* 152.33	* *	* *
* Q Total (cfs)	* 1318.00	* Flow (cfs)	* 661.53	* 656.47	* *	* *
* Top Width (ft)	* 130.57	* Top Width (ft)	* 102.18	* 28.39	* *	* *
* Vel Total (ft/s)	* 4.39	* Avg. Vel. (ft/s)	* 4.48	* 4.31	* *	* *
* Max Chl Dpth (ft)	* 7.44	* Hydr. Depth (ft)	* 2.33	* 5.37	* *	* *
* Conv. Total (cfs)	* 33555.4	* Conv. (cfs)	* 16842.1	* 16713.2	* *	* *
* Length Wtd. (ft)	* 46.37	* Wetted Per. (ft)	* 64.32	* 36.67	* *	* *
* Min Ch El (ft)	* 242.91	* Shear (lb/sq ft)	* 0.22	* 0.40	* *	* *
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 209.04	* 0.00	* 0.00	* *
* Frctn Loss (ft)	* 0.06	* Cum Volume (acre-ft)	* 1.59	* 6.90	* 1.31	* *
* C & E Loss (ft)	* 0.03	* Cum SA (acres)	* 1.37	* 0.86	* 1.77	* *

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```
*****
* E.G. Elev (ft)      * 251.52 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.37  * Wt. n-Val.      * 0.024  * 0.035  * 0.100  *
* W.S. Elev (ft)     * 251.15 * Reach Len. (ft) * 46.00  * 46.77  * 46.35  *
* Crit W.S. (ft)     * 249.39 * Flow Area (sq ft) * 198.55 * 175.31 * 0.60  *
* E.G. Slope (ft/ft) * 0.001443 * Area (sq ft)    * 286.39 * 175.31 * 0.60  *
* Q Total (cfs)      * 1815.00 * Flow (cfs)      * 1015.58 * 799.26 * 0.16  *
* Top Width (ft)     * 132.46 * Top Width (ft)  * 102.18 * 28.59  * 1.69  *
* Vel Total (ft/s)   * 4.85  * Avg. Vel. (ft/s) * 5.12  * 4.56  * 0.27  *
* Max Chl Dpth (ft)  * 8.24  * Hydr. Depth (ft) * 3.13  * 6.13  * 0.36  *
* Conv. Total (cfs)  * 47774.3 * Conv. (cfs)     * 26731.9 * 21038.1 * 4.3  *
* Length Wtd. (ft)   * 46.33 * Wetted Per. (ft) * 65.13  * 36.89  * 1.84  *
* Min Ch El (ft)     * 242.91 * Shear (lb/sq ft) * 0.27  * 0.43  * 0.03  *
* Alpha              * 1.01  * Stream Power (lb/ft s) * 209.04 * 0.00  * 0.00  *
* Frctn Loss (ft)    * 0.05  * Cum Volume (acre-ft) * 2.24  * 8.64  * 2.12  *
* C & E Loss (ft)    * 0.03  * Cum SA (acres)   * 1.54  * 0.86  * 2.05  *
*****
```

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
 REACH: main RS: 27

INPUT

Description:

Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	255.09	20	249.09	33.99	247.99	38.71	247.58	38.75	247.85
39.31	247.8	39.44	247.14	43.43	246.84	60.68	247.42	71.39	247.31
72.7	247.26	73.42	247.77	126.3	247.56	126.61	247.89	126.74	247.92
127.57	244.53	128.15	242.33	131.06	242.08	133	241.75	133.14	241.73
135.18	242.19	140.09	243.34	145.42	244.45	149.99	248.38	161	257.81

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	38.71	.02	73.42	.045	126.74	.035	149.99	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 126.74 149.99 60.75 61.7 65.02 .1 .3

Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 95.87 126.74 255 F

Blocked Obstructions num= 1
 Sta L Sta R Elev
 0 20 255

CROSS SECTION OUTPUT Profile #2-YR

```
*****
* E.G. Elev (ft)      * 248.24 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.23  * Wt. n-Val.      * 0.021  * 0.035  * 0.100  *
* W.S. Elev (ft)     * 248.01 * Reach Len. (ft) * 60.75  * 61.70  * 65.02  *
* Crit W.S. (ft)     * 245.73 * Flow Area (sq ft) * 34.98  * 101.09 * 0.60  *
* E.G. Slope (ft/ft) * 0.001751 * Area (sq ft)    * 46.88  * 101.09 * 0.60  *
* Q Total (cfs)      * 491.00 * Flow (cfs)      * 76.54  * 414.46 * 0.16  *
* Top Width (ft)     * 115.80 * Top Width (ft)  * 92.98  * 22.82  * 1.69  *
* Vel Total (ft/s)   * 3.61  * Avg. Vel. (ft/s) * 2.19  * 4.10  * 0.27  *
* Max Chl Dpth (ft)  * 6.28  * Hydr. Depth (ft) * 0.56  * 4.43  * 0.36  *
* Conv. Total (cfs)  * 11733.8 * Conv. (cfs)     * 1829.1 * 9904.7 * 4.3  *
* Length Wtd. (ft)   * 61.47 * Wetted Per. (ft) * 63.09  * 28.83  * 1.84  *
* Min Ch El (ft)     * 241.73 * Shear (lb/sq ft) * 0.06  * 0.38  * 0.03  *
* Alpha              * 1.15  * Stream Power (lb/ft s) * 161.00 * 0.00  * 0.00  *
* Frctn Loss (ft)    * 0.08  * Cum Volume (acre-ft) * 0.20  * 2.44  * 2.12  *
* C & E Loss (ft)    * 0.03  * Cum SA (acres)   * 0.56  * 0.79  * 2.05  *
*****
```


Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```
*****
* E.G. Elev (ft)      * 250.44 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.20  * Wt. n-Val.      * 0.026  * 0.035  * 0.100  *
* W.S. Elev (ft)     * 250.24 * Reach Len. (ft) * 60.75  * 61.70  * 65.02  *
* Crit W.S. (ft)     * 248.43 * Flow Area (sq ft) * 197.01 * 152.94 * 2.02  *
* E.G. Slope (ft/ft) * 0.000922 * Area (sq ft)    * 277.86 * 152.94 * 2.02  *
* Q Total (cfs)      * 1237.00 * Flow (cfs)      * 644.32 * 591.96 * 0.72  *
* Top Width (ft)     * 132.16 * Top Width (ft)  * 106.74 * 23.25  * 2.17  *
* Vel Total (ft/s)   * 3.51  * Avg. Vel. (ft/s) * 3.27  * 3.87  * 0.36  *
* Max Chl Dpth (ft) * 8.51  * Hydr. Depth (ft) * 2.60  * 6.58  * 0.93  *
* Conv. Total (cfs)  * 40733.9 * Conv. (cfs)     * 21217.2 * 19492.8 * 23.9  *
* Length Wtd. (ft)  * 61.16  * Wetted Per. (ft) * 78.05  * 29.40  * 2.86  *
* Min Ch El (ft)    * 241.73 * Shear (lb/sq ft) * 0.15  * 0.30  * 0.04  *
* Alpha             * 1.03  * Stream Power (lb/ft s) * 161.00 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 0.05  * Cum Volume (acre-ft) * 1.22  * 6.36  * 1.12  *
* C & E Loss (ft)   * 0.02  * Cum SA (acres)   * 1.24  * 0.83  * 1.71  *
*****
```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```
*****
* E.G. Elev (ft)      * 252.33 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.34  * Wt. n-Val.      * 0.027  * 0.035  * 0.100  *
* W.S. Elev (ft)     * 251.99 * Reach Len. (ft) * 60.75  * 61.70  * 65.02  *
* Crit W.S. (ft)     * 249.48 * Flow Area (sq ft) * 329.98 * 193.69 * 7.63  *
* E.G. Slope (ft/ft) * 0.001017 * Area (sq ft)    * 464.93 * 193.69 * 7.63  *
* Q Total (cfs)      * 2442.00 * Flow (cfs)      * 1515.80 * 921.74 * 4.46  *
* Top Width (ft)     * 134.21 * Top Width (ft)  * 106.74 * 23.25  * 4.22  *
* Vel Total (ft/s)   * 4.60  * Avg. Vel. (ft/s) * 4.59  * 4.76  * 0.59  *
* Max Chl Dpth (ft) * 10.26 * Hydr. Depth (ft) * 4.35  * 8.33  * 1.81  *
* Conv. Total (cfs)  * 76557.1 * Conv. (cfs)     * 47520.4 * 28896.7 * 140.0 *
* Length Wtd. (ft)  * 61.08  * Wetted Per. (ft) * 79.80  * 29.40  * 5.56  *
* Min Ch El (ft)    * 241.73 * Shear (lb/sq ft) * 0.26  * 0.42  * 0.09  *
* Alpha             * 1.02  * Stream Power (lb/ft s) * 161.00 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 0.05  * Cum Volume (acre-ft) * 2.48  * 10.39 * 3.10  *
* C & E Loss (ft)   * 0.03  * Cum SA (acres)   * 1.56  * 0.84  * 2.44  *
*****
```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```
*****
* E.G. Elev (ft)      * 253.34 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.44  * Wt. n-Val.      * 0.027  * 0.035  * 0.100  *
* W.S. Elev (ft)     * 252.90 * Reach Len. (ft) * 60.75  * 61.70  * 65.02  *
* Crit W.S. (ft)     * 250.04 * Flow Area (sq ft) * 398.96 * 214.83 * 11.95  *
* E.G. Slope (ft/ft) * 0.001095 * Area (sq ft)    * 561.99 * 214.83 * 11.95  *
* Q Total (cfs)      * 3270.00 * Flow (cfs)      * 2125.28 * 1136.30 * 8.42  *
* Top Width (ft)     * 135.27 * Top Width (ft)  * 106.74 * 23.25  * 5.28  *
* Vel Total (ft/s)   * 5.23  * Avg. Vel. (ft/s) * 5.33  * 5.29  * 0.71  *
* Max Chl Dpth (ft) * 11.17 * Hydr. Depth (ft) * 5.26  * 9.24  * 2.26  *
* Conv. Total (cfs)  * 98829.3 * Conv. (cfs)     * 64232.4 * 34342.3 * 254.6 *
* Length Wtd. (ft)  * 61.06  * Wetted Per. (ft) * 80.71  * 29.40  * 6.95  *
* Min Ch El (ft)    * 241.73 * Shear (lb/sq ft) * 0.34  * 0.50  * 0.12  *
* Alpha             * 1.03  * Stream Power (lb/ft s) * 161.00 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 0.05  * Cum Volume (acre-ft) * 3.13  * 12.54 * 4.16  *
* C & E Loss (ft)   * 0.04  * Cum SA (acres)   * 1.70  * 0.84  * 2.72  *
*****
```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

```
*****
* E.G. Elev (ft)      * 250.57 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.21  * Wt. n-Val.      * 0.026  * 0.035  * 0.100  *
* W.S. Elev (ft)     * 250.36 * Reach Len. (ft) * 60.75  * 61.70  * 65.02  *
* Crit W.S. (ft)     * 248.51 * Flow Area (sq ft) * 205.72 * 155.61 * 2.28  *
* E.G. Slope (ft/ft) * 0.000950 * Area (sq ft)    * 290.11 * 155.61 * 2.28  *
* Q Total (cfs)      * 1318.00 * Flow (cfs)      * 698.89 * 618.25 * 0.86  *
* Top Width (ft)     * 132.30 * Top Width (ft)  * 106.74 * 23.25  * 2.31  *
* Vel Total (ft/s)   * 3.62  * Avg. Vel. (ft/s) * 3.40  * 3.97  * 0.38  *
* Max Chl Dpth (ft) * 8.63  * Hydr. Depth (ft) * 2.71  * 6.69  * 0.99  *
*****
```

```

* Conv. Total (cfs)      * 42771.1 * Conv. (cfs)          * 22680.0 * 20063.1 * 28.0 *
* Length Wtd. (ft)     * 61.15  * Wetted Per. (ft)    * 78.16  * 29.40  * 3.04 *
* Min Ch El (ft)      * 241.73 * Shear (lb/sq ft)    * 0.16   * 0.31   * 0.04 *
* Alpha                * 1.03   * Stream Power (lb/ft s) * 161.00 * 0.00   * 0.00 *
* Frctn Loss (ft)     * 0.05   * Cum Volume (acre-ft) * 1.33   * 6.73   * 1.31 *
* C & E Loss (ft)     * 0.02   * Cum SA (acres)      * 1.26   * 0.84   * 1.77 *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft)       * 251.44 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)       * 0.26  * Wt. n-Val.          * 0.027  * 0.035  * 0.100  *
* W.S. Elev (ft)     * 251.17 * Reach Len. (ft)     * 60.75  * 61.70  * 65.02  *
* Crit W.S. (ft)     * 248.99 * Flow Area (sq ft)   * 267.75 * 174.62 * 4.56   *
* E.G. Slope (ft/ft) * 0.000960 * Area (sq ft)       * 377.39 * 174.62 * 4.56   *
* Q Total (cfs)      * 1815.00 * Flow (cfs)         * 1059.41 * 753.41 * 2.18   *
* Top Width (ft)     * 133.25 * Top Width (ft)     * 106.74 * 23.25  * 3.26   *
* Vel Total (ft/s)   * 4.06  * Avg. Vel. (ft/s)   * 3.96   * 4.31   * 0.48   *
* Max Chl Dpth (ft) * 9.44  * Hydr. Depth (ft)   * 3.53   * 7.51   * 1.40   *
* Conv. Total (cfs) * 58570.1 * Conv. (cfs)        * 34187.1 * 24312.5 * 70.5   *
* Length Wtd. (ft)  * 61.11 * Wetted Per. (ft)   * 78.98  * 29.40  * 4.30   *
* Min Ch El (ft)    * 241.73 * Shear (lb/sq ft)   * 0.20   * 0.36   * 0.06   *
* Alpha              * 1.02   * Stream Power (lb/ft s) * 161.00 * 0.00   * 0.00   *
* Frctn Loss (ft)   * 0.05   * Cum Volume (acre-ft) * 1.89   * 8.45   * 2.12   *
* C & E Loss (ft)   * 0.02   * Cum SA (acres)     * 1.43   * 0.84   * 2.05   *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
REACH: main

RS: 26

INPUT

Description:

Station Elevation Data num= 36

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	257.78	20	251.78	20.48	251.76	20.58	250.83	24.3	250.68
24.56	249.63	29.3	248.97	33.54	247.03	37.14	246.75	37.25	246.32
40	246.47	53.02	246.87	67.72	246.7	69.59	246.62	71.15	246.17
71.18	247.08	74.6	247.24	97.24	247.51	107.98	247.72	111.72	247.58
112.26	248.1	112.8	247.58	114	243.79	115.64	239.33	116.82	240.91
117.57	241.91	118.99	240.94	125.05	242.14	126.06	243.1	129.39	244.4
134.13	247.88	136.05	249.09	136.62	250.19	137.14	250.23	142.14	250.89
152.72	258.34								

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	33.54	.02	74.6	.045	112.8	.035	134.13	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
112.8 134.13 83.06 84.96 87.67 .1 .3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
0	20	260

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft)       * 248.12 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)       * 0.13  * Wt. n-Val.          * 0.022  * 0.035  * 0.100  *
* W.S. Elev (ft)     * 247.99 * Reach Len. (ft)     * 83.06  * 84.96  * 87.67  *
* Crit W.S. (ft)     *      * Flow Area (sq ft)   * 71.97  * 104.33 * 0.01   *
* E.G. Slope (ft/ft) * 0.001102 * Area (sq ft)       * 71.97  * 104.33 * 0.01   *
* Q Total (cfs)      * 491.00 * Flow (cfs)         * 158.64 * 332.36 * 0.00   *
* Top Width (ft)     * 102.66 * Top Width (ft)     * 81.15  * 21.33  * 0.18   *
* Vel Total (ft/s)   * 2.78  * Avg. Vel. (ft/s)   * 2.20   * 3.19   * 0.07   *
* Max Chl Dpth (ft) * 8.66  * Hydr. Depth (ft)   * 0.89   * 4.89   * 0.06   *
* Conv. Total (cfs) * 14793.2 * Conv. (cfs)        * 4779.5 * 10013.7 * 0.0    *
* Length Wtd. (ft)  * 84.58 * Wetted Per. (ft)   * 83.00  * 30.70  * 0.21   *
* Min Ch El (ft)    * 239.33 * Shear (lb/sq ft)   * 0.06   * 0.23   * 0.00   *
* Alpha              * 1.09   * Stream Power (lb/ft s) * 152.72 * 0.00   * 0.00   *
*****

```

```

* Frctn Loss (ft)          * 0.06 * Cum Volume (acre-ft) * 0.12 * 2.29 * 0.01 *
* C & E Loss (ft)        * 0.01 * Cum SA (acres) * 0.44 * 0.76 * 0.12 *
*****

```

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)          * 250.38 * Element * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.14 * Wt. n-Val. * 0.026 * 0.035 * 0.100 *
* W.S. Elev (ft)         * 250.24 * Reach Len. (ft) * 83.06 * 84.96 * 87.67 *
* Crit W.S. (ft)         * * * Flow Area (sq ft) * 262.87 * 152.22 * 3.72 *
* E.G. Slope (ft/ft)     * 0.000605 * Area (sq ft) * 262.87 * 152.22 * 3.72 *
* Q Total (cfs)          * 1237.00 * Flow (cfs) * 773.34 * 462.39 * 1.28 *
* Top Width (ft)         * 112.80 * Top Width (ft) * 88.39 * 21.33 * 3.08 *
* Vel Total (ft/s)       * 2.95 * Avg. Vel. (ft/s) * 2.94 * 3.04 * 0.34 *
* Max Chl Dpth (ft)     * 10.91 * Hydr. Depth (ft) * 2.97 * 7.14 * 1.21 *
* Conv. Total (cfs)     * 50275.9 * Conv. (cfs) * 31431.0 * 18793.0 * 51.9 *
* Length Wtd. (ft)      * 84.04 * Wetted Per. (ft) * 91.07 * 30.70 * 4.10 *
* Min Ch El (ft)        * 239.33 * Shear (lb/sq ft) * 0.11 * 0.19 * 0.03 *
* Alpha                  * 1.02 * Stream Power (lb/ft s) * 152.72 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.05 * Cum Volume (acre-ft) * 0.84 * 6.15 * 1.12 *
* C & E Loss (ft)       * 0.00 * Cum SA (acres) * 1.10 * 0.80 * 1.71 *
*****

```

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)          * 252.25 * Element * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.24 * Wt. n-Val. * 0.027 * 0.035 * 0.100 *
* W.S. Elev (ft)         * 252.01 * Reach Len. (ft) * 83.06 * 84.96 * 87.67 *
* Crit W.S. (ft)         * * * Flow Area (sq ft) * 424.27 * 189.96 * 17.18 *
* E.G. Slope (ft/ft)     * 0.000695 * Area (sq ft) * 424.27 * 189.96 * 17.18 *
* Q Total (cfs)          * 2442.00 * Flow (cfs) * 1716.28 * 716.67 * 9.05 *
* Top Width (ft)         * 123.73 * Top Width (ft) * 92.80 * 21.33 * 9.60 *
* Vel Total (ft/s)       * 3.87 * Avg. Vel. (ft/s) * 4.05 * 3.77 * 0.53 *
* Max Chl Dpth (ft)     * 12.68 * Hydr. Depth (ft) * 4.57 * 8.91 * 1.79 *
* Conv. Total (cfs)     * 92625.7 * Conv. (cfs) * 65099.1 * 27183.4 * 343.2 *
* Length Wtd. (ft)      * 83.84 * Wetted Per. (ft) * 96.89 * 30.70 * 11.02 *
* Min Ch El (ft)        * 239.33 * Shear (lb/sq ft) * 0.19 * 0.27 * 0.07 *
* Alpha                  * 1.05 * Stream Power (lb/ft s) * 152.72 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.05 * Cum Volume (acre-ft) * 1.86 * 10.11 * 3.09 *
* C & E Loss (ft)       * 0.00 * Cum SA (acres) * 1.42 * 0.80 * 2.43 *
*****

```

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)          * 253.25 * Element * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.32 * Wt. n-Val. * 0.027 * 0.035 * 0.100 *
* W.S. Elev (ft)         * 252.93 * Reach Len. (ft) * 83.06 * 84.96 * 87.67 *
* Crit W.S. (ft)         * * * Flow Area (sq ft) * 510.07 * 209.68 * 26.66 *
* E.G. Slope (ft/ft)     * 0.000751 * Area (sq ft) * 510.07 * 209.68 * 26.66 *
* Q Total (cfs)          * 3270.00 * Flow (cfs) * 2374.06 * 878.08 * 17.87 *
* Top Width (ft)         * 125.04 * Top Width (ft) * 92.80 * 21.33 * 10.91 *
* Vel Total (ft/s)       * 4.38 * Avg. Vel. (ft/s) * 4.65 * 4.19 * 0.67 *
* Max Chl Dpth (ft)     * 13.60 * Hydr. Depth (ft) * 5.50 * 9.83 * 2.44 *
* Conv. Total (cfs)     * 119348.9 * Conv. (cfs) * 86648.7 * 32048.2 * 652.1 *
* Length Wtd. (ft)      * 83.78 * Wetted Per. (ft) * 97.81 * 30.70 * 12.62 *
* Min Ch El (ft)        * 239.33 * Shear (lb/sq ft) * 0.24 * 0.32 * 0.10 *
* Alpha                  * 1.06 * Stream Power (lb/ft s) * 152.72 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.06 * Cum Volume (acre-ft) * 2.38 * 12.24 * 4.13 *
* C & E Loss (ft)       * 0.00 * Cum SA (acres) * 1.56 * 0.80 * 2.71 *
*****

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CROSS SECTION OUTPUT Profile #6HR OBS

```

*****
* E.G. Elev (ft)          * 250.50 * Element * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.15 * Wt. n-Val. * 0.026 * 0.035 * 0.100 *
* W.S. Elev (ft)         * 250.35 * Reach Len. (ft) * 83.06 * 84.96 * 87.67 *
* Crit W.S. (ft)         * * * Flow Area (sq ft) * 273.05 * 154.68 * 4.13 *
* E.G. Slope (ft/ft)     * 0.000626 * Area (sq ft) * 273.05 * 154.68 * 4.13 *
* Q Total (cfs)          * 1318.00 * Flow (cfs) * 833.66 * 482.98 * 1.36 *
* Top Width (ft)         * 113.70 * Top Width (ft) * 88.42 * 21.33 * 3.95 *
* Vel Total (ft/s)       * 3.05 * Avg. Vel. (ft/s) * 3.05 * 3.12 * 0.33 *
* Max Chl Dpth (ft)     * 11.02 * Hydr. Depth (ft) * 3.09 * 7.25 * 1.05 *
* Conv. Total (cfs)     * 52671.2 * Conv. (cfs) * 33315.6 * 19301.5 * 54.2 *
* Length Wtd. (ft)      * 84.02 * Wetted Per. (ft) * 91.19 * 30.70 * 4.98 *
* Min Ch El (ft)        * 239.33 * Shear (lb/sq ft) * 0.12 * 0.20 * 0.03 *
*****

```

```

* Alpha * 1.02 * Stream Power (lb/ft s) * 152.72 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.05 * Cum Volume (acre-ft) * 0.94 * 6.51 * 1.31 *
* C & E Loss (ft) * 0.00 * Cum SA (acres) * 1.13 * 0.80 * 1.77 *
*****

```

CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft) * 251.37 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.19 * Wt. n-Val. * 0.026 * 0.035 * 0.100 *
* W.S. Elev (ft) * 251.18 * Reach Len. (ft) * 83.06 * 84.96 * 87.67 *
* Crit W.S. (ft) * * * Flow Area (sq ft) * 347.50 * 172.24 * 9.69 *
* E.G. Slope (ft/ft) * 0.000650 * Area (sq ft) * 347.50 * 172.24 * 9.69 *
* Q Total (cfs) * 1815.00 * Flow (cfs) * 1222.60 * 588.69 * 3.70 *
* Top Width (ft) * 122.01 * Top Width (ft) * 92.26 * 21.33 * 8.42 *
* Vel Total (ft/s) * 3.43 * Avg. Vel. (ft/s) * 3.52 * 3.42 * 0.38 *
* Max Chl Dpth (ft) * 11.85 * Hydr. Depth (ft) * 3.77 * 8.08 * 1.15 *
* Conv. Total (cfs) * 71192.3 * Conv. (cfs) * 47955.9 * 23091.1 * 145.3 *
* Length Wtd. (ft) * 83.91 * Wetted Per. (ft) * 95.59 * 30.70 * 9.57 *
* Min Ch El (ft) * 239.33 * Shear (lb/sq ft) * 0.15 * 0.23 * 0.04 *
* Alpha * 1.03 * Stream Power (lb/ft s) * 152.72 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.05 * Cum Volume (acre-ft) * 1.39 * 8.21 * 2.11 *
* C & E Loss (ft) * 0.00 * Cum SA (acres) * 1.30 * 0.80 * 2.04 *
*****

```

CROSS SECTION

RIVER: hudson
REACH: main RS: 25

INPUT

Description:

Station Elevation Data		num= 27	
Sta	Elev	Sta	Elev
0	255.25	50	250.34
89.33	247.2	89.41	246.92
134.13	247.31	136.41	247.39
138.35	239.92	139.66	239.76
153.23	240.93	160.29	244.16
186.91	252.67	194.32	256.17

Manning's n Values		num= 4	
Sta	n Val	Sta	n Val
0	.02	131.96	.045
137.82		137.82	.035
166.89		166.89	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
137.82 166.89 29.59 30.248 33.09 .1 .3

Ineffective Flow		num= 2	
Sta L	Sta R	Elev	Permanent
18	68	260	F
184.35	189.68	265	F

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft) * 248.06 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.09 * Wt. n-Val. * 0.021 * 0.035 * 0.100 *
* W.S. Elev (ft) * 247.96 * Reach Len. (ft) * 29.59 * 30.25 * 33.09 *
* Crit W.S. (ft) * 242.87 * Flow Area (sq ft) * 34.72 * 179.45 * 1.38 *
* E.G. Slope (ft/ft) * 0.000448 * Area (sq ft) * 34.72 * 179.45 * 1.38 *
* Q Total (cfs) * 491.00 * Flow (cfs) * 39.74 * 451.02 * 0.24 *
* Top Width (ft) * 84.77 * Top Width (ft) * 52.49 * 29.05 * 3.23 *
* Vel Total (ft/s) * 2.28 * Avg. Vel. (ft/s) * 1.14 * 2.51 * 0.17 *
* Max Chl Dpth (ft) * 8.64 * Hydr. Depth (ft) * 0.66 * 6.18 * 0.43 *
* Conv. Total (cfs) * 23195.5 * Conv. (cfs) * 1877.4 * 21306.7 * 11.4 *
* Length Wtd. (ft) * 30.22 * Wetted Per. (ft) * 53.08 * 38.37 * 3.34 *
* Min Ch El (ft) * 239.32 * Shear (lb/sq ft) * 0.02 * 0.13 * 0.01 *
* Alpha * 1.14 * Stream Power (lb/ft s) * 194.32 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.02 * Cum Volume (acre-ft) * 0.02 * 2.02 * 0.00 *
* C & E Loss (ft) * 0.01 * Cum SA (acres) * 0.31 * 0.71 * 0.11 *
*****

```

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)          * 250.33 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.14  * Wt. n-Val.      * 0.021  * 0.035  * 0.100  *
* W.S. Elev (ft)         * 250.18 * Reach Len. (ft) * 29.59  * 30.25  * 33.09  *
* Crit W.S. (ft)         * 245.28 * Flow Area (sq ft) * 161.27 * 243.97 * 17.86  *
* E.G. Slope (ft/ft)     * 0.000498 * Area (sq ft)    * 161.27 * 243.97 * 17.86  *
* Q Total (cfs)          * 1237.00 * Flow (cfs)      * 439.39 * 789.90 * 7.71   *
* Top Width (ft)         * 109.77 * Top Width (ft)  * 69.08  * 29.07  * 11.62  *
* Vel Total (ft/s)       * 2.92  * Avg. Vel. (ft/s) * 2.72   * 3.24   * 0.43   *
* Max Chl Dpth (ft)      * 10.86  * Hydr. Depth (ft) * 2.33   * 8.39   * 1.54   *
* Conv. Total (cfs)      * 55422.2 * Conv. (cfs)     * 19686.2 * 35390.4 * 345.6  *
* Length Wtd. (ft)       * 29.98  * Wetted Per. (ft) * 70.12  * 38.63  * 12.02  *
* Min Ch El (ft)         * 239.32 * Shear (lb/sq ft) * 0.07   * 0.20   * 0.05   *
* Alpha                  * 1.09   * Stream Power (lb/ft s) * 194.32 * 0.00   * 0.00   *
* Frctn Loss (ft)        * 0.02   * Cum Volume (acre-ft) * 0.44   * 5.76   * 1.09   *
* C & E Loss (ft)        * 0.01   * Cum SA (acres)    * 0.95   * 0.75   * 1.69   *
*****

```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)          * 252.20 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.27  * Wt. n-Val.      * 0.021  * 0.035  * 0.100  *
* W.S. Elev (ft)         * 251.93 * Reach Len. (ft) * 29.59  * 30.25  * 33.09  *
* Crit W.S. (ft)         * 248.60 * Flow Area (sq ft) * 282.91 * 294.62 * 43.78  *
* E.G. Slope (ft/ft)     * 0.000599 * Area (sq ft)    * 324.34 * 294.62 * 43.83  *
* Q Total (cfs)          * 2442.00 * Flow (cfs)      * 1226.95 * 1186.32 * 28.73  *
* Top Width (ft)         * 151.04 * Top Width (ft)  * 103.98 * 29.07  * 17.99  *
* Vel Total (ft/s)       * 3.93  * Avg. Vel. (ft/s) * 4.34   * 4.03   * 0.66   *
* Max Chl Dpth (ft)      * 12.61  * Hydr. Depth (ft) * 4.05   * 10.13  * 2.51   *
* Conv. Total (cfs)      * 99764.3 * Conv. (cfs)     * 50125.2 * 48465.3 * 1173.8 *
* Length Wtd. (ft)       * 29.90  * Wetted Per. (ft) * 70.86  * 38.63  * 18.06  *
* Min Ch El (ft)         * 239.32 * Shear (lb/sq ft) * 0.15   * 0.29   * 0.09   *
* Alpha                  * 1.12   * Stream Power (lb/ft s) * 194.32 * 0.00   * 0.00   *
* Frctn Loss (ft)        * 0.03   * Cum Volume (acre-ft) * 1.15   * 9.64   * 3.02   *
* C & E Loss (ft)        * 0.02   * Cum SA (acres)    * 1.23   * 0.76   * 2.40   *
*****

```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)          * 253.19 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.36  * Wt. n-Val.      * 0.021  * 0.035  * 0.100  *
* W.S. Elev (ft)         * 252.82 * Reach Len. (ft) * 29.59  * 30.25  * 33.09  *
* Crit W.S. (ft)         * 249.22 * Flow Area (sq ft) * 345.52 * 320.69 * 59.44  *
* E.G. Slope (ft/ft)     * 0.000655 * Area (sq ft)    * 421.67 * 320.69 * 61.05  *
* Q Total (cfs)          * 3270.00 * Flow (cfs)      * 1791.84 * 1428.17 * 49.99  *
* Top Width (ft)         * 162.52 * Top Width (ft)  * 113.11 * 29.07  * 20.34  *
* Vel Total (ft/s)       * 4.51  * Avg. Vel. (ft/s) * 5.19   * 4.45   * 0.84   *
* Max Chl Dpth (ft)      * 13.50  * Hydr. Depth (ft) * 4.95   * 11.03  * 3.40   *
* Conv. Total (cfs)      * 127809.5 * Conv. (cfs)     * 70034.8 * 55820.9 * 1953.9 *
* Length Wtd. (ft)       * 29.88  * Wetted Per. (ft) * 70.86  * 38.63  * 18.06  *
* Min Ch El (ft)         * 239.32 * Shear (lb/sq ft) * 0.20   * 0.34   * 0.13   *
* Alpha                  * 1.15   * Stream Power (lb/ft s) * 194.32 * 0.00   * 0.00   *
* Frctn Loss (ft)        * 0.03   * Cum Volume (acre-ft) * 1.49   * 11.73  * 4.04   *
* C & E Loss (ft)        * 0.03   * Cum SA (acres)    * 1.37   * 0.76   * 2.68   *
*****

```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

```

*****
* E.G. Elev (ft)          * 250.45 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.16  * Wt. n-Val.      * 0.021  * 0.035  * 0.100  *
* W.S. Elev (ft)         * 250.30 * Reach Len. (ft) * 29.59  * 30.25  * 33.09  *
*****

```

```

* Crit W.S. (ft) * 245.50 * Flow Area (sq ft) * 169.11 * 247.24 * 19.19 *
* E.G. Slope (ft/ft) * 0.000521 * Area (sq ft) * 169.17 * 247.24 * 19.19 *
* Q Total (cfs) * 1318.00 * Flow (cfs) * 483.18 * 826.14 * 8.68 *
* Top Width (ft) * 112.41 * Top Width (ft) * 71.30 * 29.07 * 12.05 *
* Vel Total (ft/s) * 3.03 * Avg. Vel. (ft/s) * 2.86 * 3.34 * 0.45 *
* Max Chl Dpth (ft) * 10.98 * Hydr. Depth (ft) * 2.42 * 8.50 * 1.59 *
* Conv. Total (cfs) * 57727.7 * Conv. (cfs) * 21163.0 * 36184.4 * 380.4 *
* Length Wtd. (ft) * 29.98 * Wetted Per. (ft) * 70.86 * 38.63 * 12.46 *
* Min Ch El (ft) * 239.32 * Shear (lb/sq ft) * 0.08 * 0.21 * 0.05 *
* Alpha * 1.09 * Stream Power (lb/ft s) * 194.32 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.02 * Cum Volume (acre-ft) * 0.51 * 6.12 * 1.28 *
* C & E Loss (ft) * 0.01 * Cum SA (acres) * 0.98 * 0.75 * 1.75 *
*****

```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft) * 251.31 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.20 * Wt. n-Val. * 0.021 * 0.035 * 0.100 *
* W.S. Elev (ft) * 251.11 * Reach Len. (ft) * 29.59 * 30.25 * 33.09 *
* Crit W.S. (ft) * 246.67 * Flow Area (sq ft) * 226.08 * 270.96 * 30.28 *
* E.G. Slope (ft/ft) * 0.000552 * Area (sq ft) * 243.08 * 270.96 * 30.28 *
* Q Total (cfs) * 1815.00 * Flow (cfs) * 808.65 * 989.95 * 16.41 *
* Top Width (ft) * 139.89 * Top Width (ft) * 95.69 * 29.07 * 15.13 *
* Vel Total (ft/s) * 3.44 * Avg. Vel. (ft/s) * 3.58 * 3.65 * 0.54 *
* Max Chl Dpth (ft) * 11.79 * Hydr. Depth (ft) * 3.24 * 9.32 * 2.00 *
* Conv. Total (cfs) * 77284.5 * Conv. (cfs) * 34432.9 * 42153.0 * 698.6 *
* Length Wtd. (ft) * 29.93 * Wetted Per. (ft) * 70.86 * 38.63 * 15.65 *
* Min Ch El (ft) * 239.32 * Shear (lb/sq ft) * 0.11 * 0.24 * 0.07 *
* Alpha * 1.10 * Stream Power (lb/ft s) * 194.32 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.02 * Cum Volume (acre-ft) * 0.82 * 7.77 * 2.07 *
* C & E Loss (ft) * 0.02 * Cum SA (acres) * 1.12 * 0.76 * 2.02 *
*****

```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
REACH: main RS: 24

INPUT

Description:

Station Elevation Data num= 26

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	254.15	60	249.15	72.46	248.78	93.03	247.76	97.13	247.24
109.77	247.72	125.05	247.56	126.78	247.48	128.29	247.42	129	247.97
134.47	248.34	134.6	249.05	135.81	248.92	136.29	242.7	136.51	238.47
137.41	237.99	142.41	237.72	142.42	237.71	147.58	238.1	148.73	238.76
148.9	242.62	149.32	249.18	149.64	249.21	149.95	249.15	171.17	251.7
181.17	253.7								

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.02	129	.045	135.81	.035	149.95	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
135.81 149.32 615.41 591.97 573.52 .3 .5

Ineffective Flow num= 1
Sta L Sta R Elev Permanent
0 65 260 F

Blocked Obstructions num= 1
Sta L Sta R Elev
171.7 181.17 260

CROSS SECTION OUTPUT Profile #2-YR

* E.G. Elev (ft)	* 248.02	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 0.23	* Wt. n-Val.	* 0.020	* 0.035	*	*
* W.S. Elev (ft)	* 247.79	* Reach Len. (ft)	* 615.41	* 591.97	* 573.52	*
* Crit W.S. (ft)	* 241.64	* Flow Area (sq ft)	* 8.61	* 124.85	*	*
* E.G. Slope (ft/ft)	* 0.001288	* Area (sq ft)	* 8.61	* 124.85	*	*
* Q Total (cfs)	* 491.00	* Flow (cfs)	* 8.75	* 482.25	*	*
* Top Width (ft)	* 49.75	* Top Width (ft)	* 36.42	* 13.33	*	*
* Vel Total (ft/s)	* 3.68	* Avg. Vel. (ft/s)	* 1.02	* 3.86	*	*
* Max Chl Dpth (ft)	* 10.08	* Hydr. Depth (ft)	* 0.24	* 9.36	*	*
* Conv. Total (cfs)	* 13679.3	* Conv. (cfs)	* 243.8	* 13435.6	*	*
* Length Wtd. (ft)	* 591.97	* Wetted Per. (ft)	* 36.59	* 30.93	*	*
* Min Ch El (ft)	* 237.71	* Shear (lb/sq ft)	* 0.02	* 0.32	*	*
* Alpha	* 1.08	* Stream Power (lb/ft s)	* 181.17	* 0.00	* 0.00	*
* Frctn Loss (ft)	*	* Cum Volume (acre-ft)	* 0.00	* 1.91	* 0.00	*
* C & E Loss (ft)	*	* Cum SA (acres)	* 0.28	* 0.70	* 0.11	*

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 250.29	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 0.26	* Wt. n-Val.	* 0.021	* 0.035	* 0.073	*
* W.S. Elev (ft)	* 250.03	* Reach Len. (ft)	* 615.41	* 591.97	* 573.52	*
* Crit W.S. (ft)	* 244.75	* Flow Area (sq ft)	* 145.62	* 154.99	* 3.78	*
* E.G. Slope (ft/ft)	* 0.001243	* Area (sq ft)	* 155.08	* 154.99	* 3.78	*
* Q Total (cfs)	* 1237.00	* Flow (cfs)	* 590.66	* 644.66	* 1.69	*
* Top Width (ft)	* 107.89	* Top Width (ft)	* 86.40	* 13.51	* 7.98	*
* Vel Total (ft/s)	* 4.06	* Avg. Vel. (ft/s)	* 4.06	* 4.16	* 0.45	*
* Max Chl Dpth (ft)	* 12.32	* Hydr. Depth (ft)	* 2.06	* 11.47	* 0.47	*
* Conv. Total (cfs)	* 35088.9	* Conv. (cfs)	* 16754.6	* 18286.4	* 47.9	*
* Length Wtd. (ft)	* 591.97	* Wetted Per. (ft)	* 71.68	* 33.45	* 8.04	*
* Min Ch El (ft)	* 237.71	* Shear (lb/sq ft)	* 0.16	* 0.36	* 0.04	*
* Alpha	* 1.02	* Stream Power (lb/ft s)	* 181.17	* 0.00	* 0.00	*
* Frctn Loss (ft)	*	* Cum Volume (acre-ft)	* 0.33	* 5.62	* 1.09	*
* C & E Loss (ft)	*	* Cum SA (acres)	* 0.90	* 0.74	* 1.68	*

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 252.15	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 0.49	* Wt. n-Val.	* 0.021	* 0.035	* 0.086	*
* W.S. Elev (ft)	* 251.65	* Reach Len. (ft)	* 615.41	* 591.97	* 573.52	*
* Crit W.S. (ft)	* 249.58	* Flow Area (sq ft)	* 260.31	* 176.87	* 27.61	*
* E.G. Slope (ft/ft)	* 0.001323	* Area (sq ft)	* 310.77	* 176.87	* 27.61	*
* Q Total (cfs)	* 2442.00	* Flow (cfs)	* 1592.50	* 828.88	* 20.62	*
* Top Width (ft)	* 140.81	* Top Width (ft)	* 105.84	* 13.51	* 21.46	*
* Vel Total (ft/s)	* 5.25	* Avg. Vel. (ft/s)	* 6.12	* 4.69	* 0.75	*
* Max Chl Dpth (ft)	* 13.94	* Hydr. Depth (ft)	* 3.68	* 13.09	* 1.29	*
* Conv. Total (cfs)	* 67139.8	* Conv. (cfs)	* 43783.9	* 22789.0	* 566.9	*
* Length Wtd. (ft)	* 591.97	* Wetted Per. (ft)	* 71.68	* 33.45	* 21.61	*
* Min Ch El (ft)	* 237.71	* Shear (lb/sq ft)	* 0.30	* 0.44	* 0.11	*
* Alpha	* 1.15	* Stream Power (lb/ft s)	* 181.17	* 0.00	* 0.00	*
* Frctn Loss (ft)	*	* Cum Volume (acre-ft)	* 0.93	* 9.48	* 3.00	*
* C & E Loss (ft)	*	* Cum SA (acres)	* 1.16	* 0.74	* 2.39	*

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 253.13	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 0.67	* Wt. n-Val.	* 0.021	* 0.035	* 0.090	*
* W.S. Elev (ft)	* 252.45	* Reach Len. (ft)	* 615.41	* 591.97	* 573.52	*
* Crit W.S. (ft)	* 250.10	* Flow Area (sq ft)	* 316.98	* 187.68	* 45.46	*
* E.G. Slope (ft/ft)	* 0.001411	* Area (sq ft)	* 399.33	* 187.68	* 45.46	*
* Q Total (cfs)	* 3270.00	* Flow (cfs)	* 2280.22	* 945.13	* 44.65	*
* Top Width (ft)	* 151.34	* Top Width (ft)	* 115.45	* 13.51	* 22.38	*
* Vel Total (ft/s)	* 5.94	* Avg. Vel. (ft/s)	* 7.19	* 5.04	* 0.98	*
* Max Chl Dpth (ft)	* 14.74	* Hydr. Depth (ft)	* 4.48	* 13.89	* 2.03	*
* Conv. Total (cfs)	* 87042.1	* Conv. (cfs)	* 60695.8	* 25157.9	* 1188.4	*
* Length Wtd. (ft)	* 591.97	* Wetted Per. (ft)	* 71.68	* 33.45	* 23.20	*
* Min Ch El (ft)	* 237.71	* Shear (lb/sq ft)	* 0.39	* 0.49	* 0.17	*
* Alpha	* 1.23	* Stream Power (lb/ft s)	* 181.17	* 0.00	* 0.00	*
* Frctn Loss (ft)	*	* Cum Volume (acre-ft)	* 1.22	* 11.55	* 4.00	*

* C & E Loss (ft) * * Cum SA (acres) * 1.29 * 0.74 * 2.66 *

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #6HR OBS

 * E.G. Elev (ft) * 250.42 * Element * Left OB * Channel * Right OB *
 * Vel Head (ft) * 0.28 * Wt. n-Val. * 0.021 * 0.035 * 0.074 *
 * W.S. Elev (ft) * 250.14 * Reach Len. (ft) * 615.41 * 591.97 * 573.52 *
 * Crit W.S. (ft) * 245.05 * Flow Area (sq ft) * 152.86 * 156.37 * 4.64 *
 * E.G. Slope (ft/ft) * 0.001285 * Area (sq ft) * 163.98 * 156.37 * 4.64 *
 * Q Total (cfs) * 1318.00 * Flow (cfs) * 650.60 * 665.20 * 2.20 *
 * Top Width (ft) * 109.97 * Top Width (ft) * 87.63 * 13.51 * 8.83 *
 * Vel Total (ft/s) * 4.20 * Avg. Vel. (ft/s) * 4.26 * 4.25 * 0.48 *
 * Max Chl Dpth (ft) * 12.43 * Hydr. Depth (ft) * 2.16 * 11.57 * 0.53 *
 * Conv. Total (cfs) * 36772.1 * Conv. (cfs) * 18151.6 * 18559.0 * 61.5 *
 * Length Wtd. (ft) * 591.97 * Wetted Per. (ft) * 71.68 * 33.45 * 8.89 *
 * Min Ch El (ft) * 237.71 * Shear (lb/sq ft) * 0.17 * 0.37 * 0.04 *
 * Alpha * 1.03 * Stream Power (lb/ft s) * 181.17 * 0.00 * 0.00 *
 * Frctn Loss (ft) * * Cum Volume (acre-ft) * 0.40 * 5.98 * 1.28 *
 * C & E Loss (ft) * * Cum SA (acres) * 0.92 * 0.74 * 1.74 *

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #24HR OBS

 * E.G. Elev (ft) * 251.27 * Element * Left OB * Channel * Right OB *
 * Vel Head (ft) * 0.37 * Wt. n-Val. * 0.021 * 0.035 * 0.082 *
 * W.S. Elev (ft) * 250.91 * Reach Len. (ft) * 615.41 * 591.97 * 573.52 *
 * Crit W.S. (ft) * 249.12 * Flow Area (sq ft) * 207.54 * 166.80 * 13.93 *
 * E.G. Slope (ft/ft) * 0.001267 * Area (sq ft) * 235.22 * 166.80 * 13.93 *
 * Q Total (cfs) * 1815.00 * Flow (cfs) * 1070.83 * 735.63 * 8.54 *
 * Top Width (ft) * 125.66 * Top Width (ft) * 96.90 * 13.51 * 15.25 *
 * Vel Total (ft/s) * 4.67 * Avg. Vel. (ft/s) * 5.16 * 4.41 * 0.61 *
 * Max Chl Dpth (ft) * 13.20 * Hydr. Depth (ft) * 2.93 * 12.35 * 0.91 *
 * Conv. Total (cfs) * 50993.5 * Conv. (cfs) * 30085.7 * 20668.0 * 239.8 *
 * Length Wtd. (ft) * 591.97 * Wetted Per. (ft) * 71.68 * 33.45 * 15.37 *
 * Min Ch El (ft) * 237.71 * Shear (lb/sq ft) * 0.23 * 0.39 * 0.07 *
 * Alpha * 1.08 * Stream Power (lb/ft s) * 181.17 * 0.00 * 0.00 *
 * Frctn Loss (ft) * * Cum Volume (acre-ft) * 0.66 * 7.62 * 2.05 *
 * C & E Loss (ft) * * Cum SA (acres) * 1.05 * 0.74 * 2.01 *

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CULVERT

RIVER: hudson

REACH: main RS: 20

INPUT

Description:

Distance from Upstream XS = 2

Deck/Roadway Width = 566

Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num=

3

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
135.81	249.15				137	249.15				152	249.15			

Upstream Bridge Cross Section Data

Station Elevation Data num= 26

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	254.15	60	249.15	72.46	248.78	93.03	247.76	97.13	247.24
109.77	247.72	125.05	247.56	126.78	247.48	128.29	247.42	129	247.97
134.47	248.34	134.6	249.05	135.81	248.92	136.29	242.7	136.51	238.47
137.41	237.99	142.41	237.72	142.42	237.71	147.58	238.1	148.73	238.76
148.9	242.62	149.32	249.18	149.64	249.21	149.95	249.15	171.17	251.7
181.17	253.7								

Manning's n Values

num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val

 0 .02 129 .045 135.81 .035 149.95 .1

Bank Sta: Left Right Coeff Contr. Expan.
 135.81 149.32 .3 .5

Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 0 65 260 F

Blocked Obstructions num= 1
 Sta L Sta R Elev

 171.7 181.17 260

Downstream Deck/Roadway Coordinates
 num= 9

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
0	245.5				46	242.55				49	242.28			
69	236.72				88	232.44				113	231.06			
131	231.6				162	233.79				183	235.96			

Downstream Bridge Cross Section Data

Station	Elevation	Data	num=	27					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	248.1	14.71	237.72	23.72	231	25.86	230	28.49	229
38.71	227	42.25	227	50.16	227	55.6	228.96	71.32	229.8
113.72	230.51	160.05	232.96	160.35	232.96	186.93	237.56	188.11	241.98
189.39	242.3	193.37	242.37	197.27	242.28	197.37	242.11	217.75	242.56
234.11	241.83	235.6	241.71	236.27	242.26	242.78	242.92	249.14	247.54
255.21	248.57	259.08	250.56						

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.08	28.49	.035	55.6	.03	186.93	.04	193.37	.02
236.27	.06								

Bank Sta: Left Right Coeff Contr. Expan.
 23.72 55.6 .3 .5

Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 147.8 188 255 F

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
 Downstream Embankment side slope = 0 horiz. to 1.0 vertical
 Maximum allowable submergence for weir flow = 8
 Elevation at which weir flow begins = 244.7
 Energy head used in spillway design =
 Spillway height used in design =
 Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name Shape Rise Span
 Culvert #1 Circular 7
 FHWA Chart # 1 - Concrete Pipe Culvert
 FHWA Scale # 1 - Square edge entrance with headwall
 Solution Criteria = Highest U.S. EG

Culvert	Upstrm	Dist	Length	Top n	Bottom n	Depth	Blocked	Entrance	Loss	Coef	Exit	Loss	Coef
2	566	.024	.024	0	.2	1							

Upstream Elevation = 237.7
 Centerline Station = 142.42
 Downstream Elevation = 227.1
 Centerline Station = 44.43

CULVERT OUTPUT Profile #2-YR Culv Group: Culvert #1

 * Q Culv Group (cfs) * 460.62 * Culv Full Len (ft) * *
 * # Barrels * 1 * Culv Vel US (ft/s) * 13.88 *
 * Q Barrel (cfs) * 460.62 * Culv Vel DS (ft/s) * 14.01 *
 * E.G. US. (ft) * 248.03 * Culv Inv El Up (ft) * 237.70 *
 * W.S. US. (ft) * 247.79 * Culv Inv El Dn (ft) * 227.10 *
 * E.G. DS (ft) * 229.92 * Culv Frctn Ls (ft) * 10.60 *
 * W.S. DS (ft) * 229.78 * Culv Exit Loss (ft) * 5.80 *
 * Delta EG (ft) * 18.11 * Culv Entr Loss (ft) * 1.70 *
 * Delta WS (ft) * 18.01 * Q Weir (cfs) * 30.38 *
 * E.G. IC (ft) * 248.03 * Weir Sta Lft (ft) * 87.83 *
 * E.G. OC (ft) * 246.92 * Weir Sta Rgt (ft) * 129.71 *
 * Culvert Control * Inlet * Weir Submerg * 0.00 *

```

* Culv WS Inlet (ft)      * 243.33 * Weir Max Depth (ft)    * 0.78 *
* Culv WS Outlet (ft)    * 232.68 * Weir Avg Depth (ft)    * 0.41 *
* Culv Nml Depth (ft)    * 5.58 * Weir Flow Area (sq ft) * 17.32 *
* Culv Crt Depth (ft)    * 5.63 * Min El Weir Flow (ft) * 247.25 *
*****

```

Warning: The flow through the culvert is supercritical. However, since there is flow over the road (weir flow), the program cannot determine if the downstream cross section should be subcritical or supercritical. The program used the downstream subcritical answer, even though it may not be valid.

Warning: During the supercritical analysis, the program could not converge on a supercritical answer in the downstream cross section. The program used the solution with the least error.

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.

Note: The flow in the culvert is entirely supercritical.

```

CULVERT OUTPUT Profile #10-YR Culv Group: Culvert #1
*****
* Q Culv Group (cfs)      * 533.55 * Culv Full Len (ft)     * 398.80 *
* # Barrels              * 1      * Culv Vel US (ft/s)     * 13.86 *
* Q Barrel (cfs)         * 533.55 * Culv Vel DS (ft/s)     * 15.19 *
* E.G. US. (ft)          * 250.30 * Culv Inv El Up (ft)    * 237.70 *
* W.S. US. (ft)          * 250.03 * Culv Inv El Dn (ft)    * 227.10 *
* E.G. DS (ft)           * 232.25 * Culv Frctn Ls (ft)     * 13.01 *
* W.S. DS (ft)           * 232.03 * Culv Exit Loss (ft)    * 4.44 *
* Delta EG (ft)          * 18.05 * Culv Entr Loss (ft)    * 0.60 *
* Delta WS (ft)          * 18.00 * Q Weir (cfs)           * 703.46 *
* E.G. IC (ft)           * 250.25 * Weir Sta Lft (ft)      * 65.00 *
* E.G. OC (ft)           * 250.30 * Weir Sta Rgt (ft)     * 159.26 *
* Culvert Control        * Outlet * Weir Submerg          * 0.00 *
* Culv WS Inlet (ft)     * 244.70 * Weir Max Depth (ft)    * 3.03 *
* Culv WS Outlet (ft)    * 233.10 * Weir Avg Depth (ft)    * 1.95 *
* Culv Nml Depth (ft)    * 7.00 * Weir Flow Area (sq ft) * 183.38 *
* Culv Crt Depth (ft)    * 6.00 * Min El Weir Flow (ft) * 247.25 *
*****

```

Note: The normal depth exceeds the height of the culvert. The program assumes that the normal depth is equal to the height of the culvert.

```

CULVERT OUTPUT Profile #50-YR Culv Group: Culvert #1
*****
* Q Culv Group (cfs)      * 557.14 * Culv Full Len (ft)     * 492.08 *
* # Barrels              * 1      * Culv Vel US (ft/s)     * 14.48 *
* Q Barrel (cfs)         * 557.14 * Culv Vel DS (ft/s)     * 15.25 *
* E.G. US. (ft)          * 252.15 * Culv Inv El Up (ft)    * 237.70 *
* W.S. US. (ft)          * 251.65 * Culv Inv El Dn (ft)    * 227.10 *
* E.G. DS (ft)           * 233.77 * Culv Frctn Ls (ft)     * 14.47 *
* W.S. DS (ft)           * 233.42 * Culv Exit Loss (ft)    * 3.25 *
* Delta EG (ft)          * 18.37 * Culv Entr Loss (ft)    * 0.65 *
* Delta WS (ft)          * 18.24 * Q Weir (cfs)           * 1884.86 *
* E.G. IC (ft)           * 252.09 * Weir Sta Lft (ft)      * 65.00 *
* E.G. OC (ft)           * 252.15 * Weir Sta Rgt (ft)     * 171.70 *
* Culvert Control        * Outlet * Weir Submerg          * 0.00 *
* Culv WS Inlet (ft)     * 244.70 * Weir Max Depth (ft)    * 4.90 *
* Culv WS Outlet (ft)    * 233.42 * Weir Avg Depth (ft)    * 3.50 *
* Culv Nml Depth (ft)    * 7.00 * Weir Flow Area (sq ft) * 373.51 *
* Culv Crt Depth (ft)    * 6.10 * Min El Weir Flow (ft) * 247.25 *
*****

```

Note: The normal depth exceeds the height of the culvert. The program assumes that the normal depth is equal to the height of the culvert.

```

CULVERT OUTPUT Profile #100-YR Culv Group: Culvert #1
*****
* Q Culv Group (cfs)      * 563.82 * Culv Full Len (ft)     * 566.00 *
* # Barrels              * 1      * Culv Vel US (ft/s)     * 14.65 *
* Q Barrel (cfs)         * 563.82 * Culv Vel DS (ft/s)     * 14.65 *
* E.G. US. (ft)          * 253.13 * Culv Inv El Up (ft)    * 237.70 *
* W.S. US. (ft)          * 252.45 * Culv Inv El Dn (ft)    * 227.10 *
* E.G. DS (ft)           * 234.54 * Culv Frctn Ls (ft)     * 15.05 *
* W.S. DS (ft)           * 234.08 * Culv Exit Loss (ft)    * 2.87 *
* Delta EG (ft)          * 18.59 * Culv Entr Loss (ft)    * 0.67 *
* Delta WS (ft)          * 18.37 * Q Weir (cfs)           * 2706.18 *
* E.G. IC (ft)           * 253.06 * Weir Sta Lft (ft)      * 65.00 *
* E.G. OC (ft)           * 253.13 * Weir Sta Rgt (ft)     * 171.70 *

```

```

* Culvert Control      * Outlet * Weir Submerg      * 0.00 *
* Culv WS Inlet (ft)  * 244.70 * Weir Max Depth (ft) * 5.90 *
* Culv WS Outlet (ft) * 234.08 * Weir Avg Depth (ft) * 4.50 *
* Culv Nml Depth (ft) * 7.00 * Weir Flow Area (sq ft) * 480.02 *
* Culv Crt Depth (ft) * 6.13 * Min El Weir Flow (ft) * 247.25 *
*****

```

Note: The normal depth exceeds the height of the culvert. The program assumes that the normal depth is equal to the height of the culvert.

```

CULVERT OUTPUT Profile #6HR OBS Culv Group: Culvert #1
*****
* Q Culv Group (cfs)   * 535.08 * Culv Full Len (ft)   * 407.62 *
* # Barrels           * 1      * Culv Vel US (ft/s)   * 13.90 *
* Q Barrel (cfs)      * 535.08 * Culv Vel DS (ft/s)   * 15.22 *
* E.G. US. (ft)       * 250.42 * Culv Inv El Up (ft)  * 237.70 *
* W.S. US. (ft)       * 250.14 * Culv Inv El Dn (ft)  * 227.10 *
* E.G. DS (ft)        * 232.36 * Culv Frctn Ls (ft)   * 13.11 *
* W.S. DS (ft)        * 232.13 * Culv Exit Loss (ft)  * 4.34 *
* Delta EG (ft)       * 18.05 * Culv Entr Loss (ft)  * 0.60 *
* Delta WS (ft)       * 18.00 * Q Weir (cfs)         * 782.92 *
* E.G. IC (ft)        * 250.40 * Weir Sta Lft (ft)    * 65.00 *
* E.G. OC (ft)        * 250.42 * Weir Sta Rgt (ft)    * 160.57 *
* Culvert Control     * Outlet * Weir Submerg        * 0.00 *
* Culv WS Inlet (ft)  * 244.70 * Weir Max Depth (ft)  * 3.19 *
* Culv WS Outlet (ft) * 233.11 * Weir Avg Depth (ft)  * 2.07 *
* Culv Nml Depth (ft) * 7.00 * Weir Flow Area (sq ft) * 198.22 *
* Culv Crt Depth (ft) * 6.01 * Min El Weir Flow (ft) * 247.25 *
*****

```

Note: The normal depth exceeds the height of the culvert. The program assumes that the normal depth is equal to the height of the culvert.

```

CULVERT OUTPUT Profile #24HR OBS Culv Group: Culvert #1
*****
* Q Culv Group (cfs)   * 545.98 * Culv Full Len (ft)   * 457.57 *
* # Barrels           * 1      * Culv Vel US (ft/s)   * 14.19 *
* Q Barrel (cfs)      * 545.98 * Culv Vel DS (ft/s)   * 15.43 *
* E.G. US. (ft)       * 251.27 * Culv Inv El Up (ft)  * 237.70 *
* W.S. US. (ft)       * 250.91 * Culv Inv El Dn (ft)  * 227.10 *
* E.G. DS (ft)        * 233.08 * Culv Frctn Ls (ft)   * 13.80 *
* W.S. DS (ft)        * 232.80 * Culv Exit Loss (ft)  * 3.77 *
* Delta EG (ft)       * 18.19 * Culv Entr Loss (ft)  * 0.63 *
* Delta WS (ft)       * 18.11 * Q Weir (cfs)         * 1269.02 *
* E.G. IC (ft)        * 251.23 * Weir Sta Lft (ft)    * 65.00 *
* E.G. OC (ft)        * 251.27 * Weir Sta Rgt (ft)    * 167.54 *
* Culvert Control     * Outlet * Weir Submerg        * 0.00 *
* Culv WS Inlet (ft)  * 244.70 * Weir Max Depth (ft)  * 4.02 *
* Culv WS Outlet (ft) * 233.16 * Weir Avg Depth (ft)  * 2.74 *
* Culv Nml Depth (ft) * 7.00 * Weir Flow Area (sq ft) * 281.29 *
* Culv Crt Depth (ft) * 6.06 * Min El Weir Flow (ft) * 247.25 *
*****

```

Note: The normal depth exceeds the height of the culvert. The program assumes that the normal depth is equal to the height of the culvert.

CROSS SECTION

RIVER: hudson
REACH: main RS: 14

INPUT

Description:

Station Elevation Data		num= 27									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	248.1	14.71	237.72	23.72	228.98	25.86	226.84	28.49	222.9		
38.71	224.14	42.25	224.21	50.16	224.37	55.6	228.96	71.32	229.8		
113.72	230.51	160.05	232.96	160.35	232.96	186.93	237.56	188.11	241.98		
189.39	242.3	193.37	242.37	197.27	242.28	197.37	242.11	217.75	242.56		
234.11	241.83	235.6	241.71	236.27	242.26	242.78	242.92	249.14	247.54		
255.21	248.57	259.08	250.56								

Manning's n Values		num= 6									
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val

0 .1 28.49 .035 55.6 .045 186.93 .05 193.37 .02
 236.27 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 23.72 55.6 32.61 35.44 36.08 .3 .5
 Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 147.8 188 255 F

CROSS SECTION OUTPUT Profile #2-YR

```
*****
* E.G. Elev (ft) * 229.92 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.14 * Wt. n-Val. * 0.100 * 0.052 * 0.045 *
* W.S. Elev (ft) * 229.78 * Reach Len. (ft) * 32.61 * 35.44 * 36.08 *
* Crit W.S. (ft) * 226.31 * Flow Area (sq ft) * 0.33 * 161.11 * 6.30 *
* E.G. Slope (ft/ft) * 0.001550 * Area (sq ft) * 0.33 * 161.11 * 6.30 *
* Q Total (cfs) * 491.00 * Flow (cfs) * 0.08 * 486.40 * 4.51 *
* Top Width (ft) * 48.06 * Top Width (ft) * 0.82 * 31.88 * 15.35 *
* Vel Total (ft/s) * 2.93 * Avg. Vel. (ft/s) * 0.25 * 3.02 * 0.72 *
* Max Chl Dpth (ft) * 6.88 * Hydr. Depth (ft) * 0.40 * 5.05 * 0.41 *
* Conv. Total (cfs) * 12472.9 * Conv. (cfs) * 2.1 * 12356.1 * 114.6 *
* Length Wtd. (ft) * 35.44 * Wetted Per. (ft) * 1.15 * 36.63 * 15.37 *
* Min Ch El (ft) * 222.90 * Shear (lb/sq ft) * 0.03 * 0.43 * 0.04 *
* Alpha * 1.05 * Stream Power (lb/ft s) * 259.08 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.13 * Cum Volume (acre-ft) * 0.00 * 1.25 * 0.00 *
* C & E Loss (ft) * 0.24 * Cum SA (acres) * 0.02 * 0.39 * 0.01 *
*****
```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #10-YR

```
*****
* E.G. Elev (ft) * 232.25 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.22 * Wt. n-Val. * 0.100 * 0.052 * 0.045 *
* W.S. Elev (ft) * 232.03 * Reach Len. (ft) * 32.61 * 35.44 * 36.08 *
* Crit W.S. (ft) * 228.26 * Flow Area (sq ft) * 4.79 * 232.79 * 142.88 *
* E.G. Slope (ft/ft) * 0.001762 * Area (sq ft) * 4.79 * 232.79 * 142.88 *
* Q Total (cfs) * 1237.00 * Flow (cfs) * 3.17 * 957.92 * 275.91 *
* Top Width (ft) * 121.86 * Top Width (ft) * 3.14 * 31.88 * 86.84 *
* Vel Total (ft/s) * 3.25 * Avg. Vel. (ft/s) * 0.66 * 4.11 * 1.93 *
* Max Chl Dpth (ft) * 9.13 * Hydr. Depth (ft) * 1.52 * 7.30 * 1.65 *
* Conv. Total (cfs) * 29465.4 * Conv. (cfs) * 75.6 * 22817.7 * 6572.2 *
* Length Wtd. (ft) * 35.51 * Wetted Per. (ft) * 4.38 * 36.63 * 86.91 *
* Min Ch El (ft) * 222.90 * Shear (lb/sq ft) * 0.12 * 0.70 * 0.18 *
* Alpha * 1.32 * Stream Power (lb/ft s) * 259.08 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.13 * Cum Volume (acre-ft) * 0.33 * 2.72 * 1.09 *
* C & E Loss (ft) * 0.33 * Cum SA (acres) * 0.26 * 0.43 * 1.06 *
*****
```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50-YR

```
*****
* E.G. Elev (ft) * 233.77 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.36 * Wt. n-Val. * 0.100 * 0.052 * 0.045 *
* W.S. Elev (ft) * 233.42 * Reach Len. (ft) * 32.61 * 35.44 * 36.08 *
* Crit W.S. (ft) * 231.23 * Flow Area (sq ft) * 10.14 * 277.00 * 269.96 *
* E.G. Slope (ft/ft) * 0.002491 * Area (sq ft) * 10.14 * 277.00 * 280.24 *
* Q Total (cfs) * 2442.00 * Flow (cfs) * 10.25 * 1521.64 * 910.11 *
* Top Width (ft) * 143.83 * Top Width (ft) * 4.57 * 31.88 * 107.38 *
* Vel Total (ft/s) * 4.38 * Avg. Vel. (ft/s) * 1.01 * 5.49 * 3.37 *
* Max Chl Dpth (ft) * 10.52 * Hydr. Depth (ft) * 2.22 * 8.69 * 2.93 *
* Conv. Total (cfs) * 48927.1 * Conv. (cfs) * 205.4 * 30487.0 * 18234.7 *
* Length Wtd. (ft) * 35.61 * Wetted Per. (ft) * 6.37 * 36.63 * 92.28 *
* Min Ch El (ft) * 222.90 * Shear (lb/sq ft) * 0.25 * 1.18 * 0.45 *
* Alpha * 1.20 * Stream Power (lb/ft s) * 259.08 * 0.00 * 0.00 *
```

```

* Frctn Loss (ft)          * 0.14 * Cum Volume (acre-ft) * 0.93 * 4.08 * 3.00 *
* C & E Loss (ft)         * 0.26 * Cum SA (acres) * 0.38 * 0.43 * 1.54 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)          * 234.54 * Element * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.46 * Wt. n-Val. * 0.100 * 0.052 * 0.045 *
* W.S. Elev (ft)         * 234.08 * Reach Len. (ft) * 32.61 * 35.44 * 36.08 *
* Crit W.S. (ft)         * 232.00 * Flow Area (sq ft) * 13.40 * 298.15 * 331.15 *
* E.G. Slope (ft/ft)     * 0.002931 * Area (sq ft) * 13.40 * 298.15 * 352.78 *
* Q Total (cfs)          * 3270.00 * Flow (cfs) * 16.13 * 1866.10 * 1387.77 *
* Top Width (ft)         * 148.35 * Top Width (ft) * 5.26 * 31.88 * 111.22 *
* Vel Total (ft/s)       * 5.09 * Avg. Vel. (ft/s) * 1.20 * 6.26 * 4.19 *
* Max Chl Dpth (ft)      * 11.18 * Hydr. Depth (ft) * 2.55 * 9.35 * 3.59 *
* Conv. Total (cfs)      * 60395.7 * Conv. (cfs) * 297.9 * 34466.3 * 25631.6 *
* Length Wtd. (ft)      * 35.64 * Wetted Per. (ft) * 7.32 * 36.63 * 92.28 *
* Min Ch El (ft)         * 222.90 * Shear (lb/sq ft) * 0.33 * 1.49 * 0.66 *
* Alpha                  * 1.15 * Stream Power (lb/ft s) * 259.08 * 0.00 * 0.00 *
* Frctn Loss (ft)        * 0.16 * Cum Volume (acre-ft) * 1.22 * 4.76 * 4.00 *
* C & E Loss (ft)        * 0.27 * Cum SA (acres) * 0.44 * 0.43 * 1.78 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #6HR OBS

```

*****
* E.G. Elev (ft)          * 232.36 * Element * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.23 * Wt. n-Val. * 0.100 * 0.052 * 0.045 *
* W.S. Elev (ft)         * 232.13 * Reach Len. (ft) * 32.61 * 35.44 * 36.08 *
* Crit W.S. (ft)         * 228.43 * Flow Area (sq ft) * 5.13 * 236.13 * 152.07 *
* E.G. Slope (ft/ft)     * 0.001851 * Area (sq ft) * 5.13 * 236.13 * 152.07 *
* Q Total (cfs)          * 1318.00 * Flow (cfs) * 3.56 * 1005.37 * 309.08 *
* Top Width (ft)         * 123.95 * Top Width (ft) * 3.25 * 31.88 * 88.82 *
* Vel Total (ft/s)       * 3.35 * Avg. Vel. (ft/s) * 0.69 * 4.26 * 2.03 *
* Max Chl Dpth (ft)      * 9.23 * Hydr. Depth (ft) * 1.58 * 7.41 * 1.71 *
* Conv. Total (cfs)      * 30631.3 * Conv. (cfs) * 82.7 * 23365.4 * 7183.2 *
* Length Wtd. (ft)      * 35.52 * Wetted Per. (ft) * 4.53 * 36.63 * 88.89 *
* Min Ch El (ft)         * 222.90 * Shear (lb/sq ft) * 0.13 * 0.75 * 0.20 *
* Alpha                  * 1.32 * Stream Power (lb/ft s) * 259.08 * 0.00 * 0.00 *
* Frctn Loss (ft)        * 0.13 * Cum Volume (acre-ft) * 0.40 * 2.88 * 1.28 *
* C & E Loss (ft)        * 0.29 * Cum SA (acres) * 0.28 * 0.43 * 1.10 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft)          * 233.08 * Element * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.28 * Wt. n-Val. * 0.100 * 0.052 * 0.045 *
* W.S. Elev (ft)         * 232.80 * Reach Len. (ft) * 32.61 * 35.44 * 36.08 *
* Crit W.S. (ft)         * 229.53 * Flow Area (sq ft) * 7.52 * 257.39 * 213.28 *
* E.G. Slope (ft/ft)     * 0.002119 * Area (sq ft) * 7.52 * 257.39 * 215.53 *
* Q Total (cfs)          * 1815.00 * Flow (cfs) * 6.35 * 1241.91 * 566.74 *
* Top Width (ft)         * 137.25 * Top Width (ft) * 3.94 * 31.88 * 101.43 *
* Vel Total (ft/s)       * 3.80 * Avg. Vel. (ft/s) * 0.84 * 4.82 * 2.66 *
* Max Chl Dpth (ft)      * 9.90 * Hydr. Depth (ft) * 1.91 * 8.07 * 2.31 *

```

```

* Conv. Total (cfs)      * 39425.8 * Conv. (cfs)          * 138.0 * 26976.9 * 12310.9 *
* Length Wtd. (ft)     * 35.56  * Wetted Per. (ft)    * 5.49  * 36.63  * 92.28  *
* Min Ch El (ft)      * 222.90 * Shear (lb/sq ft)    * 0.18  * 0.93   * 0.31   *
* Alpha                * 1.26   * Stream Power (lb/ft s) * 259.08 * 0.00   * 0.00   *
* Frctn Loss (ft)     * 0.13   * Cum Volume (acre-ft) * 0.66  * 3.43   * 2.05   *
* C & E Loss (ft)     * 0.27   * Cum SA (acres)      * 0.34  * 0.43   * 1.24   *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: hudson

REACH: main RS: 13

INPUT

Description:

```

Station Elevation Data      num=      24
Sta      Elev      Sta      Elev      Sta      Elev      Sta      Elev      Sta      Elev
*****
      0      241.96   14.55   230.95   32.96   227.31   36.62   225.36   41.86   224.74
      42.53   224.66   46.66   225.42   50.53   227.84   56.2    227.42   61.55   230.48
      83.14   230.27   114.16  230.85   147.33  231.62   165.36  233      196.3   242.62
      199.29  241.9    203.15  241.91   203.26  241.69   211.59  241.93   222.67  242.05
      233.56  241.54   240.52  241.08   241.1   241.66   251.87  250.04

```

```

Manning's n Values          num=      5
Sta      n Val      Sta      n Val      Sta      n Val      Sta      n Val      Sta      n Val
*****
      0      .1    14.55   .035   61.55   .045   199.29   .02    241.1   .1

```

```

Bank Sta: Left      Right      Lengths: Left Channel      Right      Coeff Contr.      Expan.
      14.55   61.55      36.53   35.61   35.05      .1      .3

```

```

Ineffective Flow      num=      1
Sta L      Sta R      Elev      Permanent
157.7     165.4     255      F

```

```

Blocked Obstructions   num=      1
Sta L      Sta R      Elev
*****
165.4     196.3     255

```

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft)      * 229.55 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.96  * Wt. n-Val.      *         * 0.035  *         *
* W.S. Elev (ft)     * 228.59 * Reach Len. (ft) * 36.53  * 35.61  * 35.05  *
* Crit W.S. (ft)     * 228.57 * Flow Area (sq ft) *         * 62.59  *         *
* E.G. Slope (ft/ft) * 0.014862 * Area (sq ft)    *         * 62.59  *         *
* Q Total (cfs)      * 491.00 * Flow (cfs)      *         * 491.00 *         *
* Top Width (ft)     * 31.79  * Top Width (ft)  *         * 31.79  *         *
* Vel Total (ft/s)   * 7.85   * Avg. Vel. (ft/s) *         * 7.85   *         *
* Max Chl Dpth (ft) * 3.93   * Hydr. Depth (ft) *         * 1.97   *         *
* Conv. Total (cfs) * 4027.5 * Conv. (cfs)     *         * 4027.5 *         *
* Length Wtd. (ft)  * 35.61  * Wetted Per. (ft) *         * 33.54  *         *
* Min Ch El (ft)    * 224.66 * Shear (lb/sq ft) *         * 1.73   *         *
* Alpha              * 1.00   * Stream Power (lb/ft s) * 251.87 * 0.00   * 0.00   *
* Frctn Loss (ft)   * 0.24   * Cum Volume (acre-ft) * 0.00  * 1.16   * 0.00   *
* C & E Loss (ft)   * 0.19   * Cum SA (acres)  * 0.02  * 0.36   * 0.01   *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)      * 231.78 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.33  * Wt. n-Val.      *         * 0.035  * 0.045  *

```

* W.S. Elev (ft)	* 230.45	* Reach Len. (ft)	* 36.53	* 35.61	* 35.05	*
* Crit W.S. (ft)	* 230.34	* Flow Area (sq ft)	*	* 133.40	* 2.61	*
* E.G. Slope (ft/ft)	* 0.011787	* Area (sq ft)	*	* 133.40	* 2.61	*
* Q Total (cfs)	* 1237.00	* Flow (cfs)	*	* 1235.11	* 1.89	*
* Top Width (ft)	* 72.98	* Top Width (ft)	*	* 44.44	* 28.54	*
* Vel Total (ft/s)	* 9.10	* Avg. Vel. (ft/s)	*	* 9.26	* 0.73	*
* Max Chl Dpth (ft)	* 5.79	* Hydr. Depth (ft)	*	* 3.00	* 0.09	*
* Conv. Total (cfs)	* 11393.8	* Conv. (cfs)	*	* 11376.3	* 17.4	*
* Length Wtd. (ft)	* 35.60	* Wetted Per. (ft)	*	* 46.86	* 28.54	*
* Min Ch El (ft)	* 224.66	* Shear (lb/sq ft)	*	* 2.09	* 0.07	*
* Alpha	* 1.03	* Stream Power (lb/ft s)	* 251.87	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.19	* Cum Volume (acre-ft)	* 0.33	* 2.57	* 1.03	*
* C & E Loss (ft)	* 0.25	* Cum SA (acres)	* 0.26	* 0.40	* 1.01	*

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 233.37	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 1.22	* Wt. n-Val.	* 0.100	* 0.035	* 0.045	*
* W.S. Elev (ft)	* 232.15	* Reach Len. (ft)	* 36.53	* 35.61	* 35.05	*
* Crit W.S. (ft)	* 232.15	* Flow Area (sq ft)	* 0.95	* 212.48	* 119.70	*
* E.G. Slope (ft/ft)	* 0.007327	* Area (sq ft)	* 0.95	* 212.48	* 119.70	*
* Q Total (cfs)	* 2442.00	* Flow (cfs)	* 0.74	* 2040.15	* 401.11	*
* Top Width (ft)	* 141.27	* Top Width (ft)	* 1.58	* 47.00	* 92.69	*
* Vel Total (ft/s)	* 7.33	* Avg. Vel. (ft/s)	* 0.78	* 9.60	* 3.35	*
* Max Chl Dpth (ft)	* 7.49	* Hydr. Depth (ft)	* 0.60	* 4.52	* 1.29	*
* Conv. Total (cfs)	* 28529.0	* Conv. (cfs)	* 8.6	* 23834.3	* 4686.0	*
* Length Wtd. (ft)	* 35.52	* Wetted Per. (ft)	* 1.99	* 49.48	* 92.72	*
* Min Ch El (ft)	* 224.66	* Shear (lb/sq ft)	* 0.22	* 1.96	* 0.59	*
* Alpha	* 1.47	* Stream Power (lb/ft s)	* 251.87	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.20	* Cum Volume (acre-ft)	* 0.93	* 3.88	* 2.83	*
* C & E Loss (ft)	* 0.09	* Cum SA (acres)	* 0.38	* 0.40	* 1.46	*

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 234.12	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 1.35	* Wt. n-Val.	* 0.100	* 0.035	* 0.045	*
* W.S. Elev (ft)	* 232.76	* Reach Len. (ft)	* 36.53	* 35.61	* 35.05	*
* Crit W.S. (ft)	* 232.76	* Flow Area (sq ft)	* 2.17	* 241.38	* 178.34	*
* E.G. Slope (ft/ft)	* 0.007255	* Area (sq ft)	* 2.17	* 241.38	* 179.14	*
* Q Total (cfs)	* 3270.00	* Flow (cfs)	* 2.22	* 2510.78	* 757.00	*
* Top Width (ft)	* 150.11	* Top Width (ft)	* 2.40	* 47.00	* 100.72	*
* Vel Total (ft/s)	* 7.75	* Avg. Vel. (ft/s)	* 1.02	* 10.40	* 4.24	*
* Max Chl Dpth (ft)	* 8.10	* Hydr. Depth (ft)	* 0.91	* 5.14	* 1.85	*
* Conv. Total (cfs)	* 38390.0	* Conv. (cfs)	* 26.0	* 29476.7	* 8887.2	*
* Length Wtd. (ft)	* 35.48	* Wetted Per. (ft)	* 3.01	* 49.48	* 96.20	*
* Min Ch El (ft)	* 224.66	* Shear (lb/sq ft)	* 0.33	* 2.21	* 0.84	*
* Alpha	* 1.45	* Stream Power (lb/ft s)	* 251.87	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.19	* Cum Volume (acre-ft)	* 1.21	* 4.54	* 3.78	*
* C & E Loss (ft)	* 0.12	* Cum SA (acres)	* 0.43	* 0.40	* 1.69	*

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

```

*****
* E.G. Elev (ft)      * 231.94 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.21  * Wt. n-Val.      *         * 0.035  * 0.045  *
* W.S. Elev (ft)     * 230.74 * Reach Len. (ft) * 36.53  * 35.61  * 35.05  *
* Crit W.S. (ft)     * 230.74 * Flow Area (sq ft) *         * 146.26 * 13.66  *
* E.G. Slope (ft/ft) * 0.009997 * Area (sq ft)    *         * 146.26 * 13.66  *
* Q Total (cfs)      * 1318.00 * Flow (cfs)      *         * 1298.10 * 19.90  *
* Top Width (ft)     * 92.50  * Top Width (ft)  *         * 45.92  * 46.58  *
* Vel Total (ft/s)   * 8.24   * Avg. Vel. (ft/s) *         * 8.88   * 1.46   *
* Max Chl Dpth (ft)  * 6.08   * Hydr. Depth (ft) *         * 3.18   * 0.29   *
* Conv. Total (cfs)  * 13182.2 * Conv. (cfs)     *         * 12983.2 * 199.0  *
* Length Wtd. (ft)   * 35.59  * Wetted Per. (ft) *         * 48.38  * 46.58  *
* Min Ch El (ft)     * 224.66 * Shear (lb/sq ft) *         * 1.89   * 0.18   *
* Alpha              * 1.14   * Stream Power (lb/ft s) * 251.87 * 0.00   * 0.00   *
* Frctn Loss (ft)    * 0.19   * Cum Volume (acre-ft) * 0.40  * 2.73   * 1.21   *
* C & E Loss (ft)    * 0.20   * Cum SA (acres)   * 0.28  * 0.40   * 1.04   *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft)      * 232.69 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.17  * Wt. n-Val.      *         * 0.100  * 0.045  *
* W.S. Elev (ft)     * 231.52 * Reach Len. (ft) * 36.53  * 35.61  * 35.05  *
* Crit W.S. (ft)     * 231.52 * Flow Area (sq ft) *         * 182.77 * 63.87  *
* E.G. Slope (ft/ft) * 0.007964 * Area (sq ft)    *         * 182.77 * 63.87  *
* Q Total (cfs)      * 1815.00 * Flow (cfs)      *         * 1654.69 * 160.20 *
* Top Width (ft)     * 129.06 * Top Width (ft)  *         * 47.00  * 81.31  *
* Vel Total (ft/s)   * 7.35   * Avg. Vel. (ft/s) *         * 9.05   * 2.51   *
* Max Chl Dpth (ft)  * 6.86   * Hydr. Depth (ft) *         * 3.89   * 0.79   *
* Conv. Total (cfs)  * 20338.6 * Conv. (cfs)     *         * 18542.2 * 1795.2 *
* Length Wtd. (ft)   * 35.56  * Wetted Per. (ft) *         * 49.48  * 81.33  *
* Min Ch El (ft)     * 224.66 * Shear (lb/sq ft) *         * 1.84   * 0.39   *
* Alpha              * 1.39   * Stream Power (lb/ft s) * 251.87 * 0.00   * 0.00   *
* Frctn Loss (ft)    * 0.21   * Cum Volume (acre-ft) * 0.66  * 3.26   * 1.94   *
* C & E Loss (ft)    * 0.11   * Cum SA (acres)   * 0.34  * 0.40   * 1.16   *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main RS: 12

INPUT

Description:

Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

0	235.97	4.29	233.19	9.01	229.89	17.76	227.7	28.61	225.14
36.48	224.53	37.83	224.73	40.71	225.18	43.81	227.25	55.11	226.71
56.34	228.17	57.5	230.17	63.19	230.16	87.64	229.97	122.51	230.61
158.38	231.61	163.21	231.75	184.45	232.71	185.11	234.3	200.8	234.38
201.16	240.02	206.05	240.52	209.96	240.56	228.22	240.92	246.17	240.16
246.99	240.76	255.05	247.12						

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	9.01	.035	57.5	.045	206.05	.02	246.99	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

9.01	57.5	43.41	42.27	41.38	.1	.3
------	------	-------	-------	-------	----	----

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
179.23	201.87	250	F

CROSS SECTION OUTPUT Profile #2-YR

* E.G. Elev (ft)	* 229.12	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.33	* Wt. n-Val.	* 0.100	* 0.035	* 0.045
* W.S. Elev (ft)	* 228.79	* Reach Len. (ft)	* 43.41	* 42.27	* 41.38
* Crit W.S. (ft)	* 227.82	* Flow Area (sq ft)	* 0.64	* 202.19	* 42.42
* E.G. Slope (ft/ft)	* 0.003856	* Area (sq ft)	* 0.64	* 202.19	* 42.42
* Q Total (cfs)	* 491.00	* Flow (cfs)	* 0.28	* 1182.67	* 54.06
* Top Width (ft)	* 43.28	* Top Width (ft)	* 1.35	* 48.49	* 73.02
* Vel Total (ft/s)	* 4.63	* Avg. Vel. (ft/s)	* 0.44	* 5.85	* 1.27
* Max Chl Dpth (ft)	* 4.26	* Hydr. Depth (ft)	* 0.47	* 4.17	* 0.58
* Conv. Total (cfs)	* 7906.6	* Conv. (cfs)	* 5.0	* 21333.6	* 975.1
* Length Wtd. (ft)	* 42.27	* Wetted Per. (ft)	* 1.65	* 51.60	* 73.03
* Min Ch El (ft)	* 224.53	* Shear (lb/sq ft)	* 0.07	* 0.75	* 0.11
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 255.05	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.28	* Cum Volume (acre-ft)	* 0.33	* 2.43	* 1.01
* C & E Loss (ft)	* 0.08	* Cum SA (acres)	* 0.26	* 0.36	* 0.97

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 231.34	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.51	* Wt. n-Val.	* 0.100	* 0.035	* 0.045
* W.S. Elev (ft)	* 230.83	* Reach Len. (ft)	* 43.41	* 42.27	* 41.38
* Crit W.S. (ft)	* 229.31	* Flow Area (sq ft)	* 0.64	* 202.19	* 42.42
* E.G. Slope (ft/ft)	* 0.003073	* Area (sq ft)	* 0.64	* 202.19	* 42.42
* Q Total (cfs)	* 1237.00	* Flow (cfs)	* 0.28	* 1182.67	* 54.06
* Top Width (ft)	* 122.85	* Top Width (ft)	* 1.35	* 48.49	* 73.02
* Vel Total (ft/s)	* 5.04	* Avg. Vel. (ft/s)	* 0.44	* 5.85	* 1.27
* Max Chl Dpth (ft)	* 6.30	* Hydr. Depth (ft)	* 0.47	* 4.17	* 0.58
* Conv. Total (cfs)	* 22313.7	* Conv. (cfs)	* 5.0	* 21333.6	* 975.1
* Length Wtd. (ft)	* 42.23	* Wetted Per. (ft)	* 1.65	* 51.60	* 73.03
* Min Ch El (ft)	* 224.53	* Shear (lb/sq ft)	* 0.07	* 0.75	* 0.11
* Alpha	* 1.29	* Stream Power (lb/ft s)	* 255.05	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.18	* Cum Volume (acre-ft)	* 0.33	* 2.43	* 1.01
* C & E Loss (ft)	* 0.04	* Cum SA (acres)	* 0.26	* 0.36	* 0.97

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 232.79	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.91	* Wt. n-Val.	* 0.100	* 0.035	* 0.045
* W.S. Elev (ft)	* 231.88	* Reach Len. (ft)	* 43.41	* 42.27	* 41.38
* Crit W.S. (ft)	* 231.35	* Flow Area (sq ft)	* 2.82	* 252.71	* 137.83
* E.G. Slope (ft/ft)	* 0.004522	* Area (sq ft)	* 2.82	* 252.71	* 137.83
* Q Total (cfs)	* 2442.00	* Flow (cfs)	* 2.45	* 2080.58	* 358.96
* Top Width (ft)	* 159.81	* Top Width (ft)	* 2.84	* 48.49	* 108.48
* Vel Total (ft/s)	* 6.21	* Avg. Vel. (ft/s)	* 0.87	* 8.23	* 2.60
* Max Chl Dpth (ft)	* 7.35	* Hydr. Depth (ft)	* 0.99	* 5.21	* 1.27
* Conv. Total (cfs)	* 36315.4	* Conv. (cfs)	* 36.5	* 30940.7	* 5338.2
* Length Wtd. (ft)	* 42.09	* Wetted Per. (ft)	* 3.46	* 51.60	* 108.51

```

* Min Ch El (ft)          * 224.53 * Shear (lb/sq ft)      * 0.23 * 1.38 * 0.36 *
* Alpha                  * 1.52 * Stream Power (lb/ft s) * 255.05 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.17 * Cum Volume (acre-ft)  * 0.92 * 3.69 * 2.73 *
* C & E Loss (ft)       * 0.06 * Cum SA (acres)        * 0.38 * 0.36 * 1.38 *
*****

```

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)        * 233.59 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)        * 0.94 * Wt. n-Val.            * 0.100 * 0.035 * 0.045 *
* W.S. Elev (ft)       * 232.65 * Reach Len. (ft)       * 43.41 * 42.27 * 41.38 *
* Crit W.S. (ft)       * 232.09 * Flow Area (sq ft)     * 5.45 * 290.30 * 228.21 *
* E.G. Slope (ft/ft)   * 0.004188 * Area (sq ft)         * 5.45 * 290.30 * 228.56 *
* Q Total (cfs)        * 3270.00 * Flow (cfs)           * 5.69 * 2522.97 * 741.34 *
* Top Width (ft)       * 178.07 * Top Width (ft)       * 3.95 * 48.49 * 125.63 *
* Vel Total (ft/s)     * 6.24 * Avg. Vel. (ft/s)     * 1.04 * 8.69 * 3.25 *
* Max Chl Dpth (ft)   * 8.12 * Hydr. Depth (ft)     * 1.38 * 5.99 * 1.87 *
* Conv. Total (cfs)   * 50526.4 * Conv. (cfs)         * 87.9 * 38983.7 * 11454.8 *
* Length Wtd. (ft)    * 42.02 * Wetted Per. (ft)     * 4.82 * 51.60 * 121.77 *
* Min Ch El (ft)      * 224.53 * Shear (lb/sq ft)     * 0.30 * 1.47 * 0.49 *
* Alpha                * 1.56 * Stream Power (lb/ft s) * 255.05 * 0.00 * 0.00 *
* Frctn Loss (ft)     * 0.16 * Cum Volume (acre-ft) * 1.21 * 4.32 * 3.62 *
* C & E Loss (ft)     * 0.08 * Cum SA (acres)       * 0.43 * 0.36 * 1.60 *
*****

```

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

```

*****
* E.G. Elev (ft)        * 231.46 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)        * 0.54 * Wt. n-Val.            * 0.100 * 0.035 * 0.045 *
* W.S. Elev (ft)       * 230.91 * Reach Len. (ft)       * 43.41 * 42.27 * 41.38 *
* Crit W.S. (ft)       * 229.45 * Flow Area (sq ft)     * 0.75 * 206.15 * 48.50 *
* E.G. Slope (ft/ft)   * 0.003219 * Area (sq ft)         * 0.75 * 206.15 * 48.50 *
* Q Total (cfs)        * 1318.00 * Flow (cfs)           * 0.36 * 1250.26 * 67.38 *
* Top Width (ft)       * 125.90 * Top Width (ft)       * 1.47 * 48.49 * 75.95 *
* Vel Total (ft/s)     * 5.16 * Avg. Vel. (ft/s)     * 0.47 * 6.06 * 1.39 *
* Max Chl Dpth (ft)   * 6.38 * Hydr. Depth (ft)     * 0.51 * 4.25 * 0.64 *
* Conv. Total (cfs)   * 23228.5 * Conv. (cfs)         * 6.3 * 22034.7 * 1187.6 *
* Length Wtd. (ft)    * 42.22 * Wetted Per. (ft)     * 1.79 * 51.60 * 75.96 *
* Min Ch El (ft)      * 224.53 * Shear (lb/sq ft)     * 0.08 * 0.80 * 0.13 *
* Alpha                * 1.31 * Stream Power (lb/ft s) * 255.05 * 0.00 * 0.00 *
* Frctn Loss (ft)     * 0.18 * Cum Volume (acre-ft) * 0.40 * 2.58 * 1.18 *
* C & E Loss (ft)     * 0.04 * Cum SA (acres)       * 0.28 * 0.36 * 1.00 *
*****

```

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft)        * 232.05 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)        * 0.80 * Wt. n-Val.            * 0.100 * 0.035 * 0.045 *
* W.S. Elev (ft)       * 231.26 * Reach Len. (ft)       * 43.41 * 42.27 * 41.38 *
* Crit W.S. (ft)       * 230.51 * Flow Area (sq ft)     * 1.33 * 222.69 * 76.50 *
* E.G. Slope (ft/ft)   * 0.004397 * Area (sq ft)         * 1.33 * 222.69 * 76.50 *
* Q Total (cfs)        * 1815.00 * Flow (cfs)           * 0.89 * 1661.75 * 152.35 *
* Top Width (ft)       * 138.63 * Top Width (ft)       * 1.95 * 48.49 * 88.19 *
* Vel Total (ft/s)     * 6.04 * Avg. Vel. (ft/s)     * 0.67 * 7.46 * 1.99 *
* Max Chl Dpth (ft)   * 6.73 * Hydr. Depth (ft)     * 0.68 * 4.59 * 0.87 *
* Conv. Total (cfs)   * 27371.6 * Conv. (cfs)         * 13.5 * 25060.6 * 2297.6 *
* Length Wtd. (ft)    * 42.16 * Wetted Per. (ft)     * 2.38 * 51.60 * 88.20 *
* Min Ch El (ft)      * 224.53 * Shear (lb/sq ft)     * 0.15 * 1.18 * 0.24 *
* Alpha                * 1.41 * Stream Power (lb/ft s) * 255.05 * 0.00 * 0.00 *
* Frctn Loss (ft)     * 0.20 * Cum Volume (acre-ft) * 0.66 * 3.09 * 1.88 *
* C & E Loss (ft)     * 0.01 * Cum SA (acres)       * 0.34 * 0.36 * 1.10 *
*****

```

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
REACH: main RS: 11

INPUT

Description:

Station Elevation Data		num= 25							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	245.96	10.1	239.95	27.61	230.25	50	227.94	56.91	224.69
62.67	224.26	62.68	224.25	63.08	224.22	69.01	224.83	75.79	227.38
81.94	229.34	113.15	229.54	159.41	229.57	197.32	230.73	229.05	232.56
241.65	238.86	245.59	238.88	245.71	238.5	252.11	238.68	263.49	238.91
274.3	238.47	281.62	238.2	282.41	238.74	288.52	243.68	297.15	245.07

Manning's n Values		num= 6							
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val		
0	.1	50	.035	81.94	.045	229.05	.05	241.65	.02
282.41	.1								

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	50	81.94		42.45	41.39	40	.1 .3

CROSS SECTION OUTPUT Profile #2-YR

* E.G. Elev (ft)	* 228.76	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 1.12	* Wt. n-Val.	* 0.035		
* W.S. Elev (ft)	* 227.64	* Reach Len. (ft)	* 42.45	* 41.39	* 40.00
* Crit W.S. (ft)	* 227.64	* Flow Area (sq ft)	* 57.92		
* E.G. Slope (ft/ft)	* 0.014548	* Area (sq ft)	* 57.92		
* Q Total (cfs)	* 491.00	* Flow (cfs)	* 491.00		
* Top Width (ft)	* 25.98	* Top Width (ft)	* 25.98		
* Vel Total (ft/s)	* 8.48	* Avg. Vel. (ft/s)	* 8.48		
* Max Chl Dpth (ft)	* 3.42	* Hydr. Depth (ft)	* 2.23		
* Conv. Total (cfs)	* 4070.8	* Conv. (cfs)	* 4070.8		
* Length Wtd. (ft)	* 41.39	* Wetted Per. (ft)	* 27.20		
* Min Ch El (ft)	* 224.22	* Shear (lb/sq ft)	* 1.93		
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 297.15	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.46	* Cum Volume (acre-ft)	* 0.00	* 1.01	* 0.00
* C & E Loss (ft)	* 0.10	* Cum SA (acres)	* 0.02	* 0.30	* 0.01

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 231.12	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.96	* Wt. n-Val.	* 0.100	* 0.035	* 0.045
* W.S. Elev (ft)	* 230.16	* Reach Len. (ft)	* 42.45	* 41.39	* 40.00
* Crit W.S. (ft)	* 230.16	* Flow Area (sq ft)	* 23.93	* 133.79	* 56.34
* E.G. Slope (ft/ft)	* 0.005994	* Area (sq ft)	* 23.93	* 133.79	* 56.34
* Q Total (cfs)	* 1237.00	* Flow (cfs)	* 29.42	* 1107.19	* 100.39
* Top Width (ft)	* 150.29	* Top Width (ft)	* 21.54	* 31.94	* 96.82
* Vel Total (ft/s)	* 5.78	* Avg. Vel. (ft/s)	* 1.23	* 8.28	* 1.78
* Max Chl Dpth (ft)	* 5.94	* Hydr. Depth (ft)	* 1.11	* 4.19	* 0.58
* Conv. Total (cfs)	* 15977.5	* Conv. (cfs)	* 380.0	* 14300.8	* 1296.6
* Length Wtd. (ft)	* 41.26	* Wetted Per. (ft)	* 21.65	* 33.49	* 96.83
* Min Ch El (ft)	* 224.22	* Shear (lb/sq ft)	* 0.41	* 1.50	* 0.22
* Alpha	* 1.84	* Stream Power (lb/ft s)	* 297.15	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.20	* Cum Volume (acre-ft)	* 0.32	* 2.27	* 0.96
* C & E Loss (ft)	* 0.09	* Cum SA (acres)	* 0.25	* 0.32	* 0.89

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50-YR

```
*****
* E.G. Elev (ft)      * 232.55 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.72  * Wt. n-Val.      * 0.100  * 0.035  * 0.045  *
* W.S. Elev (ft)     * 231.84 * Reach Len. (ft) * 42.45  * 41.39  * 40.00  *
* Crit W.S. (ft)     *      * Flow Area (sq ft) * 63.63  * 187.24 * 254.78 *
* E.G. Slope (ft/ft) * 0.003794 * Area (sq ft)    * 63.63  * 187.24 * 254.78 *
* Q Total (cfs)      * 2442.00 * Flow (cfs)      * 106.38 * 1542.63 * 792.99 *
* Top Width (ft)     * 191.74 * Top Width (ft)  * 25.25  * 31.94  * 134.55 *
* Vel Total (ft/s)   * 4.83  * Avg. Vel. (ft/s) * 1.67   * 8.24   * 3.11   *
* Max Chl Dpth (ft)  * 7.62  * Hydr. Depth (ft) * 2.52   * 5.86   * 1.89   *
* Conv. Total (cfs)  * 39643.7 * Conv. (cfs)     * 1726.9 * 25043.2 * 12873.5 *
* Length Wtd. (ft)  * 40.97 * Wetted Per. (ft) * 25.78  * 33.49  * 134.60 *
* Min Ch El (ft)     * 224.22 * Shear (lb/sq ft) * 0.58   * 1.32   * 0.45   *
* Alpha              * 1.98  * Stream Power (lb/ft s) * 297.15 * 0.00   * 0.00   *
* Frctn Loss (ft)    * 0.11  * Cum Volume (acre-ft) * 0.89   * 3.48   * 2.54   *
* C & E Loss (ft)    * 0.09  * Cum SA (acres)   * 0.36   * 0.32   * 1.26   *
*****
```

CROSS SECTION OUTPUT Profile #100-YR

```
*****
* E.G. Elev (ft)      * 233.36 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.68  * Wt. n-Val.      * 0.100  * 0.035  * 0.045  *
* W.S. Elev (ft)     * 232.67 * Reach Len. (ft) * 42.45  * 41.39  * 40.00  *
* Crit W.S. (ft)     *      * Flow Area (sq ft) * 85.40  * 213.97 * 373.34 *
* E.G. Slope (ft/ft) * 0.003302 * Area (sq ft)    * 85.40  * 213.97 * 373.34 *
* Q Total (cfs)      * 3270.00 * Flow (cfs)      * 155.16 * 1797.37 * 1317.46 *
* Top Width (ft)     * 206.04 * Top Width (ft)  * 26.76  * 31.94  * 147.33 *
* Vel Total (ft/s)   * 4.86  * Avg. Vel. (ft/s) * 1.82   * 8.40   * 3.53   *
* Max Chl Dpth (ft)  * 8.45  * Hydr. Depth (ft) * 3.19   * 6.70   * 2.53   *
* Conv. Total (cfs)  * 56907.8 * Conv. (cfs)     * 2700.3 * 31279.7 * 22927.8 *
* Length Wtd. (ft)  * 40.88 * Wetted Per. (ft) * 27.51  * 33.49  * 147.43 *
* Min Ch El (ft)     * 224.22 * Shear (lb/sq ft) * 0.64   * 1.32   * 0.52   *
* Alpha              * 1.86  * Stream Power (lb/ft s) * 297.15 * 0.00   * 0.00   *
* Frctn Loss (ft)    * 0.10  * Cum Volume (acre-ft) * 1.16   * 4.08   * 3.33   *
* C & E Loss (ft)    * 0.07  * Cum SA (acres)   * 0.42   * 0.32   * 1.47   *
*****
```

CROSS SECTION OUTPUT Profile #6HR OBS

```
*****
* E.G. Elev (ft)      * 231.24 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.94  * Wt. n-Val.      * 0.100  * 0.035  * 0.045  *
* W.S. Elev (ft)     * 230.30 * Reach Len. (ft) * 42.45  * 41.39  * 40.00  *
* Crit W.S. (ft)     * 230.30 * Flow Area (sq ft) * 26.89  * 138.06 * 69.58  *
* E.G. Slope (ft/ft) * 0.005799 * Area (sq ft)    * 26.89  * 138.06 * 69.58  *
* Q Total (cfs)      * 1318.00 * Flow (cfs)      * 34.15  * 1147.56 * 136.29 *
* Top Width (ft)     * 155.60 * Top Width (ft)  * 22.47  * 31.94  * 101.19 *
* Vel Total (ft/s)   * 5.62  * Avg. Vel. (ft/s) * 1.27   * 8.31   * 1.96   *
* Max Chl Dpth (ft)  * 6.08  * Hydr. Depth (ft) * 1.20   * 4.32   * 0.69   *
* Conv. Total (cfs)  * 17308.1 * Conv. (cfs)     * 448.5  * 15069.8 * 1789.8 *
* Length Wtd. (ft)  * 41.22 * Wetted Per. (ft) * 22.60  * 33.49  * 101.20 *
* Min Ch El (ft)     * 224.22 * Shear (lb/sq ft) * 0.43   * 1.49   * 0.25   *
* Alpha              * 1.92  * Stream Power (lb/ft s) * 297.15 * 0.00   * 0.00   *
* Frctn Loss (ft)    * 0.17  * Cum Volume (acre-ft) * 0.38   * 2.41   * 1.13   *
* C & E Loss (ft)    * 0.12  * Cum SA (acres)   * 0.27   * 0.32   * 0.91   *
*****
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #24HR OBS

```
*****
* E.G. Elev (ft)      * 231.84 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.91  * Wt. n-Val.      * 0.100  * 0.035  * 0.045  *
* W.S. Elev (ft)     * 230.93 * Reach Len. (ft) * 42.45  * 41.39  * 40.00  *
* Crit W.S. (ft)     * 230.86 * Flow Area (sq ft) * 41.55  * 158.38 * 140.27 *
* E.G. Slope (ft/ft) * 0.005267 * Area (sq ft)    * 41.55  * 158.38 * 140.27 *
* Q Total (cfs)      * 1815.00 * Flow (cfs)      * 64.76  * 1374.97 * 375.28 *
* Top Width (ft)     * 174.44 * Top Width (ft)  * 23.62  * 31.94  * 118.88 *
* Vel Total (ft/s)   * 5.34  * Avg. Vel. (ft/s) * 1.56   * 8.68   * 2.68   *
* Max Chl Dpth (ft)  * 6.71  * Hydr. Depth (ft) * 1.76   * 4.96   * 1.18   *
* Conv. Total (cfs)  * 25008.9 * Conv. (cfs)     * 892.3  * 18945.7 * 5171.0 *
* Length Wtd. (ft)  * 41.09 * Wetted Per. (ft) * 23.92  * 33.49  * 118.91 *
*****
```

```

* Min Ch El (ft)      * 224.22 * Shear (lb/sq ft)      * 0.57 * 1.56 * 0.39 *
* Alpha              * 2.06  * Stream Power (lb/ft s) * 297.15 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 0.14  * Cum Volume (acre-ft)  * 0.64 * 2.91 * 1.78 *
* C & E Loss (ft)   * 0.15  * Cum SA (acres)        * 0.32 * 0.32 * 1.00 *
*****

```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: hudson
REACH: main RS: 10

INPUT

Description:

```

Station Elevation Data      num=      27
Sta      Elev      Sta      Elev      Sta      Elev      Sta      Elev      Sta      Elev
*****
0      254.32  27.86  234.84  35.17  229.78  70.22  228.43  73.71  226.78
79.05  224.24  84.97  223.61  84.98  223.61  85.18  223.59  91.53  224.07
98.22  226.6   103.1  228.6   141.3  228.97  185.05  229.06  221.96  230.91
249.71 232.98  255.38 233.62  263.5  236.98  267.35  237.07  267.53  236.24
273.96 236.72  285.11 236.99  295.42 236.53  296.92  236.06  297.07  236.98
300.37 237.15  316.57 238.76

```

```

Manning's n Values      num=      6
Sta      n Val      Sta      n Val      Sta      n Val      Sta      n Val
*****
0      .1   27.86   .085  70.22   .035  103.1   .045  263.5   .02
300.37   .05

```

```

Bank Sta: Left  Right  Lengths: Left Channel  Right  Coeff Contr.  Expan.
          70.22  103.1          57.02  54.55          53          .1          .3

```

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft)      * 228.19 * Element      * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.78  * Wt. n-Val.   *          * 0.035 *          *
* W.S. Elev (ft)     * 227.41 * Reach Len. (ft) * 57.02 * 54.55 * 53.00 *
* Crit W.S. (ft)     * 226.97 * Flow Area (sq ft) *          * 69.31 *          *
* E.G. Slope (ft/ft) * 0.008789 * Area (sq ft) *          * 69.31 *          *
* Q Total (cfs)      * 491.00 * Flow (cfs) *          * 491.00 *          *
* Top Width (ft)     * 27.80 * Top Width (ft) *          * 27.80 *          *
* Vel Total (ft/s)   * 7.08  * Avg. Vel. (ft/s) *          * 7.08 *          *
* Max Chl Dpth (ft)  * 3.82  * Hydr. Depth (ft) *          * 2.49 *          *
* Conv. Total (cfs)  * 5237.3 * Conv. (cfs) *          * 5237.3 *          *
* Length Wtd. (ft)   * 54.55 * Wetted Per. (ft) *          * 29.19 *          *
* Min Ch El (ft)     * 223.59 * Shear (lb/sq ft) *          * 1.30 *          *
* Alpha              * 1.00  * Stream Power (lb/ft s) * 316.57 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 0.40  * Cum Volume (acre-ft) * 0.00 * 0.95 * 0.00 *
* C & E Loss (ft)   * 0.03  * Cum SA (acres) * 0.02 * 0.28 * 0.01 *
*****

```

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)      * 230.55 * Element      * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.65  * Wt. n-Val.   * 0.085 * 0.035 * 0.045 *
* W.S. Elev (ft)     * 229.91 * Reach Len. (ft) * 57.02 * 54.55 * 53.00 *
* Crit W.S. (ft)     * 229.55 * Flow Area (sq ft) * 28.09 * 148.65 * 88.95 *
* E.G. Slope (ft/ft) * 0.003905 * Area (sq ft) * 28.09 * 148.65 * 88.95 *
* Q Total (cfs)      * 1237.00 * Flow (cfs) * 26.35 * 1039.59 * 171.06 *
* Top Width (ft)     * 166.94 * Top Width (ft) * 35.23 * 32.88 * 98.83 *
* Vel Total (ft/s)   * 4.66  * Avg. Vel. (ft/s) * 0.94 * 6.99 * 1.92 *
* Max Chl Dpth (ft)  * 6.32  * Hydr. Depth (ft) * 0.80 * 4.52 * 0.90 *
* Conv. Total (cfs)  * 19795.8 * Conv. (cfs) * 421.7 * 16636.6 * 2737.5 *
* Length Wtd. (ft)   * 54.39 * Wetted Per. (ft) * 35.30 * 34.73 * 98.85 *
* Min Ch El (ft)     * 223.59 * Shear (lb/sq ft) * 0.19 * 1.04 * 0.22 *
* Alpha              * 1.92  * Stream Power (lb/ft s) * 316.57 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 0.16  * Cum Volume (acre-ft) * 0.29 * 2.14 * 0.89 *
* C & E Loss (ft)   * 0.07  * Cum SA (acres) * 0.22 * 0.29 * 0.80 *
*****

```

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)          * 232.35 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.42  * Wt. n-Val.      * 0.085  * 0.035  * 0.045  *
* W.S. Elev (ft)        * 231.93 * Reach Len. (ft) * 57.02  * 54.55  * 53.00  *
* Crit W.S. (ft)        *        * Flow Area (sq ft) * 102.44 * 215.28 * 326.74 *
* E.G. Slope (ft/ft)    * 0.002050 * Area (sq ft)    * 102.44 * 215.28 * 326.74 *
* Q Total (cfs)         * 2442.00 * Flow (cfs)      * 154.74 * 1396.30 * 890.96 *
* Top Width (ft)        * 203.60 * Top Width (ft)  * 38.16  * 32.88  * 132.56 *
* Vel Total (ft/s)      * 3.79  * Avg. Vel. (ft/s) * 1.51  * 6.49  * 2.73  *
* Max Chl Dpth (ft)    * 8.34  * Hydr. Depth (ft) * 2.68  * 6.55  * 2.46  *
* Conv. Total (cfs)     * 53934.7 * Conv. (cfs)     * 3417.7 * 30839.0 * 19677.9 *
* Length Wtd. (ft)     * 54.16  * Wetted Per. (ft) * 38.86  * 34.73  * 132.65 *
* Min Ch El (ft)       * 223.59 * Shear (lb/sq ft) * 0.34  * 0.79  * 0.32  *
* Alpha                 * 1.87  * Stream Power (lb/ft s) * 316.57 * 0.00  * 0.00  *
* Frctn Loss (ft)      * 0.10  * Cum Volume (acre-ft) * 0.81  * 3.29  * 2.27  *
* C & E Loss (ft)      * 0.02  * Cum SA (acres)   * 0.33  * 0.29  * 1.14  *
*****

```

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)          * 233.18 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.45  * Wt. n-Val.      * 0.085  * 0.035  * 0.045  *
* W.S. Elev (ft)        * 232.73 * Reach Len. (ft) * 57.02  * 54.55  * 53.00  *
* Crit W.S. (ft)        *        * Flow Area (sq ft) * 133.40 * 241.55 * 436.95 *
* E.G. Slope (ft/ft)    * 0.002014 * Area (sq ft)    * 133.40 * 241.55 * 436.95 *
* Q Total (cfs)         * 3270.00 * Flow (cfs)      * 232.56 * 1676.62 * 1360.82 *
* Top Width (ft)        * 215.47 * Top Width (ft)  * 39.31  * 32.88  * 143.28 *
* Vel Total (ft/s)      * 4.03  * Avg. Vel. (ft/s) * 1.74  * 6.94  * 3.11  *
* Max Chl Dpth (ft)    * 9.14  * Hydr. Depth (ft) * 3.39  * 7.35  * 3.05  *
* Conv. Total (cfs)     * 72872.9 * Conv. (cfs)     * 5182.8 * 37363.9 * 30326.2 *
* Length Wtd. (ft)     * 54.12  * Wetted Per. (ft) * 40.26  * 34.73  * 143.39 *
* Min Ch El (ft)       * 223.59 * Shear (lb/sq ft) * 0.42  * 0.87  * 0.38  *
* Alpha                 * 1.78  * Stream Power (lb/ft s) * 316.57 * 0.00  * 0.00  *
* Frctn Loss (ft)      * 0.10  * Cum Volume (acre-ft) * 1.06  * 3.86  * 2.96  *
* C & E Loss (ft)      * 0.01  * Cum SA (acres)   * 0.38  * 0.29  * 1.34  *
*****

```

CROSS SECTION OUTPUT Profile #6HR OBS

```

*****
* E.G. Elev (ft)          * 230.74 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.54  * Wt. n-Val.      * 0.085  * 0.035  * 0.045  *
* W.S. Elev (ft)        * 230.20 * Reach Len. (ft) * 57.02  * 54.55  * 53.00  *
* Crit W.S. (ft)        *        * Flow Area (sq ft) * 38.44  * 158.26 * 118.66 *
* E.G. Slope (ft/ft)    * 0.003164 * Area (sq ft)    * 38.44  * 158.26 * 118.66 *
* Q Total (cfs)         * 1318.00 * Flow (cfs)      * 39.63  * 1038.77 * 239.61 *
* Top Width (ft)        * 173.19 * Top Width (ft)  * 35.65  * 32.88  * 104.66 *
* Vel Total (ft/s)      * 4.18  * Avg. Vel. (ft/s) * 1.03  * 6.56  * 2.02  *
* Max Chl Dpth (ft)    * 6.61  * Hydr. Depth (ft) * 1.08  * 4.81  * 1.13  *
* Conv. Total (cfs)     * 23429.6 * Conv. (cfs)     * 704.4  * 18465.8 * 4259.4 *
* Length Wtd. (ft)     * 54.34  * Wetted Per. (ft) * 35.81  * 34.73  * 104.69 *
* Min Ch El (ft)       * 223.59 * Shear (lb/sq ft) * 0.21  * 0.90  * 0.22  *
* Alpha                 * 1.99  * Stream Power (lb/ft s) * 316.57 * 0.00  * 0.00  *
* Frctn Loss (ft)      * 0.14  * Cum Volume (acre-ft) * 0.35  * 2.27  * 1.04  *
* C & E Loss (ft)      * 0.05  * Cum SA (acres)   * 0.24  * 0.29  * 0.82  *
*****

```

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft)          * 231.56 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.43  * Wt. n-Val.      * 0.085  * 0.035  * 0.045  *
* W.S. Elev (ft)        * 231.13 * Reach Len. (ft) * 57.02  * 54.55  * 53.00  *
* Crit W.S. (ft)        *        * Flow Area (sq ft) * 72.43  * 189.02 * 225.15 *
* E.G. Slope (ft/ft)    * 0.002283 * Area (sq ft)    * 72.43  * 189.02 * 225.15 *
* Q Total (cfs)         * 1815.00 * Flow (cfs)      * 93.91  * 1186.37 * 534.72 *
* Top Width (ft)        * 191.74 * Top Width (ft)  * 37.01  * 32.88  * 121.86 *
* Vel Total (ft/s)      * 3.73  * Avg. Vel. (ft/s) * 1.30  * 6.28  * 2.37  *
* Max Chl Dpth (ft)    * 7.54  * Hydr. Depth (ft) * 1.96  * 5.75  * 1.85  *
* Conv. Total (cfs)     * 37984.5 * Conv. (cfs)     * 1965.4 * 24828.4 * 11190.8 *
* Length Wtd. (ft)     * 54.23  * Wetted Per. (ft) * 37.45  * 34.73  * 121.92 *
* Min Ch El (ft)       * 223.59 * Shear (lb/sq ft) * 0.28  * 0.78  * 0.26  *
* Alpha                 * 1.98  * Stream Power (lb/ft s) * 316.57 * 0.00  * 0.00  *
* Frctn Loss (ft)      * 0.10  * Cum Volume (acre-ft) * 0.58  * 2.74  * 1.61  *
* C & E Loss (ft)      * 0.03  * Cum SA (acres)   * 0.29  * 0.29  * 0.89  *
*****

```

CROSS SECTION

RIVER: hudson
REACH: main RS: 9

INPUT

Description:

Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	238.33	24.58	229.92	45.06	228.52	69.24	226.93	73.73	223.36
80	223.1	80.81	223.12	88.24	223.37	92.16	226.13	95.78	228.73
133.97	228.37	138.72	228.37	155.61	228.1	193.63	229.24	249.29	234.89
254.41	235.12	258.27	235.18	258.47	234.69	265.15	234.88	276.18	235.08
287.68	234.68	288.3	235.23	303.88	237.07				

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	45.06	.085	69.24	.035	95.78	.045	254.41	.02
288.3	.05								

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
69.24 95.78 55.45 51.85 50.87 .1 .3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
193.6	249.3	250

CROSS SECTION OUTPUT Profile #2-YR

* E.G. Elev (ft)	* 227.76	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.68	* Wt. n-Val.	* 0.085	* 0.035	*
* W.S. Elev (ft)	* 227.08	* Reach Len. (ft)	* 55.45	* 51.85	* 50.87
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 0.16	* 74.19	*
* E.G. Slope (ft/ft)	* 0.006211	* Area (sq ft)	* 0.16	* 74.19	*
* Q Total (cfs)	* 491.00	* Flow (cfs)	* 0.04	* 490.96	*
* Top Width (ft)	* 26.45	* Top Width (ft)	* 2.21	* 24.24	*
* Vel Total (ft/s)	* 6.60	* Avg. Vel. (ft/s)	* 0.24	* 6.62	*
* Max Chl Dpth (ft)	* 3.98	* Hydr. Depth (ft)	* 0.07	* 3.06	*
* Conv. Total (cfs)	* 6230.0	* Conv. (cfs)	* 0.5	* 6229.5	*
* Length Wtd. (ft)	* 51.85	* Wetted Per. (ft)	* 2.22	* 26.67	*
* Min Ch El (ft)	* 223.10	* Shear (lb/sq ft)	* 0.03	* 1.08	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 303.88	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.27	* Cum Volume (acre-ft)	* 0.00	* 0.86	* 0.00
* C & E Loss (ft)	* 0.04	* Cum SA (acres)	* 0.02	* 0.24	* 0.01

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 230.32	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.43	* Wt. n-Val.	* 0.086	* 0.035	* 0.045
* W.S. Elev (ft)	* 229.89	* Reach Len. (ft)	* 55.45	* 51.85	* 50.87
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 66.19	* 147.05	* 132.95
* E.G. Slope (ft/ft)	* 0.002397	* Area (sq ft)	* 66.19	* 147.05	* 132.95
* Q Total (cfs)	* 1237.00	* Flow (cfs)	* 82.80	* 891.69	* 262.51
* Top Width (ft)	* 168.62	* Top Width (ft)	* 44.26	* 26.54	* 97.82
* Vel Total (ft/s)	* 3.57	* Avg. Vel. (ft/s)	* 1.25	* 6.06	* 1.97
* Max Chl Dpth (ft)	* 6.79	* Hydr. Depth (ft)	* 1.50	* 5.54	* 1.36
* Conv. Total (cfs)	* 25267.0	* Conv. (cfs)	* 1691.2	* 18213.7	* 5362.0
* Length Wtd. (ft)	* 51.82	* Wetted Per. (ft)	* 44.36	* 29.51	* 98.49
* Min Ch El (ft)	* 223.10	* Shear (lb/sq ft)	* 0.22	* 0.75	* 0.20
* Alpha	* 2.15	* Stream Power (lb/ft s)	* 303.88	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.09	* Cum Volume (acre-ft)	* 0.23	* 1.95	* 0.76
* C & E Loss (ft)	* 0.05	* Cum SA (acres)	* 0.17	* 0.25	* 0.68

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 232.23	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.35	* Wt. n-Val.	* 0.089	* 0.035	* 0.045
* W.S. Elev (ft)	* 231.88	* Reach Len. (ft)	* 55.45	* 51.85	* 50.87
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 160.47	* 199.75	* 327.21
* E.G. Slope (ft/ft)	* 0.001648	* Area (sq ft)	* 160.47	* 199.75	* 327.21
* Q Total (cfs)	* 2442.00	* Flow (cfs)	* 246.26	* 1232.04	* 963.70
* Top Width (ft)	* 174.74	* Top Width (ft)	* 50.38	* 26.54	* 97.82
* Vel Total (ft/s)	* 3.55	* Avg. Vel. (ft/s)	* 1.53	* 6.17	* 2.95
* Max Chl Dpth (ft)	* 8.78	* Hydr. Depth (ft)	* 3.19	* 7.53	* 3.35
* Conv. Total (cfs)	* 60151.2	* Conv. (cfs)	* 6065.9	* 30347.6	* 23737.7
* Length Wtd. (ft)	* 51.75	* Wetted Per. (ft)	* 50.81	* 29.51	* 100.48
* Min Ch El (ft)	* 223.10	* Shear (lb/sq ft)	* 0.32	* 0.70	* 0.34
* Alpha	* 1.81	* Stream Power (lb/ft s)	* 303.88	* 0.00	* 0.00

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* Frctn Loss (ft)          * 0.07 * Cum Volume (acre-ft) * 0.64 * 3.03 * 1.88 *
* C & E Loss (ft)         * 0.03 * Cum SA (acres) * 0.27 * 0.25 * 1.00 *
*****

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CROSS SECTION OUTPUT Profile #100-YR

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*****
* E.G. Elev (ft)          * 233.07 * Element * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.42 * Wt. n-Val. * 0.089 * 0.035 * 0.045 *
* W.S. Elev (ft)         * 232.65 * Reach Len. (ft) * 55.45 * 51.85 * 50.87 *
* Crit W.S. (ft)         * * * Flow Area (sq ft) * 200.17 * 220.21 * 402.60 *
* E.G. Slope (ft/ft)     * 0.001781 * Area (sq ft) * 200.17 * 220.21 * 402.60 *
* Q Total (cfs)          * 3270.00 * Flow (cfs) * 354.96 * 1506.80 * 1408.24 *
* Top Width (ft)         * 177.00 * Top Width (ft) * 52.64 * 26.54 * 97.82 *
* Vel Total (ft/s)       * 3.97 * Avg. Vel. (ft/s) * 1.77 * 6.84 * 3.50 *
* Max Chl Dpth (ft)      * 9.55 * Hydr. Depth (ft) * 3.80 * 8.30 * 4.12 *
* Conv. Total (cfs)      * 77479.3 * Conv. (cfs) * 8410.5 * 35702.1 * 33366.7 *
* Length Wtd. (ft)       * 51.75 * Wetted Per. (ft) * 53.19 * 29.51 * 101.25 *
* Min Ch El (ft)         * 223.10 * Shear (lb/sq ft) * 0.42 * 0.83 * 0.44 *
* Alpha                  * 1.72 * Stream Power (lb/ft s) * 303.88 * 0.00 * 0.00 *
* Frctn Loss (ft)        * 0.07 * Cum Volume (acre-ft) * 0.84 * 3.57 * 2.45 *
* C & E Loss (ft)        * 0.04 * Cum SA (acres) * 0.32 * 0.25 * 1.19 *
*****

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CROSS SECTION OUTPUT Profile #6HR OBS

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*****
* E.G. Elev (ft)          * 230.55 * Element * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.36 * Wt. n-Val. * 0.087 * 0.035 * 0.045 *
* W.S. Elev (ft)         * 230.18 * Reach Len. (ft) * 55.45 * 51.85 * 50.87 *
* Crit W.S. (ft)         * * * Flow Area (sq ft) * 79.25 * 154.75 * 161.35 *
* E.G. Slope (ft/ft)     * 0.002011 * Area (sq ft) * 79.25 * 154.75 * 161.35 *
* Q Total (cfs)          * 1318.00 * Flow (cfs) * 97.30 * 889.34 * 331.37 *
* Top Width (ft)         * 169.79 * Top Width (ft) * 45.43 * 26.54 * 97.82 *
* Vel Total (ft/s)       * 3.33 * Avg. Vel. (ft/s) * 1.23 * 5.75 * 2.05 *
* Max Chl Dpth (ft)      * 7.08 * Hydr. Depth (ft) * 1.74 * 5.83 * 1.65 *
* Conv. Total (cfs)      * 29391.1 * Conv. (cfs) * 2169.7 * 19832.0 * 7389.4 *
* Length Wtd. (ft)       * 51.80 * Wetted Per. (ft) * 45.57 * 29.51 * 98.78 *
* Min Ch El (ft)         * 223.10 * Shear (lb/sq ft) * 0.22 * 0.66 * 0.21 *
* Alpha                  * 2.11 * Stream Power (lb/ft s) * 303.88 * 0.00 * 0.00 *
* Frctn Loss (ft)        * 0.08 * Cum Volume (acre-ft) * 0.28 * 2.08 * 0.87 *
* C & E Loss (ft)        * 0.04 * Cum SA (acres) * 0.18 * 0.25 * 0.69 *
*****

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CROSS SECTION OUTPUT Profile #24HR OBS

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*****
* E.G. Elev (ft)          * 231.43 * Element * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.32 * Wt. n-Val. * 0.088 * 0.035 * 0.045 *
* W.S. Elev (ft)         * 231.10 * Reach Len. (ft) * 55.45 * 51.85 * 50.87 *
* Crit W.S. (ft)         * * * Flow Area (sq ft) * 122.20 * 179.12 * 251.18 *
* E.G. Slope (ft/ft)     * 0.001647 * Area (sq ft) * 122.20 * 179.12 * 251.18 *
* Q Total (cfs)          * 1815.00 * Flow (cfs) * 164.70 * 1027.07 * 623.24 *
* Top Width (ft)         * 172.47 * Top Width (ft) * 48.11 * 26.54 * 97.82 *
* Vel Total (ft/s)       * 3.29 * Avg. Vel. (ft/s) * 1.35 * 5.73 * 2.48 *
* Max Chl Dpth (ft)      * 8.00 * Hydr. Depth (ft) * 2.54 * 6.75 * 2.57 *
* Conv. Total (cfs)      * 44720.5 * Conv. (cfs) * 4058.0 * 25306.3 * 15356.2 *
* Length Wtd. (ft)       * 51.76 * Wetted Per. (ft) * 48.41 * 29.51 * 99.70 *
* Min Ch El (ft)         * 223.10 * Shear (lb/sq ft) * 0.26 * 0.62 * 0.26 *
* Alpha                  * 1.94 * Stream Power (lb/ft s) * 303.88 * 0.00 * 0.00 *
* Frctn Loss (ft)        * 0.07 * Cum Volume (acre-ft) * 0.45 * 2.51 * 1.32 *
* C & E Loss (ft)        * 0.03 * Cum SA (acres) * 0.24 * 0.25 * 0.75 *
*****

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CROSS SECTION

RIVER: hudson
REACH: main RS: 8

INPUT

Description:

Station Elevation Data		num= 24							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	232.66	10	231.25	20	230.58	45.39	228.78	62.29	226.96
73.22	226.75	78.86	222.87	84.37	222.42	85.34	222.48	91.4	222.85
93.16	222.95	100.51	227.98	129.11	227.53	173.64	228.25	221.13	229.38
256.1	234.43	261.75	233.86	265.78	233.85	265.89	233.49	272.62	233.6
283.68	233.78	295	233.52	295.71	234.03	308.74	235.94		

Manning's n Values		num= 5					
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val

0 .1 73.22 .035 100.51 .045 261.75 .02 295 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
73.22 100.51 84.59 69.8 31.19 .1 .3
Blocked Obstructions num= 1
Sta L Sta R Elev

221.13 256.1 250

CROSS SECTION OUTPUT Profile #2-YR

* E.G. Elev (ft) * 227.44 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.53 * Wt. n-Val. * 0.100 * 0.035 * * *
* W.S. Elev (ft) * 226.91 * Reach Len. (ft) * 84.59 * 69.80 * 31.19 *
* Crit W.S. (ft) * * * Flow Area (sq ft) * 0.66 * 83.91 * * *
* E.G. Slope (ft/ft) * 0.004436 * Area (sq ft) * 0.66 * 83.91 * * *
* Q Total (cfs) * 491.00 * Flow (cfs) * 0.12 * 490.88 * * *
* Top Width (ft) * 34.05 * Top Width (ft) * 8.32 * 25.73 * * *
* Vel Total (ft/s) * 5.81 * Avg. Vel. (ft/s) * 0.18 * 5.85 * * *
* Max Chl Dpth (ft) * 4.49 * Hydr. Depth (ft) * 0.08 * 3.26 * * *
* Conv. Total (cfs) * 7372.4 * Conv. (cfs) * 1.8 * 7370.6 * * *
* Length Wtd. (ft) * 69.80 * Wetted Per. (ft) * 8.32 * 28.19 * * *
* Min Ch El (ft) * 222.42 * Shear (lb/sq ft) * 0.02 * 0.82 * * *
* Alpha * 1.02 * Stream Power (lb/ft s) * 308.74 * 0.00 * 0.00 * *
* Frctn Loss (ft) * 0.26 * Cum Volume (acre-ft) * 0.00 * 0.77 * 0.00 * *
* C & E Loss (ft) * 0.09 * Cum SA (acres) * 0.01 * 0.21 * 0.01 * *

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft) * 230.18 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.27 * Wt. n-Val. * 0.100 * 0.035 * 0.045 * *
* W.S. Elev (ft) * 229.91 * Reach Len. (ft) * 84.59 * 69.80 * 31.19 * *
* Crit W.S. (ft) * * * Flow Area (sq ft) * 76.89 * 164.95 * 203.62 * *
* E.G. Slope (ft/ft) * 0.001410 * Area (sq ft) * 76.89 * 164.95 * 203.62 * *
* Q Total (cfs) * 1237.00 * Flow (cfs) * 62.33 * 817.75 * 356.92 * *
* Top Width (ft) * 191.68 * Top Width (ft) * 43.77 * 27.29 * 120.62 * *
* Vel Total (ft/s) * 2.78 * Avg. Vel. (ft/s) * 0.81 * 4.96 * 1.75 * *
* Max Chl Dpth (ft) * 7.49 * Hydr. Depth (ft) * 1.76 * 6.04 * 1.69 * *
* Conv. Total (cfs) * 32937.7 * Conv. (cfs) * 1659.7 * 21774.3 * 9503.7 * *
* Length Wtd. (ft) * 58.41 * Wetted Per. (ft) * 43.91 * 30.09 * 121.17 * *
* Min Ch El (ft) * 222.42 * Shear (lb/sq ft) * 0.15 * 0.48 * 0.15 * *
* Alpha * 2.23 * Stream Power (lb/ft s) * 308.74 * 0.00 * 0.00 * *
* Frctn Loss (ft) * 0.08 * Cum Volume (acre-ft) * 0.14 * 1.76 * 0.56 * *
* C & E Loss (ft) * 0.03 * Cum SA (acres) * 0.12 * 0.22 * 0.55 * *

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft) * 232.13 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.24 * Wt. n-Val. * 0.100 * 0.035 * 0.045 * *
* W.S. Elev (ft) * 231.89 * Reach Len. (ft) * 84.59 * 69.80 * 31.19 * *
* Crit W.S. (ft) * * * Flow Area (sq ft) * 190.13 * 218.92 * 442.14 * *
* E.G. Slope (ft/ft) * 0.001068 * Area (sq ft) * 190.13 * 218.92 * 442.14 * *
* Q Total (cfs) * 2442.00 * Flow (cfs) * 183.26 * 1140.28 * 1118.47 * *
* Top Width (ft) * 215.65 * Top Width (ft) * 67.74 * 27.29 * 120.62 * *
* Vel Total (ft/s) * 2.87 * Avg. Vel. (ft/s) * 0.96 * 5.21 * 2.53 * *
* Max Chl Dpth (ft) * 9.47 * Hydr. Depth (ft) * 2.81 * 8.02 * 3.67 * *
* Conv. Total (cfs) * 74738.0 * Conv. (cfs) * 5608.6 * 34898.5 * 34231.0 * *
* Length Wtd. (ft) * 52.85 * Wetted Per. (ft) * 67.97 * 30.09 * 123.15 * *
* Min Ch El (ft) * 222.42 * Shear (lb/sq ft) * 0.19 * 0.48 * 0.24 * *
* Alpha * 1.90 * Stream Power (lb/ft s) * 308.74 * 0.00 * 0.00 * *
* Frctn Loss (ft) * 0.06 * Cum Volume (acre-ft) * 0.42 * 2.78 * 1.43 * *
* C & E Loss (ft) * 0.02 * Cum SA (acres) * 0.20 * 0.22 * 0.87 * *

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft) * 232.96 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.29 * Wt. n-Val. * 0.100 * 0.035 * 0.045 * *
* W.S. Elev (ft) * 232.67 * Reach Len. (ft) * 84.59 * 69.80 * 31.19 * *
* Crit W.S. (ft) * * * Flow Area (sq ft) * 245.05 * 240.17 * 536.10 * *
* E.G. Slope (ft/ft) * 0.001164 * Area (sq ft) * 245.05 * 240.17 * 536.10 * *
* Q Total (cfs) * 3270.00 * Flow (cfs) * 277.21 * 1389.45 * 1603.34 * *
* Top Width (ft) * 221.13 * Top Width (ft) * 73.22 * 27.29 * 120.62 * *
* Vel Total (ft/s) * 3.20 * Avg. Vel. (ft/s) * 1.13 * 5.79 * 2.99 * *
* Max Chl Dpth (ft) * 10.25 * Hydr. Depth (ft) * 3.35 * 8.80 * 4.44 * *
* Conv. Total (cfs) * 95850.7 * Conv. (cfs) * 8125.6 * 40727.7 * 46997.4 * *
* Length Wtd. (ft) * 51.79 * Wetted Per. (ft) * 73.51 * 30.09 * 123.93 * *

```

* Min Ch El (ft)          * 222.42 * Shear (lb/sq ft)      * 0.24 * 0.58 * 0.31 *
* Alpha                  * 1.83  * Stream Power (lb/ft s) * 308.74 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.07  * Cum Volume (acre-ft)  * 0.55 * 3.30 * 1.90 *
* C & E Loss (ft)       * 0.02  * Cum SA (acres)        * 0.24 * 0.22 * 1.07 *
*****

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Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION OUTPUT Profile #6HR OBS

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*****
* E.G. Elev (ft)        * 230.43 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)        * 0.23  * Wt. n-Val.           * 0.100 * 0.035 * 0.045 *
* W.S. Elev (ft)       * 230.19 * Reach Len. (ft)     * 84.59 * 69.80 * 31.19 *
* Crit W.S. (ft)       *        * Flow Area (sq ft)    * 89.80 * 172.65 * 237.66 *
* E.G. Slope (ft/ft)   * 0.001216 * Area (sq ft)        * 89.80 * 172.65 * 237.66 *
* Q Total (cfs)        * 1318.00 * Flow (cfs)          * 70.73 * 819.20 * 428.07 *
* Top Width (ft)       * 195.66 * Top Width (ft)      * 47.75 * 27.29 * 120.62 *
* Vel Total (ft/s)     * 2.64  * Avg. Vel. (ft/s)    * 0.79 * 4.74 * 1.80 *
* Max Chl Dpth (ft)    * 7.77  * Hydr. Depth (ft)    * 1.88 * 6.33 * 1.97 *
* Conv. Total (cfs)    * 37799.8 * Conv. (cfs)         * 2028.6 * 23494.4 * 12276.8 *
* Length Wtd. (ft)     * 57.22 * Wetted Per. (ft)    * 47.90 * 30.09 * 121.46 *
* Min Ch El (ft)      * 222.42 * Shear (lb/sq ft)    * 0.14 * 0.44 * 0.15 *
* Alpha                * 2.17  * Stream Power (lb/ft s) * 308.74 * 0.00 * 0.00 *
* Frctn Loss (ft)     * 0.08  * Cum Volume (acre-ft) * 0.17 * 1.88 * 0.64 *
* C & E Loss (ft)     * 0.02  * Cum SA (acres)      * 0.13 * 0.22 * 0.57 *
*****

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CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft)        * 231.33 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)        * 0.22  * Wt. n-Val.           * 0.100 * 0.035 * 0.045 *
* W.S. Elev (ft)       * 231.11 * Reach Len. (ft)     * 84.59 * 69.80 * 31.19 *
* Crit W.S. (ft)       *        * Flow Area (sq ft)    * 139.45 * 197.60 * 347.90 *
* E.G. Slope (ft/ft)   * 0.001048 * Area (sq ft)        * 139.45 * 197.60 * 347.90 *
* Q Total (cfs)        * 1815.00 * Flow (cfs)          * 116.09 * 952.49 * 746.42 *
* Top Width (ft)       * 208.99 * Top Width (ft)      * 61.08 * 27.29 * 120.62 *
* Vel Total (ft/s)     * 2.65  * Avg. Vel. (ft/s)    * 0.83 * 4.82 * 2.15 *
* Max Chl Dpth (ft)    * 8.69  * Hydr. Depth (ft)    * 2.28 * 7.24 * 2.88 *
* Conv. Total (cfs)    * 56060.8 * Conv. (cfs)         * 3585.8 * 29419.9 * 23055.1 *
* Length Wtd. (ft)     * 54.38 * Wetted Per. (ft)    * 61.26 * 30.09 * 122.37 *
* Min Ch El (ft)      * 222.42 * Shear (lb/sq ft)    * 0.15 * 0.43 * 0.19 *
* Alpha                * 2.01  * Stream Power (lb/ft s) * 308.74 * 0.00 * 0.00 *
* Frctn Loss (ft)     * 0.06  * Cum Volume (acre-ft) * 0.29 * 2.29 * 0.97 *
* C & E Loss (ft)     * 0.02  * Cum SA (acres)      * 0.17 * 0.22 * 0.63 *
*****

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CROSS SECTION

RIVER: hudson

REACH: main RS: 7

INPUT

Description:

Station Elevation Data		num= 33							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	234.04	10	230.35	20.49	229.26	49.25	228.19	49.94	225.03
50.48	222.23	52	221.26	53.15	220.87	57.91	221.25	57.92	221.25
58.62	221.31	70.98	222.8	77.17	225.03	82.97	227.02	87.29	227.48
102.57	228.06	126.88	227.25	155.03	227.58	176.4	228.42	200.94	228.99
209.92	229.21	212.72	229.36	218.32	230.36	244.3	234	249.97	233.49
253.93	233.54	254.06	233.18	260.63	233.3	271.65	233.45	283.01	233.19
283.75	233.74	295.85	234.97	305.8	242.14				

Manning's n Values		num= 7							
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val		
0	.1	49.25	.05	82.97	.1	102.57	.045	176.4	.05
249.97	.02	283.75	.05						

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
49.25 82.97 20.21 31 42.19 .1 .3

Blocked Obstructions			num= 1
Sta L	Sta R	Elev	
191.3	244.3	250	

CROSS SECTION OUTPUT Profile #2-YR

```

* E.G. Elev (ft)          * 227.09 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.23  * Wt. n-Val.      *          * 0.050 *          *
* W.S. Elev (ft)         * 226.85 * Reach Len. (ft) * 20.21 * 31.00 * 42.19 *
* Crit W.S. (ft)         *        * Flow Area (sq ft) *          * 130.39 *          *
* E.G. Slope (ft/ft)     * 0.003280 * Area (sq ft) *          * 130.39 *          *
* Q Total (cfs)          * 506.00 * Flow (cfs)      *          * 506.00 *          *
* Top Width (ft)         * 32.94 * Top Width (ft)  *          * 32.94 *          *
* Vel Total (ft/s)       * 3.88  * Avg. Vel. (ft/s) *          * 3.88 *          *
* Max Chl Dpth (ft)     * 5.98  * Hydr. Depth (ft) *          * 3.96 *          *
* Conv. Total (cfs)     * 8835.8 * Conv. (cfs)     *          * 8835.8 *          *
* Length Wtd. (ft)      * 31.00 * Wetted Per. (ft) *          * 37.87 *          *
* Min Ch El (ft)        * 220.87 * Shear (lb/sq ft) *          * 0.70 *          *
* Alpha                  * 1.00  * Stream Power (lb/ft s) * 305.80 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.06  * Cum Volume (acre-ft) * 0.00 * 0.59 * 0.00 *
* C & E Loss (ft)       * 0.00  * Cum SA (acres)   * 0.00 * 0.17 * 0.01 *
*****

```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)          * 230.06 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.15  * Wt. n-Val.      * 0.100 * 0.050 * 0.051 *
* W.S. Elev (ft)         * 229.91 * Reach Len. (ft) * 20.21 * 31.00 * 42.19 *
* Crit W.S. (ft)         *        * Flow Area (sq ft) * 35.96 * 233.08 * 229.20 *
* E.G. Slope (ft/ft)     * 0.001437 * Area (sq ft) * 35.96 * 233.08 * 229.20 *
* Q Total (cfs)          * 1297.00 * Flow (cfs)      * 20.61 * 853.78 * 422.60 *
* Top Width (ft)         * 177.02 * Top Width (ft)  * 34.97 * 33.72 * 108.33 *
* Vel Total (ft/s)       * 2.60  * Avg. Vel. (ft/s) * 0.57 * 3.66 * 1.84 *
* Max Chl Dpth (ft)     * 9.04  * Hydr. Depth (ft) * 1.03 * 6.91 * 2.12 *
* Conv. Total (cfs)     * 34216.3 * Conv. (cfs)     * 543.8 * 22523.8 * 11148.8 *
* Length Wtd. (ft)      * 33.30 * Wetted Per. (ft) * 35.03 * 39.75 * 109.54 *
* Min Ch El (ft)        * 220.87 * Shear (lb/sq ft) * 0.09 * 0.53 * 0.19 *
* Alpha                  * 1.47  * Stream Power (lb/ft s) * 305.80 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.05  * Cum Volume (acre-ft) * 0.03 * 1.45 * 0.41 *
* C & E Loss (ft)       * 0.02  * Cum SA (acres)   * 0.04 * 0.17 * 0.47 *
*****

```

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)          * 232.05 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.18  * Wt. n-Val.      * 0.100 * 0.050 * 0.051 *
* W.S. Elev (ft)         * 231.87 * Reach Len. (ft) * 20.21 * 31.00 * 42.19 *
* Crit W.S. (ft)         *        * Flow Area (sq ft) * 115.22 * 299.31 * 441.94 *
* E.G. Slope (ft/ft)     * 0.001300 * Area (sq ft) * 115.22 * 299.31 * 441.94 *
* Q Total (cfs)          * 2530.00 * Flow (cfs)      * 117.79 * 1232.08 * 1180.13 *
* Top Width (ft)         * 185.42 * Top Width (ft)  * 43.37 * 33.72 * 108.33 *
* Vel Total (ft/s)       * 2.95  * Avg. Vel. (ft/s) * 1.02 * 4.12 * 2.67 *
* Max Chl Dpth (ft)     * 11.00 * Hydr. Depth (ft) * 2.66 * 8.88 * 4.08 *
* Conv. Total (cfs)     * 70165.6 * Conv. (cfs)     * 3266.6 * 34169.8 * 32729.2 *
* Length Wtd. (ft)      * 34.14 * Wetted Per. (ft) * 43.72 * 39.75 * 111.50 *
* Min Ch El (ft)        * 220.87 * Shear (lb/sq ft) * 0.21 * 0.61 * 0.32 *
* Alpha                  * 1.33  * Stream Power (lb/ft s) * 305.80 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.06  * Cum Volume (acre-ft) * 0.12 * 2.37 * 1.11 *
* C & E Loss (ft)       * 0.05  * Cum SA (acres)   * 0.09 * 0.17 * 0.79 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)          * 232.87 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.23  * Wt. n-Val.      * 0.100 * 0.050 * 0.051 *
* W.S. Elev (ft)         * 232.64 * Reach Len. (ft) * 20.21 * 31.00 * 42.19 *
* Crit W.S. (ft)         *        * Flow Area (sq ft) * 149.38 * 325.25 * 525.29 *
* E.G. Slope (ft/ft)     * 0.001503 * Area (sq ft) * 149.38 * 325.25 * 525.29 *
* Q Total (cfs)          * 3396.00 * Flow (cfs)      * 188.91 * 1521.72 * 1685.37 *
* Top Width (ft)         * 187.50 * Top Width (ft)  * 45.45 * 33.72 * 108.33 *
* Vel Total (ft/s)       * 3.40  * Avg. Vel. (ft/s) * 1.26 * 4.68 * 3.21 *
* Max Chl Dpth (ft)     * 11.77 * Hydr. Depth (ft) * 3.29 * 9.65 * 4.85 *
* Conv. Total (cfs)     * 87587.2 * Conv. (cfs)     * 4872.1 * 39247.1 * 43468.0 *
* Length Wtd. (ft)      * 34.26 * Wetted Per. (ft) * 45.94 * 39.75 * 112.27 *
* Min Ch El (ft)        * 220.87 * Shear (lb/sq ft) * 0.31 * 0.77 * 0.44 *
* Alpha                  * 1.30  * Stream Power (lb/ft s) * 305.80 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.07  * Cum Volume (acre-ft) * 0.17 * 2.85 * 1.52 *
* C & E Loss (ft)       * 0.08  * Cum SA (acres)   * 0.13 * 0.17 * 0.98 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
 This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #6HR OBS

```
*****
* E.G. Elev (ft)      * 230.33 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.16  * Wt. n-Val.      * 0.100  * 0.050  * 0.051  *
* W.S. Elev (ft)     * 230.17 * Reach Len. (ft) * 20.21  * 31.00  * 42.19  *
* Crit W.S. (ft)     *        * Flow Area (sq ft) * 45.55  * 242.01 * 257.87 *
* E.G. Slope (ft/ft) * 0.001418 * Area (sq ft)    * 45.55  * 242.01 * 257.87 *
* Q Total (cfs)      * 1441.00 * Flow (cfs)      * 28.97  * 902.97 * 509.06 *
* Top Width (ft)     * 179.57 * Top Width (ft)  * 37.52  * 33.72  * 108.33 *
* Vel Total (ft/s)   * 2.64  * Avg. Vel. (ft/s) * 0.64  * 3.73  * 1.97  *
* Max Chl Dpth (ft) * 9.30  * Hydr. Depth (ft) * 1.21  * 7.18  * 2.38  *
* Conv. Total (cfs)  * 38267.5 * Conv. (cfs)     * 769.4  * 23979.4 * 13518.7 *
* Length Wtd. (ft)  * 33.47  * Wetted Per. (ft) * 37.59  * 39.75  * 109.81 *
* Min Ch El (ft)    * 220.87 * Shear (lb/sq ft) * 0.11  * 0.54  * 0.21  *
* Alpha             * 1.45  * Stream Power (lb/ft s) * 305.80 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 0.05  * Cum Volume (acre-ft) * 0.04  * 1.55  * 0.46  *
* C & E Loss (ft)   * 0.03  * Cum SA (acres)   * 0.04  * 0.17  * 0.48  *
*****
```

CROSS SECTION OUTPUT Profile #24HR OBS

```
*****
* E.G. Elev (ft)      * 231.24 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.16  * Wt. n-Val.      * 0.100  * 0.050  * 0.051  *
* W.S. Elev (ft)     * 231.09 * Reach Len. (ft) * 20.21  * 31.00  * 42.19  *
* Crit W.S. (ft)     *        * Flow Area (sq ft) * 82.17  * 272.97 * 357.33 *
* E.G. Slope (ft/ft) * 0.001253 * Area (sq ft)    * 82.17  * 272.97 * 357.33 *
* Q Total (cfs)      * 1923.00 * Flow (cfs)      * 68.20  * 1037.55 * 817.25 *
* Top Width (ft)     * 183.30 * Top Width (ft)  * 41.25  * 33.72  * 108.33 *
* Vel Total (ft/s)   * 2.70  * Avg. Vel. (ft/s) * 0.83  * 3.80  * 2.29  *
* Max Chl Dpth (ft) * 10.22 * Hydr. Depth (ft) * 1.99  * 8.10  * 3.30  *
* Conv. Total (cfs)  * 54317.5 * Conv. (cfs)     * 1926.5 * 29306.9 * 23084.2 *
* Length Wtd. (ft)  * 33.93  * Wetted Per. (ft) * 41.46  * 39.75  * 110.72 *
* Min Ch El (ft)    * 220.87 * Shear (lb/sq ft) * 0.16  * 0.54  * 0.25  *
* Alpha             * 1.38  * Stream Power (lb/ft s) * 305.80 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 0.05  * Cum Volume (acre-ft) * 0.07  * 1.91  * 0.72  *
* C & E Loss (ft)   * 0.04  * Cum SA (acres)   * 0.07  * 0.17  * 0.54  *
*****
```

CROSS SECTION

RIVER: hudson
 REACH: main RS: 6

INPUT

Description:

Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	232.81	5	230.96	33.91	229.84	59.4	227.76	60.24	222.1
63.1	220.81	66.12	220.29	66.23	220.27	69.39	220.61	76.64	221.39
91.29	227.87	96.51	227.85	109.84	226.87	129.26	226.95	146.31	227.92
180.09	228.74	190.82	229.33	212.5	233.18	218.13	232.45	222.02	232.45
222.21	232.15	228.69	232.32	239.79	232.57	251.13	232.34	251.79	232.87
264	234.33	274.08	241.19						

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	59.4	.035	91.29	.1	218.13	.02	251.79	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 59.4 91.29 19.21 30.14 38.14 .1 .3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
159	208.5	250

CROSS SECTION OUTPUT Profile #2-YR

```
*****
* E.G. Elev (ft)      * 227.02 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.23  * Wt. n-Val.      *        * 0.035  *        *
* W.S. Elev (ft)     * 226.79 * Reach Len. (ft) * 19.21  * 30.14  * 38.14  *
*****
```

* Crit W.S. (ft)	*	* Flow Area (sq ft)	*	* 131.52	*	*
* E.G. Slope (ft/ft)	* 0.001399	* Area (sq ft)	*	* 131.52	*	*
* Q Total (cfs)	* 506.00	* Flow (cfs)	*	* 506.00	*	*
* Top Width (ft)	* 29.31	* Top Width (ft)	*	* 29.31	*	*
* Vel Total (ft/s)	* 3.85	* Avg. Vel. (ft/s)	*	* 3.85	*	*
* Max Chl Dpth (ft)	* 6.52	* Hydr. Depth (ft)	*	* 4.49	*	*
* Conv. Total (cfs)	* 13526.9	* Conv. (cfs)	*	* 13526.9	*	*
* Length Wtd. (ft)	* 30.14	* Wetted Per. (ft)	*	* 34.88	*	*
* Min Ch El (ft)	* 220.27	* Shear (lb/sq ft)	*	* 0.33	*	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 274.08	* 0.00	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.06	* Cum Volume (acre-ft)	* 0.00	* 0.50	* 0.00	* 0.00
* C & E Loss (ft)	* 0.03	* Cum SA (acres)	* 0.00	* 0.14	* 0.01	*

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 229.99	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 0.37	* Wt. n-Val.	* 0.100	* 0.035	* 0.100	*
* W.S. Elev (ft)	* 229.62	* Reach Len. (ft)	* 19.21	* 30.14	* 38.14	*
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 21.15	* 220.26	* 148.68	*
* E.G. Slope (ft/ft)	* 0.001466	* Area (sq ft)	* 21.15	* 220.26	* 148.68	*
* Q Total (cfs)	* 1297.00	* Flow (cfs)	* 11.43	* 1144.68	* 140.88	*
* Top Width (ft)	* 122.37	* Top Width (ft)	* 22.77	* 31.89	* 67.71	*
* Vel Total (ft/s)	* 3.32	* Avg. Vel. (ft/s)	* 0.54	* 5.20	* 0.95	*
* Max Chl Dpth (ft)	* 9.35	* Hydr. Depth (ft)	* 0.93	* 6.91	* 2.20	*
* Conv. Total (cfs)	* 33876.5	* Conv. (cfs)	* 298.6	* 29898.1	* 3679.8	*
* Length Wtd. (ft)	* 30.94	* Wetted Per. (ft)	* 22.85	* 38.52	* 69.17	*
* Min Ch El (ft)	* 220.27	* Shear (lb/sq ft)	* 0.08	* 0.52	* 0.20	*
* Alpha	* 2.17	* Stream Power (lb/ft s)	* 274.08	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.08	* Cum Volume (acre-ft)	* 0.02	* 1.28	* 0.23	*
* C & E Loss (ft)	* 0.06	* Cum SA (acres)	* 0.03	* 0.15	* 0.39	*

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 231.94	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 0.68	* Wt. n-Val.	* 0.100	* 0.035	* 0.100	*
* W.S. Elev (ft)	* 231.26	* Reach Len. (ft)	* 19.21	* 30.14	* 38.14	*
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 87.84	* 272.70	* 260.04	*
* E.G. Slope (ft/ft)	* 0.002223	* Area (sq ft)	* 87.84	* 272.70	* 260.04	*
* Q Total (cfs)	* 2530.00	* Flow (cfs)	* 83.71	* 2012.61	* 433.68	*
* Top Width (ft)	* 154.82	* Top Width (ft)	* 55.22	* 31.89	* 67.71	*
* Vel Total (ft/s)	* 4.08	* Avg. Vel. (ft/s)	* 0.95	* 7.38	* 1.67	*
* Max Chl Dpth (ft)	* 10.99	* Hydr. Depth (ft)	* 1.59	* 8.55	* 3.84	*
* Conv. Total (cfs)	* 53655.6	* Conv. (cfs)	* 1775.3	* 42682.9	* 9197.5	*
* Length Wtd. (ft)	* 32.07	* Wetted Per. (ft)	* 55.38	* 38.52	* 70.81	*
* Min Ch El (ft)	* 220.27	* Shear (lb/sq ft)	* 0.22	* 0.98	* 0.51	*
* Alpha	* 2.64	* Stream Power (lb/ft s)	* 274.08	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.09	* Cum Volume (acre-ft)	* 0.07	* 2.16	* 0.77	*
* C & E Loss (ft)	* 0.02	* Cum SA (acres)	* 0.07	* 0.15	* 0.70	*

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 232.72	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 1.02	* Wt. n-Val.	* 0.100	* 0.035	* 0.100	*
* W.S. Elev (ft)	* 231.70	* Reach Len. (ft)	* 19.21	* 30.14	* 38.14	*
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 112.02	* 286.52	* 289.39	*
* E.G. Slope (ft/ft)	* 0.003212	* Area (sq ft)	* 112.02	* 286.52	* 289.39	*
* Q Total (cfs)	* 3396.00	* Flow (cfs)	* 148.67	* 2626.90	* 620.43	*
* Top Width (ft)	* 155.99	* Top Width (ft)	* 56.39	* 31.89	* 67.71	*
* Vel Total (ft/s)	* 4.94	* Avg. Vel. (ft/s)	* 1.33	* 9.17	* 2.14	*
* Max Chl Dpth (ft)	* 11.43	* Hydr. Depth (ft)	* 1.99	* 8.98	* 4.27	*
* Conv. Total (cfs)	* 59918.1	* Conv. (cfs)	* 2623.1	* 46348.3	* 10946.7	*
* Length Wtd. (ft)	* 32.18	* Wetted Per. (ft)	* 56.63	* 38.52	* 71.25	*
* Min Ch El (ft)	* 220.27	* Shear (lb/sq ft)	* 0.40	* 1.49	* 0.81	*
* Alpha	* 2.71	* Stream Power (lb/ft s)	* 274.08	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.13	* Cum Volume (acre-ft)	* 0.11	* 2.63	* 1.13	*
* C & E Loss (ft)	* 0.03	* Cum SA (acres)	* 0.10	* 0.15	* 0.90	*

CROSS SECTION OUTPUT Profile #6HR OBS

```
*****
* E.G. Elev (ft)      * 230.25 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.41  * Wt. n-Val.      * 0.100  * 0.035  * 0.100  *
* W.S. Elev (ft)     * 229.84 * Reach Len. (ft) * 19.21  * 30.14  * 38.14  *
* Crit W.S. (ft)     *      * Flow Area (sq ft) * 26.46  * 227.28 * 163.59 *
* E.G. Slope (ft/ft) * 0.001584 * Area (sq ft)    * 26.46  * 227.28 * 163.59 *
* Q Total (cfs)      * 1441.00 * Flow (cfs)      * 16.02  * 1253.63 * 171.35 *
* Top Width (ft)     * 125.07 * Top Width (ft)  * 25.47  * 31.89  * 67.71  *
* Vel Total (ft/s)   * 3.45  * Avg. Vel. (ft/s) * 0.61  * 5.52  * 1.05  *
* Max Chl Dpth (ft) * 9.57  * Hydr. Depth (ft) * 1.04  * 7.13  * 2.42  *
* Conv. Total (cfs)  * 36211.9 * Conv. (cfs)     * 402.5  * 31503.5 * 4305.9 *
* Length Wtd. (ft)  * 31.04  * Wetted Per. (ft) * 25.55  * 38.52  * 69.39  *
* Min Ch El (ft)    * 220.27 * Shear (lb/sq ft) * 0.10  * 0.58  * 0.23  *
* Alpha              * 2.23  * Stream Power (lb/ft s) * 274.08 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 0.08  * Cum Volume (acre-ft) * 0.02  * 1.38  * 0.25  *
* C & E Loss (ft)   * 0.07  * Cum SA (acres)   * 0.03  * 0.15  * 0.40  *
*****
```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
 This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #24HR OBS

```
*****
* E.G. Elev (ft)      * 231.16 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.51  * Wt. n-Val.      * 0.100  * 0.035  * 0.100  *
* W.S. Elev (ft)     * 230.64 * Reach Len. (ft) * 19.21  * 30.14  * 38.14  *
* Crit W.S. (ft)     *      * Flow Area (sq ft) * 55.38  * 253.00 * 218.20 *
* E.G. Slope (ft/ft) * 0.001786 * Area (sq ft)    * 55.38  * 253.00 * 218.20 *
* Q Total (cfs)      * 1923.00 * Flow (cfs)      * 39.16  * 1591.97 * 291.87 *
* Top Width (ft)     * 145.86 * Top Width (ft)  * 46.26  * 31.89  * 67.71  *
* Vel Total (ft/s)   * 3.65  * Avg. Vel. (ft/s) * 0.71  * 6.29  * 1.34  *
* Max Chl Dpth (ft) * 10.37 * Hydr. Depth (ft) * 1.20  * 7.93  * 3.22  *
* Conv. Total (cfs)  * 45499.2 * Conv. (cfs)     * 926.5  * 37666.8 * 6905.9 *
* Length Wtd. (ft)  * 31.81  * Wetted Per. (ft) * 46.36  * 38.52  * 70.19  *
* Min Ch El (ft)    * 220.27 * Shear (lb/sq ft) * 0.13  * 0.73  * 0.35  *
* Alpha              * 2.48  * Stream Power (lb/ft s) * 274.08 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 0.08  * Cum Volume (acre-ft) * 0.04  * 1.72  * 0.44  *
* C & E Loss (ft)   * 0.02  * Cum SA (acres)   * 0.05  * 0.15  * 0.46  *
*****
```

CROSS SECTION

RIVER: hudson
 REACH: main RS: 5

INPUT

Description:

Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	237.05	19.33	231.35	34.54	230.9	49.16	226.44	49.71	221.74
54.79	221.59	60	219.53	61.57	219.8	61.58	219.8	62.02	219.88
63.98	219.98	66.43	226.23	69.34	227.52	113.51	228.23	150.48	227.88
173.2	229.28	184.22	231	187	231.13	190.89	231.01	190.99	230.72
197.15	230.94	207.98	231.26	218.02	231.1	225.62	230.81	226.28	231.35
242.65	238.23	244.51	238.31						

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	49.16	.035	69.34	.045	150.48	.05	187	.02
226.28	.05								

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	49.16	66.43		33.07	34.23	33.12	.1 .3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
138.5	173.2	240	F

CROSS SECTION OUTPUT Profile #2-YR

```
*****
* E.G. Elev (ft)      * 226.94 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.48  * Wt. n-Val.      * 0.000  * 0.035  * 0.035  *
* W.S. Elev (ft)     * 226.46 * Reach Len. (ft) * 33.07  * 34.23  * 33.12  *
*****
```

```

* Crit W.S. (ft)          * 224.03 * Flow Area (sq ft)      * 0.00 * 90.99 * 0.06 *
* E.G. Slope (ft/ft)    * 0.003253 * Area (sq ft)          * 0.00 * 90.99 * 0.06 *
* Q Total (cfs)         * 506.00 * Flow (cfs)            * 0.00 * 505.97 * 0.03 *
* Top Width (ft)        * 17.83 * Top Width (ft)        * 0.05 * 17.27 * 0.51 *
* Vel Total (ft/s)      * 5.56 * Avg. Vel. (ft/s)      * 0.03 * 5.56 * 0.53 *
* Max Chl Dpth (ft)    * 6.93 * Hydr. Depth (ft)     * 0.01 * 5.27 * 0.11 *
* Conv. Total (cfs)     * 8871.9 * Conv. (cfs)           * 0.0 * 8871.3 * 0.5 *
* Length Wtd. (ft)     * 34.23 * Wetted Per. (ft)     * 0.05 * 26.14 * 0.56 *
* Min Ch El (ft)       * 219.53 * Shear (lb/sq ft)     * * 0.71 * 0.02 *
* Alpha                 * 1.00 * Stream Power (lb/ft s) * 244.51 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 0.09 * Cum Volume (acre-ft) * 0.00 * 0.42 * 0.00 *
* C & E Loss (ft)       * 0.04 * Cum SA (acres)       * 0.00 * 0.13 * 0.01 *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)        * 229.85 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)        * 1.02 * Wt. n-Val.             * 0.100 * 0.035 * 0.043 *
* W.S. Elev (ft)       * 228.83 * Reach Len. (ft)        * 33.07 * 34.23 * 33.12 *
* Crit W.S. (ft)       * 226.84 * Flow Area (sq ft)      * 9.35 * 131.96 * 65.69 *
* E.G. Slope (ft/ft)   * 0.004762 * Area (sq ft)           * 9.35 * 131.96 * 83.66 *
* Q Total (cfs)        * 1297.00 * Flow (cfs)             * 10.47 * 1137.66 * 148.87 *
* Top Width (ft)       * 124.54 * Top Width (ft)        * 7.83 * 17.27 * 99.44 *
* Vel Total (ft/s)     * 6.27 * Avg. Vel. (ft/s)      * 1.12 * 8.62 * 2.27 *
* Max Chl Dpth (ft)    * 9.30 * Hydr. Depth (ft)     * 1.19 * 7.64 * 0.91 *
* Conv. Total (cfs)    * 18795.4 * Conv. (cfs)           * 151.8 * 16486.3 * 2157.3 *
* Length Wtd. (ft)    * 34.16 * Wetted Per. (ft)     * 8.18 * 26.14 * 72.35 *
* Min Ch El (ft)       * 219.53 * Shear (lb/sq ft)     * 0.34 * 1.50 * 0.27 *
* Alpha                 * 1.68 * Stream Power (lb/ft s) * 244.51 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 0.15 * Cum Volume (acre-ft) * 0.01 * 1.16 * 0.12 *
* C & E Loss (ft)       * 0.03 * Cum SA (acres)       * 0.02 * 0.13 * 0.31 *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)        * 231.83 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)        * 0.85 * Wt. n-Val.             * 0.100 * 0.035 * 0.044 *
* W.S. Elev (ft)       * 230.98 * Reach Len. (ft)        * 33.07 * 34.23 * 33.12 *
* Crit W.S. (ft)       * 230.14 * Flow Area (sq ft)      * 33.93 * 169.18 * 231.68 *
* E.G. Slope (ft/ft)   * 0.003693 * Area (sq ft)           * 33.93 * 169.18 * 322.78 *
* Q Total (cfs)        * 2530.00 * Flow (cfs)             * 46.60 * 1515.68 * 967.72 *
* Top Width (ft)       * 164.84 * Top Width (ft)        * 17.43 * 17.27 * 130.14 *
* Vel Total (ft/s)     * 5.82 * Avg. Vel. (ft/s)      * 1.37 * 8.96 * 4.18 *
* Max Chl Dpth (ft)    * 11.45 * Hydr. Depth (ft)     * 1.95 * 9.80 * 2.43 *
* Conv. Total (cfs)    * 41635.0 * Conv. (cfs)           * 766.8 * 24942.9 * 15925.4 *
* Length Wtd. (ft)    * 33.90 * Wetted Per. (ft)     * 18.09 * 26.14 * 96.11 *
* Min Ch El (ft)       * 219.53 * Shear (lb/sq ft)     * 0.43 * 1.49 * 0.56 *
* Alpha                 * 1.62 * Stream Power (lb/ft s) * 244.51 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 0.13 * Cum Volume (acre-ft) * 0.04 * 2.01 * 0.52 *
* C & E Loss (ft)       * 0.03 * Cum SA (acres)       * 0.05 * 0.13 * 0.62 *
*****

```

Warning: Divided flow computed for this cross-section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)        * 232.56 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)        * 1.28 * Wt. n-Val.             * 0.100 * 0.035 * 0.044 *
* W.S. Elev (ft)       * 231.28 * Reach Len. (ft)        * 33.07 * 34.23 * 33.12 *
* Crit W.S. (ft)       * 230.88 * Flow Area (sq ft)      * 40.51 * 174.25 * 264.34 *
* E.G. Slope (ft/ft)   * 0.005495 * Area (sq ft)           * 40.51 * 174.25 * 365.62 *
* Q Total (cfs)        * 3396.00 * Flow (cfs)             * 57.04 * 1942.23 * 1396.73 *
* Top Width (ft)       * 204.39 * Top Width (ft)        * 27.36 * 17.27 * 159.76 *
* Vel Total (ft/s)     * 7.09 * Avg. Vel. (ft/s)      * 1.41 * 11.15 * 5.28 *
* Max Chl Dpth (ft)    * 11.75 * Hydr. Depth (ft)     * 1.48 * 10.09 * 2.11 *
* Conv. Total (cfs)    * 45813.8 * Conv. (cfs)           * 769.5 * 26201.6 * 18842.6 *
* Length Wtd. (ft)    * 33.83 * Wetted Per. (ft)     * 28.03 * 26.14 * 125.87 *
* Min Ch El (ft)       * 219.53 * Shear (lb/sq ft)     * 0.50 * 2.29 * 0.72 *
* Alpha                 * 1.64 * Stream Power (lb/ft s) * 244.51 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 0.17 * Cum Volume (acre-ft) * 0.08 * 2.47 * 0.84 *
* C & E Loss (ft)       * 0.01 * Cum SA (acres)       * 0.09 * 0.13 * 0.80 *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

```
*****
* E.G. Elev (ft)      * 230.10 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.14  * Wt. n-Val.      * 0.100  * 0.035  * 0.044  *
* W.S. Elev (ft)     * 228.95 * Reach Len. (ft) * 33.07  * 34.23  * 33.12  *
* Crit W.S. (ft)     * 227.33 * Flow Area (sq ft) * 10.36  * 134.14 * 74.76  *
* E.G. Slope (ft/ft) * 0.005314 * Area (sq ft)    * 10.36  * 134.14 * 96.30  *
* Q Total (cfs)      * 1441.00 * Flow (cfs)      * 12.69  * 1234.95 * 193.37 *
* Top Width (ft)     * 126.99 * Top Width (ft)  * 8.24   * 17.27  * 101.48 *
* Vel Total (ft/s)   * 6.57   * Avg. Vel. (ft/s) * 1.22   * 9.21   * 2.59   *
* Max Chl Dpth (ft)  * 9.42   * Hydr. Depth (ft) * 1.26   * 7.77   * 1.04   *
* Conv. Total (cfs)  * 19768.1 * Conv. (cfs)     * 174.0  * 16941.3 * 2652.7 *
* Length Wtd. (ft)   * 34.15  * Wetted Per. (ft) * 8.62   * 26.14  * 72.35  *
* Min Ch El (ft)     * 219.53 * Shear (lb/sq ft) * 0.40   * 1.70   * 0.34   *
* Alpha              * 1.70   * Stream Power (lb/ft s) * 244.51 * 0.00   * 0.00   *
* Frctn Loss (ft)    * 0.17   * Cum Volume (acre-ft) * 0.01   * 1.26   * 0.14   *
* C & E Loss (ft)    * 0.01   * Cum SA (acres)    * 0.02   * 0.13   * 0.32   *
*****
```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```
*****
* E.G. Elev (ft)      * 231.06 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.75   * Wt. n-Val.      * 0.100  * 0.035  * 0.044  *
* W.S. Elev (ft)     * 230.31 * Reach Len. (ft) * 33.07  * 34.23  * 33.12  *
* Crit W.S. (ft)     * 229.51 * Flow Area (sq ft) * 24.53  * 157.54 * 175.80 *
* E.G. Slope (ft/ft) * 0.003366 * Area (sq ft)    * 24.53  * 157.54 * 243.49 *
* Q Total (cfs)      * 1923.00 * Flow (cfs)      * 31.88  * 1284.96 * 606.16 *
* Top Width (ft)     * 143.31 * Top Width (ft)  * 12.68  * 17.27  * 113.36 *
* Vel Total (ft/s)   * 5.37   * Avg. Vel. (ft/s) * 1.30   * 8.16   * 3.45   *
* Max Chl Dpth (ft)  * 10.78  * Hydr. Depth (ft) * 1.93   * 9.12   * 2.23   *
* Conv. Total (cfs)  * 33145.5 * Conv. (cfs)     * 549.4  * 22148.0 * 10448.0 *
* Length Wtd. (ft)   * 34.04  * Wetted Per. (ft) * 13.26  * 26.14  * 79.02  *
* Min Ch El (ft)     * 219.53 * Shear (lb/sq ft) * 0.39   * 1.27   * 0.47   *
* Alpha              * 1.67   * Stream Power (lb/ft s) * 244.51 * 0.00   * 0.00   *
* Frctn Loss (ft)    * 0.17   * Cum Volume (acre-ft) * 0.02   * 1.58   * 0.24   *
* C & E Loss (ft)    * 0.13   * Cum SA (acres)    * 0.04   * 0.13   * 0.38   *
*****
```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
REACH: main RS: 4

INPUT

Description:

Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	236.53	25.81	231.56	34.44	227.61	36.43	225.45	40.94	219.23
43.91	218.9	46.89	219.58	48.04	219.84	56.6	224.71	62	228.28
77.44	229.09	101.22	231.33	123.11	228.43	154.18	229.18	167.64	229.57
171.48	229.63	171.59	229.32	177.83	229.47	188.28	229.72	198.64	229.54
206.83	229.21	207.55	229.77	218.65	234.17	221.38	234.44	232.87	234.82

Manning's n Values num= 7

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	34.44	.035	62	.05	77.44	.045	167.64	.02
207.55	.05	218.65	.02						

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
34.44 62 47.24 49.31 53.94 .1 .3
Ineffective Flow num= 1
Sta L Sta R Elev Permanent

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft) * 226.80 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.34 * Wt. n-Val. * * 0.035 * *
* W.S. Elev (ft) * 226.47 * Reach Len. (ft) * 47.24 * 49.31 * 53.94 *
* Crit W.S. (ft) * 223.66 * Flow Area (sq ft) * * 108.59 * *
* E.G. Slope (ft/ft) * 0.002103 * Area (sq ft) * * 108.59 * *
* Q Total (cfs) * 506.00 * Flow (cfs) * * 506.00 * *
* Top Width (ft) * 23.76 * Top Width (ft) * * 23.76 * *
* Vel Total (ft/s) * 4.66 * Avg. Vel. (ft/s) * * 4.66 * *
* Max Chl Dpth (ft) * 7.57 * Hydr. Depth (ft) * * 4.57 * *
* Conv. Total (cfs) * 11034.9 * Conv. (cfs) * * 11034.9 * *
* Length Wtd. (ft) * 49.31 * Wetted Per. (ft) * * 29.32 * *
* Min Ch El (ft) * 218.90 * Shear (lb/sq ft) * * 0.49 * *
* Alpha * 1.00 * Stream Power (lb/ft s) * 232.87 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.06 * Cum Volume (acre-ft) * 0.00 * 0.35 * 0.00 *
* C & E Loss (ft) * 0.05 * Cum SA (acres) * 0.00 * 0.11 * 0.01 *
*****
    
```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft) * 229.67 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.91 * Wt. n-Val. * 0.100 * 0.035 * 0.047 *
* W.S. Elev (ft) * 228.76 * Reach Len. (ft) * 47.24 * 49.31 * 53.94 *
* Crit W.S. (ft) * 226.41 * Flow Area (sq ft) * 1.46 * 168.83 * 4.55 *
* E.G. Slope (ft/ft) * 0.003865 * Area (sq ft) * 1.46 * 168.83 * 4.98 *
* Q Total (cfs) * 1297.00 * Flow (cfs) * 0.88 * 1292.79 * 3.34 *
* Top Width (ft) * 55.70 * Top Width (ft) * 2.52 * 27.56 * 25.62 *
* Vel Total (ft/s) * 7.42 * Avg. Vel. (ft/s) * 0.60 * 7.66 * 0.73 *
* Max Chl Dpth (ft) * 9.86 * Hydr. Depth (ft) * 0.58 * 6.13 * 0.23 *
* Conv. Total (cfs) * 20862.1 * Conv. (cfs) * 14.1 * 20794.3 * 53.7 *
* Length Wtd. (ft) * 49.80 * Wetted Per. (ft) * 2.77 * 34.17 * 19.69 *
* Min Ch El (ft) * 218.90 * Shear (lb/sq ft) * 0.13 * 1.19 * 0.06 *
* Alpha * 1.06 * Stream Power (lb/ft s) * 232.87 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.08 * Cum Volume (acre-ft) * 0.01 * 1.04 * 0.09 *
* C & E Loss (ft) * 0.20 * Cum SA (acres) * 0.02 * 0.12 * 0.27 *
*****
    
```

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft) * 231.67 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 1.18 * Wt. n-Val. * 0.100 * 0.035 * 0.036 *
* W.S. Elev (ft) * 230.49 * Reach Len. (ft) * 47.24 * 49.31 * 53.94 *
* Crit W.S. (ft) * 230.49 * Flow Area (sq ft) * 9.05 * 216.35 * 145.44 *
* E.G. Slope (ft/ft) * 0.004302 * Area (sq ft) * 9.05 * 216.35 * 160.61 *
* Q Total (cfs) * 2530.00 * Flow (cfs) * 10.56 * 2062.00 * 457.45 *
* Top Width (ft) * 165.93 * Top Width (ft) * 6.29 * 27.56 * 132.08 *
* Vel Total (ft/s) * 6.82 * Avg. Vel. (ft/s) * 1.17 * 9.53 * 3.15 *
* Max Chl Dpth (ft) * 11.59 * Hydr. Depth (ft) * 1.44 * 7.85 * 1.18 *
* Conv. Total (cfs) * 38573.7 * Conv. (cfs) * 160.9 * 31438.3 * 6974.5 *
* Length Wtd. (ft) * 50.58 * Wetted Per. (ft) * 6.92 * 34.17 * 124.28 *
* Min Ch El (ft) * 218.90 * Shear (lb/sq ft) * 0.35 * 1.70 * 0.31 *
* Alpha * 1.63 * Stream Power (lb/ft s) * 232.87 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.10 * Cum Volume (acre-ft) * 0.03 * 1.86 * 0.33 *
* C & E Loss (ft) * 0.24 * Cum SA (acres) * 0.04 * 0.12 * 0.52 *
*****
    
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```
*****
* E.G. Elev (ft)          * 232.38 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 1.26  * Wt. n-Val.      * 0.100  * 0.035  * 0.034  *
* W.S. Elev (ft)         * 231.12 * Reach Len. (ft) * 47.24  * 49.31  * 53.94  *
* Crit W.S. (ft)         * 231.12 * Flow Area (sq ft) * 13.47  * 233.80 * 227.77 *
* E.G. Slope (ft/ft)     * 0.004561 * Area (sq ft)    * 13.47  * 233.80 * 248.39 *
* Q Total (cfs)          * 3396.00 * Flow (cfs)      * 18.47  * 2416.15 * 961.38 *
* Top Width (ft)         * 180.41 * Top Width (ft)  * 7.67   * 27.56  * 145.18 *
* Vel Total (ft/s)       * 7.15   * Avg. Vel. (ft/s) * 1.37   * 10.33  * 4.22   *
* Max Chl Dpth (ft)      * 12.22  * Hydr. Depth (ft) * 1.76   * 8.48   * 1.67   *
* Conv. Total (cfs)      * 50286.3 * Conv. (cfs)     * 273.5  * 35777.2 * 14235.6 *
* Length Wtd. (ft)       * 50.97  * Wetted Per. (ft) * 8.44   * 34.17  * 137.57 *
* Min Ch El (ft)         * 218.90 * Shear (lb/sq ft) * 0.45   * 1.95   * 0.47   *
* Alpha                  * 1.59   * Stream Power (lb/ft s) * 232.87 * 0.00   * 0.00   *
* Frctn Loss (ft)        * 0.12   * Cum Volume (acre-ft) * 0.06   * 2.31   * 0.61   *
* C & E Loss (ft)        * 0.24   * Cum SA (acres)    * 0.07   * 0.12   * 0.68   *
*****
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

```
*****
* E.G. Elev (ft)          * 229.91 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 1.10  * Wt. n-Val.      * 0.100  * 0.035  * 0.047  *
* W.S. Elev (ft)         * 228.82 * Reach Len. (ft) * 47.24  * 49.31  * 53.94  *
* Crit W.S. (ft)         * 226.80 * Flow Area (sq ft) * 1.59   * 170.23 * 5.58   *
* E.G. Slope (ft/ft)     * 0.004633 * Area (sq ft)    * 1.59   * 170.23 * 6.36   *
* Q Total (cfs)          * 1441.00 * Flow (cfs)      * 1.07   * 1435.01 * 4.92   *
* Top Width (ft)         * 59.26  * Top Width (ft)  * 2.63   * 27.56  * 29.07  *
* Vel Total (ft/s)       * 8.12   * Avg. Vel. (ft/s) * 0.68   * 8.43   * 0.88   *
* Max Chl Dpth (ft)      * 9.92   * Hydr. Depth (ft) * 0.60   * 6.18   * 0.27   *
* Conv. Total (cfs)      * 21170.1 * Conv. (cfs)     * 15.8   * 21082.1 * 72.3   *
* Length Wtd. (ft)       * 49.86  * Wetted Per. (ft) * 2.90   * 34.17  * 21.04  *
* Min Ch El (ft)         * 218.90 * Shear (lb/sq ft) * 0.16   * 1.44   * 0.08   *
* Alpha                  * 1.07   * Stream Power (lb/ft s) * 232.87 * 0.00   * 0.00   *
* Frctn Loss (ft)        * 0.09   * Cum Volume (acre-ft) * 0.01   * 1.14   * 0.10   *
* C & E Loss (ft)        * 0.25   * Cum SA (acres)    * 0.02   * 0.12   * 0.28   *
*****
```

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```
*****
* E.G. Elev (ft)          * 230.76 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 2.00  * Wt. n-Val.      * 0.100  * 0.035  * 0.047  *
* W.S. Elev (ft)         * 228.76 * Reach Len. (ft) * 47.24  * 49.31  * 53.94  *
*****
```

```

* Crit W.S. (ft) * 227.93 * Flow Area (sq ft) * 1.44 * 168.65 * 4.42 *
* E.G. Slope (ft/ft) * 0.008528 * Area (sq ft) * 1.44 * 168.65 * 4.81 *
* Q Total (cfs) * 1923.00 * Flow (cfs) * 1.28 * 1916.96 * 4.76 *
* Top Width (ft) * 55.24 * Top Width (ft) * 2.51 * 27.56 * 25.18 *
* Vel Total (ft/s) * 11.02 * Avg. Vel. (ft/s) * 0.89 * 11.37 * 1.08 *
* Max Chl Dpth (ft) * 9.86 * Hydr. Depth (ft) * 0.57 * 6.12 * 0.23 *
* Conv. Total (cfs) * 20823.3 * Conv. (cfs) * 13.9 * 20757.8 * 51.6 *
* Length Wtd. (ft) * 50.00 * Wetted Per. (ft) * 2.76 * 34.17 * 19.51 *
* Min Ch El (ft) * 218.90 * Shear (lb/sq ft) * 0.28 * 2.63 * 0.12 *
* Alpha * 1.06 * Stream Power (lb/ft s) * 232.87 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.12 * Cum Volume (acre-ft) * 0.01 * 1.45 * 0.14 *
* C & E Loss (ft) * 0.50 * Cum SA (acres) * 0.03 * 0.12 * 0.33 *
*****

```

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main

RS: 3

INPUT

Description: Channel vegetation heavy

Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	234.33	12.74	233.78	27.06	229.74	36.02	226.32	41.07	223.02
45.32	220.34	49.21	217.7	50.93	217.52	51.14	217.5	54.29	218.25
59.95	222.39	65.56	225.54	72.74	228.64	102.54	228.16	121.2	229.93
135.83	227.74	149.63	227.65	153.57	227.69	153.67	227.23	159.35	227.29
169.96	227.5	180.29	227.5	188.17	227.34	188.91	227.93	191.54	227.85
192.54	229.42	203.14	230.82	206.02	230.85	216.02	232.35		

Manning's n Values

num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	36.02	.035	65.56	.045	149.63	.02

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	36.02	65.56		112.21	120.13	138.27	
						.3	.5

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
207.91	216.02	245	F

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft) * 226.69 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.17 * Wt. n-Val. * 0.100 * 0.035 * 0.045 *
* W.S. Elev (ft) * 226.52 * Reach Len. (ft) * 112.21 * 120.13 * 138.27 *
* Crit W.S. (ft) * 222.42 * Flow Area (sq ft) * 0.05 * 153.04 * 1.12 *
* E.G. Slope (ft/ft) * 0.000826 * Area (sq ft) * 0.05 * 153.04 * 1.12 *
* Q Total (cfs) * 506.00 * Flow (cfs) * 0.00 * 505.37 * 0.62 *
* Top Width (ft) * 32.35 * Top Width (ft) * 0.53 * 29.54 * 2.28 *
* Vel Total (ft/s) * 3.28 * Avg. Vel. (ft/s) * 0.09 * 3.30 * 0.56 *
* Max Chl Dpth (ft) * 9.02 * Hydr. Depth (ft) * 0.10 * 5.18 * 0.49 *
* Conv. Total (cfs) * 17602.7 * Conv. (cfs) * 0.2 * 17580.8 * 21.7 *
* Length Wtd. (ft) * 120.13 * Wetted Per. (ft) * 0.57 * 34.38 * 2.48 *
* Min Ch El (ft) * 217.50 * Shear (lb/sq ft) * 0.00 * 0.23 * 0.02 *
* Alpha * 1.01 * Stream Power (lb/ft s) * 216.02 * 0.00 * 0.00 *
* Frctn Loss (ft) * * Cum Volume (acre-ft) * * 0.20 * *
* C & E Loss (ft) * * Cum SA (acres) * 0.00 * 0.08 * 0.00 *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft) * 229.40 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.25 * Wt. n-Val. * 0.100 * 0.035 * 0.026 *
* W.S. Elev (ft) * 229.15 * Reach Len. (ft) * 112.21 * 120.13 * 138.27 *
* Crit W.S. (ft) * 225.08 * Flow Area (sq ft) * 10.48 * 230.60 * 139.83 *
*****

```

* E.G. Slope (ft/ft)	*0.000850	* Area (sq ft)	* 10.48	* 230.60	* 139.83	*
* Q Total (cfs)	* 1297.00	* Flow (cfs)	* 5.46	* 1015.06	* 276.48	*
* Top Width (ft)	* 150.29	* Top Width (ft)	* 7.41	* 29.54	* 113.34	*
* Vel Total (ft/s)	* 3.41	* Avg. Vel. (ft/s)	* 0.52	* 4.40	* 1.98	*
* Max Chl Dpth (ft)	* 11.65	* Hydr. Depth (ft)	* 1.41	* 7.81	* 1.23	*
* Conv. Total (cfs)	* 44487.8	* Conv. (cfs)	* 187.5	* 34817.0	* 9483.4	*
* Length Wtd. (ft)	* 120.13	* Wetted Per. (ft)	* 7.93	* 34.38	* 115.43	*
* Min Ch El (ft)	* 217.50	* Shear (lb/sq ft)	* 0.07	* 0.36	* 0.06	*
* Alpha	* 1.38	* Stream Power (lb/ft s)	* 216.02	* 0.00	* 0.00	*
* Frctn Loss (ft)	*	* Cum Volume (acre-ft)	* 0.00	* 0.82	* 0.00	*
* C & E Loss (ft)	*	* Cum SA (acres)	* 0.01	* 0.08	* 0.18	*

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 230.84	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 0.38	* Wt. n-Val.	* 0.100	* 0.035	* 0.028	*
* W.S. Elev (ft)	* 230.46	* Reach Len. (ft)	* 112.21	* 120.13	* 138.27	*
* Crit W.S. (ft)	* 228.63	* Flow Area (sq ft)	* 22.71	* 269.40	* 305.45	*
* E.G. Slope (ft/ft)	*0.001203	* Area (sq ft)	* 22.71	* 269.40	* 305.45	*
* Q Total (cfs)	* 2530.00	* Flow (cfs)	* 17.67	* 1565.11	* 947.23	*
* Top Width (ft)	* 175.93	* Top Width (ft)	* 11.52	* 29.54	* 134.87	*
* Vel Total (ft/s)	* 4.23	* Avg. Vel. (ft/s)	* 0.78	* 5.81	* 3.10	*
* Max Chl Dpth (ft)	* 12.96	* Hydr. Depth (ft)	* 1.97	* 9.12	* 2.26	*
* Conv. Total (cfs)	* 72936.2	* Conv. (cfs)	* 509.4	* 45119.7	* 27307.1	*
* Length Wtd. (ft)	* 120.13	* Wetted Per. (ft)	* 12.25	* 34.38	* 137.27	*
* Min Ch El (ft)	* 217.50	* Shear (lb/sq ft)	* 0.14	* 0.59	* 0.17	*
* Alpha	* 1.37	* Stream Power (lb/ft s)	* 216.02	* 0.00	* 0.00	*
* Frctn Loss (ft)	*	* Cum Volume (acre-ft)	* 0.01	* 1.58	* 0.04	*
* C & E Loss (ft)	*	* Cum SA (acres)	* 0.03	* 0.08	* 0.35	*

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 231.63	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 0.45	* Wt. n-Val.	* 0.100	* 0.035	* 0.029	*
* W.S. Elev (ft)	* 231.18	* Reach Len. (ft)	* 112.21	* 120.13	* 138.27	*
* Crit W.S. (ft)	* 229.41	* Flow Area (sq ft)	* 31.85	* 290.52	* 404.63	*
* E.G. Slope (ft/ft)	*0.001345	* Area (sq ft)	* 31.85	* 290.52	* 404.63	*
* Q Total (cfs)	* 3396.00	* Flow (cfs)	* 28.82	* 1876.38	* 1490.80	*
* Top Width (ft)	* 186.23	* Top Width (ft)	* 14.05	* 29.54	* 142.64	*
* Vel Total (ft/s)	* 4.67	* Avg. Vel. (ft/s)	* 0.91	* 6.46	* 3.68	*
* Max Chl Dpth (ft)	* 13.68	* Hydr. Depth (ft)	* 2.27	* 9.83	* 2.84	*
* Conv. Total (cfs)	* 92603.2	* Conv. (cfs)	* 786.0	* 51165.7	* 40651.6	*
* Length Wtd. (ft)	* 120.13	* Wetted Per. (ft)	* 14.88	* 34.38	* 144.80	*
* Min Ch El (ft)	* 217.50	* Shear (lb/sq ft)	* 0.18	* 0.71	* 0.23	*
* Alpha	* 1.33	* Stream Power (lb/ft s)	* 216.02	* 0.00	* 0.00	*
* Frctn Loss (ft)	*	* Cum Volume (acre-ft)	* 0.03	* 2.01	* 0.20	*
* C & E Loss (ft)	*	* Cum SA (acres)	* 0.06	* 0.08	* 0.50	*

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION OUTPUT Profile #6HR OBS

* E.G. Elev (ft)	* 229.58	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 0.27	* Wt. n-Val.	* 0.100	* 0.035	* 0.026	*
* W.S. Elev (ft)	* 229.31	* Reach Len. (ft)	* 112.21	* 120.13	* 138.27	*
* Crit W.S. (ft)	* 225.44	* Flow Area (sq ft)	* 11.68	* 235.27	* 157.97	*
* E.G. Slope (ft/ft)	*0.000923	* Area (sq ft)	* 11.68	* 235.27	* 157.97	*
* Q Total (cfs)	* 1441.00	* Flow (cfs)	* 6.58	* 1093.64	* 340.78	*
* Top Width (ft)	* 153.53	* Top Width (ft)	* 7.82	* 29.54	* 116.17	*
* Vel Total (ft/s)	* 3.56	* Avg. Vel. (ft/s)	* 0.56	* 4.65	* 2.16	*
* Max Chl Dpth (ft)	* 11.81	* Hydr. Depth (ft)	* 1.49	* 7.96	* 1.36	*
* Conv. Total (cfs)	* 47435.1	* Conv. (cfs)	* 216.7	* 36000.5	* 11217.8	*
* Length Wtd. (ft)	* 120.13	* Wetted Per. (ft)	* 8.37	* 34.38	* 118.36	*
* Min Ch El (ft)	* 217.50	* Shear (lb/sq ft)	* 0.08	* 0.39	* 0.08	*
* Alpha	* 1.38	* Stream Power (lb/ft s)	* 216.02	* 0.00	* 0.00	*
* Frctn Loss (ft)	*	* Cum Volume (acre-ft)	* 0.00	* 0.91	* 0.00	*
* C & E Loss (ft)	*	* Cum SA (acres)	* 0.01	* 0.08	* 0.19	*

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```
*****
* E.G. Elev (ft)          * 230.14 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.34  * Wt. n-Val.      * 0.100  * 0.035  * 0.027  *
* W.S. Elev (ft)         * 229.80 * Reach Len. (ft) * 112.21 * 120.13 * 138.27 *
* Crit W.S. (ft)        * 226.46 * Flow Area (sq ft) * 15.84  * 249.77 * 217.66 *
* E.G. Slope (ft/ft)    * 0.001131 * Area (sq ft)    * 15.84  * 249.77 * 217.66 *
* Q Total (cfs)         * 1923.00 * Flow (cfs)      * 10.90  * 1337.63 * 574.47 *
* Top Width (ft)        * 166.25 * Top Width (ft)  * 9.16   * 29.54  * 127.55 *
* Vel Total (ft/s)      * 3.98   * Avg. Vel. (ft/s) * 0.69   * 5.36   * 2.64   *
* Max Chl Dpth (ft)     * 12.30  * Hydr. Depth (ft) * 1.73   * 8.46   * 1.71   *
* Conv. Total (cfs)     * 57181.1 * Conv. (cfs)     * 324.2  * 39774.8 * 17082.1 *
* Length Wtd. (ft)     * 120.13 * Wetted Per. (ft) * 9.80   * 34.38  * 129.90 *
* Min Ch El (ft)       * 217.50 * Shear (lb/sq ft) * 0.11   * 0.51   * 0.12   *
* Alpha                 * 1.39   * Stream Power (lb/ft s) * 216.02 * 0.00   * 0.00   *
* Frctn Loss (ft)      *         * Cum Volume (acre-ft) * 0.00   * 1.21   * 0.00   *
* C & E Loss (ft)      *         * Cum SA (acres)    * 0.02   * 0.08   * 0.23   *
*****
```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CULVERT

RIVER: hudson
REACH: main RS: 2.5

INPUT

Description:
Distance from Upstream XS = 13
Deck/Roadway Width = 95
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 6

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
25		229			33.33		229			41.09		228.5		
54.48		227.93			67.7		228			90		228		

Upstream Bridge Cross Section Data

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	234.33	12.74	233.78	27.06	229.74	36.02	226.32	41.07	223.02
45.32	220.34	49.21	217.7	50.93	217.52	51.14	217.5	54.29	218.25
59.95	222.39	65.56	225.54	72.74	228.64	102.54	228.16	121.2	229.93
135.83	227.74	149.63	227.65	153.57	227.69	153.67	227.23	159.35	227.29
169.96	227.5	180.29	227.5	188.17	227.34	188.91	227.93	191.54	227.85
192.54	229.42	203.14	230.82	206.02	230.85	216.02	232.35		

Manning's n Values

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	36.02	.035	65.56	.045	149.63	.02

Bank Sta: Left Right Coeff Contr. Expan.
36.02 65.56 .3 .5

Ineffective Flow num= 1
Sta L Sta R Elev Permanent
207.91 216.02 245 F

Downstream Deck/Roadway Coordinates

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
0		225			24		225			24.8		229		
34.2		228.5			49		227.93			50		225		
90		225												

Downstream Bridge Cross Section Data

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	227.98	20.1	224.25	30.05	222.24	30.41	219.53	30.82	217.54
31.07	215.18	39.03	214.76	40.17	214.78	46.05	214.86	46.12	217.7

46.53	219.53	47.08	222.67	75.26	224.24	87.23	224.69	122.58	225.91
127.5	225.75	127.65	225.43	133.54	225.65	143.95	225.88	153.46	225.71
159.5	225.41	160.11	225.99	160.7	226	161.7	228.68	177.81	229.82

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	31.07	.035	47.08	.045	122.58	.02

Bank Sta: Left Right Coeff Contr. Expan.
 30.41 46.53 .3 .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
56.4	111.4	240	F
171.08	177.81	240	F

Blocked Obstructions num= 1

Sta L	Sta R	Elev
14.6	21.6	230

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
 Downstream Embankment side slope = 0 horiz. to 1.0 vertical
 Maximum allowable submergence for weir flow = .98
 Elevation at which weir flow begins = 224.95
 Energy head used in spillway design =
 Spillway height used in design =
 Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name Shape Rise Span
 Culvert #1 Circular 8
 FHWA Chart # 1 - Concrete Pipe Culvert
 FHWA Scale # 1 - Square edge entrance with headwall
 Solution Criteria = Highest U.S. EG

Culvert Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
13.5	94.77	.024	.024	0	.5	1

Upstream Elevation = 216.95
 Centerline Station = 51.14
 Downstream Elevation = 215.35
 Centerline Station = 39.16

CULVERT OUTPUT Profile #2-YR Culv Group: Culvert #1

* Q Culv Group (cfs)	* 506.00	* Culv Full Len (ft)	* *
* # Barrels	* 1	* Culv Vel US (ft/s)	* 13.12 *
* Q Barrel (cfs)	* 506.00	* Culv Vel DS (ft/s)	* 14.15 *
* E.G. US. (ft)	* 226.70	* Culv Inv El Up (ft)	* 216.95 *
* W.S. US. (ft)	* 226.52	* Culv Inv El Dn (ft)	* 215.35 *
* E.G. DS (ft)	* 219.78	* Culv Frctn Ls (ft)	* 1.54 *
* W.S. DS (ft)	* 218.27	* Culv Exit Loss (ft)	* 4.03 *
* Delta EG (ft)	* 6.91	* Culv Entr Loss (ft)	* 1.34 *
* Delta WS (ft)	* 8.25	* Q Weir (cfs)	* *
* E.G. IC (ft)	* 226.28	* Weir Sta Lft (ft)	* *
* E.G. OC (ft)	* 226.70	* Weir Sta Rgt (ft)	* *
* Culvert Control	* Outlet	* Weir Submerg	* *
* Culv WS Inlet (ft)	* 222.68	* Weir Max Depth (ft)	* *
* Culv WS Outlet (ft)	* 220.70	* Weir Avg Depth (ft)	* *
* Culv Nml Depth (ft)	* 5.35	* Weir Flow Area (sq ft)	* *
* Culv Crt Depth (ft)	* 5.73	* Min El Weir Flow (ft)	* 227.24 *

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
 Note: During the supercritical calculations a hydraulic jump occurred at the outlet of (leaving) the culvert.
 Warning: During the supercritical analysis, the program could not converge on a supercritical answer in the downstream cross section. The program used the solution with the least error.
 Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
 Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #10-YR Culv Group: Culvert #1

* Q Culv Group (cfs)	* 673.92	* Culv Full Len (ft)	* *
* # Barrels	* 1	* Culv Vel US (ft/s)	* 13.41 *
* Q Barrel (cfs)	* 673.92	* Culv Vel DS (ft/s)	* 16.36 *
* E.G. US. (ft)	* 229.40	* Culv Inv El Up (ft)	* 216.95 *

* W.S. US. (ft)	* 229.15	* Culv Inv El Dn (ft)	* 215.35	*
* E.G. DS (ft)	* 223.90	* Culv Frctn Ls (ft)	* 2.39	*
* W.S. DS (ft)	* 220.98	* Culv Exit Loss (ft)	* 1.72	*
* Delta EG (ft)	* 5.50	* Culv Entr Loss (ft)	* 1.40	*
* Delta WS (ft)	* 8.17	* Q Weir (cfs)	* 623.08	*
* E.G. IC (ft)	* 229.40	* Weir Sta Lft (ft)	* 27.97	*
* E.G. OC (ft)	* 228.82	* Weir Sta Rgt (ft)	* 192.52	*
* Culvert Control	* Inlet	* Weir Submerg	* 0.00	*
* Culv WS Inlet (ft)	* 224.95	* Weir Max Depth (ft)	* 2.16	*
* Culv WS Outlet (ft)	* 221.46	* Weir Avg Depth (ft)	* 1.29	*
* Culv Nml Depth (ft)	* 6.99	* Weir Flow Area (sq ft)	* 199.59	*
* Culv Crt Depth (ft)	* 6.57	* Min El Weir Flow (ft)	* 227.24	*

Warning: The flow through the culvert is supercritical. However, since there is flow over the road (weir flow), the program cannot determine if the downstream cross section should be subcritical or supercritical. The program used the downstream subcritical answer, even though it may not be valid.

Warning: During the supercritical analysis, the program could not converge on a supercritical answer in the downstream cross section. The program used the solution with the least error.

Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #50-YR Culv Group: Culvert #1

* Q Culv Group (cfs)	* 625.40	* Culv Full Len (ft)	* 94.77	*
* # Barrels	* 1	* Culv Vel US (ft/s)	* 12.44	*
* Q Barrel (cfs)	* 625.40	* Culv Vel DS (ft/s)	* 12.44	*
* E.G. US. (ft)	* 230.84	* Culv Inv El Up (ft)	* 216.95	*
* W.S. US. (ft)	* 230.46	* Culv Inv El Dn (ft)	* 215.35	*
* E.G. DS (ft)	* 228.12	* Culv Frctn Ls (ft)	* 1.52	*
* W.S. DS (ft)	* 225.07	* Culv Exit Loss (ft)	* 0.00	*
* Delta EG (ft)	* 2.72	* Culv Entr Loss (ft)	* 1.20	*
* Delta WS (ft)	* 5.39	* Q Weir (cfs)	* 1904.60	*
* E.G. IC (ft)	* 230.73	* Weir Sta Lft (ft)	* 23.14	*
* E.G. OC (ft)	* 230.84	* Weir Sta Rgt (ft)	* 205.64	*
* Culvert Control	* Outlet	* Weir Submerg	* 0.00	*
* Culv WS Inlet (ft)	* 224.95	* Weir Max Depth (ft)	* 3.62	*
* Culv WS Outlet (ft)	* 223.35	* Weir Avg Depth (ft)	* 2.45	*
* Culv Nml Depth (ft)	*	* Weir Flow Area (sq ft)	* 447.37	*
* Culv Crt Depth (ft)	* 6.36	* Min El Weir Flow (ft)	* 227.24	*

CULVERT OUTPUT Profile #100-YR Culv Group: Culvert #1

* Q Culv Group (cfs)	* 564.75	* Culv Full Len (ft)	* 94.77	*
* # Barrels	* 1	* Culv Vel US (ft/s)	* 11.24	*
* Q Barrel (cfs)	* 564.75	* Culv Vel DS (ft/s)	* 11.24	*
* E.G. US. (ft)	* 231.63	* Culv Inv El Up (ft)	* 216.95	*
* W.S. US. (ft)	* 231.18	* Culv Inv El Dn (ft)	* 215.35	*
* E.G. DS (ft)	* 229.15	* Culv Frctn Ls (ft)	* 1.24	*
* W.S. DS (ft)	* 227.45	* Culv Exit Loss (ft)	* 0.26	*
* Delta EG (ft)	* 2.48	* Culv Entr Loss (ft)	* 0.98	*
* Delta WS (ft)	* 3.73	* Q Weir (cfs)	* 2831.25	*
* E.G. IC (ft)	* 231.49	* Weir Sta Lft (ft)	* 20.37	*
* E.G. OC (ft)	* 231.63	* Weir Sta Rgt (ft)	* 207.91	*
* Culvert Control	* Outlet	* Weir Submerg	* 0.00	*
* Culv WS Inlet (ft)	* 224.95	* Weir Max Depth (ft)	* 4.40	*
* Culv WS Outlet (ft)	* 223.35	* Weir Avg Depth (ft)	* 3.16	*
* Culv Nml Depth (ft)	*	* Weir Flow Area (sq ft)	* 592.49	*
* Culv Crt Depth (ft)	* 6.05	* Min El Weir Flow (ft)	* 227.24	*

CULVERT OUTPUT Profile #6HR OBS Culv Group: Culvert #1

* Q Culv Group (cfs)	* 682.42	* Culv Full Len (ft)	*	*
* # Barrels	* 1	* Culv Vel US (ft/s)	* 13.58	*
* Q Barrel (cfs)	* 682.42	* Culv Vel DS (ft/s)	* 16.50	*
* E.G. US. (ft)	* 229.58	* Culv Inv El Up (ft)	* 216.95	*
* W.S. US. (ft)	* 229.31	* Culv Inv El Dn (ft)	* 215.35	*
* E.G. DS (ft)	* 224.53	* Culv Frctn Ls (ft)	* 2.43	*
* W.S. DS (ft)	* 221.40	* Culv Exit Loss (ft)	* 1.18	*
* Delta EG (ft)	* 5.05	* Culv Entr Loss (ft)	* 1.43	*
* Delta WS (ft)	* 7.91	* Q Weir (cfs)	* 758.58	*
* E.G. IC (ft)	* 229.58	* Weir Sta Lft (ft)	* 27.45	*
* E.G. OC (ft)	* 228.93	* Weir Sta Rgt (ft)	* 193.82	*
* Culvert Control	* Inlet	* Weir Submerg	* 0.00	*
* Culv WS Inlet (ft)	* 224.95	* Weir Max Depth (ft)	* 2.36	*
* Culv WS Outlet (ft)	* 221.48	* Weir Avg Depth (ft)	* 1.44	*

```

* Culv Nml Depth (ft)      * 7.16 * Weir Flow Area (sq ft) * 230.67 *
* Culv Crt Depth (ft)     * 6.61 * Min El Weir Flow (ft) * 227.24 *
*****

```

Warning: The flow through the culvert is supercritical. However, since there is flow over the road (weir flow), the program cannot determine if the downstream cross section should be subcritical or supercritical. The program used the downstream subcritical answer, even though it may not be valid.

Warning: During the supercritical analysis, the program could not converge on a supercritical answer in the downstream cross section. The program used the solution with the least error.

Note: The flow in the culvert is entirely supercritical.

```

CULVERT OUTPUT Profile #24HR OBS Culv Group: Culvert #1
*****
* Q Culv Group (cfs)      * 717.31 * Culv Full Len (ft)    * 94.77 *
* # Barrels              * 1      * Culv Vel US (ft/s)    * 14.27 *
* Q Barrel (cfs)         * 717.31 * Culv Vel DS (ft/s)    * 14.27 *
* E.G. US. (ft)          * 230.14 * Culv Inv El Up (ft)   * 216.95 *
* W.S. US. (ft)          * 229.80 * Culv Inv El Dn (ft)   * 215.35 *
* E.G. DS (ft)           * 226.50 * Culv Frctn Ls (ft)    * 2.00 *
* W.S. DS (ft)           * 223.40 * Culv Exit Loss (ft)   * 0.06 *
* Delta EG (ft)          * 3.64   * Culv Entr Loss (ft)   * 1.58 *
* Delta WS (ft)          * 6.40   * Q Weir (cfs)          * 1205.69 *
* E.G. IC (ft)           * 230.15 * Weir Sta Lft (ft)     * 25.63 *
* E.G. OC (ft)           * 230.14 * Weir Sta Rgt (ft)     * 198.01 *
* Culvert Control        * Outlet * Weir Submerg          * 0.00 *
* Culv WS Inlet (ft)     * 224.95 * Weir Max Depth (ft)   * 2.91 *
* Culv WS Outlet (ft)    * 223.35 * Weir Avg Depth (ft)   * 1.88 *
* Culv Nml Depth (ft)    * 8.00   * Weir Flow Area (sq ft) * 323.27 *
* Culv Crt Depth (ft)    * 6.75   * Min El Weir Flow (ft) * 227.24 *
*****

```

Note: The normal depth exceeds the height of the culvert. The program assumes that the normal depth is equal to the height of the culvert.

Note: During the supercritical calculations a hydraulic jump occurred inside of the culvert.

Note: The culvert inlet is submerged and the culvert flows full over part or all of its length. Therefore, the culvert inlet equations are not valid and the supercritical result has been discarded. The outlet answer will be used.

CROSS SECTION

RIVER: hudson
 REACH: main RS: 2

INPUT

Description:

Station Elevation Data		num= 25							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	227.98	20.1	224.25	30.05	222.24	30.41	219.53	30.82	217.54
31.07	215.18	39.03	214.76	40.17	214.78	46.05	214.86	46.12	217.7
46.53	219.53	47.08	222.67	75.26	224.24	87.23	224.69	122.58	225.91
127.5	225.75	127.65	225.43	133.54	225.65	143.95	225.88	153.46	225.71
159.5	225.41	160.11	225.99	160.7	226	161.7	228.68	177.81	229.82

Manning's n Values

num= 4							
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	31.07	.035	47.08	.045	122.58	.02

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 30.41 46.53 46.04 48.67 51.13 .3 .5

Ineffective Flow num= 2
 Sta L Sta R Elev Permanent
 56.4 111.4 240 F
 171.08 177.81 240 F

Blocked Obstructions num= 1
 Sta L Sta R Elev
 14.6 21.6 230

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft)        * 219.78 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)         * 1.52  * Wt. n-Val.          *         * 0.037 *

```



```

* W.S. Elev (ft)          * 218.27 * Reach Len. (ft)          * 46.04 * 48.67 * 51.13 *
* Crit W.S. (ft)         * 218.18 * Flow Area (sq ft)       *         * 51.23 *         *
* E.G. Slope (ft/ft)     * 0.018568 * Area (sq ft)           *         * 51.23 *         *
* Q Total (cfs)          * 506.00 * Flow (cfs)              *         * 506.00 *         *
* Top Width (ft)         * 15.58 * Top Width (ft)          *         * 15.58 *         *
* Vel Total (ft/s)       * 9.88 * Avg. Vel. (ft/s)        *         * 9.88 *         *
* Max Chl Dpth (ft)      * 3.51 * Hydr. Depth (ft)        *         * 3.29 *         *
* Conv. Total (cfs)      * 3713.4 * Conv. (cfs)             *         * 3713.4 *         *
* Length Wtd. (ft)       * 48.67 * Wetted Per. (ft)        *         * 21.53 *         *
* Min Ch El (ft)         * 214.76 * Shear (lb/sq ft)        *         * 2.76 *         *
* Alpha                  * 1.00 * Stream Power (lb/ft s) * 177.81 * 0.00 * 0.00 *
* Frctn Loss (ft)        * 0.82 * Cum Volume (acre-ft)    *         * 0.06 *         *
* C & E Loss (ft)        * 0.10 * Cum SA (acres)          *         * 0.02 *         *
*****

```

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)          * 223.90 * Element                  * Left OB * Channel * Right OB *
* Vel Head (ft)          * 2.92 * Wt. n-Val.               * 0.045 * 0.037 * 0.035 *
* W.S. Elev (ft)         * 220.98 * Reach Len. (ft)          * 46.04 * 48.67 * 51.13 *
* Crit W.S. (ft)         * 220.98 * Flow Area (sq ft)        * 0.14 * 94.56 * 0.18 *
* E.G. Slope (ft/ft)     * 0.018778 * Area (sq ft)            * 0.14 * 94.56 * 0.18 *
* Q Total (cfs)          * 1297.00 * Flow (cfs)              * 0.13 * 1296.60 * 0.27 *
* Top Width (ft)         * 16.57 * Top Width (ft)          * 0.19 * 16.12 * 0.25 *
* Vel Total (ft/s)       * 13.67 * Avg. Vel. (ft/s)        * 0.94 * 13.71 * 1.45 *
* Max Chl Dpth (ft)      * 6.22 * Hydr. Depth (ft)        * 0.72 * 5.87 * 0.72 *
* Conv. Total (cfs)      * 9465.0 * Conv. (cfs)             * 1.0 * 9462.1 * 1.9 *
* Length Wtd. (ft)       * 48.67 * Wetted Per. (ft)        * 1.46 * 24.11 * 1.47 *
* Min Ch El (ft)         * 214.76 * Shear (lb/sq ft)        * 0.11 * 4.60 * 0.15 *
* Alpha                  * 1.01 * Stream Power (lb/ft s) * 177.81 * 0.00 * 0.00 *
* Frctn Loss (ft)        * 0.83 * Cum Volume (acre-ft)    * 0.00 * 0.10 * 0.00 *
* C & E Loss (ft)        * 0.22 * Cum SA (acres)          * 0.00 * 0.02 * 0.00 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)          * 228.12 * Element                  * Left OB * Channel * Right OB *
* Vel Head (ft)          * 3.05 * Wt. n-Val.               * 0.045 * 0.037 * 0.044 *
* W.S. Elev (ft)         * 225.07 * Reach Len. (ft)          * 46.04 * 48.67 * 51.13 *
* Crit W.S. (ft)         * 225.07 * Flow Area (sq ft)        * 18.22 * 160.54 * 22.14 *
* E.G. Slope (ft/ft)     * 0.010405 * Area (sq ft)            * 18.22 * 160.54 * 57.07 *
* Q Total (cfs)          * 2530.00 * Flow (cfs)              * 78.95 * 2332.15 * 118.90 *
* Top Width (ft)         * 76.66 * Top Width (ft)          * 8.81 * 16.12 * 51.73 *
* Vel Total (ft/s)       * 12.59 * Avg. Vel. (ft/s)        * 4.33 * 14.53 * 5.37 *
* Max Chl Dpth (ft)      * 10.31 * Hydr. Depth (ft)        * 2.07 * 9.96 * 2.24 *
* Conv. Total (cfs)      * 24803.0 * Conv. (cfs)             * 774.0 * 22863.4 * 1165.6 *
* Length Wtd. (ft)       * 48.73 * Wetted Per. (ft)        * 12.48 * 24.11 * 12.52 *
* Min Ch El (ft)         * 214.76 * Shear (lb/sq ft)        * 0.95 * 4.32 * 1.15 *
* Alpha                  * 1.24 * Stream Power (lb/ft s) * 177.81 * 0.00 * 0.00 *
* Frctn Loss (ft)        * 0.39 * Cum Volume (acre-ft)    * 0.01 * 0.16 * 0.04 *
* C & E Loss (ft)        * 0.71 * Cum SA (acres)          * 0.01 * 0.02 * 0.06 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100-YR

```
*****
* E.G. Elev (ft)      * 229.15 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.70  * Wt. n-Val.      * 0.045  * 0.037  * 0.030  *
* W.S. Elev (ft)     * 227.45 * Reach Len. (ft) * 46.04  * 48.67  * 51.13  *
* Crit W.S. (ft)     * 227.45 * Flow Area (sq ft) * 51.95  * 198.87 * 131.44 *
* E.G. Slope (ft/ft) * 0.005260 * Area (sq ft)    * 51.95  * 198.87 * 294.19 *
* Q Total (cfs)      * 3396.00 * Flow (cfs)      * 207.66 * 2369.40 * 818.94 *
* Top Width (ft)     * 151.38 * Top Width (ft)  * 20.55  * 16.12  * 114.71 *
* Vel Total (ft/s)   * 8.88  * Avg. Vel. (ft/s) * 4.00  * 11.91  * 6.23  *
* Max Chl Dpth (ft) * 12.69 * Hydr. Depth (ft) * 2.53  * 12.34  * 2.20  *
* Conv. Total (cfs)  * 46823.6 * Conv. (cfs)     * 2863.2 * 32668.9 * 11291.5 *
* Length Wtd. (ft)  * 49.08 * Wetted Per. (ft) * 28.97  * 24.11  * 63.83 *
* Min Ch El (ft)    * 214.76 * Shear (lb/sq ft) * 0.59  * 2.71  * 0.68  *
* Alpha             * 1.39  * Stream Power (lb/ft s) * 177.81 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 0.29  * Cum Volume (acre-ft) * 0.03  * 0.19  * 0.20  *
* C & E Loss (ft)   * 0.10  * Cum SA (acres)   * 0.02  * 0.02  * 0.10  *
*****
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #6HR OBS

```
*****
* E.G. Elev (ft)      * 224.53 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 3.14  * Wt. n-Val.      * 0.045  * 0.037  * 0.035  *
* W.S. Elev (ft)     * 221.40 * Reach Len. (ft) * 46.04  * 48.67  * 51.13  *
* Crit W.S. (ft)     * 221.40 * Flow Area (sq ft) * 0.23  * 101.32 * 0.31  *
* E.G. Slope (ft/ft) * 0.018405 * Area (sq ft)    * 0.23  * 101.32 * 0.31  *
* Q Total (cfs)      * 1441.00 * Flow (cfs)      * 0.26  * 1440.22 * 0.52  *
* Top Width (ft)     * 16.69 * Top Width (ft)  * 0.25  * 16.12  * 0.33  *
* Vel Total (ft/s)   * 14.15 * Avg. Vel. (ft/s) * 1.11  * 14.22  * 1.70  *
* Max Chl Dpth (ft) * 6.64  * Hydr. Depth (ft) * 0.93  * 6.29  * 0.93  *
* Conv. Total (cfs)  * 10621.7 * Conv. (cfs)     * 1.9  * 10616.0 * 3.8  *
* Length Wtd. (ft)  * 48.67 * Wetted Per. (ft) * 1.88  * 24.11  * 1.90  *
* Min Ch El (ft)    * 214.76 * Shear (lb/sq ft) * 0.14  * 4.83  * 0.19  *
* Alpha             * 1.01  * Stream Power (lb/ft s) * 177.81 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 0.82  * Cum Volume (acre-ft) * 0.00  * 0.11  * 0.00  *
* C & E Loss (ft)   * 0.22  * Cum SA (acres)   * 0.00  * 0.02  * 0.00  *
*****
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```

* E.G. Elev (ft)          * 226.50 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 3.11  * Wt. n-Val.      * 0.045  * 0.037  * 0.043  *
* W.S. Elev (ft)         * 223.40 * Reach Len. (ft) * 46.04  * 48.67  * 51.13  *
* Crit W.S. (ft)         * 223.40 * Flow Area (sq ft) * 4.23  * 133.58 * 5.64  *
* E.G. Slope (ft/ft)     * 0.012745 * Area (sq ft)    * 4.23  * 133.58 * 6.03  *
* Q Total (cfs)          * 1923.00 * Flow (cfs)      * 9.83  * 1900.07 * 13.10 *
* Top Width (ft)         * 35.84  * Top Width (ft)  * 6.10  * 16.12  * 13.63 *
* Vel Total (ft/s)       * 13.41  * Avg. Vel. (ft/s) * 2.32  * 14.22  * 2.32  *
* Max Chl Dpth (ft)      * 8.64   * Hydr. Depth (ft) * 0.69  * 8.29   * 0.57  *
* Conv. Total (cfs)      * 17033.5 * Conv. (cfs)     * 87.1  * 16830.5 * 116.0 *
* Length Wtd. (ft)       * 48.67  * Wetted Per. (ft) * 8.59  * 24.11  * 12.52 *
* Min Ch El (ft)         * 214.76 * Shear (lb/sq ft) * 0.39  * 4.41   * 0.36  *
* Alpha                  * 1.11   * Stream Power (lb/ft s) * 177.81 * 0.00  * 0.00  *
* Frctn Loss (ft)       * 0.41   * Cum Volume (acre-ft) * 0.00  * 0.14  * 0.00  *
* C & E Loss (ft)        * 0.87   * Cum SA (acres)    * 0.00  * 0.02  * 0.01  *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: hudson

REACH: main RS: 1

INPUT

Description:

```

Station Elevation Data num= 25
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
*****
0 230.14 25.94 222.15 37.57 221.8 42.97 220.18 43.67 218.62
44.08 217.3 45.37 214.42 51.45 214.18 52.87 214.13 61 214.53
62.45 217.58 63.27 219.47 63.72 220.69 65.96 220.54 105.43 221.17
130.89 223.8 152.14 226.21 154.82 225.97 160.48 226.02 170.65 226.19
180.49 226 187.04 225.77 187.73 226.32 190.41 226.66 200 229.64

```

```

Manning's n Values num= 4
Sta n Val Sta n Val Sta n Val Sta n Val
*****
0 .045 45.37 .035 63.72 .02 190.41 .045

```

```

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
43.67 63.27 0 0 0 .1 .3

```

```

Ineffective Flow num= 1
Sta L Sta R Elev Permanent
103.5 146.6 240 F

```

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft)          * 218.86 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 1.31  * Wt. n-Val.      * 0.037  * 0.037  * 0.037  *
* W.S. Elev (ft)         * 217.55 * Reach Len. (ft) * 55.12  * 55.12  * 55.12  *
* Crit W.S. (ft)         * 217.41 * Flow Area (sq ft) * 5.64  * 55.12  * 5.64  *
* E.G. Slope (ft/ft)     * 0.015405 * Area (sq ft)    * 5.64  * 55.12  * 5.64  *
* Q Total (cfs)          * 506.00 * Flow (cfs)      * 9.83  * 506.00 * 9.83  *
* Top Width (ft)         * 18.43  * Top Width (ft)  * 6.10  * 18.43  * 6.10  *
* Vel Total (ft/s)       * 9.18   * Avg. Vel. (ft/s) * 2.32  * 9.18   * 2.32  *
* Max Chl Dpth (ft)      * 3.42   * Hydr. Depth (ft) * 0.69  * 2.99   * 0.69  *
* Conv. Total (cfs)      * 4076.8 * Conv. (cfs)     * 87.1  * 4076.8 * 87.1  *
* Length Wtd. (ft)       * 22.41  * Wetted Per. (ft) * 8.59  * 22.41  * 8.59  *
* Min Ch El (ft)         * 214.13 * Shear (lb/sq ft) * 0.39  * 2.37   * 0.39  *
* Alpha                  * 1.00   * Stream Power (lb/ft s) * 200.00 * 0.00  * 0.00  *

```

```

* Frctn Loss (ft)          *          * Cum Volume (acre-ft) *          *          *          *
* C & E Loss (ft)         *          * Cum SA (acres)       *          *          *          *
*****

```

Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)          * 222.67 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)          * 3.43  * Wt. n-Val.          * 0.045  * 0.037  *          *
* W.S. Elev (ft)         * 219.24 * Reach Len. (ft)     *          *          *          *
* Crit W.S. (ft)         * 219.93 * Flow Area (sq ft)   * 0.09   * 87.25  *          *
* E.G. Slope (ft/ft)     * 0.026222 * Area (sq ft)       * 0.09   * 87.25  *          *
* Q Total (cfs)          * 1297.00 * Flow (cfs)          * 0.12   * 1296.88 *          *
* Top Width (ft)         * 19.78  * Top Width (ft)      * 0.28   * 19.50  *          *
* Vel Total (ft/s)       * 14.85  * Avg. Vel. (ft/s)    * 1.35   * 14.86  *          *
* Max Chl Dpth (ft)      * 5.11   * Hydr. Depth (ft)    * 0.31   * 4.47   *          *
* Conv. Total (cfs)      * 8009.6 * Conv. (cfs)         * 0.7    * 8008.8 *          *
* Length Wtd. (ft)       *          * Wetted Per. (ft)    * 0.68   * 25.37  *          *
* Min Ch El (ft)         * 214.13 * Shear (lb/sq ft)    * 0.21   * 5.63   *          *
* Alpha                  * 1.00   * Stream Power (lb/ft s) * 200.00 * 0.00   * 0.00 *
* Frctn Loss (ft)        * 1.07   * Cum Volume (acre-ft) *          *          *          *
* C & E Loss (ft)        * 0.15   * Cum SA (acres)      *          *          *          *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

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*****
* E.G. Elev (ft)          * 226.64 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)          * 5.41  * Wt. n-Val.          * 0.045  * 0.037  * 0.020 *
* W.S. Elev (ft)         * 221.23 * Reach Len. (ft)     *          *          *          *
* Crit W.S. (ft)         * 222.83 * Flow Area (sq ft)   * 3.12   * 126.30 * 16.61 *
* E.G. Slope (ft/ft)     * 0.026707 * Area (sq ft)       * 3.12   * 126.30 * 16.78 *
* Q Total (cfs)          * 2530.00 * Flow (cfs)          * 11.75  * 2409.46 * 108.79 *
* Top Width (ft)         * 66.56 * Top Width (ft)      * 4.20   * 19.60  * 42.75 *
* Vel Total (ft/s)       * 17.33 * Avg. Vel. (ft/s)    * 3.76   * 19.08  * 6.55 *
* Max Chl Dpth (ft)      * 7.10   * Hydr. Depth (ft)    * 0.74   * 6.44   * 0.41 *
* Conv. Total (cfs)      * 15481.3 * Conv. (cfs)         * 71.9   * 14743.7 * 665.7 *
* Length Wtd. (ft)       *          * Wetted Per. (ft)    * 5.37   * 25.62  * 41.09 *
* Min Ch El (ft)         * 214.13 * Shear (lb/sq ft)    * 0.97   * 8.22   * 0.67 *
* Alpha                  * 1.16   * Stream Power (lb/ft s) * 200.00 * 0.00   * 0.00 *
* Frctn Loss (ft)        * 0.77   * Cum Volume (acre-ft) *          *          *          *
* C & E Loss (ft)        * 0.71   * Cum SA (acres)      *          *          *          *
*****

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Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)          * 227.50 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)          * 5.57  * Wt. n-Val.          * 0.045  * 0.037  * 0.020 *
* W.S. Elev (ft)         * 221.93 * Reach Len. (ft)     *          *          *          *
* Crit W.S. (ft)         * 223.51 * Flow Area (sq ft)   * 7.12   * 139.98 * 44.70 *
* E.G. Slope (ft/ft)     * 0.025722 * Area (sq ft)       * 7.12   * 139.98 * 48.99 *
* Q Total (cfs)          * 3396.00 * Flow (cfs)          * 27.17  * 2806.85 * 561.98 *
* Top Width (ft)         * 79.52 * Top Width (ft)      * 10.41  * 19.60  * 49.51 *

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* Vel Total (ft/s)	* 17.71	* Avg. Vel. (ft/s)	* 3.81	* 20.05	* 12.57	*
* Max Chl Dpth (ft)	* 7.80	* Hydr. Depth (ft)	* 0.68	* 7.14	* 1.11	*
* Conv. Total (cfs)	* 21174.7	* Conv. (cfs)	* 169.4	* 17501.3	* 3504.1	*
* Length Wtd. (ft)	*	* Wetted Per. (ft)	* 11.66	* 25.62	* 41.09	*
* Min Ch El (ft)	* 214.13	* Shear (lb/sq ft)	* 0.98	* 8.77	* 1.75	*
* Alpha	* 1.14	* Stream Power (lb/ft s)	* 200.00	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.49	* Cum Volume (acre-ft)	*	*	*	*
* C & E Loss (ft)	* 1.16	* Cum SA (acres)	*	*	*	*

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

* E.G. Elev (ft)	* 223.27	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 3.76	* Wt. n-Val.	* 0.045	* 0.037	* 0.000	*
* W.S. Elev (ft)	* 219.51	* Reach Len. (ft)	*	*	*	*
* Crit W.S. (ft)	* 220.32	* Flow Area (sq ft)	* 0.18	* 92.55	* 0.00	*
* E.G. Slope (ft/ft)	* 0.026911	* Area (sq ft)	* 0.18	* 92.55	* 0.00	*
* Q Total (cfs)	* 1441.00	* Flow (cfs)	* 0.31	* 1440.69	* 0.00	*
* Top Width (ft)	* 20.01	* Top Width (ft)	* 0.40	* 19.60	* 0.01	*
* Vel Total (ft/s)	* 15.54	* Avg. Vel. (ft/s)	* 1.74	* 15.57	* 0.25	*
* Max Chl Dpth (ft)	* 5.38	* Hydr. Depth (ft)	* 0.44	* 4.72	* 0.02	*
* Conv. Total (cfs)	* 8784.1	* Conv. (cfs)	* 1.9	* 8782.2	* 0.0	*
* Length Wtd. (ft)	*	* Wetted Per. (ft)	* 0.98	* 25.62	* 0.04	*
* Min Ch El (ft)	* 214.13	* Shear (lb/sq ft)	* 0.31	* 6.07	*	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 200.00	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 1.07	* Cum Volume (acre-ft)	*	*	*	*
* C & E Loss (ft)	* 0.19	* Cum SA (acres)	*	*	*	*

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

* E.G. Elev (ft)	* 225.14	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 4.75	* Wt. n-Val.	* 0.045	* 0.037	* 0.035	*
* W.S. Elev (ft)	* 220.39	* Reach Len. (ft)	*	*	*	*
* Crit W.S. (ft)	* 222.29	* Flow Area (sq ft)	* 0.76	* 109.77	* 0.16	*
* E.G. Slope (ft/ft)	* 0.027084	* Area (sq ft)	* 0.76	* 109.77	* 0.16	*
* Q Total (cfs)	* 1923.00	* Flow (cfs)	* 1.92	* 1920.76	* 0.32	*
* Top Width (ft)	* 21.33	* Top Width (ft)	* 1.39	* 19.60	* 0.34	*
* Vel Total (ft/s)	* 17.37	* Avg. Vel. (ft/s)	* 2.51	* 17.50	* 2.05	*
* Max Chl Dpth (ft)	* 6.26	* Hydr. Depth (ft)	* 0.55	* 5.60	* 0.46	*
* Conv. Total (cfs)	* 11684.9	* Conv. (cfs)	* 11.7	* 11671.3	* 1.9	*
* Length Wtd. (ft)	*	* Wetted Per. (ft)	* 2.44	* 25.62	* 0.98	*
* Min Ch El (ft)	* 214.13	* Shear (lb/sq ft)	* 0.53	* 7.24	* 0.27	*
* Alpha	* 1.01	* Stream Power (lb/ft s)	* 200.00	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.87	* Cum Volume (acre-ft)	*	*	*	*
* C & E Loss (ft)	* 0.49	* Cum SA (acres)	*	*	*	*

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

need for additional cross sections.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

SUMMARY OF MANNING'S N VALUES

River: hudson

* Reach	* River Sta.	* n1	* n2	* n3	* n4	* n5	* n6	* n7
*main	* 40	* .085*	* .045*	* .02*	* .045*	* .035*	* .045*	* *
*main	* 39	* .045*	* .02*	* .035*	* .045*	* *	* *	* *
*main	* 38	* .045*	* .02*	* .035*	* .02*	* .045*	* .1*	* *
*main	* 37	* .045*	* .02*	* .035*	* .045*	* .02*	* .1*	* *
*main	* 36	* .045*	* .02*	* .045*	* .035*	* .02*	* .1*	* *
*main	* 35	* .045*	* .02*	* .045*	* .035*	* .1*	* *	* *
*main	* 34	* .045*	* .02*	* .045*	* .05*	* .045*	* .1*	* *
*main	* 33	* .045*	* .02*	* .045*	* .05*	* .045*	* .1*	* *
*main	* 32	* .045*	* .02*	* .045*	* .05*	* .1*	* *	* *
*main	* 31.5	* Bridge	* *	* *	* *	* *	* *	* *
*main	* 31	* .045*	* .02*	* .045*	* .035*	* .1*	* *	* *
*main	* 30	* .045*	* .02*	* .045*	* .035*	* .1*	* *	* *
*main	* 29	* .045*	* .02*	* .045*	* .05*	* .1*	* *	* *
*main	* 28	* .045*	* .02*	* .045*	* .035*	* .1*	* *	* *
*main	* 27	* .045*	* .02*	* .045*	* .035*	* .1*	* *	* *
*main	* 26	* .045*	* .02*	* .045*	* .035*	* .1*	* *	* *
*main	* 25	* .02*	* .045*	* .035*	* .1*	* *	* *	* *
*main	* 24	* .02*	* .045*	* .035*	* .1*	* *	* *	* *
*main	* 20	* Culvert	* *	* *	* *	* *	* *	* *
*main	* 14	* .1*	* .035*	* .045*	* .05*	* .02*	* .1*	* *
*main	* 13	* .1*	* .035*	* .045*	* .02*	* .1*	* *	* *
*main	* 12	* .1*	* .035*	* .045*	* .02*	* .1*	* *	* *
*main	* 11	* .1*	* .035*	* .045*	* .05*	* .02*	* .1*	* *
*main	* 10	* .1*	* .085*	* .035*	* .045*	* .02*	* .05*	* *
*main	* 9	* .1*	* .085*	* .035*	* .045*	* .02*	* .05*	* *
*main	* 8	* .1*	* .035*	* .045*	* .02*	* .05*	* *	* *
*main	* 7	* .1*	* .05*	* .1*	* .045*	* .05*	* .02*	* .05*
*main	* 6	* .1*	* .035*	* .1*	* .02*	* .05*	* *	* *
*main	* 5	* .1*	* .035*	* .045*	* .05*	* .02*	* .05*	* *
*main	* 4	* .1*	* .035*	* .05*	* .045*	* .02*	* .05*	* .02*
*main	* 3	* .1*	* .035*	* .045*	* .02*	* *	* *	* *
*main	* 2.5	* Culvert	* *	* *	* *	* *	* *	* *
*main	* 2	* .045*	* .035*	* .045*	* .02*	* *	* *	* *
*main	* 1	* .045*	* .035*	* .02*	* .045*	* *	* *	* *

SUMMARY OF REACH LENGTHS

River: hudson

* Reach	* River Sta.	* Left	* Channel	* Right
*main	* 40	* 93.6*	* 97.1*	* 92.95*
*main	* 39	* 113.96*	* 114.57*	* 114.59*
*main	* 38	* 50.64*	* 50.85*	* 51.22*
*main	* 37	* 63.51*	* 64.27*	* 60.78*
*main	* 36	* 34*	* 38.78*	* 43.34*
*main	* 35	* 69.27*	* 79.77*	* 85.15*
*main	* 34	* 59.8*	* 61.46*	* 61.27*
*main	* 33	* 21.85*	* 21.89*	* 21.7*
*main	* 32	* 24.44*	* 27.61*	* 26.31*
*main	* 31.5	* Bridge	* *	* *
*main	* 31	* 95.55*	* 97.06*	* 99*
*main	* 30	* 69.42*	* 70.58*	* 71.76*
*main	* 29	* 57*	* 58.22*	* 61.16*
*main	* 28	* 46*	* 46.77*	* 46.35*
*main	* 27	* 60.75*	* 61.7*	* 65.02*
*main	* 26	* 83.06*	* 84.96*	* 87.67*
*main	* 25	* 29.59*	* 30.248*	* 33.09*
*main	* 24	* 615.41*	* 591.97*	* 573.52*
*main	* 20	* Culvert	* *	* *
*main	* 14	* 32.61*	* 35.44*	* 36.08*
*main	* 13	* 36.53*	* 35.61*	* 35.05*

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*main      * 12      * 43.41* 42.27* 41.38*
*main      * 11      * 42.45* 41.39* 40*
*main      * 10      * 57.02* 54.55* 53*
*main      * 9       * 55.45* 51.85* 50.87*
*main      * 8       * 84.59* 69.8* 31.19*
*main      * 7       * 20.21* 31* 42.19*
*main      * 6       * 19.21* 30.14* 38.14*
*main      * 5       * 33.07* 34.23* 33.12*
*main      * 4       * 47.24* 49.31* 53.94*
*main      * 3       * 112.21* 120.13* 138.27*
*main      * 2.5     *Culvert * * *
*main      * 2       * 46.04* 48.67* 51.13*
*main      * 1       * 0* 0* 0*
*****

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SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: hudson

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*****
* Reach      * River Sta. * Contr. * Expan. *
*****
*main      * 40      * .1* .3*
*main      * 39      * .1* .3*
*main      * 38      * .1* .3*
*main      * 37      * .1* .3*
*main      * 36      * .1* .3*
*main      * 35      * .1* .3*
*main      * 34      * .1* .3*
*main      * 33      * .1* .3*
*main      * 32      * .3* .5*
*main      * 31.5    *Bridge * *
*main      * 31      * .3* .5*
*main      * 30      * .1* .3*
*main      * 29      * .1* .3*
*main      * 28      * .1* .3*
*main      * 27      * .1* .3*
*main      * 26      * .1* .3*
*main      * 25      * .1* .3*
*main      * 24      * .3* .5*
*main      * 20      *Culvert * *
*main      * 14      * .3* .5*
*main      * 13      * .1* .3*
*main      * 12      * .1* .3*
*main      * 11      * .1* .3*
*main      * 10      * .1* .3*
*main      * 9       * .1* .3*
*main      * 8       * .1* .3*
*main      * 7       * .1* .3*
*main      * 6       * .1* .3*
*main      * 5       * .1* .3*
*main      * 4       * .1* .3*
*main      * 3       * .3* .5*
*main      * 2.5     *Culvert * *
*main      * 2       * .3* .5*
*main      * 1       * .1* .3*
*****

```

Profile Output Table - Standard Table 1

* Reach	* River Sta	* Profile	* Q Total	* Min Ch El	* W.S. Elev	* Crit W.S.	* E.G. Elev	* E.G. Slope	* Vel Chnl	* Flow Area	* Top Width	* Froude #	* Chl *
*	*	*	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	*	*
* main	* 40	* 2-YR	* 436.00	* 256.38	* 260.12	* 259.87	* 261.15	* 0.011595	* 8.15	* 53.49	* 19.66	* 0.87	* 0.87
* main	* 40	* 10-YR	* 1121.00	* 256.38	* 263.13	* 263.13	* 263.96	* 0.005290	* 7.78	* 179.31	* 106.32	* 0.63	* 0.63
* main	* 40	* 50-YR	* 2176.00	* 256.38	* 264.12	* 264.12	* 265.18	* 0.006110	* 9.47	* 291.27	* 120.56	* 0.69	* 0.69
* main	* 40	* 100-YR	* 2936.00	* 256.38	* 264.63	* 264.63	* 265.87	* 0.006524	* 10.35	* 354.21	* 147.75	* 0.73	* 0.73
* main	* 40	* 6HR OBS	* 1169.00	* 256.38	* 263.20	* 263.20	* 264.03	* 0.005300	* 7.86	* 186.21	* 107.25	* 0.63	* 0.63
* main	* 40	* 24HR OBS	* 1598.00	* 256.38	* 263.66	* 263.66	* 264.57	* 0.005600	* 8.58	* 237.10	* 113.89	* 0.66	* 0.66
*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 39	* 2-YR	* 436.00	* 254.87	* 258.75	* 258.66	* 259.86	* 0.015022	* 8.47	* 51.47	* 20.65	* 0.95	* 0.95
* main	* 39	* 10-YR	* 1121.00	* 254.87	* 261.12	* 260.79	* 262.97	* 0.012720	* 10.94	* 103.88	* 35.55	* 0.90	* 0.90
* main	* 39	* 50-YR	* 2176.00	* 254.87	* 262.37	* 263.00	* 264.30	* 0.012085	* 12.38	* 218.61	* 140.68	* 0.90	* 0.90
* main	* 39	* 100-YR	* 2936.00	* 254.87	* 262.73	* 263.41	* 264.91	* 0.013339	* 13.54	* 272.31	* 154.04	* 0.96	* 0.96
* main	* 39	* 6HR OBS	* 1169.00	* 254.87	* 261.14	* 262.20	* 263.13	* 0.013601	* 11.35	* 104.70	* 36.72	* 0.93	* 0.93
* main	* 39	* 24HR OBS	* 1598.00	* 254.87	* 261.96	* 262.62	* 263.75	* 0.011249	* 11.39	* 166.01	* 117.75	* 0.86	* 0.86
*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 38	* 2-YR	* 436.00	* 254.31	* 257.59	*	* 258.43	* 0.009579	* 7.36	* 59.24	* 20.95	* 0.77	* 0.77
* main	* 38	* 10-YR	* 1121.00	* 254.31	* 260.78	* 259.26	* 261.81	* 0.005484	* 8.34	* 148.79	* 77.21	* 0.61	* 0.61
* main	* 38	* 50-YR	* 2176.00	* 254.31	* 262.21	* 262.21	* 263.19	* 0.004826	* 9.06	* 305.14	* 146.89	* 0.59	* 0.59
* main	* 38	* 100-YR	* 2936.00	* 254.31	* 262.72	* 262.72	* 263.79	* 0.005089	* 9.73	* 384.79	* 162.53	* 0.62	* 0.62
* main	* 38	* 6HR OBS	* 1169.00	* 254.31	* 261.28	* 259.36	* 261.99	* 0.003657	* 7.20	* 194.06	* 99.12	* 0.50	* 0.50
* main	* 38	* 24HR OBS	* 1598.00	* 254.31	* 261.25	* 261.56	* 262.61	* 0.007002	* 9.93	* 191.75	* 98.46	* 0.70	* 0.70
*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 37	* 2-YR	* 491.00	* 253.19	* 257.26	* 256.22	* 258.00	* 0.006572	* 6.88	* 71.37	* 19.04	* 0.63	* 0.63
* main	* 37	* 10-YR	* 1237.00	* 253.19	* 259.87	* 258.64	* 261.42	* 0.008390	* 10.02	* 128.94	* 54.59	* 0.71	* 0.71
* main	* 37	* 50-YR	* 2442.00	* 253.19	* 261.32	* 261.68	* 262.83	* 0.007930	* 11.22	* 290.08	* 137.07	* 0.72	* 0.72
* main	* 37	* 100-YR	* 3270.00	* 253.19	* 261.86	* 262.14	* 263.42	* 0.007820	* 11.67	* 364.75	* 140.99	* 0.72	* 0.72
* main	* 37	* 6HR OBS	* 1318.00	* 253.19	* 260.34	* 258.86	* 261.67	* 0.006810	* 9.48	* 164.75	* 110.26	* 0.65	* 0.65
* main	* 37	* 24HR OBS	* 1815.00	* 253.19	* 260.90	* 261.26	* 262.26	* 0.007085	* 10.21	* 235.01	* 134.09	* 0.67	* 0.67
*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 36	* 2-YR	* 491.00	* 252.84	* 256.00	* 256.00	* 257.30	* 0.016465	* 9.18	* 53.48	* 20.42	* 1.00	* 1.00
* main	* 36	* 10-YR	* 1237.00	* 252.84	* 258.24	* 258.24	* 260.61	* 0.016200	* 12.35	* 100.18	* 21.17	* 1.00	* 1.00
* main	* 36	* 50-YR	* 2442.00	* 252.84	* 260.25	* 260.89	* 262.20	* 0.010790	* 12.57	* 250.69	* 138.16	* 0.85	* 0.85
* main	* 36	* 100-YR	* 3270.00	* 252.84	* 260.68	* 261.29	* 262.78	* 0.011437	* 13.49	* 314.29	* 152.99	* 0.89	* 0.89
* main	* 36	* 6HR OBS	* 1318.00	* 252.84	* 258.45	* 258.45	* 260.92	* 0.016264	* 12.61	* 104.54	* 21.24	* 1.00	* 1.00
* main	* 36	* 24HR OBS	* 1815.00	* 252.84	* 259.78	* 260.44	* 261.66	* 0.010324	* 11.72	* 191.05	* 121.23	* 0.83	* 0.83
*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 35	* 2-YR	* 491.00	* 252.21	* 254.70	* 255.16	* 256.43	* 0.028382	* 10.55	* 46.52	* 24.95	* 1.36	* 1.36
* main	* 35	* 10-YR	* 1237.00	* 252.21	* 255.96	* 257.08	* 259.58	* 0.036731	* 15.26	* 81.04	* 29.93	* 1.63	* 1.63
* main	* 35	* 50-YR	* 2442.00	* 252.21	* 258.61	* 259.68	* 261.60	* 0.015377	* 13.97	* 184.93	* 94.80	* 1.15	* 1.15
* main	* 35	* 100-YR	* 3270.00	* 252.21	* 259.37	* 260.27	* 262.23	* 0.013165	* 14.32	* 274.57	* 120.85	* 1.09	* 1.09
* main	* 35	* 6HR OBS	* 1318.00	* 252.21	* 256.06	* 257.25	* 259.86	* 0.037356	* 15.64	* 84.25	* 30.34	* 1.65	* 1.65
* main	* 35	* 24HR OBS	* 1815.00	* 252.21	* 257.06	* 258.24	* 260.84	* 0.028665	* 15.61	* 116.30	* 34.19	* 1.49	* 1.49
*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 34	* 2-YR	* 491.00	* 248.88	* 251.78	* 252.16	* 253.40	* 0.052015	* 10.23	* 47.97	* 24.80	* 1.30	* 1.30
* main	* 34	* 10-YR	* 1237.00	* 248.88	* 253.61	* 254.13	* 256.17	* 0.040640	* 12.84	* 96.34	* 27.94	* 1.22	* 1.22
* main	* 34	* 50-YR	* 2442.00	* 248.88	* 255.41	* 256.40	* 259.57	* 0.042759	* 16.36	* 149.44	* 31.13	* 1.30	* 1.30
* main	* 34	* 100-YR	* 3270.00	* 248.88	* 257.49	* 258.63	* 260.85	* 0.022264	* 14.93	* 237.84	* 100.67	* 0.99	* 0.99
* main	* 34	* 6HR OBS	* 1318.00	* 248.88	* 255.70	* 254.31	* 256.78	* 0.010299	* 8.34	* 158.48	* 31.70	* 0.64	* 0.64
* main	* 34	* 24HR OBS	* 1815.00	* 248.88	* 254.51	* 255.30	* 257.94	* 0.043729	* 14.85	* 122.23	* 29.48	* 1.29	* 1.29
*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 33	* 2-YR	* 491.00	* 246.48	* 251.16	* 250.02	* 251.75	* 0.009938	* 6.13	* 80.07	* 23.47	* 0.59	* 0.59
* main	* 33	* 10-YR	* 1237.00	* 246.48	* 254.09	* 252.24	* 255.06	* 0.008834	* 7.91	* 156.69	* 30.47	* 0.59	* 0.59
* main	* 33	* 50-YR	* 2442.00	* 246.48	* 257.15	* 254.77	* 258.21	* 0.006018	* 8.60	* 303.82	* 94.46	* 0.52	* 0.52
* main	* 33	* 100-YR	* 3270.00	* 246.48	* 258.47	* 257.37	* 259.46	* 0.004196	* 7.92	* 418.63	* 102.14	* 0.45	* 0.45

* main	* 33	* 6HR OBS	* 1318.00	* 246.48	* 255.57	* 252.45	* 256.25	* 0.004689	* 6.61	* 200.40	* 38.62	* 0.45
* main	* 33	* 24HR OBS	* 1815.00	* 246.48	* 255.91	* 253.56	* 257.06	* 0.007505	* 8.63	* 213.82	* 59.63	* 0.57
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 32	* 2-YR	* 491.00	* 246.39	* 250.96	* 249.85	* 251.52	* 0.009888	* 6.04	* 81.31	* 24.87	* 0.59
* main	* 32	* 10-YR	* 1237.00	* 246.39	* 254.00	* 252.02	* 254.84	* 0.008103	* 7.40	* 167.66	* 32.90	* 0.56
* main	* 32	* 50-YR	* 2442.00	* 246.39	* 257.41	* 254.50	* 257.97	* 0.003019	* 6.12	* 418.54	* 110.29	* 0.37
* main	* 32	* 100-YR	* 3270.00	* 246.39	* 258.68	* 256.61	* 259.28	* 0.002313	* 5.88	* 547.76	* 113.10	* 0.33
* main	* 32	* 6HR OBS	* 1318.00	* 246.39	* 255.60	* 252.22	* 256.11	* 0.003762	* 5.82	* 240.91	* 96.08	* 0.40
* main	* 32	* 24HR OBS	* 1815.00	* 246.39	* 256.12	* 253.28	* 256.79	* 0.004697	* 6.84	* 290.22	* 105.77	* 0.45
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 31.5	* Bridge	*	*	*	*	*	*	*	*	*	*
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 31	* 2-YR	* 491.00	* 246.81	* 249.75	* 249.75	* 251.05	* 0.016015	* 9.16	* 53.59	* 20.52	* 1.00
* main	* 31	* 10-YR	* 1237.00	* 246.81	* 252.03	* 252.03	* 254.21	* 0.014936	* 11.86	* 104.33	* 23.92	* 1.00
* main	* 31	* 50-YR	* 2442.00	* 246.81	* 255.70	* 255.70	* 257.17	* 0.006024	* 10.30	* 264.99	* 104.54	* 0.66
* main	* 31	* 100-YR	* 3270.00	* 246.81	* 256.37	* 256.37	* 258.09	* 0.006402	* 11.24	* 324.12	* 110.49	* 0.69
* main	* 31	* 6HR OBS	* 1318.00	* 246.81	* 252.23	* 252.23	* 254.49	* 0.014891	* 12.06	* 109.26	* 24.22	* 1.00
* main	* 31	* 24HR OBS	* 1815.00	* 246.81	* 253.40	* 253.40	* 256.07	* 0.014558	* 13.10	* 138.54	* 25.97	* 1.00
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 30	* 2-YR	* 491.00	* 243.63	* 248.51	* 247.96	* 249.53	* 0.009797	* 8.10	* 60.63	* 18.32	* 0.78
* main	* 30	* 10-YR	* 1237.00	* 243.63	* 250.84	* 251.58	* 252.76	* 0.012379	* 11.24	* 116.80	* 62.10	* 0.90
* main	* 30	* 50-YR	* 2442.00	* 243.63	* 251.46	* 252.55	* 255.38	* 0.025650	* 16.89	* 164.81	* 91.83	* 1.29
* main	* 30	* 100-YR	* 3270.00	* 243.63	* 251.92	* 253.11	* 256.20	* 0.027111	* 17.86	* 203.01	* 97.98	* 1.33
* main	* 30	* 6HR OBS	* 1318.00	* 243.63	* 250.79	* 251.67	* 253.06	* 0.014640	* 12.18	* 113.74	* 57.21	* 0.97
* main	* 30	* 24HR OBS	* 1815.00	* 243.63	* 251.15	* 252.09	* 254.28	* 0.020158	* 14.67	* 139.28	* 87.66	* 1.14
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 29	* 2-YR	* 491.00	* 242.70	* 248.16	* 246.55	* 248.73	* 0.009042	* 6.08	* 80.74	* 19.87	* 0.53
* main	* 29	* 10-YR	* 1237.00	* 242.70	* 248.90	* 249.82	* 251.35	* 0.034384	* 12.64	* 100.33	* 38.62	* 1.04
* main	* 29	* 50-YR	* 2442.00	* 242.70	* 249.95	* 250.81	* 252.95	* 0.037646	* 14.28	* 176.27	* 107.75	* 1.10
* main	* 29	* 100-YR	* 3270.00	* 242.70	* 252.74	* 251.47	* 253.68	* 0.003469	* 5.56	* 449.09	* 134.04	* 0.35
* main	* 29	* 6HR OBS	* 1318.00	* 242.70	* 249.08	* 249.90	* 251.53	* 0.033978	* 12.74	* 107.71	* 55.00	* 1.04
* main	* 29	* 24HR OBS	* 1815.00	* 242.70	* 249.53	* 250.30	* 252.27	* 0.037738	* 13.89	* 140.56	* 104.42	* 1.10
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 28	* 2-YR	* 491.00	* 242.91	* 248.01	* 246.16	* 248.39	* 0.003062	* 5.09	* 104.21	* 63.04	* 0.45
* main	* 28	* 10-YR	* 1237.00	* 242.91	* 250.24	* 248.85	* 250.52	* 0.001512	* 4.23	* 289.60	* 130.31	* 0.32
* main	* 28	* 50-YR	* 2442.00	* 242.91	* 251.96	* 249.89	* 252.43	* 0.001447	* 4.96	* 450.45	* 134.37	* 0.33
* main	* 28	* 100-YR	* 3270.00	* 242.91	* 252.84	* 250.47	* 253.45	* 0.001492	* 5.45	* 536.15	* 139.98	* 0.34
* main	* 28	* 6HR OBS	* 1318.00	* 242.91	* 250.35	* 248.93	* 250.65	* 0.001543	* 4.31	* 299.94	* 130.57	* 0.33
* main	* 28	* 24HR OBS	* 1815.00	* 242.91	* 251.15	* 249.39	* 251.52	* 0.001443	* 4.56	* 374.46	* 132.46	* 0.32
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 27	* 2-YR	* 491.00	* 241.73	* 248.01	* 245.73	* 248.24	* 0.001751	* 4.10	* 136.07	* 115.80	* 0.34
* main	* 27	* 10-YR	* 1237.00	* 241.73	* 250.24	* 248.43	* 250.44	* 0.000922	* 3.87	* 351.97	* 132.16	* 0.27
* main	* 27	* 50-YR	* 2442.00	* 241.73	* 251.99	* 249.48	* 252.33	* 0.001017	* 4.76	* 531.29	* 134.21	* 0.29
* main	* 27	* 100-YR	* 3270.00	* 241.73	* 252.90	* 250.04	* 253.34	* 0.001095	* 5.29	* 625.74	* 135.27	* 0.31
* main	* 27	* 6HR OBS	* 1318.00	* 241.73	* 250.36	* 248.51	* 250.57	* 0.000950	* 3.97	* 363.60	* 132.30	* 0.27
* main	* 27	* 24HR OBS	* 1815.00	* 241.73	* 251.17	* 248.99	* 251.44	* 0.000960	* 4.31	* 446.93	* 133.25	* 0.28
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 26	* 2-YR	* 491.00	* 239.33	* 247.99	*	* 248.12	* 0.001102	* 3.19	* 176.32	* 102.66	* 0.25
* main	* 26	* 10-YR	* 1237.00	* 239.33	* 250.24	*	* 250.38	* 0.000605	* 3.04	* 418.81	* 112.80	* 0.20
* main	* 26	* 50-YR	* 2442.00	* 239.33	* 252.01	*	* 252.25	* 0.000695	* 3.77	* 631.40	* 123.73	* 0.22
* main	* 26	* 100-YR	* 3270.00	* 239.33	* 252.93	*	* 253.25	* 0.000751	* 4.19	* 746.41	* 125.04	* 0.24
* main	* 26	* 6HR OBS	* 1318.00	* 239.33	* 250.35	*	* 250.50	* 0.000626	* 3.12	* 431.86	* 113.70	* 0.20
* main	* 26	* 24HR OBS	* 1815.00	* 239.33	* 251.18	*	* 251.37	* 0.000650	* 3.42	* 529.43	* 122.01	* 0.21
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 25	* 2-YR	* 491.00	* 239.32	* 247.96	* 242.87	* 248.06	* 0.000448	* 2.51	* 215.56	* 84.77	* 0.18
* main	* 25	* 10-YR	* 1237.00	* 239.32	* 250.18	* 245.28	* 250.33	* 0.000498	* 3.24	* 423.10	* 109.77	* 0.20
* main	* 25	* 50-YR	* 2442.00	* 239.32	* 251.93	* 248.60	* 252.20	* 0.000599	* 4.03	* 621.31	* 151.04	* 0.22
* main	* 25	* 100-YR	* 3270.00	* 239.32	* 252.82	* 249.22	* 253.19	* 0.000655	* 4.45	* 725.64	* 162.52	* 0.24
* main	* 25	* 6HR OBS	* 1318.00	* 239.32	* 250.30	* 245.50	* 250.45	* 0.000521	* 3.34	* 435.54	* 112.41	* 0.20

* main	* 25	* 24HR OBS	* 1815.00	* 239.32	* 251.11	* 246.67	* 251.31	* 0.000552	* 3.65	* 527.32	* 139.89	* 0.21
* main	* 24	* 2-YR	* 491.00	* 237.71	* 247.79	* 241.64	* 248.02	* 0.001288	* 3.86	* 133.46	* 49.75	* 0.22
* main	* 24	* 10-YR	* 1237.00	* 237.71	* 250.03	* 244.75	* 250.29	* 0.001243	* 4.16	* 304.38	* 107.89	* 0.22
* main	* 24	* 50-YR	* 2442.00	* 237.71	* 251.65	* 249.58	* 252.15	* 0.001323	* 4.69	* 464.79	* 140.81	* 0.23
* main	* 24	* 100-YR	* 3270.00	* 237.71	* 252.45	* 250.10	* 253.13	* 0.001411	* 5.04	* 550.13	* 151.34	* 0.24
* main	* 24	* 6HR OBS	* 1318.00	* 237.71	* 250.14	* 245.05	* 250.42	* 0.001285	* 4.25	* 313.87	* 109.97	* 0.22
* main	* 24	* 24HR OBS	* 1815.00	* 237.71	* 250.91	* 249.12	* 251.27	* 0.001267	* 4.41	* 388.27	* 125.66	* 0.22
* main	* 20	* Culvert										
* main	* 14	* 2-YR	* 491.00	* 222.90	* 229.78	* 226.31	* 229.92	* 0.001550	* 3.02	* 167.74	* 48.06	* 0.24
* main	* 14	* 10-YR	* 1237.00	* 222.90	* 232.03	* 228.26	* 232.25	* 0.001762	* 4.11	* 380.46	* 121.86	* 0.27
* main	* 14	* 50-YR	* 2442.00	* 222.90	* 233.42	* 231.23	* 233.77	* 0.002491	* 5.49	* 557.10	* 143.83	* 0.33
* main	* 14	* 100-YR	* 3270.00	* 222.90	* 234.08	* 232.00	* 234.54	* 0.002931	* 6.26	* 642.71	* 148.35	* 0.36
* main	* 14	* 6HR OBS	* 1318.00	* 222.90	* 232.13	* 228.43	* 232.36	* 0.001851	* 4.26	* 393.33	* 123.95	* 0.28
* main	* 14	* 24HR OBS	* 1815.00	* 222.90	* 232.80	* 229.53	* 233.08	* 0.002119	* 4.82	* 478.19	* 137.25	* 0.30
* main	* 13	* 2-YR	* 491.00	* 224.66	* 228.59	* 228.57	* 229.55	* 0.014862	* 7.85	* 62.59	* 31.79	* 0.99
* main	* 13	* 10-YR	* 1237.00	* 224.66	* 230.45	* 230.34	* 231.78	* 0.011787	* 9.26	* 136.01	* 72.98	* 0.94
* main	* 13	* 50-YR	* 2442.00	* 224.66	* 232.15	* 232.15	* 233.37	* 0.007327	* 9.60	* 333.13	* 141.27	* 0.80
* main	* 13	* 100-YR	* 3270.00	* 224.66	* 232.76	* 232.76	* 234.12	* 0.007255	* 10.40	* 421.89	* 150.11	* 0.81
* main	* 13	* 6HR OBS	* 1318.00	* 224.66	* 230.74	* 230.74	* 231.94	* 0.009997	* 8.88	* 159.92	* 92.50	* 0.88
* main	* 13	* 24HR OBS	* 1815.00	* 224.66	* 231.52	* 231.52	* 232.69	* 0.007964	* 9.05	* 246.85	* 129.06	* 0.81
* main	* 12	* 2-YR	* 491.00	* 224.53	* 228.79	* 227.82	* 229.12	* 0.003856	* 4.63	* 105.95	* 43.28	* 0.52
* main	* 12	* 10-YR	* 1237.00	* 224.53	* 230.83	* 229.31	* 231.34	* 0.003073	* 5.85	* 245.24	* 122.85	* 0.50
* main	* 12	* 50-YR	* 2442.00	* 224.53	* 231.88	* 231.35	* 232.79	* 0.004522	* 8.23	* 393.36	* 159.81	* 0.64
* main	* 12	* 100-YR	* 3270.00	* 224.53	* 232.65	* 232.09	* 233.59	* 0.004188	* 8.69	* 523.96	* 178.07	* 0.63
* main	* 12	* 6HR OBS	* 1318.00	* 224.53	* 230.91	* 229.45	* 231.46	* 0.003219	* 6.06	* 255.40	* 125.90	* 0.52
* main	* 12	* 24HR OBS	* 1815.00	* 224.53	* 231.26	* 230.51	* 232.05	* 0.004397	* 7.46	* 300.53	* 138.63	* 0.61
* main	* 11	* 2-YR	* 491.00	* 224.22	* 227.64	* 227.64	* 228.76	* 0.014548	* 8.48	* 57.92	* 25.98	* 1.00
* main	* 11	* 10-YR	* 1237.00	* 224.22	* 230.16	* 230.16	* 231.12	* 0.005994	* 8.28	* 214.05	* 150.29	* 0.71
* main	* 11	* 50-YR	* 2442.00	* 224.22	* 231.84		* 232.55	* 0.003794	* 8.24	* 505.66	* 191.74	* 0.60
* main	* 11	* 100-YR	* 3270.00	* 224.22	* 232.67		* 233.36	* 0.003302	* 8.40	* 672.70	* 206.04	* 0.57
* main	* 11	* 6HR OBS	* 1318.00	* 224.22	* 230.30	* 230.30	* 231.24	* 0.005799	* 8.31	* 234.52	* 155.60	* 0.70
* main	* 11	* 24HR OBS	* 1815.00	* 224.22	* 230.93	* 230.86	* 231.84	* 0.005267	* 8.68	* 340.20	* 174.44	* 0.69
* main	* 10	* 2-YR	* 491.00	* 223.59	* 227.41	* 226.97	* 228.19	* 0.008789	* 7.08	* 69.31	* 27.80	* 0.79
* main	* 10	* 10-YR	* 1237.00	* 223.59	* 229.91	* 229.55	* 230.55	* 0.003905	* 6.99	* 265.69	* 166.94	* 0.58
* main	* 10	* 50-YR	* 2442.00	* 223.59	* 231.93		* 232.35	* 0.002050	* 6.49	* 644.46	* 203.60	* 0.45
* main	* 10	* 100-YR	* 3270.00	* 223.59	* 232.73		* 233.18	* 0.002014	* 6.94	* 811.90	* 215.47	* 0.45
* main	* 10	* 6HR OBS	* 1318.00	* 223.59	* 230.20	* 229.69	* 230.74	* 0.003164	* 6.56	* 315.35	* 173.19	* 0.53
* main	* 10	* 24HR OBS	* 1815.00	* 223.59	* 231.13		* 231.56	* 0.002283	* 6.28	* 486.60	* 191.74	* 0.46
* main	* 9	* 2-YR	* 491.00	* 223.10	* 227.08		* 227.76	* 0.006211	* 6.62	* 74.35	* 26.45	* 0.67
* main	* 9	* 10-YR	* 1237.00	* 223.10	* 229.89		* 230.32	* 0.002397	* 6.06	* 346.18	* 168.62	* 0.45
* main	* 9	* 50-YR	* 2442.00	* 223.10	* 231.88		* 232.23	* 0.001648	* 6.17	* 687.43	* 174.74	* 0.40
* main	* 9	* 100-YR	* 3270.00	* 223.10	* 232.65		* 233.07	* 0.001781	* 6.84	* 822.99	* 177.00	* 0.42
* main	* 9	* 6HR OBS	* 1318.00	* 223.10	* 230.18		* 230.55	* 0.002011	* 5.75	* 395.35	* 169.79	* 0.42
* main	* 9	* 24HR OBS	* 1815.00	* 223.10	* 231.10		* 231.43	* 0.001647	* 5.73	* 552.50	* 172.47	* 0.39
* main	* 8	* 2-YR	* 491.00	* 222.42	* 226.91		* 227.44	* 0.004436	* 5.85	* 84.57	* 34.05	* 0.57
* main	* 8	* 10-YR	* 1237.00	* 222.42	* 229.91		* 230.18	* 0.001410	* 4.96	* 445.46	* 191.68	* 0.36
* main	* 8	* 50-YR	* 2442.00	* 222.42	* 231.89		* 232.13	* 0.001068	* 5.21	* 851.18	* 215.65	* 0.32
* main	* 8	* 100-YR	* 3270.00	* 222.42	* 232.67		* 232.96	* 0.001164	* 5.79	* 1021.33	* 221.13	* 0.34
* main	* 8	* 6HR OBS	* 1318.00	* 222.42	* 230.19		* 230.43	* 0.001216	* 4.74	* 500.11	* 195.66	* 0.33
* main	* 8	* 24HR OBS	* 1815.00	* 222.42	* 231.11		* 231.33	* 0.001048	* 4.82	* 684.95	* 208.99	* 0.32

*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 7	* 2-YR	* 506.00	* 220.87	* 226.85	*	* 227.09	* 0.003280	*	3.88	*	130.39	*	32.94	*	0.34	*	
* main	* 7	* 10-YR	* 1297.00	* 220.87	* 229.91	*	* 230.06	* 0.001437	*	3.66	*	498.25	*	177.02	*	0.25	*	
* main	* 7	* 50-YR	* 2530.00	* 220.87	* 231.87	*	* 232.05	* 0.001300	*	4.12	*	856.47	*	185.42	*	0.24	*	
* main	* 7	* 100-YR	* 3396.00	* 220.87	* 232.64	*	* 232.87	* 0.001503	*	4.68	*	999.92	*	187.50	*	0.27	*	
* main	* 7	* 6HR OBS	* 1441.00	* 220.87	* 230.17	*	* 230.33	* 0.001418	*	3.73	*	545.43	*	179.57	*	0.25	*	
* main	* 7	* 24HR OBS	* 1923.00	* 220.87	* 231.09	*	* 231.24	* 0.001253	*	3.80	*	712.47	*	183.30	*	0.24	*	
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
* main	* 6	* 2-YR	* 506.00	* 220.27	* 226.79	*	* 227.02	* 0.001399	*	3.85	*	131.52	*	29.31	*	0.32	*	
* main	* 6	* 10-YR	* 1297.00	* 220.27	* 229.62	*	* 229.99	* 0.001466	*	5.20	*	390.09	*	122.37	*	0.35	*	
* main	* 6	* 50-YR	* 2530.00	* 220.27	* 231.26	*	* 231.94	* 0.002223	*	7.38	*	620.59	*	154.82	*	0.44	*	
* main	* 6	* 100-YR	* 3396.00	* 220.27	* 231.70	*	* 232.72	* 0.003212	*	9.17	*	687.93	*	155.99	*	0.54	*	
* main	* 6	* 6HR OBS	* 1441.00	* 220.27	* 229.84	*	* 230.25	* 0.001584	*	5.52	*	417.33	*	125.07	*	0.36	*	
* main	* 6	* 24HR OBS	* 1923.00	* 220.27	* 230.64	*	* 231.16	* 0.001786	*	6.29	*	526.58	*	145.86	*	0.39	*	
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
* main	* 5	* 2-YR	* 506.00	* 219.53	* 226.46	* 224.03	* 226.94	* 0.003253	*	5.56	*	91.04	*	17.83	*	0.43	*	
* main	* 5	* 10-YR	* 1297.00	* 219.53	* 228.83	* 226.84	* 229.85	* 0.004762	*	8.62	*	207.00	*	124.54	*	0.55	*	
* main	* 5	* 50-YR	* 2530.00	* 219.53	* 230.98	* 230.14	* 231.83	* 0.003693	*	8.96	*	434.80	*	164.84	*	0.50	*	
* main	* 5	* 100-YR	* 3396.00	* 219.53	* 231.28	* 230.88	* 232.56	* 0.005495	*	11.15	*	479.10	*	204.39	*	0.62	*	
* main	* 5	* 6HR OBS	* 1441.00	* 219.53	* 228.95	* 227.33	* 230.10	* 0.005314	*	9.21	*	219.25	*	126.99	*	0.58	*	
* main	* 5	* 24HR OBS	* 1923.00	* 219.53	* 230.31	* 229.51	* 231.06	* 0.003366	*	8.16	*	357.87	*	143.31	*	0.48	*	
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
* main	* 4	* 2-YR	* 506.00	* 218.90	* 226.47	* 223.66	* 226.80	* 0.002103	*	4.66	*	108.59	*	23.76	*	0.38	*	
* main	* 4	* 10-YR	* 1297.00	* 218.90	* 228.76	* 226.41	* 229.67	* 0.003865	*	7.66	*	174.83	*	55.70	*	0.55	*	
* main	* 4	* 50-YR	* 2530.00	* 218.90	* 230.49	* 230.49	* 231.67	* 0.004302	*	9.53	*	370.84	*	165.93	*	0.60	*	
* main	* 4	* 100-YR	* 3396.00	* 218.90	* 231.12	* 231.12	* 232.38	* 0.004561	*	10.33	*	475.04	*	180.41	*	0.63	*	
* main	* 4	* 6HR OBS	* 1441.00	* 218.90	* 228.82	* 226.80	* 229.91	* 0.004633	*	8.43	*	177.39	*	59.26	*	0.60	*	
* main	* 4	* 24HR OBS	* 1923.00	* 218.90	* 228.76	* 227.93	* 230.76	* 0.008528	*	11.37	*	174.51	*	55.24	*	0.81	*	
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
* main	* 3	* 2-YR	* 506.00	* 217.50	* 226.52	* 222.42	* 226.69	* 0.000826	*	3.30	*	154.21	*	32.35	*	0.26	*	
* main	* 3	* 10-YR	* 1297.00	* 217.50	* 229.15	* 225.08	* 229.40	* 0.000850	*	4.40	*	380.90	*	150.29	*	0.28	*	
* main	* 3	* 50-YR	* 2530.00	* 217.50	* 230.46	* 228.63	* 230.84	* 0.001203	*	5.81	*	597.56	*	175.93	*	0.34	*	
* main	* 3	* 100-YR	* 3396.00	* 217.50	* 231.18	* 229.41	* 231.63	* 0.001345	*	6.46	*	726.99	*	186.23	*	0.36	*	
* main	* 3	* 6HR OBS	* 1441.00	* 217.50	* 229.31	* 225.44	* 229.58	* 0.000923	*	4.65	*	404.93	*	153.53	*	0.29	*	
* main	* 3	* 24HR OBS	* 1923.00	* 217.50	* 229.80	* 226.46	* 230.14	* 0.001131	*	5.36	*	483.27	*	166.25	*	0.32	*	
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
* main	* 2.5		* Culvert	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
* main	* 2	* 2-YR	* 506.00	* 214.76	* 218.27	* 218.18	* 219.78	* 0.018568	*	9.88	*	51.23	*	15.58	*	0.96	*	
* main	* 2	* 10-YR	* 1297.00	* 214.76	* 220.98	* 220.98	* 223.90	* 0.018778	*	13.71	*	94.88	*	16.57	*	1.00	*	
* main	* 2	* 50-YR	* 2530.00	* 214.76	* 225.07	* 225.07	* 228.12	* 0.010405	*	14.53	*	200.90	*	76.66	*	0.81	*	
* main	* 2	* 100-YR	* 3396.00	* 214.76	* 227.45	* 227.45	* 229.15	* 0.005260	*	11.91	*	382.27	*	151.38	*	0.60	*	
* main	* 2	* 6HR OBS	* 1441.00	* 214.76	* 221.40	* 221.40	* 224.53	* 0.018405	*	14.22	*	101.85	*	16.69	*	1.00	*	
* main	* 2	* 24HR OBS	* 1923.00	* 214.76	* 223.40	* 223.40	* 226.50	* 0.012745	*	14.22	*	143.45	*	35.84	*	0.87	*	
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
* main	* 1	* 2-YR	* 506.00	* 214.13	* 217.55	* 217.41	* 218.86	* 0.015405	*	9.18	*	55.12	*	18.43	*	0.94	*	
* main	* 1	* 10-YR	* 1297.00	* 214.13	* 219.24	* 219.93	* 222.67	* 0.026222	*	14.86	*	87.34	*	19.78	*	1.24	*	
* main	* 1	* 50-YR	* 2530.00	* 214.13	* 221.23	* 222.83	* 226.64	* 0.026707	*	19.08	*	146.03	*	66.56	*	1.32	*	
* main	* 1	* 100-YR	* 3396.00	* 214.13	* 221.93	* 223.51	* 227.50	* 0.025722	*	20.05	*	191.80	*	79.52	*	1.32	*	
* main	* 1	* 6HR OBS	* 1441.00	* 214.13	* 219.51	* 220.32	* 223.27	* 0.026911	*	15.57	*	92.73	*	20.01	*	1.26	*	
* main	* 1	* 24HR OBS	* 1923.00	* 214.13	* 220.39	* 222.29	* 225.14	* 0.027084	*	17.50	*	110.69	*	21.33	*	1.30	*	

Profile Output Table - Standard Table 2

* Reach	* River Sta	* Profile	* E.G. Elev (ft)	* W.S. Elev (ft)	* Vel Head (ft)	* Frctn Loss (ft)	* C & E Loss (ft)	* Q Left (cfs)	* Q Channel (cfs)	* Q Right (cfs)	* Top Width (ft)
* main	* 40	* 2-YR	* 261.15	* 260.12	* 1.03	* 1.28	* 0.01	*	* 436.00	*	* 19.66
* main	* 40	* 10-YR	* 263.96	* 263.13	* 0.83	* 0.76	* 0.10	* 153.58	* 967.37	* 0.05	* 106.32
* main	* 40	* 50-YR	* 265.18	* 264.12	* 1.06	* 0.53	* 0.06	* 755.53	* 1420.01	* 0.46	* 120.56
* main	* 40	* 100-YR	* 265.87	* 264.63	* 1.24	* 0.57	* 0.07	* 1246.92	* 1688.15	* 0.93	* 147.75
* main	* 40	* 6HR OBS	* 264.03	* 263.20	* 0.83	* 0.46	* 0.04	* 178.83	* 990.11	* 0.06	* 107.25
* main	* 40	* 24HR OBS	* 264.57	* 263.66	* 0.92	* 0.49	* 0.05	* 414.50	* 1183.31	* 0.20	* 113.89
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 39	* 2-YR	* 259.86	* 258.75	* 1.11	* 1.36	* 0.08	*	* 436.00	*	* 20.65
* main	* 39	* 10-YR	* 262.97	* 261.12	* 1.85	* 0.92	* 0.24	* 3.93	* 1117.07	*	* 35.55
* main	* 39	* 50-YR	* 264.30	* 262.37	* 1.93	* 0.80	* 0.09	* 564.72	* 1606.14	* 5.14	* 140.68
* main	* 39	* 100-YR	* 264.91	* 262.73	* 2.18	* 0.86	* 0.09	* 1058.15	* 1865.07	* 12.78	* 154.04
* main	* 39	* 6HR OBS	* 263.13	* 261.14	* 1.99	* 0.78	* 0.12	* 5.05	* 1163.95	*	* 36.72
* main	* 39	* 24HR OBS	* 263.75	* 261.96	* 1.79	* 0.74	* 0.09	* 222.24	* 1375.03	* 0.73	* 117.75
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 38	* 2-YR	* 258.43	* 257.59	* 0.84	* 0.40	* 0.03	*	* 436.00	*	* 20.95
* main	* 38	* 10-YR	* 261.81	* 260.78	* 1.04	* 0.34	* 0.05	* 35.34	* 1071.03	* 14.63	* 77.21
* main	* 38	* 50-YR	* 263.19	* 262.21	* 0.98	* 0.26	* 0.01	* 557.41	* 1450.39	* 168.20	* 146.89
* main	* 38	* 100-YR	* 263.79	* 262.72	* 1.07	* 0.28	* 0.02	* 899.50	* 1666.85	* 369.65	* 162.53
* main	* 38	* 6HR OBS	* 261.99	* 261.28	* 0.71	* 0.25	* 0.06	* 126.52	* 1003.46	* 39.02	* 99.12
* main	* 38	* 24HR OBS	* 262.61	* 261.25	* 1.36	* 1.00	* 0.13	* 166.37	* 1380.03	* 51.60	* 98.46
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 37	* 2-YR	* 258.00	* 257.26	* 0.74	* 0.63	* 0.06	*	* 491.00	*	* 19.04
* main	* 37	* 10-YR	* 261.42	* 259.87	* 1.55	* 0.73	* 0.08	* 3.10	* 1229.63	* 4.27	* 54.59
* main	* 37	* 50-YR	* 262.83	* 261.32	* 1.51	* 0.31	* 0.05	* 408.44	* 1703.04	* 330.52	* 137.07
* main	* 37	* 100-YR	* 263.42	* 261.86	* 1.56	* 0.32	* 0.05	* 731.63	* 1901.09	* 637.28	* 140.99
* main	* 37	* 6HR OBS	* 261.67	* 260.34	* 1.33	* 0.64	* 0.11	* 39.92	* 1252.40	* 25.68	* 110.26
* main	* 37	* 24HR OBS	* 262.26	* 260.90	* 1.36	* 0.36	* 0.00	* 202.65	* 1464.79	* 147.56	* 134.09
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 36	* 2-YR	* 257.30	* 256.00	* 1.31	* 0.61	* 0.06	*	* 491.00	*	* 20.42
* main	* 36	* 10-YR	* 260.61	* 258.24	* 2.37	* 0.56	* 0.19	*	* 1237.00	*	* 21.17
* main	* 36	* 50-YR	* 262.20	* 260.25	* 1.95	* 0.59	* 0.04	* 462.11	* 1794.97	* 184.92	* 138.16
* main	* 36	* 100-YR	* 262.78	* 260.68	* 2.10	* 0.60	* 0.05	* 840.20	* 2051.07	* 378.73	* 152.99
* main	* 36	* 6HR OBS	* 260.92	* 258.45	* 2.47	* 0.56	* 0.21	*	* 1318.00	*	* 21.24
* main	* 36	* 24HR OBS	* 261.66	* 259.78	* 1.88	* 0.54	* 0.05	* 179.29	* 1559.24	* 76.47	* 121.23
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 35	* 2-YR	* 256.43	* 254.70	* 1.73	* 0.82	* 0.04	*	* 491.00	*	* 24.95
* main	* 35	* 10-YR	* 259.58	* 255.96	* 3.62	* 0.91	* 0.13	*	* 1237.00	*	* 29.93
* main	* 35	* 50-YR	* 261.60	* 258.61	* 3.00	* 0.49	* 0.10	* 27.01	* 2414.11	* 0.88	* 94.80
* main	* 35	* 100-YR	* 262.23	* 259.37	* 2.86	* 0.47	* 0.08	* 383.14	* 2882.51	* 4.35	* 120.85
* main	* 35	* 6HR OBS	* 259.86	* 256.06	* 3.80	* 0.92	* 0.13	*	* 1318.00	*	* 30.34
* main	* 35	* 24HR OBS	* 260.84	* 257.06	* 3.78	* 0.62	* 0.19	*	* 1815.00	*	* 34.19
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 34	* 2-YR	* 253.40	* 251.78	* 1.63	* 3.00	* 0.03	*	* 491.00	*	* 24.80
* main	* 34	* 10-YR	* 256.17	* 253.61	* 2.56	* 3.08	* 0.32	*	* 1237.00	*	* 27.94
* main	* 34	* 50-YR	* 259.57	* 255.41	* 4.15	* 1.92	* 0.12	* 0.21	* 2441.67	* 0.13	* 31.13
* main	* 34	* 100-YR	* 260.85	* 257.49	* 3.36	* 1.33	* 0.05	* 86.39	* 3168.93	* 14.68	* 100.67
* main	* 34	* 6HR OBS	* 256.78	* 255.70	* 1.08	* 0.41	* 0.12	* 0.35	* 1317.36	* 0.29	* 31.70
* main	* 34	* 24HR OBS	* 257.94	* 254.51	* 3.42	* 2.79	* 0.11	*	* 1815.00	*	* 29.48
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 33	* 2-YR	* 251.75	* 251.16	* 0.58	* 0.22	* 0.01	*	* 491.00	*	* 23.47

* main	* 33	* 10-YR	* 255.06	* 254.09	* 0.97	* 0.19	* 0.04	* 1.79	* 1235.21	* *	* 30.47
* main	* 33	* 50-YR	* 258.21	* 257.15	* 1.07	* 0.09	* 0.15	* 335.98	* 2101.76	* 4.27	* 94.46
* main	* 33	* 100-YR	* 259.46	* 258.47	* 0.98	* 0.07	* 0.12	* 1015.82	* 2241.43	* 12.75	* 102.14
* main	* 33	* 6HR OBS	* 256.25	* 255.57	* 0.68	* 0.09	* 0.05	* 5.26	* 1312.62	* 0.12	* 38.62
* main	* 33	* 24HR OBS	* 257.06	* 255.91	* 1.15	* 0.13	* 0.14	* 14.52	* 1799.98	* 0.50	* 59.63
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 32	* 2-YR	* 251.52	* 250.96	* 0.57	* 0.02	* 0.00	* *	* 491.00	* *	* 24.87
* main	* 32	* 10-YR	* 254.84	* 254.00	* 0.85	* 0.02	* 0.01	* 0.83	* 1236.17	* *	* 32.90
* main	* 32	* 50-YR	* 257.97	* 257.41	* 0.55	* *	* *	* 723.41	* 1707.34	* 11.26	* 110.29
* main	* 32	* 100-YR	* 259.28	* 258.68	* 0.60	* *	* *	* 1356.86	* 1885.04	* 28.10	* 113.10
* main	* 32	* 6HR OBS	* 256.11	* 255.60	* 0.51	* *	* *	* 44.26	* 1273.54	* 0.20	* 96.08
* main	* 32	* 24HR OBS	* 256.79	* 256.12	* 0.67	* *	* *	* 199.76	* 1613.72	* 1.52	* 105.77
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 31.5	* *	* Bridge	* *	* *	* *	* *	* *	* *	* *	* *
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 31	* 2-YR	* 251.05	* 249.75	* 1.30	* 1.20	* 0.14	* *	* 491.00	* *	* 20.52
* main	* 31	* 10-YR	* 254.21	* 252.03	* 2.18	* 0.85	* 0.65	* *	* 1237.00	* *	* 23.92
* main	* 31	* 50-YR	* 257.17	* 255.70	* 1.47	* 0.65	* 0.03	* 390.23	* 2050.98	* 0.79	* 104.54
* main	* 31	* 100-YR	* 258.09	* 256.37	* 1.73	* 0.68	* 0.01	* 825.88	* 2438.38	* 5.74	* 110.49
* main	* 31	* 6HR OBS	* 254.49	* 252.23	* 2.26	* 0.86	* 0.68	* *	* 1318.00	* *	* 24.22
* main	* 31	* 24HR OBS	* 256.07	* 253.40	* 2.66	* 0.93	* 0.77	* *	* 1815.00	* *	* 25.97
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 30	* 2-YR	* 249.53	* 248.51	* 1.02	* 0.66	* 0.13	* *	* 491.00	* *	* 18.32
* main	* 30	* 10-YR	* 252.76	* 250.84	* 1.92	* 1.32	* 0.13	* 27.97	* 1209.03	* *	* 62.10
* main	* 30	* 50-YR	* 255.38	* 251.46	* 3.92	* 1.06	* 0.73	* 391.23	* 2050.77	* *	* 91.83
* main	* 30	* 100-YR	* 256.20	* 251.92	* 4.29	* 1.12	* 0.77	* 911.96	* 2358.04	* *	* 97.98
* main	* 30	* 6HR OBS	* 253.06	* 250.79	* 2.27	* 1.43	* 0.00	* 22.31	* 1295.69	* *	* 57.21
* main	* 30	* 24HR OBS	* 254.28	* 251.15	* 3.12	* 1.65	* 0.14	* 136.31	* 1678.69	* *	* 87.66
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 29	* 2-YR	* 248.73	* 248.16	* 0.57	* 0.28	* 0.06	* *	* 491.00	* *	* 19.87
* main	* 29	* 10-YR	* 251.35	* 248.90	* 2.44	* 1.36	* 0.05	* 23.32	* 1213.68	* *	* 38.62
* main	* 29	* 50-YR	* 252.95	* 249.95	* 3.00	* 2.16	* 0.28	* 742.38	* 1699.62	* *	* 107.75
* main	* 29	* 100-YR	* 253.68	* 252.74	* 0.93	* 0.12	* 0.10	* 2234.16	* 1033.56	* 2.29	* 134.04
* main	* 29	* 6HR OBS	* 251.53	* 249.08	* 2.45	* 1.51	* 0.02	* 47.57	* 1270.43	* *	* 55.00
* main	* 29	* 24HR OBS	* 252.27	* 249.53	* 2.74	* 1.90	* 0.12	* 293.48	* 1521.52	* *	* 104.42
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 28	* 2-YR	* 248.39	* 248.01	* 0.39	* 0.11	* 0.05	* 22.46	* 468.54	* *	* 63.04
* main	* 28	* 10-YR	* 250.52	* 250.24	* 0.28	* 0.05	* 0.03	* 606.55	* 630.45	* *	* 130.31
* main	* 28	* 50-YR	* 252.43	* 251.96	* 0.47	* 0.06	* 0.04	* 1458.23	* 982.56	* 1.21	* 134.37
* main	* 28	* 100-YR	* 253.45	* 252.84	* 0.61	* 0.06	* 0.05	* 2046.43	* 1219.36	* 4.21	* 139.98
* main	* 28	* 6HR OBS	* 250.65	* 250.35	* 0.30	* 0.06	* 0.03	* 661.53	* 656.47	* *	* 130.57
* main	* 28	* 24HR OBS	* 251.52	* 251.15	* 0.37	* 0.05	* 0.03	* 1015.58	* 799.26	* 0.16	* 132.46
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 27	* 2-YR	* 248.24	* 248.01	* 0.23	* 0.08	* 0.03	* 76.54	* 414.46	* *	* 115.80
* main	* 27	* 10-YR	* 250.44	* 250.24	* 0.20	* 0.05	* 0.02	* 644.32	* 591.96	* 0.72	* 132.16
* main	* 27	* 50-YR	* 252.33	* 251.99	* 0.34	* 0.05	* 0.03	* 1515.80	* 921.74	* 4.46	* 134.21
* main	* 27	* 100-YR	* 253.34	* 252.90	* 0.44	* 0.05	* 0.04	* 2125.28	* 1136.30	* 8.42	* 135.27
* main	* 27	* 6HR OBS	* 250.57	* 250.36	* 0.21	* 0.05	* 0.02	* 698.89	* 618.25	* 0.86	* 132.30
* main	* 27	* 24HR OBS	* 251.44	* 251.17	* 0.26	* 0.05	* 0.02	* 1059.41	* 753.41	* 2.18	* 133.25
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 26	* 2-YR	* 248.12	* 247.99	* 0.13	* 0.06	* 0.01	* 158.64	* 332.36	* 0.00	* 102.66
* main	* 26	* 10-YR	* 250.38	* 250.24	* 0.14	* 0.05	* 0.00	* 773.34	* 462.39	* 1.28	* 112.80
* main	* 26	* 50-YR	* 252.25	* 252.01	* 0.24	* 0.05	* 0.00	* 1716.28	* 716.67	* 9.05	* 123.73
* main	* 26	* 100-YR	* 253.25	* 252.93	* 0.32	* 0.06	* 0.00	* 2374.06	* 878.08	* 17.87	* 125.04
* main	* 26	* 6HR OBS	* 250.50	* 250.35	* 0.15	* 0.05	* 0.00	* 833.66	* 482.98	* 1.36	* 113.70

* main	* 26	* 24HR OBS	* 251.37	* 251.18	* 0.19	* 0.05	* 0.00	* 1222.60	* 588.69	* 3.70	* 122.01
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 25	* 2-YR	* 248.06	* 247.96	* 0.09	* 0.02	* 0.01	* 39.74	* 451.02	* 0.24	* 84.77
* main	* 25	* 10-YR	* 250.33	* 250.18	* 0.14	* 0.02	* 0.01	* 439.39	* 789.90	* 7.71	* 109.77
* main	* 25	* 50-YR	* 252.20	* 251.93	* 0.27	* 0.03	* 0.02	* 1226.95	* 1186.32	* 28.73	* 151.04
* main	* 25	* 100-YR	* 253.19	* 252.82	* 0.36	* 0.03	* 0.03	* 1791.84	* 1428.17	* 49.99	* 162.52
* main	* 25	* 6HR OBS	* 250.45	* 250.30	* 0.16	* 0.02	* 0.01	* 483.18	* 826.14	* 8.68	* 112.41
* main	* 25	* 24HR OBS	* 251.31	* 251.11	* 0.20	* 0.02	* 0.02	* 808.65	* 989.95	* 16.41	* 139.89
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 24	* 2-YR	* 248.02	* 247.79	* 0.23	*	*	* 8.75	* 482.25	*	* 49.75
* main	* 24	* 10-YR	* 250.29	* 250.03	* 0.26	*	*	* 590.66	* 644.66	* 1.69	* 107.89
* main	* 24	* 50-YR	* 252.15	* 251.65	* 0.49	*	*	* 1592.50	* 828.88	* 20.62	* 140.81
* main	* 24	* 100-YR	* 253.13	* 252.45	* 0.67	*	*	* 2280.22	* 945.13	* 44.65	* 151.34
* main	* 24	* 6HR OBS	* 250.42	* 250.14	* 0.28	*	*	* 650.60	* 665.20	* 2.20	* 109.97
* main	* 24	* 24HR OBS	* 251.27	* 250.91	* 0.37	*	*	* 1070.83	* 735.63	* 8.54	* 125.66
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 20	*	* Culvert	*	*	*	*	*	*	*	*
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 14	* 2-YR	* 229.92	* 229.78	* 0.14	* 0.13	* 0.24	* 0.08	* 486.40	* 4.51	* 48.06
* main	* 14	* 10-YR	* 232.25	* 232.03	* 0.22	* 0.13	* 0.33	* 3.17	* 957.92	* 275.91	* 121.86
* main	* 14	* 50-YR	* 233.77	* 233.42	* 0.36	* 0.14	* 0.26	* 10.25	* 1521.64	* 910.11	* 143.83
* main	* 14	* 100-YR	* 234.54	* 234.08	* 0.46	* 0.16	* 0.27	* 16.13	* 1866.10	* 1387.77	* 148.35
* main	* 14	* 6HR OBS	* 232.36	* 232.13	* 0.23	* 0.13	* 0.29	* 3.56	* 1005.37	* 309.08	* 123.95
* main	* 14	* 24HR OBS	* 233.08	* 232.80	* 0.28	* 0.13	* 0.27	* 6.35	* 1241.91	* 566.74	* 137.25
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 13	* 2-YR	* 229.55	* 228.59	* 0.96	* 0.24	* 0.19	*	* 491.00	*	* 31.79
* main	* 13	* 10-YR	* 231.78	* 230.45	* 1.33	* 0.19	* 0.25	*	* 1235.11	* 1.89	* 72.98
* main	* 13	* 50-YR	* 233.37	* 232.15	* 1.22	* 0.20	* 0.09	* 0.74	* 2040.15	* 401.11	* 141.27
* main	* 13	* 100-YR	* 234.12	* 232.76	* 1.35	* 0.19	* 0.12	* 2.22	* 2510.78	* 757.00	* 150.11
* main	* 13	* 6HR OBS	* 231.94	* 230.74	* 1.21	* 0.19	* 0.20	*	* 1298.10	* 19.90	* 92.50
* main	* 13	* 24HR OBS	* 232.69	* 231.52	* 1.17	* 0.21	* 0.11	* 0.10	* 1654.69	* 160.20	* 129.06
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 12	* 2-YR	* 229.12	* 228.79	* 0.33	* 0.28	* 0.08	*	* 491.00	*	* 43.28
* main	* 12	* 10-YR	* 231.34	* 230.83	* 0.51	* 0.18	* 0.04	* 0.28	* 1182.67	* 54.06	* 122.85
* main	* 12	* 50-YR	* 232.79	* 231.88	* 0.91	* 0.17	* 0.06	* 2.45	* 2080.58	* 358.96	* 159.81
* main	* 12	* 100-YR	* 233.59	* 232.65	* 0.94	* 0.16	* 0.08	* 5.69	* 2522.97	* 741.34	* 178.07
* main	* 12	* 6HR OBS	* 231.46	* 230.91	* 0.54	* 0.18	* 0.04	* 0.36	* 1250.26	* 67.38	* 125.90
* main	* 12	* 24HR OBS	* 232.05	* 231.26	* 0.80	* 0.20	* 0.01	* 0.89	* 1661.75	* 152.35	* 138.63
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 11	* 2-YR	* 228.76	* 227.64	* 1.12	* 0.46	* 0.10	*	* 491.00	*	* 25.98
* main	* 11	* 10-YR	* 231.12	* 230.16	* 0.96	* 0.20	* 0.09	* 29.42	* 1107.19	* 100.39	* 150.29
* main	* 11	* 50-YR	* 232.55	* 231.84	* 0.72	* 0.11	* 0.09	* 106.38	* 1542.63	* 792.99	* 191.74
* main	* 11	* 100-YR	* 233.36	* 232.67	* 0.68	* 0.10	* 0.07	* 155.16	* 1797.37	* 1317.46	* 206.04
* main	* 11	* 6HR OBS	* 231.24	* 230.30	* 0.94	* 0.17	* 0.12	* 34.15	* 1147.56	* 136.29	* 155.60
* main	* 11	* 24HR OBS	* 231.84	* 230.93	* 0.91	* 0.14	* 0.15	* 64.76	* 1374.97	* 375.28	* 174.44
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 10	* 2-YR	* 228.19	* 227.41	* 0.78	* 0.40	* 0.03	*	* 491.00	*	* 27.80
* main	* 10	* 10-YR	* 230.55	* 229.91	* 0.65	* 0.16	* 0.07	* 26.35	* 1039.59	* 171.06	* 166.94
* main	* 10	* 50-YR	* 232.35	* 231.93	* 0.42	* 0.10	* 0.02	* 154.74	* 1396.30	* 890.96	* 203.60
* main	* 10	* 100-YR	* 233.18	* 232.73	* 0.45	* 0.10	* 0.01	* 232.56	* 1676.62	* 1360.82	* 215.47
* main	* 10	* 6HR OBS	* 230.74	* 230.20	* 0.54	* 0.14	* 0.05	* 39.63	* 1038.77	* 239.61	* 173.19
* main	* 10	* 24HR OBS	* 231.56	* 231.13	* 0.43	* 0.10	* 0.03	* 93.91	* 1186.37	* 534.72	* 191.74
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 9	* 2-YR	* 227.76	* 227.08	* 0.68	* 0.27	* 0.04	* 0.04	* 490.96	*	* 26.45
* main	* 9	* 10-YR	* 230.32	* 229.89	* 0.43	* 0.09	* 0.05	* 82.80	* 891.69	* 262.51	* 168.62

* main	* 9	* 50-YR	* 232.23	* 231.88	* 0.35	* 0.07	* 0.03	* 246.26	* 1232.04	* 963.70	* 174.74
* main	* 9	* 100-YR	* 233.07	* 232.65	* 0.42	* 0.07	* 0.04	* 354.96	* 1506.80	* 1408.24	* 177.00
* main	* 9	* 6HR OBS	* 230.55	* 230.18	* 0.36	* 0.08	* 0.04	* 97.30	* 889.34	* 331.37	* 169.79
* main	* 9	* 24HR OBS	* 231.43	* 231.10	* 0.32	* 0.07	* 0.03	* 164.70	* 1027.07	* 623.24	* 172.47
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 8	* 2-YR	* 227.44	* 226.91	* 0.53	* 0.26	* 0.09	* 0.12	* 490.88	*	* 34.05
* main	* 8	* 10-YR	* 230.18	* 229.91	* 0.27	* 0.08	* 0.03	* 62.33	* 817.75	* 356.92	* 191.68
* main	* 8	* 50-YR	* 232.13	* 231.89	* 0.24	* 0.06	* 0.02	* 183.26	* 1140.28	* 1118.47	* 215.65
* main	* 8	* 100-YR	* 232.96	* 232.67	* 0.29	* 0.07	* 0.02	* 277.21	* 1389.45	* 1603.34	* 221.13
* main	* 8	* 6HR OBS	* 230.43	* 230.19	* 0.23	* 0.08	* 0.02	* 70.73	* 819.20	* 428.07	* 195.66
* main	* 8	* 24HR OBS	* 231.33	* 231.11	* 0.22	* 0.06	* 0.02	* 116.09	* 952.49	* 746.42	* 208.99
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 7	* 2-YR	* 227.09	* 226.85	* 0.23	* 0.06	* 0.00	*	* 506.00	*	* 32.94
* main	* 7	* 10-YR	* 230.06	* 229.91	* 0.15	* 0.05	* 0.02	* 20.61	* 853.78	* 422.60	* 177.02
* main	* 7	* 50-YR	* 232.05	* 231.87	* 0.18	* 0.06	* 0.05	* 117.79	* 1232.08	* 1180.13	* 185.42
* main	* 7	* 100-YR	* 232.87	* 232.64	* 0.23	* 0.07	* 0.08	* 188.91	* 1521.72	* 1685.37	* 187.50
* main	* 7	* 6HR OBS	* 230.33	* 230.17	* 0.16	* 0.05	* 0.03	* 28.97	* 902.97	* 509.06	* 179.57
* main	* 7	* 24HR OBS	* 231.24	* 231.09	* 0.16	* 0.05	* 0.04	* 68.20	* 1037.55	* 817.25	* 183.30
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 6	* 2-YR	* 227.02	* 226.79	* 0.23	* 0.06	* 0.03	*	* 506.00	*	* 29.31
* main	* 6	* 10-YR	* 229.99	* 229.62	* 0.37	* 0.08	* 0.06	* 11.43	* 1144.68	* 140.88	* 122.37
* main	* 6	* 50-YR	* 231.94	* 231.26	* 0.68	* 0.09	* 0.02	* 83.71	* 2012.61	* 433.68	* 154.82
* main	* 6	* 100-YR	* 232.72	* 231.70	* 1.02	* 0.13	* 0.03	* 148.67	* 2626.90	* 620.43	* 155.99
* main	* 6	* 6HR OBS	* 230.25	* 229.84	* 0.41	* 0.08	* 0.07	* 16.02	* 1253.63	* 171.35	* 125.07
* main	* 6	* 24HR OBS	* 231.16	* 230.64	* 0.51	* 0.08	* 0.02	* 39.16	* 1591.97	* 291.87	* 145.86
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 5	* 2-YR	* 226.94	* 226.46	* 0.48	* 0.09	* 0.04	* 0.00	* 505.97	* 0.03	* 17.83
* main	* 5	* 10-YR	* 229.85	* 228.83	* 1.02	* 0.15	* 0.03	* 10.47	* 1137.66	* 148.87	* 124.54
* main	* 5	* 50-YR	* 231.83	* 230.98	* 0.85	* 0.13	* 0.03	* 46.60	* 1515.68	* 967.72	* 164.84
* main	* 5	* 100-YR	* 232.56	* 231.28	* 1.28	* 0.17	* 0.01	* 57.04	* 1942.23	* 1396.73	* 204.39
* main	* 5	* 6HR OBS	* 230.10	* 228.95	* 1.14	* 0.17	* 0.01	* 12.69	* 1234.95	* 193.37	* 126.99
* main	* 5	* 24HR OBS	* 231.06	* 230.31	* 0.75	* 0.17	* 0.13	* 31.88	* 1284.96	* 606.16	* 143.31
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 4	* 2-YR	* 226.80	* 226.47	* 0.34	* 0.06	* 0.05	*	* 506.00	*	* 23.76
* main	* 4	* 10-YR	* 229.67	* 228.76	* 0.91	* 0.08	* 0.20	* 0.88	* 1292.79	* 3.34	* 55.70
* main	* 4	* 50-YR	* 231.67	* 230.49	* 1.18	* 0.10	* 0.24	* 10.56	* 2062.00	* 457.45	* 165.93
* main	* 4	* 100-YR	* 232.38	* 231.12	* 1.26	* 0.12	* 0.24	* 18.47	* 2416.15	* 961.38	* 180.41
* main	* 4	* 6HR OBS	* 229.91	* 228.82	* 1.10	* 0.09	* 0.25	* 1.07	* 1435.01	* 4.92	* 59.26
* main	* 4	* 24HR OBS	* 230.76	* 228.76	* 2.00	* 0.12	* 0.50	* 1.28	* 1916.96	* 4.76	* 55.24
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 3	* 2-YR	* 226.69	* 226.52	* 0.17	*	*	* 0.00	* 505.37	* 0.62	* 32.35
* main	* 3	* 10-YR	* 229.40	* 229.15	* 0.25	*	*	* 5.46	* 1015.06	* 276.48	* 150.29
* main	* 3	* 50-YR	* 230.84	* 230.46	* 0.38	*	*	* 17.67	* 1565.11	* 947.23	* 175.93
* main	* 3	* 100-YR	* 231.63	* 231.18	* 0.45	*	*	* 28.82	* 1876.38	* 1490.80	* 186.23
* main	* 3	* 6HR OBS	* 229.58	* 229.31	* 0.27	*	*	* 6.58	* 1093.64	* 340.78	* 153.53
* main	* 3	* 24HR OBS	* 230.14	* 229.80	* 0.34	*	*	* 10.90	* 1337.63	* 574.47	* 166.25
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 2.5		Culvert	*	*	*	*	*	*	*	*
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 2	* 2-YR	* 219.78	* 218.27	* 1.52	* 0.82	* 0.10	*	* 506.00	*	* 15.58
* main	* 2	* 10-YR	* 223.90	* 220.98	* 2.92	* 0.83	* 0.22	* 0.13	* 1296.60	* 0.27	* 16.57
* main	* 2	* 50-YR	* 228.12	* 225.07	* 3.05	* 0.39	* 0.71	* 78.95	* 2332.15	* 118.90	* 76.66
* main	* 2	* 100-YR	* 229.15	* 227.45	* 1.70	* 0.29	* 0.10	* 207.66	* 2369.40	* 818.94	* 151.38
* main	* 2	* 6HR OBS	* 224.53	* 221.40	* 3.14	* 0.82	* 0.22	* 0.26	* 1440.22	* 0.52	* 16.69
* main	* 2	* 24HR OBS	* 226.50	* 223.40	* 3.11	* 0.41	* 0.87	* 9.83	* 1900.07	* 13.10	* 35.84

```

*          *          *          *          *          *          *          *          *          *          *
* main    * 1          * 2-YR      * 218.86 * 217.55 * 1.31 *          *          *          *          *          *
* main    * 1          * 10-YR     * 222.67 * 219.24 * 3.43 * 1.07 * 0.15 * 0.12 * 1296.88 *          * 18.43 *
* main    * 1          * 50-YR     * 226.64 * 221.23 * 5.41 * 0.77 * 0.71 * 11.75 * 2409.46 * 108.79 * 66.56 *
* main    * 1          * 100-YR    * 227.50 * 221.93 * 5.57 * 0.49 * 1.16 * 27.17 * 2806.85 * 561.98 * 79.52 *
* main    * 1          * 6HR OBS   * 223.27 * 219.51 * 3.76 * 1.07 * 0.19 * 0.31 * 1440.69 * 0.00 * 20.01 *
* main    * 1          * 24HR OBS  * 225.14 * 220.39 * 4.75 * 0.87 * 0.49 * 1.92 * 1920.76 * 0.32 * 21.33 *
*****

```


HEC-RAS Version 4.1.0 Jan 2010
 U.S. Army Corps of Engineers
 Hydrologic Engineering Center
 609 Second Street
 Davis, California

```

X   X  XXXXXX   XXXX       XXXX       XX       XXXX
X   X  X        X  X       X  X       X  X       X
X   X  X        X         X  X       X  X       X
XXXXXXXX XXXX   X         XXX XXXX   XXXXXX   XXXX
X   X  X        X         X  X       X  X       X
X   X  X        X  X       X  X       X  X       X
X   X  XXXXXX   XXXX       X  X       X  X       XXXXX
  
```

PROJECT DATA

Project Title: Ecity
 Project File : Ecity.prj
 Run Date and Time: 7/12/2013 4:01:16 PM

Project in English units

PLAN DATA

Plan Title: HIFLOW_7_12_FLOW
 Plan File : i:\5493 - Howard County\01 - Ellicott City Flood Study\H&H\HEC-RAS\Ecity.p21

Geometry Title: 7-12-13HIFLOW
 Geometry File : i:\5493 - Howard County\01 - Ellicott City Flood Study\H&H\HEC-RAS\Ecity.g06

Flow Title : 7-12-13HighFlows
 Flow File : i:\5493 - Howard County\01 - Ellicott City Flood Study\H&H\HEC-RAS\Ecity.f15

Plan Summary Information:

Number of:	Cross Sections =	40	Multiple Openings =	0
	Culverts =	1	Inline Structures =	0
	Bridges =	1	Lateral Structures =	0

Computational Information

Water surface calculation tolerance = 0.01
 Critical depth calculation tolerance = 0.01
 Maximum number of iterations = 20
 Maximum difference tolerance = 0.3
 Flow tolerance factor = 0.001

Computation Options

Critical depth computed only where necessary
 Conveyance Calculation Method: At breaks in n values only
 Friction Slope Method: Average Conveyance
 Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: 7-12-13HighFlows
 Flow File : i:\5493 - Howard County\01 - Ellicott City Flood Study\H&H\HEC-RAS\Ecity.f15

Flow Data (cfs)

```

*****
*****
* River      Reach      RS      *      2-YR      10-YR      50-YR      100-YR
6HR OBS     24HR OBS *
* hudson    main      40      *      436       1121       2176       2936
1169        1598 *
* hudson    main      37      *      491       1237       2442       3270
1318        1815 *
* hudson    main      24      *      21        767       1972       2800
848         1345 *
* hudson    main      14      *      491       1237       2442       3270
1318        1815 *
  
```

Boundary Conditions

```
*****
* River Reach Profile * Upstream Downstream *
*****
* hudson main 2-YR * Critical Normal S = 0.0154 *
*****
```

GEOMETRY DATA

Geometry Title: 7-12-13HIFLOW
 Geometry File : i:\5493 - Howard County\01 - Ellicott City Flood Study\H&H\HEC-RAS\Ecity.g06

CROSS SECTION

RIVER: hudson
 REACH: main RS: 40

INPUT

Description:

Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	264.96	15.41	264.78	42.02	264.43	82.53	265.79	100.98	266.38
124.25	264.3	153.94	262.2	160.39	262.32	176.03	262.94	188	262.45
192.31	261.98	195.33	261.51	205.84	262.58	220.94	262.3	226.78	260.3
229.45	256.44	234.7	256.38	239.49	256.83	246.53	259.85	246.86	262.35
250	273.22	254.98	274.03	284.82	277.7				

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.085	124.25	.045	153.94	.02	192.31	.045	220.94	.035
246.86	.045								

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

Left	Right	Left	Channel	Right	Coeff	Contr.	Expan.
220.94	246.86	93.6	97.1	92.95	.1	.3	

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	101	267	F

CROSS SECTION OUTPUT Profile #2-YR

```
*****
* E.G. Elev (ft) * 261.15 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 1.03 * Wt. n-Val. * * 0.035 * *
* W.S. Elev (ft) * 260.12 * Reach Len. (ft) * 93.60 * 97.10 * 92.95 *
* Crit W.S. (ft) * 259.87 * Flow Area (sq ft) * * 53.49 * *
* E.G. Slope (ft/ft) * 0.011595 * Area (sq ft) * * 53.49 * *
* Q Total (cfs) * 436.00 * Flow (cfs) * * 436.00 * *
* Top Width (ft) * 19.66 * Top Width (ft) * * 19.66 * *
* Vel Total (ft/s) * 8.15 * Avg. Vel. (ft/s) * * 8.15 * *
* Max Chl Dpth (ft) * 3.74 * Hydr. Depth (ft) * * 2.72 * *
* Conv. Total (cfs) * 4049.0 * Conv. (cfs) * * 4049.0 * *
* Length Wtd. (ft) * 97.10 * Wetted Per. (ft) * * 22.46 * *
* Min Ch El (ft) * 256.38 * Shear (lb/sq ft) * * 1.72 * *
* Alpha * 1.00 * Stream Power (lb/ft s) * 284.82 * 0.00 * 0.00 *
* Frctn Loss (ft) * 1.28 * Cum Volume (acre-ft) * 0.42 * 3.92 * 0.05 *
* C & E Loss (ft) * 0.01 * Cum SA (acres) * 0.55 * 1.48 * 0.15 *
*****
```

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```
*****
* E.G. Elev (ft) * 263.96 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.83 * Wt. n-Val. * 0.031 * 0.035 * 0.045 *
* W.S. Elev (ft) * 263.13 * Reach Len. (ft) * 93.60 * 97.10 * 92.95 *
* Crit W.S. (ft) * 263.13 * Flow Area (sq ft) * 54.85 * 124.37 * 0.09 *
```

* E.G. Slope (ft/ft)	*0.005290	* Area (sq ft)	* 54.85	* 124.37	* 0.09	*
* Q Total (cfs)	* 1121.00	* Flow (cfs)	* 153.58	* 967.37	* 0.05	*
* Top Width (ft)	* 106.32	* Top Width (ft)	* 80.18	* 25.92	* 0.23	*
* Vel Total (ft/s)	* 6.25	* Avg. Vel. (ft/s)	* 2.80	* 7.78	* 0.55	*
* Max Chl Dpth (ft)	* 6.75	* Hydr. Depth (ft)	* 0.68	* 4.80	* 0.39	*
* Conv. Total (cfs)	* 15412.7	* Conv. (cfs)	* 2111.6	* 13300.4	* 0.7	*
* Length Wtd. (ft)	* 96.85	* Wetted Per. (ft)	* 80.35	* 31.11	* 0.81	*
* Min Ch El (ft)	* 256.38	* Shear (lb/sq ft)	* 0.23	* 1.32	* 0.04	*
* Alpha	* 1.36	* Stream Power (lb/ft s)	* 284.82	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.76	* Cum Volume (acre-ft)	* 2.25	* 7.81	* 1.67	*
* C & E Loss (ft)	* 0.10	* Cum SA (acres)	* 1.51	* 1.88	* 1.68	*

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 265.18	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 1.06	* Wt. n-Val.	* 0.029	* 0.035	* 0.045	*
* W.S. Elev (ft)	* 264.12	* Reach Len. (ft)	* 93.60	* 97.10	* 92.95	*
* Crit W.S. (ft)	* 264.12	* Flow Area (sq ft)	* 140.87	* 149.95	* 0.45	*
* E.G. Slope (ft/ft)	*0.006110	* Area (sq ft)	* 140.87	* 149.95	* 0.45	*
* Q Total (cfs)	* 2176.00	* Flow (cfs)	* 755.53	* 1420.01	* 0.46	*
* Top Width (ft)	* 120.56	* Top Width (ft)	* 94.13	* 25.92	* 0.51	*
* Vel Total (ft/s)	* 7.47	* Avg. Vel. (ft/s)	* 5.36	* 9.47	* 1.01	*
* Max Chl Dpth (ft)	* 7.74	* Hydr. Depth (ft)	* 1.50	* 5.79	* 0.88	*
* Conv. Total (cfs)	* 27836.9	* Conv. (cfs)	* 9665.3	* 18165.8	* 5.8	*
* Length Wtd. (ft)	* 96.03	* Wetted Per. (ft)	* 94.34	* 31.11	* 1.84	*
* Min Ch El (ft)	* 256.38	* Shear (lb/sq ft)	* 0.57	* 1.84	* 0.09	*
* Alpha	* 1.23	* Stream Power (lb/ft s)	* 284.82	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.53	* Cum Volume (acre-ft)	* 5.31	* 11.08	* 4.43	*
* C & E Loss (ft)	* 0.06	* Cum SA (acres)	* 2.72	* 1.93	* 2.47	*

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 265.87	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 1.24	* Wt. n-Val.	* 0.029	* 0.035	* 0.045	*
* W.S. Elev (ft)	* 264.63	* Reach Len. (ft)	* 93.60	* 97.10	* 92.95	*
* Crit W.S. (ft)	* 264.63	* Flow Area (sq ft)	* 190.34	* 163.12	* 0.75	*
* E.G. Slope (ft/ft)	*0.006524	* Area (sq ft)	* 192.39	* 163.12	* 0.75	*
* Q Total (cfs)	* 2936.00	* Flow (cfs)	* 1246.92	* 1688.15	* 0.93	*
* Top Width (ft)	* 147.75	* Top Width (ft)	* 121.17	* 25.92	* 0.66	*
* Vel Total (ft/s)	* 8.29	* Avg. Vel. (ft/s)	* 6.55	* 10.35	* 1.24	*
* Max Chl Dpth (ft)	* 8.25	* Hydr. Depth (ft)	* 1.90	* 6.29	* 1.14	*
* Conv. Total (cfs)	* 36350.7	* Conv. (cfs)	* 15438.2	* 20901.1	* 11.5	*
* Length Wtd. (ft)	* 95.72	* Wetted Per. (ft)	* 100.58	* 31.11	* 2.37	*
* Min Ch El (ft)	* 256.38	* Shear (lb/sq ft)	* 0.77	* 2.14	* 0.13	*
* Alpha	* 1.16	* Stream Power (lb/ft s)	* 284.82	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.57	* Cum Volume (acre-ft)	* 7.16	* 12.72	* 5.98	*
* C & E Loss (ft)	* 0.07	* Cum SA (acres)	* 3.16	* 1.94	* 2.83	*

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

Table with 7 columns: Parameter, Value, Element, Left OB, Channel, Right OB. Rows include E.G. Elev, Vel Head, W.S. Elev, Crit W.S., E.G. Slope, Q Total, Top Width, Vel Total, Max Chl Dpth, Conv. Total, Length Wtd., Min Ch El, Alpha, Frctn Loss, C & E Loss.

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

Table with 7 columns: Parameter, Value, Element, Left OB, Channel, Right OB. Rows include E.G. Elev, Vel Head, W.S. Elev, Crit W.S., E.G. Slope, Q Total, Top Width, Vel Total, Max Chl Dpth, Conv. Total, Length Wtd., Min Ch El, Alpha, Frctn Loss, C & E Loss.

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main RS: 39

INPUT

Description:

Station Elevation Data		num= 26		Sta Elev		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	266.26	5.63	266.12	23.64	263.71	63.98	262.23	91.83	261.37		
92.63	260.85	100.64	261.02	115.95	261.34	143.09	261.55	155.5	262.02		
167.36	261.79	168.09	262.42	174.27	262.29	176.57	260.93	177.24	258.17		
177.64	255.56	186.83	254.87	187.72	255.8	187.9	255.97	191.83	257.42		
197.4	257.79	198.77	261.58	202.55	262.02	220.58	268.88	237.64	273.36		
264.28	276.53										

Manning's n Values		num= 4		Sta n Val		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	91.83	.02	176.57	.035	198.77	.045

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	176.57	198.77		113.96	114.57		.1	.3
Ineffective Flow			num=	1				
Sta L	Sta R	Elev	Permanent					
236.2	264.28	290	F					

CROSS SECTION OUTPUT Profile #2-YR

* E.G. Elev (ft)	* 259.86	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 1.11	* Wt. n-Val.	* 0.020	* 0.035	*
* W.S. Elev (ft)	* 258.75	* Reach Len. (ft)	* 113.96	* 114.57	* 114.59
* Crit W.S. (ft)	* 258.66	* Flow Area (sq ft)	*	* 51.47	*
* E.G. Slope (ft/ft)	* 0.015022	* Area (sq ft)	*	* 51.47	*
* Q Total (cfs)	* 436.00	* Flow (cfs)	*	* 436.00	*
* Top Width (ft)	* 20.65	* Top Width (ft)	*	* 20.65	*
* Vel Total (ft/s)	* 8.47	* Avg. Vel. (ft/s)	*	* 8.47	*
* Max Chl Dpth (ft)	* 3.88	* Hydr. Depth (ft)	*	* 2.49	*
* Conv. Total (cfs)	* 3557.3	* Conv. (cfs)	*	* 3557.3	*
* Length Wtd. (ft)	* 114.57	* Wetted Per. (ft)	*	* 24.78	*
* Min Ch El (ft)	* 254.87	* Shear (lb/sq ft)	*	* 1.95	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 264.28	* 0.00	* 0.00
* Frctn Loss (ft)	* 1.36	* Cum Volume (acre-ft)	* 0.42	* 3.80	* 0.05
* C & E Loss (ft)	* 0.08	* Cum SA (acres)	* 0.55	* 1.44	* 0.15

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 262.97	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 1.85	* Wt. n-Val.	* 0.020	* 0.035	*
* W.S. Elev (ft)	* 261.12	* Reach Len. (ft)	* 113.96	* 114.57	* 114.59
* Crit W.S. (ft)	* 260.79	* Flow Area (sq ft)	* 1.80	* 102.08	*
* E.G. Slope (ft/ft)	* 0.012720	* Area (sq ft)	* 1.80	* 102.08	*
* Q Total (cfs)	* 1121.00	* Flow (cfs)	* 3.93	* 1117.07	*
* Top Width (ft)	* 35.55	* Top Width (ft)	* 13.51	* 22.03	*
* Vel Total (ft/s)	* 10.79	* Avg. Vel. (ft/s)	* 2.18	* 10.94	*
* Max Chl Dpth (ft)	* 6.25	* Hydr. Depth (ft)	* 0.13	* 4.63	*
* Conv. Total (cfs)	* 9939.3	* Conv. (cfs)	* 34.8	* 9904.5	*
* Length Wtd. (ft)	* 114.56	* Wetted Per. (ft)	* 13.65	* 29.54	*
* Min Ch El (ft)	* 254.87	* Shear (lb/sq ft)	* 0.10	* 2.74	*
* Alpha	* 1.02	* Stream Power (lb/ft s)	* 264.28	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.92	* Cum Volume (acre-ft)	* 2.19	* 7.56	* 1.67
* C & E Loss (ft)	* 0.24	* Cum SA (acres)	* 1.41	* 1.83	* 1.68

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
 This may indicate the need for additional cross sections.
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
 Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```
*****
* E.G. Elev (ft)      * 264.30 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.93  * Wt. n-Val.      * 0.022  * 0.035  * 0.045  *
* W.S. Elev (ft)     * 262.37 * Reach Len. (ft) * 113.96 * 114.57 * 114.59 *
* Crit W.S. (ft)     * 263.00 * Flow Area (sq ft) * 86.56 * 129.74 * 2.30 *
* E.G. Slope (ft/ft) * 0.012085 * Area (sq ft) * 86.56 * 129.74 * 2.30 *
* Q Total (cfs)      * 2176.00 * Flow (cfs) * 564.72 * 1606.14 * 5.14 *
* Top Width (ft)     * 140.68 * Top Width (ft) * 113.78 * 22.20 * 4.69 *
* Vel Total (ft/s)   * 9.95  * Avg. Vel. (ft/s) * 6.52 * 12.38 * 2.23 *
* Max Chl Dpth (ft) * 7.50  * Hydr. Depth (ft) * 0.76 * 5.84 * 0.49 *
* Conv. Total (cfs) * 19794.4 * Conv. (cfs) * 5137.1 * 14610.6 * 46.8 *
* Length Wtd. (ft)  * 114.36 * Wetted Per. (ft) * 114.56 * 30.03 * 4.78 *
* Min Ch El (ft)    * 254.87 * Shear (lb/sq ft) * 0.57 * 3.26 * 0.36 *
* Alpha             * 1.25  * Stream Power (lb/ft s) * 264.28 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 0.80  * Cum Volume (acre-ft) * 5.06 * 10.77 * 4.43 *
* C & E Loss (ft)   * 0.09  * Cum SA (acres) * 2.50 * 1.88 * 2.46 *
*****
```

Warning: Divided flow computed for this cross-section.
 Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
 This may indicate the need for additional cross sections.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```
*****
* E.G. Elev (ft)      * 264.91 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 2.18  * Wt. n-Val.      * 0.022  * 0.035  * 0.045  *
* W.S. Elev (ft)     * 262.73 * Reach Len. (ft) * 113.96 * 114.57 * 114.59 *
* Crit W.S. (ft)     * 263.41 * Flow Area (sq ft) * 130.36 * 137.77 * 4.17 *
* E.G. Slope (ft/ft) * 0.013339 * Area (sq ft) * 130.36 * 137.77 * 4.17 *
* Q Total (cfs)      * 2936.00 * Flow (cfs) * 1058.15 * 1865.07 * 12.78 *
* Top Width (ft)     * 154.04 * Top Width (ft) * 126.20 * 22.20 * 5.64 *
* Vel Total (ft/s)   * 10.78 * Avg. Vel. (ft/s) * 8.12 * 13.54 * 3.06 *
* Max Chl Dpth (ft) * 7.86  * Hydr. Depth (ft) * 1.03 * 6.21 * 0.74 *
* Conv. Total (cfs) * 25421.5 * Conv. (cfs) * 9162.1 * 16148.8 * 110.7 *
* Length Wtd. (ft)  * 114.32 * Wetted Per. (ft) * 127.00 * 30.03 * 5.80 *
* Min Ch El (ft)    * 254.87 * Shear (lb/sq ft) * 0.85 * 3.82 * 0.60 *
* Alpha             * 1.21  * Stream Power (lb/ft s) * 264.28 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 0.86  * Cum Volume (acre-ft) * 6.82 * 12.38 * 5.97 *
* C & E Loss (ft)   * 0.09  * Cum SA (acres) * 2.89 * 1.89 * 2.83 *
*****
```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
 This may indicate the need for additional cross sections.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

```
*****
* E.G. Elev (ft)      * 263.13 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.99  * Wt. n-Val.      * 0.020  * 0.035  * 0.045  *
* W.S. Elev (ft)     * 261.14 * Reach Len. (ft) * 113.96 * 114.57 * 114.59 *
* Crit W.S. (ft)     * 262.20 * Flow Area (sq ft) * 2.12 * 102.58 *  *
* E.G. Slope (ft/ft) * 0.013601 * Area (sq ft) * 2.12 * 102.58 *  *
* Q Total (cfs)      * 1169.00 * Flow (cfs) * 5.05 * 1163.95 *  *
* Top Width (ft)     * 36.72 * Top Width (ft) * 14.68 * 22.04 *  *
* Vel Total (ft/s)   * 11.17 * Avg. Vel. (ft/s) * 2.38 * 11.35 *  *
* Max Chl Dpth (ft) * 6.27  * Hydr. Depth (ft) * 0.14 * 4.65 *  *
* Conv. Total (cfs) * 10023.6 * Conv. (cfs) * 43.3 * 9980.3 *  *
*****
```

```

* Length Wtd. (ft)      * 114.47 * Wetted Per. (ft)      * 14.82 * 29.57 *
* Min Ch El (ft)      * 254.87 * Shear (lb/sq ft)     * 0.12 * 2.95 *
* Alpha                * 1.03 * Stream Power (lb/ft s) * 264.28 * 0.00 * 0.00 *
* Frctn Loss (ft)     * 0.78 * Cum Volume (acre-ft) * 2.47 * 8.05 * 1.94 *
* C & E Loss (ft)     * 0.12 * Cum SA (acres)       * 1.59 * 1.83 * 1.78 *
*****

```

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft)      * 263.75 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.79 * Wt. n-Val.          * 0.021 * 0.035 * 0.045 *
* W.S. Elev (ft)     * 261.96 * Reach Len. (ft)     * 113.96 * 114.57 * 114.59 *
* Crit W.S. (ft)     * 262.62 * Flow Area (sq ft)   * 44.62 * 120.76 * 0.63 *
* E.G. Slope (ft/ft) * 0.011249 * Area (sq ft)       * 44.62 * 120.76 * 0.63 *
* Q Total (cfs)      * 1598.00 * Flow (cfs)         * 222.24 * 1375.03 * 0.73 *
* Top Width (ft)     * 117.75 * Top Width (ft)     * 92.26 * 22.20 * 3.29 *
* Vel Total (ft/s)   * 9.63 * Avg. Vel. (ft/s)   * 4.98 * 11.39 * 1.16 *
* Max Chl Dpth (ft) * 7.09 * Hydr. Depth (ft)   * 0.48 * 5.44 * 0.19 *
* Conv. Total (cfs) * 15067.1 * Conv. (cfs)        * 2095.4 * 12964.8 * 6.9 *
* Length Wtd. (ft)  * 114.50 * Wetted Per. (ft)   * 92.78 * 30.03 * 3.31 *
* Min Ch El (ft)    * 254.87 * Shear (lb/sq ft)   * 0.34 * 2.82 * 0.13 *
* Alpha              * 1.24 * Stream Power (lb/ft s) * 264.28 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 0.74 * Cum Volume (acre-ft) * 3.58 * 9.33 * 3.06 *
* C & E Loss (ft)   * 0.09 * Cum SA (acres)     * 2.14 * 1.86 * 2.02 *
*****

```

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main RS: 38

INPUT

Description:

Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	265.02	23.79	264.07	37.79	262.29	45.18	262.39	66.67	261.05
88.5	260.1	91.74	260.25	105.08	260.64	117.16	260.25	117.92	260.91
123.72	260.82	123.88	259.81	124.49	257.07	124.89	255.1	133.09	254.44
134.62	254.31	144.72	254.95	145.15	256.94	145.95	259.81	150.06	260.27
169.33	261.87	181.94	262.16	192.36	261.55	206.48	265.12	222.68	272.01

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	88.5	.02	123.88	.035	145.95	.02	181.94	.045
206.48	.1								

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	123.88	145.95		50.64	50.85	51.22	.1 .3

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft)      * 258.43 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.84 * Wt. n-Val.          * * * 0.035 *
* W.S. Elev (ft)     * 257.59 * Reach Len. (ft)     * 50.64 * 50.85 * 51.22 *
* Crit W.S. (ft)     * * * Flow Area (sq ft) * * * 59.24 *
* E.G. Slope (ft/ft) * 0.009579 * Area (sq ft)       * * * 59.24 *
* Q Total (cfs)      * 436.00 * Flow (cfs)         * * * 436.00 *
* Top Width (ft)     * 20.95 * Top Width (ft)     * * * 20.95 *
*****

```

```

* Vel Total (ft/s)      * 7.36 * Avg. Vel. (ft/s)      * 7.36 *
* Max Chl Dpth (ft)    * 3.28 * Hydr. Depth (ft)     * 2.83 *
* Conv. Total (cfs)    * 4454.8 * Conv. (cfs)          * 4454.8 *
* Length Wtd. (ft)     * 50.85 * Wetted Per. (ft)     * 25.13 *
* Min Ch El (ft)       * 254.31 * Shear (lb/sq ft)     * 1.41 *
* Alpha                 * 1.00 * Stream Power (lb/ft s) * 222.68 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 0.40 * Cum Volume (acre-ft) * 0.42 * 3.66 * 0.05 *
* C & E Loss (ft)      * 0.03 * Cum SA (acres)       * 0.55 * 1.38 * 0.15 *
*****

```

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)       * 261.81 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)        * 1.04 * Wt. n-Val.           * 0.024 * 0.035 * 0.020 *
* W.S. Elev (ft)       * 260.78 * Reach Len. (ft)      * 50.64 * 50.85 * 51.22 *
* Crit W.S. (ft)       * 259.26 * Flow Area (sq ft)    * 15.82 * 128.40 * 4.56 *
* E.G. Slope (ft/ft)   * 0.005484 * Area (sq ft)         * 15.82 * 128.40 * 4.56 *
* Q Total (cfs)        * 1121.00 * Flow (cfs)           * 35.34 * 1071.03 * 14.63 *
* Top Width (ft)       * 77.21 * Top Width (ft)       * 44.94 * 22.07 * 10.20 *
* Vel Total (ft/s)     * 7.53 * Avg. Vel. (ft/s)     * 2.23 * 8.34 * 3.21 *
* Max Chl Dpth (ft)    * 6.47 * Hydr. Depth (ft)     * 0.35 * 5.82 * 0.45 *
* Conv. Total (cfs)    * 15137.3 * Conv. (cfs)          * 477.1 * 14462.6 * 197.6 *
* Length Wtd. (ft)     * 50.85 * Wetted Per. (ft)     * 45.99 * 29.71 * 10.24 *
* Min Ch El (ft)       * 254.31 * Shear (lb/sq ft)     * 0.12 * 1.48 * 0.15 *
* Alpha                 * 1.18 * Stream Power (lb/ft s) * 222.68 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 0.34 * Cum Volume (acre-ft) * 2.17 * 7.25 * 1.67 *
* C & E Loss (ft)      * 0.05 * Cum SA (acres)       * 1.33 * 1.77 * 1.66 *
*****

```

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)       * 263.19 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)        * 0.98 * Wt. n-Val.           * 0.025 * 0.035 * 0.021 *
* W.S. Elev (ft)       * 262.21 * Reach Len. (ft)      * 50.64 * 50.85 * 51.22 *
* Crit W.S. (ft)       * 262.21 * Flow Area (sq ft)    * 107.23 * 160.05 * 37.87 *
* E.G. Slope (ft/ft)   * 0.004826 * Area (sq ft)         * 107.23 * 160.05 * 37.87 *
* Q Total (cfs)        * 2176.00 * Flow (cfs)           * 557.41 * 1450.39 * 168.20 *
* Top Width (ft)       * 146.89 * Top Width (ft)       * 75.80 * 22.07 * 49.02 *
* Vel Total (ft/s)     * 7.13 * Avg. Vel. (ft/s)     * 5.20 * 9.06 * 4.44 *
* Max Chl Dpth (ft)    * 7.90 * Hydr. Depth (ft)     * 1.41 * 7.25 * 0.77 *
* Conv. Total (cfs)    * 31323.5 * Conv. (cfs)          * 8023.9 * 20878.3 * 2421.3 *
* Length Wtd. (ft)     * 50.85 * Wetted Per. (ft)     * 76.98 * 29.71 * 49.21 *
* Min Ch El (ft)       * 254.31 * Shear (lb/sq ft)     * 0.42 * 1.62 * 0.23 *
* Alpha                 * 1.24 * Stream Power (lb/ft s) * 222.68 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 0.26 * Cum Volume (acre-ft) * 4.81 * 10.39 * 4.38 *
* C & E Loss (ft)      * 0.01 * Cum SA (acres)       * 2.25 * 1.82 * 2.39 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)       * 263.79 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)        * 1.07 * Wt. n-Val.           * 0.026 * 0.035 * 0.022 *
* W.S. Elev (ft)       * 262.72 * Reach Len. (ft)      * 50.64 * 50.85 * 51.22 *
* Crit W.S. (ft)       * 262.72 * Flow Area (sq ft)    * 150.34 * 171.23 * 63.22 *
* E.G. Slope (ft/ft)   * 0.005089 * Area (sq ft)         * 150.34 * 171.23 * 63.22 *
* Q Total (cfs)        * 2936.00 * Flow (cfs)           * 899.50 * 1666.85 * 369.65 *
* Top Width (ft)       * 162.53 * Top Width (ft)       * 89.44 * 22.07 * 51.02 *
* Vel Total (ft/s)     * 7.63 * Avg. Vel. (ft/s)     * 5.98 * 9.73 * 5.85 *
* Max Chl Dpth (ft)    * 8.41 * Hydr. Depth (ft)     * 1.68 * 7.76 * 1.24 *
* Conv. Total (cfs)    * 41157.3 * Conv. (cfs)          * 12609.3 * 23366.2 * 5181.8 *
* Length Wtd. (ft)     * 50.85 * Wetted Per. (ft)     * 90.66 * 29.71 * 51.28 *
* Min Ch El (ft)       * 254.31 * Shear (lb/sq ft)     * 0.53 * 1.83 * 0.39 *
* Alpha                 * 1.19 * Stream Power (lb/ft s) * 222.68 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 0.28 * Cum Volume (acre-ft) * 6.45 * 11.98 * 5.88 *
* C & E Loss (ft)      * 0.02 * Cum SA (acres)       * 2.61 * 1.83 * 2.75 *
*****

```


Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #6HR OBS

```
*****
* E.G. Elev (ft)      * 261.99 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.71  * Wt. n-Val.      * 0.024  * 0.035  * 0.020  *
* W.S. Elev (ft)     * 261.28 * Reach Len. (ft) * 50.64  * 50.85  * 51.22  *
* Crit W.S. (ft)     * 259.36 * Flow Area (sq ft) * 43.45  * 139.44 * 11.17  *
* E.G. Slope (ft/ft) * 0.003657 * Area (sq ft)    * 43.45  * 139.44 * 11.17  *
* Q Total (cfs)      * 1169.00 * Flow (cfs)      * 126.52 * 1003.46 * 39.02  *
* Top Width (ft)     * 99.12  * Top Width (ft)  * 60.83  * 22.07  * 16.22  *
* Vel Total (ft/s)   * 6.02  * Avg. Vel. (ft/s) * 2.91  * 7.20  * 3.49  *
* Max Chl Dpth (ft) * 6.97  * Hydr. Depth (ft) * 0.71  * 6.32  * 0.69  *
* Conv. Total (cfs)  * 19331.1 * Conv. (cfs)     * 2092.2 * 16593.7 * 645.2  *
* Length Wtd. (ft)  * 50.85  * Wetted Per. (ft) * 61.98  * 29.71  * 16.29  *
* Min Ch El (ft)    * 254.31 * Shear (lb/sq ft) * 0.16  * 1.07  * 0.16  *
* Alpha             * 1.26  * Stream Power (lb/ft s) * 222.68 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 0.25  * Cum Volume (acre-ft) * 2.41  * 7.73  * 1.93  *
* C & E Loss (ft)   * 0.06  * Cum SA (acres)   * 1.49  * 1.77  * 1.75  *
*****
```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION OUTPUT Profile #24HR OBS

```
*****
* E.G. Elev (ft)      * 262.61 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.36  * Wt. n-Val.      * 0.024  * 0.035  * 0.020  *
* W.S. Elev (ft)     * 261.25 * Reach Len. (ft) * 50.64  * 50.85  * 51.22  *
* Crit W.S. (ft)     * 261.56 * Flow Area (sq ft) * 42.03  * 138.93 * 10.79  *
* E.G. Slope (ft/ft) * 0.007002 * Area (sq ft)    * 42.03  * 138.93 * 10.79  *
* Q Total (cfs)      * 1598.00 * Flow (cfs)      * 166.37 * 1380.03 * 51.60  *
* Top Width (ft)     * 98.46  * Top Width (ft)  * 60.45  * 22.07  * 15.94  *
* Vel Total (ft/s)   * 8.33  * Avg. Vel. (ft/s) * 3.96  * 9.93  * 4.78  *
* Max Chl Dpth (ft) * 6.94  * Hydr. Depth (ft) * 0.70  * 6.29  * 0.68  *
* Conv. Total (cfs)  * 19096.4 * Conv. (cfs)     * 1988.2 * 16491.6 * 616.6  *
* Length Wtd. (ft)  * 50.85  * Wetted Per. (ft) * 61.61  * 29.71  * 16.01  *
* Min Ch El (ft)    * 254.31 * Shear (lb/sq ft) * 0.30  * 2.04  * 0.29  *
* Alpha             * 1.26  * Stream Power (lb/ft s) * 222.68 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 1.00  * Cum Volume (acre-ft) * 3.46  * 8.99  * 3.04  *
* C & E Loss (ft)   * 0.13  * Cum SA (acres)   * 1.94  * 1.80  * 2.00  *
*****
```

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: hudson
REACH: main RS: 37

INPUT

Description:

Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	264	20	260.01	36.61	259.64	40.55	259.78	51.16	260.22
63.4	260.02	64.06	260.27	69.53	260.38	75.38	259.43	76.33	256.54
76.82	253.52	80.8	253.37	85.55	253.19	94.42	253.51	94.78	255.27
94.97	256.342	95.51	259.39	114.56	260	126.13	260.27	138.62	260.6
153.18	260.1	168.22	262.2						

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	40.55	.02	75.38	.035	95.51	.045	126.13	.02
153.18	.1								

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	75.38	95.51		63.51 64.27	60.78	.1	.3
Ineffective Flow	num=		1				
Sta L	Sta R	Elev	Permanent				
24.82	27.7	265	F				
Blocked Obstructions	num=		1				
Sta L	Sta R	Elev	*****				
0	24.82	265	*****				

CROSS SECTION OUTPUT Profile #2-YR

```
*****
* E.G. Elev (ft) * 258.00 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.74 * Wt. n-Val. * * 0.035 * *
* W.S. Elev (ft) * 257.26 * Reach Len. (ft) * 63.51 * 64.27 * 60.78 *
* Crit W.S. (ft) * 256.22 * Flow Area (sq ft) * * 71.37 * *
* E.G. Slope (ft/ft) * 0.006572 * Area (sq ft) * * 71.37 * *
* Q Total (cfs) * 491.00 * Flow (cfs) * * 491.00 * *
* Top Width (ft) * 19.04 * Top Width (ft) * * 19.04 * *
* Vel Total (ft/s) * 6.88 * Avg. Vel. (ft/s) * * 6.88 * *
* Max Chl Dpth (ft) * 4.07 * Hydr. Depth (ft) * * 3.75 * *
* Conv. Total (cfs) * 6056.6 * Conv. (cfs) * * 6056.6 * *
* Length Wtd. (ft) * 64.27 * Wetted Per. (ft) * * 25.25 * *
* Min Ch El (ft) * 253.19 * Shear (lb/sq ft) * * 1.16 * *
* Alpha * 1.00 * Stream Power (lb/ft s) * 168.22 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.63 * Cum Volume (acre-ft) * 0.42 * 3.58 * 0.05 *
* C & E Loss (ft) * 0.06 * Cum SA (acres) * 0.55 * 1.36 * 0.15 *
*****
```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```
*****
* E.G. Elev (ft) * 261.42 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 1.55 * Wt. n-Val. * * 0.032 * * 0.035 * * 0.045 *
* W.S. Elev (ft) * 259.87 * Reach Len. (ft) * 63.51 * 64.27 * 60.78 *
* Crit W.S. (ft) * 258.64 * Flow Area (sq ft) * * 2.54 * * 122.76 * * 3.64 *
* E.G. Slope (ft/ft) * 0.008390 * Area (sq ft) * * 2.57 * * 122.76 * * 3.64 *
* Q Total (cfs) * 1237.00 * Flow (cfs) * * 3.10 * * 1229.63 * * 4.27 *
* Top Width (ft) * 54.59 * Top Width (ft) * * 19.37 * * 20.13 * * 15.08 *
* Vel Total (ft/s) * 9.59 * Avg. Vel. (ft/s) * * 1.22 * * 10.02 * * 1.17 *
* Max Chl Dpth (ft) * 6.68 * Hydr. Depth (ft) * * 0.14 * * 6.10 * * 0.24 *
* Conv. Total (cfs) * 13504.6 * Conv. (cfs) * * 33.8 * * 13424.2 * * 46.6 *
* Length Wtd. (ft) * 64.26 * Wetted Per. (ft) * * 17.86 * * 29.69 * * 15.09 *
* Min Ch El (ft) * 253.19 * Shear (lb/sq ft) * * 0.07 * * 2.17 * * 0.13 *
* Alpha * 1.08 * Stream Power (lb/ft s) * 168.22 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.73 * Cum Volume (acre-ft) * * 2.16 * * 7.11 * * 1.66 *
* C & E Loss (ft) * 0.08 * Cum SA (acres) * * 1.30 * * 1.75 * * 1.65 *
*****
```

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```
*****
* E.G. Elev (ft) * 262.83 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 1.51 * Wt. n-Val. * * 0.025 * * 0.035 * * 0.034 *
* W.S. Elev (ft) * 261.32 * Reach Len. (ft) * 63.51 * 64.27 * 60.78 *
* Crit W.S. (ft) * 261.68 * Flow Area (sq ft) * * 63.41 * * 151.80 * * 74.88 *
* E.G. Slope (ft/ft) * 0.007930 * Area (sq ft) * * 67.57 * * 151.80 * * 74.88 *
* Q Total (cfs) * 2442.00 * Flow (cfs) * * 408.44 * * 1703.04 * * 330.52 *
* Top Width (ft) * 137.07 * Top Width (ft) * * 50.56 * * 20.13 * * 66.38 *
* Vel Total (ft/s) * 8.42 * Avg. Vel. (ft/s) * * 6.44 * * 11.22 * * 4.41 *
* Max Chl Dpth (ft) * 8.13 * Hydr. Depth (ft) * * 1.33 * * 7.54 * * 1.13 *
* Conv. Total (cfs) * 27421.9 * Conv. (cfs) * * 4586.5 * * 19123.9 * * 3711.5 *
* Length Wtd. (ft) * 63.77 * Wetted Per. (ft) * * 47.82 * * 29.69 * * 66.49 *
* Min Ch El (ft) * 253.19 * Shear (lb/sq ft) * * 0.66 * * 2.53 * * 0.56 *
* Alpha * 1.37 * Stream Power (lb/ft s) * 168.22 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.31 * Cum Volume (acre-ft) * * 4.71 * * 10.21 * * 4.31 *
* C & E Loss (ft) * 0.05 * Cum SA (acres) * * 2.18 * * 1.79 * * 2.33 *
*****
```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

			Left OB	Channel	Right OB	
* E.G. Elev (ft)	* 263.42	* Element	* 0.025	* 0.035	* 0.033	*
* Vel Head (ft)	* 1.56	* Wt. n-Val.	* 63.51	* 64.27	* 60.78	*
* W.S. Elev (ft)	* 261.86	* Reach Len. (ft)	* 89.55	* 162.83	* 112.36	*
* Crit W.S. (ft)	* 262.14	* Flow Area (sq ft)	* 95.30	* 162.83	* 112.36	*
* E.G. Slope (ft/ft)	* 0.007820	* Area (sq ft)	* 731.63	* 1901.09	* 637.28	*
* Q Total (cfs)	* 3270.00	* Flow (cfs)	* 50.56	* 20.13	* 70.30	*
* Top Width (ft)	* 140.99	* Top Width (ft)	* 8.17	* 11.67	* 5.67	*
* Vel Total (ft/s)	* 8.97	* Avg. Vel. (ft/s)	* 1.88	* 8.09	* 1.60	*
* Max Chl Dpth (ft)	* 8.67	* Hydr. Depth (ft)	* 8273.3	* 21497.6	* 7206.4	*
* Conv. Total (cfs)	* 36977.3	* Conv. (cfs)	* 47.82	* 29.69	* 70.45	*
* Length Wtd. (ft)	* 63.55	* Wetted Per. (ft)	* 0.91	* 2.68	* 0.78	*
* Min Ch El (ft)	* 253.19	* Shear (lb/sq ft)	* 168.22	* 0.00	* 0.00	*
* Alpha	* 1.25	* Stream Power (lb/ft s)	* 6.31	* 11.78	* 5.78	*
* Frctn Loss (ft)	* 0.32	* Cum Volume (acre-ft)	* 2.53	* 1.81	* 2.68	*
* C & E Loss (ft)	* 0.05	* Cum SA (acres)				

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

			Left OB	Channel	Right OB	
* E.G. Elev (ft)	* 261.67	* Element	* 0.030	* 0.035	* 0.044	*
* Vel Head (ft)	* 1.33	* Wt. n-Val.	* 63.51	* 64.27	* 60.78	*
* W.S. Elev (ft)	* 260.34	* Reach Len. (ft)	* 16.88	* 132.13	* 15.74	*
* Crit W.S. (ft)	* 258.86	* Flow Area (sq ft)	* 18.23	* 132.13	* 15.74	*
* E.G. Slope (ft/ft)	* 0.006810	* Area (sq ft)	* 39.92	* 1252.40	* 25.68	*
* Q Total (cfs)	* 1318.00	* Flow (cfs)	* 48.25	* 20.13	* 41.88	*
* Top Width (ft)	* 110.26	* Top Width (ft)	* 2.37	* 9.48	* 1.63	*
* Vel Total (ft/s)	* 8.00	* Avg. Vel. (ft/s)	* 0.37	* 6.56	* 0.38	*
* Max Chl Dpth (ft)	* 7.15	* Hydr. Depth (ft)	* 483.7	* 15175.9	* 311.2	*
* Conv. Total (cfs)	* 15970.8	* Conv. (cfs)	* 45.51	* 29.69	* 41.92	*
* Length Wtd. (ft)	* 64.22	* Wetted Per. (ft)	* 0.16	* 1.89	* 0.16	*
* Min Ch El (ft)	* 253.19	* Shear (lb/sq ft)	* 168.22	* 0.00	* 0.00	*
* Alpha	* 1.34	* Stream Power (lb/ft s)	* 2.37	* 7.57	* 1.91	*
* Frctn Loss (ft)	* 0.64	* Cum Volume (acre-ft)	* 1.43	* 1.75	* 1.72	*
* C & E Loss (ft)	* 0.11	* Cum SA (acres)				

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

			Left OB	Channel	Right OB	
* E.G. Elev (ft)	* 262.26	* Element	* 0.026	* 0.035	* 0.036	*
* Vel Head (ft)	* 1.36	* Wt. n-Val.	* 63.51	* 64.27	* 60.78	*
* W.S. Elev (ft)	* 260.90	* Reach Len. (ft)	* 43.62	* 143.44	* 47.95	*
* Crit W.S. (ft)	* 261.26	* Flow Area (sq ft)	* 46.58	* 143.44	* 47.95	*
* E.G. Slope (ft/ft)	* 0.007085	* Area (sq ft)	* 202.65	* 1464.79	* 147.56	*
* Q Total (cfs)	* 1815.00	* Flow (cfs)	* 50.56	* 20.13	* 63.40	*
* Top Width (ft)	* 134.09	* Top Width (ft)	* 4.65	* 10.21	* 3.08	*
* Vel Total (ft/s)	* 7.72	* Avg. Vel. (ft/s)	* 0.91	* 7.13	* 0.76	*
* Max Chl Dpth (ft)	* 7.71	* Hydr. Depth (ft)	* 2407.6	* 17402.0	* 1753.1	*
* Conv. Total (cfs)	* 21562.6	* Conv. (cfs)	* 47.82	* 29.69	* 63.48	*
* Length Wtd. (ft)	* 63.97	* Wetted Per. (ft)	* 0.40	* 2.14	* 0.33	*
* Min Ch El (ft)	* 253.19	* Shear (lb/sq ft)	* 168.22	* 0.00	* 0.00	*
* Alpha	* 1.46	* Stream Power (lb/ft s)	* 3.41	* 8.82	* 3.01	*
* Frctn Loss (ft)	* 0.36	* Cum Volume (acre-ft)	* 1.87	* 1.77	* 1.95	*
* C & E Loss (ft)	* 0.00	* Cum SA (acres)				

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main RS: 36

INPUT

Description:

Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	261.81	18.27	260.05	31.92	258.51	38.67	258.86	48.77	259.26
63.07	259.14	63.8	259.62	68.79	259.63	78.21	259.56	85.38	259.39
95.85	258.62	96.33	255.18	96.88	253.12	104.68	252.84	105.34	252.93
111.53	253.8	116.04	253.82	116.53	255.43	117.13	258.54	134.15	259.47
148.83	260.07	164.32	260.56	184.71	266.62				

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	31.92	.02	68.79	.045	95.85	.035	117.13	.02
164.32	.1								

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	95.85	117.13		34	38.78		.1	.3
Ineffective Flow			num=	1				
Sta L	Sta R	Elev	Permanent					
0	10.17	270	F					

CROSS SECTION OUTPUT Profile #2-YR

* E.G. Elev (ft)	* 257.30	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 1.31	* Wt. n-Val.	* 0.035	*	*
* W.S. Elev (ft)	* 256.00	* Reach Len. (ft)	* 34.00	* 38.78	* 43.34
* Crit W.S. (ft)	* 256.00	* Flow Area (sq ft)	*	* 53.48	*
* E.G. Slope (ft/ft)	* 0.016465	* Area (sq ft)	*	* 53.48	*
* Q Total (cfs)	* 491.00	* Flow (cfs)	*	* 491.00	*
* Top Width (ft)	* 20.42	* Top Width (ft)	*	* 20.42	*
* Vel Total (ft/s)	* 9.18	* Avg. Vel. (ft/s)	*	* 9.18	*
* Max Chl Dpth (ft)	* 3.16	* Hydr. Depth (ft)	*	* 2.62	*
* Conv. Total (cfs)	* 3826.4	* Conv. (cfs)	*	* 3826.4	*
* Length Wtd. (ft)	* 38.78	* Wetted Per. (ft)	*	* 24.45	*
* Min Ch El (ft)	* 252.84	* Shear (lb/sq ft)	*	* 2.25	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 184.71	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.61	* Cum Volume (acre-ft)	* 0.42	* 3.49	* 0.05
* C & E Loss (ft)	* 0.06	* Cum SA (acres)	* 0.55	* 1.33	* 0.15

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 260.61	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 2.37	* Wt. n-Val.	* 0.035	*	*
* W.S. Elev (ft)	* 258.24	* Reach Len. (ft)	* 34.00	* 38.78	* 43.34
* Crit W.S. (ft)	* 258.24	* Flow Area (sq ft)	*	* 100.18	*
* E.G. Slope (ft/ft)	* 0.016200	* Area (sq ft)	*	* 100.18	*
* Q Total (cfs)	* 1237.00	* Flow (cfs)	*	* 1237.00	*
* Top Width (ft)	* 21.17	* Top Width (ft)	*	* 21.17	*
* Vel Total (ft/s)	* 12.35	* Avg. Vel. (ft/s)	*	* 12.35	*
* Max Chl Dpth (ft)	* 5.40	* Hydr. Depth (ft)	*	* 4.73	*
* Conv. Total (cfs)	* 9718.7	* Conv. (cfs)	*	* 9718.7	*
* Length Wtd. (ft)	* 38.78	* Wetted Per. (ft)	*	* 29.00	*
* Min Ch El (ft)	* 252.84	* Shear (lb/sq ft)	*	* 3.49	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 184.71	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.56	* Cum Volume (acre-ft)	* 2.16	* 6.94	* 1.66
* C & E Loss (ft)	* 0.19	* Cum SA (acres)	* 1.28	* 1.72	* 1.64

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```
*****
* E.G. Elev (ft)      * 262.20 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.95  * Wt. n-Val.      * 0.027  * 0.035  * 0.020  *
* W.S. Elev (ft)     * 260.25 * Reach Len. (ft) * 34.00  * 38.78  * 43.34  *
* Crit W.S. (ft)     * 260.89 * Flow Area (sq ft) * 79.26  * 142.83 * 28.60  *
* E.G. Slope (ft/ft) * 0.010790 * Area (sq ft)    * 79.26  * 142.83 * 28.60  *
* Q Total (cfs)      * 2442.00 * Flow (cfs)      * 462.11 * 1794.97 * 184.92 *
* Top Width (ft)     * 138.16 * Top Width (ft)  * 79.62  * 21.28  * 37.27  *
* Vel Total (ft/s)   * 9.74  * Avg. Vel. (ft/s) * 5.83   * 12.57  * 6.46   *
* Max Chl Dpth (ft) * 7.41  * Hydr. Depth (ft) * 1.00   * 6.71   * 0.77   *
* Conv. Total (cfs)  * 23509.4 * Conv. (cfs)     * 4448.8 * 17280.4 * 1780.3 *
* Length Wtd. (ft)  * 38.47  * Wetted Per. (ft) * 79.90  * 29.69  * 37.31  *
* Min Ch El (ft)    * 252.84 * Shear (lb/sq ft) * 0.67   * 3.24   * 0.52   *
* Alpha             * 1.32  * Stream Power (lb/ft s) * 184.71 * 0.00   * 0.00   *
* Frctn Loss (ft)   * 0.59  * Cum Volume (acre-ft) * 4.60   * 9.99   * 4.24   *
* C & E Loss (ft)   * 0.04  * Cum SA (acres)   * 2.08   * 1.76   * 2.25   *
*****
```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```
*****
* E.G. Elev (ft)      * 262.78 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 2.10  * Wt. n-Val.      * 0.027  * 0.035  * 0.020  *
* W.S. Elev (ft)     * 260.68 * Reach Len. (ft) * 34.00  * 38.78  * 43.34  *
* Crit W.S. (ft)     * 261.29 * Flow Area (sq ft) * 114.72 * 152.05 * 47.52  *
* E.G. Slope (ft/ft) * 0.011437 * Area (sq ft)    * 114.72 * 152.05 * 47.52  *
* Q Total (cfs)      * 3270.00 * Flow (cfs)      * 840.20 * 2051.07 * 378.73 *
* Top Width (ft)     * 152.99 * Top Width (ft)  * 84.11  * 21.28  * 47.59  *
* Vel Total (ft/s)   * 10.40 * Avg. Vel. (ft/s) * 7.32   * 13.49  * 7.97   *
* Max Chl Dpth (ft) * 7.84  * Hydr. Depth (ft) * 1.36   * 7.15   * 1.00   *
* Conv. Total (cfs)  * 30577.2 * Conv. (cfs)     * 7856.5 * 19179.3 * 3541.4 *
* Length Wtd. (ft)  * 38.15 * Wetted Per. (ft) * 84.42  * 29.69  * 47.65  *
* Min Ch El (ft)    * 252.84 * Shear (lb/sq ft) * 0.97   * 3.66   * 0.71   *
* Alpha             * 1.25  * Stream Power (lb/ft s) * 184.71 * 0.00   * 0.00   *
* Frctn Loss (ft)   * 0.60  * Cum Volume (acre-ft) * 6.15   * 11.55  * 5.67   *
* C & E Loss (ft)   * 0.05  * Cum SA (acres)   * 2.43   * 1.77   * 2.60   *
*****
```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

```
*****
* E.G. Elev (ft)      * 260.92 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 2.47  * Wt. n-Val.      *      * 0.035  *      *
* W.S. Elev (ft)     * 258.45 * Reach Len. (ft) * 34.00  * 38.78  * 43.34  *
* Crit W.S. (ft)     * 258.45 * Flow Area (sq ft) *      * 104.54 *      *
* E.G. Slope (ft/ft) * 0.016264 * Area (sq ft)    *      * 104.54 *      *
* Q Total (cfs)      * 1318.00 * Flow (cfs)      *      * 1318.00 *      *
* Top Width (ft)     * 21.24 * Top Width (ft)  *      * 21.24  *      *
* Vel Total (ft/s)   * 12.61 * Avg. Vel. (ft/s) *      * 12.61  *      *
* Max Chl Dpth (ft) * 5.61  * Hydr. Depth (ft) *      * 4.92   *      *
* Conv. Total (cfs)  * 10334.7 * Conv. (cfs)     *      * 10334.7 *      *
* Length Wtd. (ft)  * 38.78 * Wetted Per. (ft) *      * 29.42  *      *
* Min Ch El (ft)    * 252.84 * Shear (lb/sq ft) *      * 3.61   *      *
* Alpha             * 1.00  * Stream Power (lb/ft s) * 184.71 * 0.00   * 0.00   *
*****
```

```

* Frctn Loss (ft)          * 0.56 * Cum Volume (acre-ft) * 2.36 * 7.40 * 1.90 *
* C & E Loss (ft)         * 0.21 * Cum SA (acres) * 1.39 * 1.72 * 1.69 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft)          * 261.66 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 1.88  * Wt. n-Val.      * 0.026  * 0.035  * 0.020  *
* W.S. Elev (ft)         * 259.78 * Reach Len. (ft) * 34.00  * 38.78  * 43.34  *
* Crit W.S. (ft)         * 260.44 * Flow Area (sq ft) * 43.57  * 133.01 * 14.48  *
* E.G. Slope (ft/ft)     * 0.010324 * Area (sq ft) * 43.57  * 133.01 * 14.48  *
* Q Total (cfs)          * 1815.00 * Flow (cfs)      * 179.29 * 1559.24 * 76.47  *
* Top Width (ft)         * 121.23 * Top Width (ft)  * 75.23  * 21.28  * 24.72  *
* Vel Total (ft/s)       * 9.50  * Avg. Vel. (ft/s) * 4.12   * 11.72  * 5.28   *
* Max Chl Dpth (ft)     * 6.94  * Hydr. Depth (ft) * 0.58   * 6.25   * 0.59   *
* Conv. Total (cfs)     * 17863.0 * Conv. (cfs)     * 1764.5 * 15345.9 * 752.6  *
* Length Wtd. (ft)      * 38.64  * Wetted Per. (ft) * 75.49  * 29.69  * 24.75  *
* Min Ch El (ft)        * 252.84 * Shear (lb/sq ft) * 0.37   * 2.89   * 0.38   *
* Alpha                  * 1.34  * Stream Power (lb/ft s) * 184.71 * 0.00   * 0.00   *
* Frctn Loss (ft)       * 0.54  * Cum Volume (acre-ft) * 3.35   * 8.62   * 2.96   *
* C & E Loss (ft)       * 0.05  * Cum SA (acres)   * 1.78   * 1.74   * 1.89   *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main RS: 35

INPUT

Description:

Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	272.29	12.72	268.66	14.93	263.32	22.97	258.48	24.24	258.47
28.13	258.35	28.26	258.02	35.22	258.31	46.72	258.76	58.21	258.6
62.8	258.53	65.06	258.27	65.77	258.45	66.39	258.71	97.96	258.28
101.22	258.07	106.12	255.1	111.68	252.21	119.94	252.29	120.05	252.29
126.93	252.72	131.27	254.45	138.58	257.73	150.13	262.76	157.42	263.01

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	28.13	.02	65.77	.045	101.22	.035	138.58	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

101.22	138.58	69.27	79.77	85.15	.1	.3
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CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft)          * 256.43 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 1.73  * Wt. n-Val.      * *      * 0.035  * *      *
* W.S. Elev (ft)         * 254.70 * Reach Len. (ft) * 69.27  * 79.77  * 85.15  *
* Crit W.S. (ft)         * 255.16 * Flow Area (sq ft) * *      * 46.52  * *      *
* E.G. Slope (ft/ft)     * 0.028382 * Area (sq ft) * *      * 46.52  * *      *
* Q Total (cfs)          * 491.00 * Flow (cfs)      * *      * 491.00 * *      *
* Top Width (ft)         * 24.95  * Top Width (ft)  * *      * 24.95  * *      *
* Vel Total (ft/s)       * 10.55  * Avg. Vel. (ft/s) * *      * 10.55  * *      *
*****

```

```

* Max Chl Dpth (ft)      * 2.49 * Hydr. Depth (ft)      *      * 1.86 *
* Conv. Total (cfs)     * 2914.5 * Conv. (cfs)          *      * 2914.5 *
* Length Wtd. (ft)     * 79.77 * Wetted Per. (ft)    *      * 25.95 *
* Min Ch El (ft)       * 252.21 * Shear (lb/sq ft)    *      * 3.18 *
* Alpha                 * 1.00 * Stream Power (lb/ft s) * 157.42 * 0.00 *
* Frctn Loss (ft)      * 0.82 * Cum Volume (acre-ft) * 0.42 * 3.44 *
* C & E Loss (ft)      * 0.04 * Cum SA (acres)      * 0.55 * 1.31 *
*****

```

Note: Program found supercritical flow starting at this cross section.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)        * 259.58 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)        * 3.62 * Wt. n-Val.           *      * 0.035 *      *
* W.S. Elev (ft)       * 255.96 * Reach Len. (ft)     * 69.27 * 79.77 * 85.15 *
* Crit W.S. (ft)       * 257.08 * Flow Area (sq ft)   *      * 81.04 *      *
* E.G. Slope (ft/ft)   * 0.036731 * Area (sq ft)        *      * 81.04 *      *
* Q Total (cfs)         * 1237.00 * Flow (cfs)          *      * 1237.00 *
* Top Width (ft)       * 29.93 * Top Width (ft)      *      * 29.93 *
* Vel Total (ft/s)     * 15.26 * Avg. Vel. (ft/s)    *      * 15.26 *
* Max Chl Dpth (ft)   * 3.75 * Hydr. Depth (ft)    *      * 2.71 *
* Conv. Total (cfs)    * 6454.3 * Conv. (cfs)         *      * 6454.3 *
* Length Wtd. (ft)    * 79.77 * Wetted Per. (ft)    *      * 31.54 *
* Min Ch El (ft)      * 252.21 * Shear (lb/sq ft)    *      * 5.89 *
* Alpha                * 1.00 * Stream Power (lb/ft s) * 157.42 * 0.00 *
* Frctn Loss (ft)     * 0.91 * Cum Volume (acre-ft) * 2.16 * 6.86 *
* C & E Loss (ft)     * 0.13 * Cum SA (acres)      * 1.28 * 1.69 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Program found supercritical flow starting at this cross section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)        * 261.60 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)        * 3.00 * Wt. n-Val.           * 0.028 * 0.035 * 0.100 *
* W.S. Elev (ft)       * 258.61 * Reach Len. (ft)     * 69.27 * 79.77 * 85.15 *
* Crit W.S. (ft)       * 259.68 * Flow Area (sq ft)   * 11.30 * 172.75 * 0.88 *
* E.G. Slope (ft/ft)   * 0.015377 * Area (sq ft)        * 11.30 * 172.75 * 0.88 *
* Q Total (cfs)         * 2442.00 * Flow (cfs)          * 27.01 * 2414.11 * 0.88 *
* Top Width (ft)       * 94.80 * Top Width (ft)      * 55.43 * 37.36 * 2.01 *
* Vel Total (ft/s)     * 13.20 * Avg. Vel. (ft/s)    * 2.39 * 13.97 * 1.00 *
* Max Chl Dpth (ft)   * 6.40 * Hydr. Depth (ft)    * 0.20 * 4.62 * 0.44 *
* Conv. Total (cfs)    * 19693.2 * Conv. (cfs)         * 217.8 * 19468.3 * 7.1 *
* Length Wtd. (ft)    * 79.71 * Wetted Per. (ft)    * 55.78 * 39.94 * 2.19 *
* Min Ch El (ft)      * 252.21 * Shear (lb/sq ft)    * 0.19 * 4.15 * 0.39 *
* Alpha                * 1.11 * Stream Power (lb/ft s) * 157.42 * 0.00 * 0.00 *
* Frctn Loss (ft)     * 0.49 * Cum Volume (acre-ft) * 4.57 * 9.85 * 4.23 *
* C & E Loss (ft)     * 0.10 * Cum SA (acres)      * 2.03 * 1.74 * 2.23 *
*****

```

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)        * 262.23 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)        * 2.86 * Wt. n-Val.           * 0.029 * 0.035 * 0.100 *
* W.S. Elev (ft)       * 259.37 * Reach Len. (ft)     * 69.27 * 79.77 * 85.15 *
* Crit W.S. (ft)       * 260.27 * Flow Area (sq ft)   * 70.17 * 201.31 * 3.09 *
* E.G. Slope (ft/ft)   * 0.013165 * Area (sq ft)        * 70.17 * 201.31 * 3.09 *
* Q Total (cfs)         * 3270.00 * Flow (cfs)          * 383.14 * 2882.51 * 4.35 *
* Top Width (ft)       * 120.85 * Top Width (ft)      * 79.73 * 37.36 * 3.76 *
* Vel Total (ft/s)     * 11.91 * Avg. Vel. (ft/s)    * 5.46 * 14.32 * 1.41 *
* Max Chl Dpth (ft)   * 7.16 * Hydr. Depth (ft)    * 0.88 * 5.39 * 0.82 *
* Conv. Total (cfs)    * 28499.5 * Conv. (cfs)         * 3339.2 * 25122.4 * 37.9 *

```

```

* Length Wtd. (ft)      * 79.03 * Wetted Per. (ft)      * 80.32 * 39.94 * 4.11 *
* Min Ch El (ft)       * 252.21 * Shear (lb/sq ft)     * 0.72 * 4.14 * 0.62 *
* Alpha                * 1.30 * Stream Power (lb/ft s) * 157.42 * 0.00 * 0.00 *
* Frctn Loss (ft)     * 0.47 * Cum Volume (acre-ft) * 6.08 * 11.39 * 5.64 *
* C & E Loss (ft)     * 0.08 * Cum SA (acres)       * 2.37 * 1.75 * 2.57 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #6HR OBS

```

*****
* E.G. Elev (ft)       * 259.86 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)        * 3.80 * Wt. n-Val.           *          * 0.035 *          *
* W.S. Elev (ft)       * 256.06 * Reach Len. (ft)     * 69.27 * 79.77 * 85.15 *
* Crit W.S. (ft)       * 257.25 * Flow Area (sq ft)   *          * 84.25 *          *
* E.G. Slope (ft/ft)   * 0.037356 * Area (sq ft)        *          * 84.25 *          *
* Q Total (cfs)        * 1318.00 * Flow (cfs)           *          * 1318.00 *          *
* Top Width (ft)       * 30.34 * Top Width (ft)      *          * 30.34 *          *
* Vel Total (ft/s)     * 15.64 * Avg. Vel. (ft/s)    *          * 15.64 *          *
* Max Chl Dpth (ft)   * 3.85 * Hydr. Depth (ft)    *          * 2.78 *          *
* Conv. Total (cfs)    * 6819.2 * Conv. (cfs)         *          * 6819.2 *          *
* Length Wtd. (ft)    * 79.77 * Wetted Per. (ft)    *          * 32.01 *          *
* Min Ch El (ft)      * 252.21 * Shear (lb/sq ft)    *          * 6.14 *          *
* Alpha               * 1.00 * Stream Power (lb/ft s) * 157.42 * 0.00 * 0.00 *
* Frctn Loss (ft)     * 0.92 * Cum Volume (acre-ft) * 2.36 * 7.31 * 1.90 *
* C & E Loss (ft)     * 0.13 * Cum SA (acres)      * 1.39 * 1.69 * 1.69 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Program found supercritical flow starting at this cross section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft)       * 260.84 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)        * 3.78 * Wt. n-Val.           *          * 0.035 *          *
* W.S. Elev (ft)       * 257.06 * Reach Len. (ft)     * 69.27 * 79.77 * 85.15 *
* Crit W.S. (ft)       * 258.24 * Flow Area (sq ft)   *          * 116.30 *          *
* E.G. Slope (ft/ft)   * 0.028665 * Area (sq ft)        *          * 116.30 *          *
* Q Total (cfs)        * 1815.00 * Flow (cfs)           *          * 1815.00 *          *
* Top Width (ft)       * 34.19 * Top Width (ft)      *          * 34.19 *          *
* Vel Total (ft/s)     * 15.61 * Avg. Vel. (ft/s)    *          * 15.61 *          *
* Max Chl Dpth (ft)   * 4.85 * Hydr. Depth (ft)    *          * 3.40 *          *
* Conv. Total (cfs)    * 10720.2 * Conv. (cfs)         *          * 10720.2 *          *
* Length Wtd. (ft)    * 79.76 * Wetted Per. (ft)    *          * 36.35 *          *
* Min Ch El (ft)      * 252.21 * Shear (lb/sq ft)    *          * 5.73 *          *
* Alpha               * 1.00 * Stream Power (lb/ft s) * 157.42 * 0.00 * 0.00 *
* Frctn Loss (ft)     * 0.62 * Cum Volume (acre-ft) * 3.33 * 8.51 * 2.96 *
* C & E Loss (ft)     * 0.19 * Cum SA (acres)      * 1.75 * 1.72 * 1.88 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: hudson
REACH: main RS: 34

INPUT

Description:

```

Station Elevation Data      num=      26
  Sta      Elev      Sta      Elev      Sta      Elev      Sta      Elev      Sta      Elev
*****
  0  270.86   5.82  269.22  16.88  263.73  17.79  259.61  22.7  257.28
 26.7 257.19  26.85  256.92  33.08  257.17  44.84  257.6   55.58  257.27

```


59.49	257.15	61.23	256.88	62.36	256.99	63.12	257.26	82.27	256.72
95.14	256.54	96.56	254.93	98.86	251.53	103.36	249.74	105.37	248.88
113.05	249	116.46	249.69	123.31	251.6	126.88	255.05	132.96	260.69
151.23	267.31								

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	22.7	.02	63.12	.045	96.56	.05	126.88	.045
132.96	.1								

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

96.56	126.88	59.8	61.46	61.27	.1	.3
-------	--------	------	-------	-------	----	----

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
83.83	95	265	F

CROSS SECTION OUTPUT Profile #2-YR

				Left OB	Channel	Right OB
* E.G. Elev (ft)	* 253.40	* Element		*	*	*
* Vel Head (ft)	* 1.63	* Wt. n-Val.		*	* 0.050	*
* W.S. Elev (ft)	* 251.78	* Reach Len. (ft)	* 59.80	*	* 61.46	* 61.27
* Crit W.S. (ft)	* 252.16	* Flow Area (sq ft)	*	*	* 47.97	*
* E.G. Slope (ft/ft)	* 0.052015	* Area (sq ft)	*	*	* 47.97	*
* Q Total (cfs)	* 491.00	* Flow (cfs)	*	*	* 491.00	*
* Top Width (ft)	* 24.80	* Top Width (ft)	*	*	* 24.80	*
* Vel Total (ft/s)	* 10.23	* Avg. Vel. (ft/s)	*	*	* 10.23	*
* Max Chl Dpth (ft)	* 2.90	* Hydr. Depth (ft)	*	*	* 1.93	*
* Conv. Total (cfs)	* 2152.9	* Conv. (cfs)	*	*	* 2152.9	*
* Length Wtd. (ft)	* 61.46	* Wetted Per. (ft)	*	*	* 25.85	*
* Min Ch El (ft)	* 248.88	* Shear (lb/sq ft)	*	*	* 6.03	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 151.23	*	* 0.00	* 0.00
* Frctn Loss (ft)	* 3.00	* Cum Volume (acre-ft)	* 0.42	*	* 3.36	* 0.05
* C & E Loss (ft)	* 0.03	* Cum SA (acres)	* 0.55	*	* 1.27	* 0.15

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

				Left OB	Channel	Right OB
* E.G. Elev (ft)	* 256.17	* Element		*	*	*
* Vel Head (ft)	* 2.56	* Wt. n-Val.		*	* 0.050	*
* W.S. Elev (ft)	* 253.61	* Reach Len. (ft)	* 59.80	*	* 61.46	* 61.27
* Crit W.S. (ft)	* 254.13	* Flow Area (sq ft)	*	*	* 96.34	*
* E.G. Slope (ft/ft)	* 0.040640	* Area (sq ft)	*	*	* 96.34	*
* Q Total (cfs)	* 1237.00	* Flow (cfs)	*	*	* 1237.00	*
* Top Width (ft)	* 27.94	* Top Width (ft)	*	*	* 27.94	*
* Vel Total (ft/s)	* 12.84	* Avg. Vel. (ft/s)	*	*	* 12.84	*
* Max Chl Dpth (ft)	* 4.73	* Hydr. Depth (ft)	*	*	* 3.45	*
* Conv. Total (cfs)	* 6136.1	* Conv. (cfs)	*	*	* 6136.1	*
* Length Wtd. (ft)	* 61.46	* Wetted Per. (ft)	*	*	* 30.71	*
* Min Ch El (ft)	* 248.88	* Shear (lb/sq ft)	*	*	* 7.96	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 151.23	*	* 0.00	* 0.00
* Frctn Loss (ft)	* 3.08	* Cum Volume (acre-ft)	* 2.16	*	* 6.70	* 1.66
* C & E Loss (ft)	* 0.32	* Cum SA (acres)	* 1.28	*	* 1.64	* 1.64

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

				Left OB	Channel	Right OB
* E.G. Elev (ft)	* 259.57	* Element		*	*	*
* Vel Head (ft)	* 4.15	* Wt. n-Val.		*	* 0.045	* 0.045
* W.S. Elev (ft)	* 255.41	* Reach Len. (ft)	* 59.80	*	* 61.46	* 61.27
* Crit W.S. (ft)	* 256.40	* Flow Area (sq ft)	* 0.10	*	* 149.27	* 0.07
* E.G. Slope (ft/ft)	* 0.042759	* Area (sq ft)	* 0.10	*	* 149.27	* 0.07
* Q Total (cfs)	* 2442.00	* Flow (cfs)	* 0.21	*	* 2441.67	* 0.13
* Top Width (ft)	* 31.13	* Top Width (ft)	* 0.42	*	* 30.32	* 0.39
* Vel Total (ft/s)	* 16.34	* Avg. Vel. (ft/s)	* 2.01	*	* 16.36	* 1.78

* Max Chl Dpth (ft)	* 6.53	* Hydr. Depth (ft)	* 0.24	* 4.92	* 0.18	*
* Conv. Total (cfs)	* 11809.5	* Conv. (cfs)	* 1.0	* 11807.9	* 0.6	*
* Length Wtd. (ft)	* 61.33	* Wetted Per. (ft)	* 0.64	* 34.37	* 0.53	*
* Min Ch El (ft)	* 248.88	* Shear (lb/sq ft)	* 0.43	* 11.59	* 0.35	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 151.23	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 1.92	* Cum Volume (acre-ft)	* 4.56	* 9.56	* 4.22	*
* C & E Loss (ft)	* 0.12	* Cum SA (acres)	* 1.99	* 1.67	* 2.23	*

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 260.85	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 3.36	* Wt. n-Val.	* 0.033	* 0.050	* 0.045	*
* W.S. Elev (ft)	* 257.49	* Reach Len. (ft)	* 59.80	* 61.46	* 61.27	*
* Crit W.S. (ft)	* 258.63	* Flow Area (sq ft)	* 22.34	* 212.29	* 3.21	*
* E.G. Slope (ft/ft)	* 0.022264	* Area (sq ft)	* 32.06	* 212.29	* 3.21	*
* Q Total (cfs)	* 3270.00	* Flow (cfs)	* 86.39	* 3168.93	* 14.68	*
* Top Width (ft)	* 100.67	* Top Width (ft)	* 67.72	* 30.32	* 2.63	*
* Vel Total (ft/s)	* 13.75	* Avg. Vel. (ft/s)	* 3.87	* 14.93	* 4.57	*
* Max Chl Dpth (ft)	* 8.61	* Hydr. Depth (ft)	* 0.40	* 7.00	* 1.22	*
* Conv. Total (cfs)	* 21915.1	* Conv. (cfs)	* 579.0	* 21237.8	* 98.4	*
* Length Wtd. (ft)	* 61.03	* Wetted Per. (ft)	* 57.58	* 34.37	* 3.59	*
* Min Ch El (ft)	* 248.88	* Shear (lb/sq ft)	* 0.54	* 8.59	* 1.24	*
* Alpha	* 1.14	* Stream Power (lb/ft s)	* 151.23	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 1.33	* Cum Volume (acre-ft)	* 6.00	* 11.01	* 5.64	*
* C & E Loss (ft)	* 0.05	* Cum SA (acres)	* 2.25	* 1.69	* 2.57	*

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

* E.G. Elev (ft)	* 256.80	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 1.07	* Wt. n-Val.	* 0.045	* 0.050	* 0.045	*
* W.S. Elev (ft)	* 255.73	* Reach Len. (ft)	* 59.80	* 61.46	* 61.27	*
* Crit W.S. (ft)	* 254.31	* Flow Area (sq ft)	* 0.28	* 159.01	* 0.25	*
* E.G. Slope (ft/ft)	* 0.010079	* Area (sq ft)	* 0.28	* 159.01	* 0.25	*
* Q Total (cfs)	* 1318.00	* Flow (cfs)	* 0.39	* 1317.28	* 0.33	*
* Top Width (ft)	* 31.76	* Top Width (ft)	* 0.71	* 30.32	* 0.74	*
* Vel Total (ft/s)	* 8.26	* Avg. Vel. (ft/s)	* 1.37	* 8.28	* 1.32	*
* Max Chl Dpth (ft)	* 6.85	* Hydr. Depth (ft)	* 0.40	* 5.24	* 0.34	*
* Conv. Total (cfs)	* 13128.0	* Conv. (cfs)	* 3.9	* 13120.9	* 3.3	*
* Length Wtd. (ft)	* 61.46	* Wetted Per. (ft)	* 1.07	* 34.37	* 1.00	*
* Min Ch El (ft)	* 248.88	* Shear (lb/sq ft)	* 0.17	* 2.91	* 0.16	*
* Alpha	* 1.01	* Stream Power (lb/ft s)	* 151.23	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.40	* Cum Volume (acre-ft)	* 2.36	* 7.09	* 1.90	*
* C & E Loss (ft)	* 0.12	* Cum SA (acres)	* 1.39	* 1.64	* 1.69	*

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

* E.G. Elev (ft)	* 257.90	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 1.69	* Wt. n-Val.	* 0.045	* 0.050	* 0.045	*
* W.S. Elev (ft)	* 256.21	* Reach Len. (ft)	* 59.80	* 61.46	* 61.27	*

```

* Crit W.S. (ft)          * 255.30 * Flow Area (sq ft)      * 0.72 * 173.49 * 0.73 *
* E.G. Slope (ft/ft)     * 0.014261 * Area (sq ft)         * 0.72 * 173.49 * 0.73 *
* Q Total (cfs)          * 1815.00 * Flow (cfs)           * 1.61 * 1811.77 * 1.62 *
* Top Width (ft)         * 32.70 * Top Width (ft)       * 1.13 * 30.32 * 1.25 *
* Vel Total (ft/s)       * 10.37 * Avg. Vel. (ft/s)     * 2.22 * 10.44 * 2.23 *
* Max Chl Dpth (ft)     * 7.33 * Hydr. Depth (ft)     * 0.64 * 5.72 * 0.58 *
* Conv. Total (cfs)      * 15198.7 * Conv. (cfs)          * 13.5 * 15171.6 * 13.6 *
* Length Wtd. (ft)      * 61.45 * Wetted Per. (ft)     * 1.71 * 34.37 * 1.71 *
* Min Ch El (ft)        * 248.88 * Shear (lb/sq ft)     * 0.38 * 4.49 * 0.38 *
* Alpha                  * 1.01 * Stream Power (lb/ft s) * 151.23 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.60 * Cum Volume (acre-ft) * 3.33 * 8.24 * 2.96 *
* C & E Loss (ft)       * 0.18 * Cum SA (acres)       * 1.75 * 1.66 * 1.88 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main RS: 33

INPUT

Description:

Station Elevation Data num= 31

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	267.97	11.3	262.18	12.79	256.32	14.18	255.91	17.8	255.8
17.92	255.46	24.87	255.71	35.98	256.23	47.24	256.09	51.14	255.99
52.99	255.73	54.13	255.85	54.77	256.14	56.99	256.29	59.17	257.32
63.7	257.22	68.17	255.85	74.07	255.58	75.41	254.94	79.49	252.81
81.03	250.1	81.57	248.66	82.17	247.45	88.62	246.6	89.54	246.48
93.53	247.41	98.75	247.71	100.67	248.38	102.43	249.97	108.59	254.98
126.55	265.81								

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	14.18	.02	63.7	.045	79.49	.05	102.43	.045
108.59	.1								

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
79.49 108.59 21.85 21.89 21.7 .3 .5

Ineffective Flow num= 1
Sta L Sta R Elev Permanent
65 79 265 F

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft)          * 251.75 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.58 * Wt. n-Val.           *          * 0.050 *          *
* W.S. Elev (ft)         * 251.17 * Reach Len. (ft)     * 21.85 * 21.89 * 21.70 *
* Crit W.S. (ft)         * 250.02 * Flow Area (sq ft)   *          * 80.15 *          *
* E.G. Slope (ft/ft)     * 0.009909 * Area (sq ft)        *          * 80.15 *          *
* Q Total (cfs)          * 491.00 * Flow (cfs)          *          * 491.00 *          *
* Top Width (ft)         * 23.48 * Top Width (ft)       *          * 23.48 *          *
* Vel Total (ft/s)       * 6.13 * Avg. Vel. (ft/s)    *          * 6.13 *          *
* Max Chl Dpth (ft)     * 4.69 * Hydr. Depth (ft)    *          * 3.41 *          *
* Conv. Total (cfs)      * 4932.5 * Conv. (cfs)         *          * 4932.5 *          *
* Length Wtd. (ft)      * 21.89 * Wetted Per. (ft)    *          * 27.17 *          *
* Min Ch El (ft)        * 246.48 * Shear (lb/sq ft)    *          * 1.82 *          *
* Alpha                  * 1.00 * Stream Power (lb/ft s) * 126.55 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.22 * Cum Volume (acre-ft) * 0.42 * 3.27 * 0.05 *
* C & E Loss (ft)       * 0.01 * Cum SA (acres)      * 0.55 * 1.23 * 0.15 *
*****

```

Note: Manning's n values were composited to a single value in the main channel.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)          * 255.08 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.96 * Wt. n-Val.           *          * 0.045 *          *

```

* W.S. Elev (ft)	* 254.12	* Reach Len. (ft)	* 21.85	* 21.89	* 21.70	*
* Crit W.S. (ft)	* 252.24	* Flow Area (sq ft)	* 0.58	* 156.96	*	*
* E.G. Slope (ft/ft)	* 0.008692	* Area (sq ft)	* 1.65	* 156.96	*	*
* Q Total (cfs)	* 1237.00	* Flow (cfs)	* 1.85	* 1235.15	*	*
* Top Width (ft)	* 30.56	* Top Width (ft)	* 2.52	* 28.05	*	*
* Vel Total (ft/s)	* 7.85	* Avg. Vel. (ft/s)	* 3.18	* 7.87	*	*
* Max Chl Dpth (ft)	* 7.64	* Hydr. Depth (ft)	* 1.19	* 5.60	*	*
* Conv. Total (cfs)	* 13268.1	* Conv. (cfs)	* 19.8	* 13248.3	*	*
* Length Wtd. (ft)	* 21.89	* Wetted Per. (ft)	* 0.55	* 33.75	*	*
* Min Ch El (ft)	* 246.48	* Shear (lb/sq ft)	* 0.57	* 2.52	*	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 126.55	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.18	* Cum Volume (acre-ft)	* 2.15	* 6.52	* 1.66	*
* C & E Loss (ft)	* 0.06	* Cum SA (acres)	* 1.28	* 1.60	* 1.64	*

Note: Manning's n values were composited to a single value in the main channel.
 Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 258.27	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 0.98	* Wt. n-Val.	* 0.021	* 0.049	* 0.100	*
* W.S. Elev (ft)	* 257.29	* Reach Len. (ft)	* 21.85	* 21.89	* 21.70	*
* Crit W.S. (ft)	* 254.77	* Flow Area (sq ft)	* 62.70	* 248.78	* 4.44	*
* E.G. Slope (ft/ft)	* 0.005405	* Area (sq ft)	* 89.59	* 248.78	* 4.44	*
* Q Total (cfs)	* 2442.00	* Flow (cfs)	* 386.53	* 2050.65	* 4.82	*
* Top Width (ft)	* 98.66	* Top Width (ft)	* 65.72	* 29.10	* 3.84	*
* Vel Total (ft/s)	* 7.73	* Avg. Vel. (ft/s)	* 6.17	* 8.24	* 1.09	*
* Max Chl Dpth (ft)	* 10.81	* Hydr. Depth (ft)	* 1.21	* 8.55	* 1.16	*
* Conv. Total (cfs)	* 33215.8	* Conv. (cfs)	* 5257.6	* 27892.7	* 65.6	*
* Length Wtd. (ft)	* 21.88	* Wetted Per. (ft)	* 53.24	* 35.11	* 4.48	*
* Min Ch El (ft)	* 246.48	* Shear (lb/sq ft)	* 0.40	* 2.39	* 0.33	*
* Alpha	* 1.06	* Stream Power (lb/ft s)	* 126.55	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.09	* Cum Volume (acre-ft)	* 4.50	* 9.28	* 4.22	*
* C & E Loss (ft)	* 0.22	* Cum SA (acres)	* 1.94	* 1.63	* 2.23	*

Warning: Divided flow computed for this cross-section.
 Note: Manning's n values were composited to a single value in the main channel.
 Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 259.52	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 0.94	* Wt. n-Val.	* 0.021	* 0.049	* 0.100	*
* W.S. Elev (ft)	* 258.58	* Reach Len. (ft)	* 21.85	* 21.89	* 21.70	*
* Crit W.S. (ft)	* 257.37	* Flow Area (sq ft)	* 131.06	* 286.24	* 10.76	*
* E.G. Slope (ft/ft)	* 0.003904	* Area (sq ft)	* 175.98	* 286.24	* 10.76	*
* Q Total (cfs)	* 3270.00	* Flow (cfs)	* 1054.76	* 2201.91	* 13.33	*
* Top Width (ft)	* 102.35	* Top Width (ft)	* 67.28	* 29.10	* 5.97	*
* Vel Total (ft/s)	* 7.64	* Avg. Vel. (ft/s)	* 8.05	* 7.69	* 1.24	*
* Max Chl Dpth (ft)	* 12.10	* Hydr. Depth (ft)	* 2.46	* 9.84	* 1.80	*
* Conv. Total (cfs)	* 52333.3	* Conv. (cfs)	* 16880.5	* 35239.5	* 213.3	*
* Length Wtd. (ft)	* 21.87	* Wetted Per. (ft)	* 55.80	* 35.11	* 6.97	*
* Min Ch El (ft)	* 246.48	* Shear (lb/sq ft)	* 0.57	* 1.99	* 0.38	*
* Alpha	* 1.04	* Stream Power (lb/ft s)	* 126.55	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.06	* Cum Volume (acre-ft)	* 5.86	* 10.66	* 5.63	*
* C & E Loss (ft)	* 0.19	* Cum SA (acres)	* 2.16	* 1.64	* 2.56	*

Note: Manning's n values were composited to a single value in the main channel.
 Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

* E.G. Elev (ft)	* 256.28	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 0.67	* Wt. n-Val.	* 0.044	* 0.049	* 0.100	*
* W.S. Elev (ft)	* 255.61	* Reach Len. (ft)	* 21.85	* 21.89	* 21.70	*
* Crit W.S. (ft)	* 252.45	* Flow Area (sq ft)	* 1.62	* 199.73	* 0.33	*
* E.G. Slope (ft/ft)	* 0.004603	* Area (sq ft)	* 7.86	* 199.73	* 0.33	*
* Q Total (cfs)	* 1318.00	* Flow (cfs)	* 5.48	* 1312.38	* 0.14	*
* Top Width (ft)	* 40.38	* Top Width (ft)	* 10.23	* 29.10	* 1.04	*
* Vel Total (ft/s)	* 6.54	* Avg. Vel. (ft/s)	* 3.38	* 6.57	* 0.42	*

```

* Max Chl Dpth (ft)      * 9.13 * Hydr. Depth (ft)      * 0.35 * 6.86 * 0.31 *
* Conv. Total (cfs)     * 19427.1 * Conv. (cfs)          * 80.8 * 19344.3 * 2.0 *
* Length Wtd. (ft)     * 21.89 * Wetted Per. (ft)    * 4.85 * 35.11 * 1.22 *
* Min Ch El (ft)       * 246.48 * Shear (lb/sq ft)    * 0.10 * 1.63 * 0.08 *
* Alpha                 * 1.01 * Stream Power (lb/ft s) * 126.55 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 0.09 * Cum Volume (acre-ft) * 2.36 * 6.84 * 1.90 *
* C & E Loss (ft)      * 0.08 * Cum SA (acres)      * 1.39 * 1.60 * 1.69 *
*****

```

Warning: Divided flow computed for this cross-section.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft)       * 257.13 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)       * 1.10 * Wt. n-Val.           * 0.029 * 0.049 * 0.100 *
* W.S. Elev (ft)      * 256.03 * Reach Len. (ft)     * 21.85 * 21.89 * 21.70 *
* Crit W.S. (ft)      * 253.56 * Flow Area (sq ft)   * 6.97 * 211.88 * 0.91 *
* E.G. Slope (ft/ft)  * 0.007053 * Area (sq ft)        * 17.15 * 211.88 * 0.91 *
* Q Total (cfs)       * 1815.00 * Flow (cfs)          * 21.79 * 1792.55 * 0.66 *
* Top Width (ft)     * 65.35 * Top Width (ft)      * 34.51 * 29.10 * 1.73 *
* Vel Total (ft/s)   * 8.26 * Avg. Vel. (ft/s)    * 3.13 * 8.46 * 0.73 *
* Max Chl Dpth (ft)  * 9.55 * Hydr. Depth (ft)    * 0.30 * 7.28 * 0.52 *
* Conv. Total (cfs)   * 21611.3 * Conv. (cfs)         * 259.4 * 21343.9 * 7.9 *
* Length Wtd. (ft)   * 21.89 * Wetted Per. (ft)    * 23.51 * 35.11 * 2.03 *
* Min Ch El (ft)     * 246.48 * Shear (lb/sq ft)    * 0.13 * 2.66 * 0.20 *
* Alpha              * 1.04 * Stream Power (lb/ft s) * 126.55 * 0.00 * 0.00 *
* Frctn Loss (ft)    * 0.12 * Cum Volume (acre-ft) * 3.32 * 7.97 * 2.96 *
* C & E Loss (ft)    * 0.22 * Cum SA (acres)      * 1.73 * 1.62 * 1.88 *
*****

```

Warning: Divided flow computed for this cross-section.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main RS: 32

INPUT

Description:

```

Station Elevation Data num= 26
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
*****
0 266.84 9.53 261.29 11.26 255.77 14.67 255.03 17.66 254.94
17.8 254.66 26.41 255.03 37.4 255.52 48.5 255.51 52.57 255.4
54.31 255.14 55.62 255.34 56.23 255.61 65.26 255.59 74.5 255.3
79.26 253.29 81.14 250.5 82.86 247.64 85.73 246.65 88.71 246.53
92.02 246.39 101.96 248.55 106 251.15 112.23 255.1 119.71 256.72
133.84 264.12

```

```

Manning's n Values num= 5
Sta n Val Sta n Val Sta n Val Sta n Val Sta n Val
*****
0 .045 14.67 .02 56.23 .045 79.26 .05 112.23 .1

```

```

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
79.26 112.23 24.44 27.61 26.31 .3 .5

```

```

Ineffective Flow num= 1
Sta L Sta R Elev Permanent
67.8 74.5 265 F

```

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft)       * 251.52 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)       * 0.57 * Wt. n-Val.           * 0.050 * 0.050 * 0.050 *
* W.S. Elev (ft)      * 250.96 * Reach Len. (ft)     * 2.00 * 2.00 * 2.00 *
* Crit W.S. (ft)      * 249.85 * Flow Area (sq ft)   * 81.31 * 81.31 * 81.31 *
* E.G. Slope (ft/ft)  * 0.009888 * Area (sq ft)        * 81.31 * 81.31 * 81.31 *
* Q Total (cfs)       * 491.00 * Flow (cfs)          * 491.00 * 491.00 * 491.00 *
* Top Width (ft)     * 24.87 * Top Width (ft)      * 24.87 * 24.87 * 24.87 *
* Vel Total (ft/s)   * 6.04 * Avg. Vel. (ft/s)    * 6.04 * 6.04 * 6.04 *
* Max Chl Dpth (ft)  * 4.57 * Hydr. Depth (ft)    * 3.27 * 3.27 * 3.27 *
* Conv. Total (cfs)   * 4937.8 * Conv. (cfs)         * 4937.8 * 4937.8 * 4937.8 *

```

```

* Length Wtd. (ft)      * 2.00 * Wetted Per. (ft)      *      * 27.84 *      *
* Min Ch El (ft)       * 246.39 * Shear (lb/sq ft)     *      * 1.80 *      *
* Alpha                * 1.00 * Stream Power (lb/ft s) * 133.84 * 0.00 * 0.00 *
* Frctn Loss (ft)     * 0.02 * Cum Volume (acre-ft) * 0.42 * 3.23 * 0.05 *
* C & E Loss (ft)     * 0.00 * Cum SA (acres)       * 0.55 * 1.22 * 0.15 *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)       * 254.84 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)       * 0.85 * Wt. n-Val.          * 0.045 * 0.050 *      *
* W.S. Elev (ft)      * 254.00 * Reach Len. (ft)     * 2.00 * 2.00 * 2.00 *
* Crit W.S. (ft)      * 252.02 * Flow Area (sq ft)   * 0.59 * 167.07 *      *
* E.G. Slope (ft/ft)  * 0.008103 * Area (sq ft)       * 0.59 * 167.07 *      *
* Q Total (cfs)       * 1237.00 * Flow (cfs)         * 0.83 * 1236.17 *      *
* Top Width (ft)     * 32.90 * Top Width (ft)     * 1.67 * 31.23 *      *
* Vel Total (ft/s)    * 7.38 * Avg. Vel. (ft/s)   * 1.40 * 7.40 *      *
* Max Chl Dpth (ft)  * 7.61 * Hydr. Depth (ft)   * 0.35 * 5.35 *      *
* Conv. Total (cfs)   * 13741.9 * Conv. (cfs)        * 9.2 * 13732.7 *      *
* Length Wtd. (ft)   * 2.00 * Wetted Per. (ft)   * 1.81 * 36.32 *      *
* Min Ch El (ft)     * 246.39 * Shear (lb/sq ft)   * 0.16 * 2.33 *      *
* Alpha              * 1.01 * Stream Power (lb/ft s) * 133.84 * 0.00 * 0.00 *
* Frctn Loss (ft)    * 0.02 * Cum Volume (acre-ft) * 2.15 * 6.44 * 1.66 *
* C & E Loss (ft)    * 0.01 * Cum SA (acres)     * 1.28 * 1.59 * 1.64 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)       * 257.97 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)       * 0.54 * Wt. n-Val.          * 0.024 * 0.050 * 0.100 *
* W.S. Elev (ft)      * 257.43 * Reach Len. (ft)     * 2.00 * 2.00 * 2.00 *
* Crit W.S. (ft)      * 254.50 * Flow Area (sq ft)   * 134.33 * 279.37 * 11.85 *
* E.G. Slope (ft/ft)  * 0.002946 * Area (sq ft)       * 147.90 * 279.37 * 11.85 *
* Q Total (cfs)       * 2442.00 * Flow (cfs)         * 738.27 * 1692.40 * 11.33 *
* Top Width (ft)     * 110.33 * Top Width (ft)     * 68.52 * 32.97 * 8.84 *
* Vel Total (ft/s)    * 5.74 * Avg. Vel. (ft/s)   * 5.50 * 6.06 * 0.96 *
* Max Chl Dpth (ft)  * 11.04 * Hydr. Depth (ft)   * 2.17 * 8.47 * 1.34 *
* Conv. Total (cfs)   * 44990.7 * Conv. (cfs)        * 13601.7 * 31180.3 * 208.8 *
* Length Wtd. (ft)   * 2.00 * Wetted Per. (ft)   * 63.81 * 38.39 * 9.18 *
* Min Ch El (ft)     * 246.39 * Shear (lb/sq ft)   * 0.39 * 1.34 * 0.24 *
* Alpha              * 1.05 * Stream Power (lb/ft s) * 133.84 * 0.00 * 0.00 *
* Frctn Loss (ft)    *      * Cum Volume (acre-ft) * 4.44 * 9.14 * 4.22 *
* C & E Loss (ft)    *      * Cum SA (acres)     * 1.91 * 1.62 * 2.23 *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)       * 259.28 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)       * 0.57 * Wt. n-Val.          * 0.024 * 0.050 * 0.100 *
* W.S. Elev (ft)      * 258.70 * Reach Len. (ft)     * 2.00 * 2.00 * 2.00 *
* Crit W.S. (ft)      * 256.60 * Flow Area (sq ft)   * 213.33 * 321.37 * 24.66 *
* E.G. Slope (ft/ft)  * 0.002235 * Area (sq ft)       * 235.43 * 321.37 * 24.66 *
* Q Total (cfs)       * 3270.00 * Flow (cfs)         * 1380.49 * 1861.41 * 28.10 *
* Top Width (ft)     * 113.16 * Top Width (ft)     * 68.92 * 32.97 * 11.27 *
* Vel Total (ft/s)    * 5.85 * Avg. Vel. (ft/s)   * 6.47 * 5.79 * 1.14 *
* Max Chl Dpth (ft)  * 12.31 * Hydr. Depth (ft)   * 3.43 * 9.75 * 2.19 *
* Conv. Total (cfs)   * 69175.5 * Conv. (cfs)        * 29203.6 * 39377.4 * 594.5 *
* Length Wtd. (ft)   * 2.00 * Wetted Per. (ft)   * 65.15 * 38.39 * 11.93 *
* Min Ch El (ft)     * 246.39 * Shear (lb/sq ft)   * 0.46 * 1.17 * 0.29 *
* Alpha              * 1.08 * Stream Power (lb/ft s) * 133.84 * 0.00 * 0.00 *
* Frctn Loss (ft)    *      * Cum Volume (acre-ft) * 5.75 * 10.51 * 5.62 *
* C & E Loss (ft)    *      * Cum SA (acres)     * 2.12 * 1.63 * 2.56 *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #6HR OBS

```

*****
* E.G. Elev (ft)      * 256.11 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.51  * Wt. n-Val.      * 0.026  * 0.050  * 0.100  *
* W.S. Elev (ft)     * 255.60 * Reach Len. (ft) * 2.00   * 2.00   * 2.00   *
* Crit W.S. (ft)     * 252.22 * Flow Area (sq ft) * 21.57  * 218.89 * 0.57   *
* E.G. Slope (ft/ft) * 0.003772 * Area (sq ft)    * 22.84  * 218.89 * 0.57   *
* Q Total (cfs)      * 1318.00 * Flow (cfs)      * 42.53  * 1275.27 * 0.20   *
* Top Width (ft)     * 96.08  * Top Width (ft)  * 60.82  * 32.97  * 2.29   *
* Vel Total (ft/s)   * 5.47   * Avg. Vel. (ft/s) * 1.97   * 5.83   * 0.35   *
* Max Chl Dpth (ft) * 9.21   * Hydr. Depth (ft) * 0.40   * 6.64   * 0.25   *
* Conv. Total (cfs)  * 21459.1 * Conv. (cfs)     * 692.4  * 20763.5 * 3.3    *
* Length Wtd. (ft)  * 2.00   * Wetted Per. (ft) * 54.87  * 38.39  * 2.34   *
* Min Ch El (ft)    * 246.39 * Shear (lb/sq ft) * 0.09   * 1.34   * 0.06   *
* Alpha             * 1.10   * Stream Power (lb/ft s) * 133.84 * 0.00   * 0.00   *
* Frctn Loss (ft)   *         * Cum Volume (acre-ft) * 2.35   * 6.73   * 1.90   *
* C & E Loss (ft)   *         * Cum SA (acres)   * 1.37   * 1.58   * 1.69   *
*****

```

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft)      * 256.78 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.67  * Wt. n-Val.      * 0.024  * 0.050  * 0.100  *
* W.S. Elev (ft)     * 256.12 * Reach Len. (ft) * 2.00   * 2.00   * 2.00   *
* Crit W.S. (ft)     * 253.28 * Flow Area (sq ft) * 53.46  * 236.10 * 2.39   *
* E.G. Slope (ft/ft) * 0.004681 * Area (sq ft)    * 58.23  * 236.10 * 2.39   *
* Q Total (cfs)      * 1815.00 * Flow (cfs)      * 201.96 * 1611.52 * 1.53   *
* Top Width (ft)     * 105.78 * Top Width (ft)  * 68.11  * 32.97  * 4.70   *
* Vel Total (ft/s)   * 6.22   * Avg. Vel. (ft/s) * 3.78   * 6.83   * 0.64   *
* Max Chl Dpth (ft) * 9.73   * Hydr. Depth (ft) * 0.87   * 7.16   * 0.51   *
* Conv. Total (cfs)  * 26528.2 * Conv. (cfs)     * 2951.9 * 23554.0 * 22.3   *
* Length Wtd. (ft)  * 2.00   * Wetted Per. (ft) * 62.44  * 38.39  * 4.81   *
* Min Ch El (ft)    * 246.39 * Shear (lb/sq ft) * 0.25   * 1.80   * 0.15   *
* Alpha             * 1.11   * Stream Power (lb/ft s) * 133.84 * 0.00   * 0.00   *
* Frctn Loss (ft)   *         * Cum Volume (acre-ft) * 3.30   * 7.86   * 2.95   *
* C & E Loss (ft)   *         * Cum SA (acres)   * 1.70   * 1.60   * 1.87   *
*****

```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

BRIDGE

RIVER: hudson

REACH: main RS: 31.5

INPUT

Description:

Distance from Upstream XS = 2

Deck/Roadway Width = 18

Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num= 4

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
65	265	255	109	265	255	109.1	265	250						
110	265	250												

Upstream Bridge Cross Section Data

Station Elevation Data num= 26

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	266.84	9.53	261.29	11.26	255.77	14.67	255.03	17.66	254.94
17.8	254.66	26.41	255.03	37.4	255.52	48.5	255.51	52.57	255.4
54.31	255.14	55.62	255.34	56.23	255.61	65.26	255.59	74.5	255.3
79.26	253.29	81.14	250.5	82.86	247.64	85.73	246.65	88.71	246.53
92.02	246.39	101.96	248.55	106	251.15	112.23	255.1	119.71	256.72

133.84 264.12

Manning's n Values num= 5
 Sta n Val Sta n Val Sta n Val Sta n Val Sta n Val

 0 .045 14.67 .02 56.23 .045 79.26 .05 112.23 .1

Bank Sta: Left Right Coeff Contr. Expan.
 79.26 112.23 .3 .5
 Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 67.8 74.5 265 F

Downstream Deck/Roadway Coordinates
 num= 4
 Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord

 68 265 255 112 265 255 112.1 265 250
 113 265 250

Downstream Bridge Cross Section Data
 Station Elevation Data num= 28
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev

 0 265.97 10.7 260.17 11.79 255.21 15.21 254.22 19.1 254.07
 19.19 253.84 28.59 254.27 39.3 254.7 50.59 254.7 54.49 254.58
 56.09 254.29 57.57 254.47 58.16 254.71 82.38 255.45 86.44 255.21
 87.14 251.02 87.29 249.71 87.53 246.88 95.77 246.81 99.73 246.85
 103.43 246.88 104.83 247.39 107.58 249.58 108.86 250.5 112.96 253.59
 114.18 255.6 121.03 255.92 134 261.71

Manning's n Values num= 5
 Sta n Val Sta n Val Sta n Val Sta n Val Sta n Val

 0 .045 15.21 .02 58.16 .045 86.44 .035 112.96 .1

Bank Sta: Left Right Coeff Contr. Expan.
 86.44 112.96 .1 .3
 Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 65.65 86.44 265 F

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
 Downstream Embankment side slope = 0 horiz. to 1.0 vertical
 Maximum allowable submergence for weir flow = .98
 Elevation at which weir flow begins =
 Energy head used in spillway design =
 Spillway height used in design =
 Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
 Energy
 Selected Low Flow Methods = Highest Energy Answer

High Flow Method
 Pressure and Weir flow
 Submerged Inlet Cd =
 Submerged Inlet + Outlet Cd = .8
 Max Low Cord =

Additional Bridge Parameters
 Add Friction component to Momentum
 Do not add Weight component to Momentum
 Class B flow critical depth computations use critical depth
 inside the bridge at the upstream end
 Criteria to check for pressure flow = Upstream energy grade line

BRIDGE OUTPUT Profile #2-YR

 * E.G. US. (ft) * 251.52 * Element *Inside BR US *Inside BR DS *
 * W.S. US. (ft) * 250.96 * E.G. Elev (ft) * 251.50 * 251.29 *
 * Q Total (cfs) * 491.00 * W.S. Elev (ft) * 250.93 * 250.53 *
 * Q Bridge (cfs) * 491.00 * Crit W.S. (ft) * 249.85 * 249.74 *
 * Q Weir (cfs) * * Max Chl Dpth (ft) * 4.54 * 3.72 *
 * Weir Sta Lft (ft) * * Vel Total (ft/s) * 6.10 * 6.99 *
 * Weir Sta Rgt (ft) * * Flow Area (sq ft) * 80.53 * 70.20 *
 * Weir Submerg * * Froude # Chl * 0.60 * 0.69 *

* Weir Max Depth (ft)	*		* Specif Force (cu ft)	*	242.91	*	229.98	*
* Min El Weir Flow (ft)	*	253.70	* Hydr Depth (ft)	*	3.25	*	3.23	*
* Min El Prs (ft)	*	255.00	* W.P. Total (ft)	*	27.74	*	26.20	*
* Delta EG (ft)	*	0.47	* Conv. Total (cfs)	*	4870.3	*	5749.5	*
* Delta WS (ft)	*	1.21	* Top Width (ft)	*	24.80	*	21.71	*
* BR Open Area (sq ft)	*	179.01	* Frctn Loss (ft)	*	0.15	*	0.08	*
* BR Open Vel (ft/s)	*	6.99	* C & E Loss (ft)	*	0.05	*	0.16	*
* Coef of Q	*		* Shear Total (lb/sq ft)	*	1.84	*	1.22	*
* Br Sel Method		*Energy only	* Power Total (lb/ft s)	*	0.00	*	0.00	*

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

BRIDGE OUTPUT Profile #10-YR

* E.G. US. (ft)	*	254.84	* Element		*Inside BR US	*Inside BR DS	*	
* W.S. US. (ft)	*	254.00	* E.G. Elev (ft)	*	254.83	*	254.55	*
* Q Total (cfs)	*	1237.00	* W.S. Elev (ft)	*	253.96	*	253.22	*
* Q Bridge (cfs)	*	1236.97	* Crit W.S. (ft)	*	252.01	*	252.03	*
* Q Weir (cfs)	*		* Max Chl Dpth (ft)	*	7.57	*	6.41	*
* Weir Sta Lft (ft)	*		* Vel Total (ft/s)	*	7.45	*	9.24	*
* Weir Sta Rgt (ft)	*		* Flow Area (sq ft)	*	165.93	*	133.88	*
* Weir Submerg	*		* Froude # Chl	*	0.48	*	0.64	*
* Weir Max Depth (ft)	*		* Specif Force (cu ft)	*	805.80	*	750.50	*
* Min El Weir Flow (ft)	*	253.70	* Hydr Depth (ft)	*	5.22	*	5.30	*
* Min El Prs (ft)	*	255.00	* W.P. Total (ft)	*	37.99	*	33.18	*
* Delta EG (ft)	*	0.63	* Conv. Total (cfs)	*	13523.4	*	14404.6	*
* Delta WS (ft)	*	1.97	* Top Width (ft)	*	31.78	*	25.26	*
* BR Open Area (sq ft)	*	179.01	* Frctn Loss (ft)	*	0.14	*	0.08	*
* BR Open Vel (ft/s)	*	9.24	* C & E Loss (ft)	*	0.14	*	0.26	*
* Coef of Q	*		* Shear Total (lb/sq ft)	*	2.28	*	1.86	*
* Br Sel Method		*Energy only	* Power Total (lb/ft s)	*	0.00	*	0.00	*

Warning: The pure energy/weir calculations did not converge within the given number of iterations.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

BRIDGE OUTPUT Profile #50-YR

* E.G. US. (ft)	*	257.97	* Element		*Inside BR US	*Inside BR DS	*	
* W.S. US. (ft)	*	257.43	* E.G. Elev (ft)	*	257.97	*	257.24	*
* Q Total (cfs)	*	2442.00	* W.S. Elev (ft)	*	257.43	*	256.25	*
* Q Bridge (cfs)	*	1733.21	* Crit W.S. (ft)	*	254.47	*	255.46	*
* Q Weir (cfs)	*	708.79	* Max Chl Dpth (ft)	*	11.04	*	9.44	*
* Weir Sta Lft (ft)	*	10.57	* Vel Total (ft/s)	*	6.64	*	6.26	*
* Weir Sta Rgt (ft)	*	122.09	* Flow Area (sq ft)	*	367.92	*	390.37	*
* Weir Submerg	*	0.15	* Froude # Chl	*	0.45	*	0.51	*
* Weir Max Depth (ft)	*	4.28	* Specif Force (cu ft)	*	1954.48	*	1663.14	*
* Min El Weir Flow (ft)	*	253.70	* Hydr Depth (ft)	*	5.63	*	6.21	*
* Min El Prs (ft)	*	255.00	* W.P. Total (ft)	*	147.97	*	130.17	*
* Delta EG (ft)	*	0.80	* Conv. Total (cfs)	*		*		*
* Delta WS (ft)	*	1.73	* Top Width (ft)	*	65.33	*	65.21	*
* BR Open Area (sq ft)	*	179.01	* Frctn Loss (ft)	*		*		*
* BR Open Vel (ft/s)	*	9.68	* C & E Loss (ft)	*		*		*
* Coef of Q	*		* Shear Total (lb/sq ft)	*		*		*
* Br Sel Method		* Press/Weir	* Power Total (lb/ft s)	*	0.00	*	0.00	*

Note: The downstream water surface is above the minimum elevation required for orifice flow. The orifice flow equation was used for pressure flow.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: For the cross section inside the bridge at the upstream end, the water surface and energy have been projected from the upstream cross section. The selected bridge modeling method does not compute answers inside the bridge.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: For the cross section inside the bridge at the downstream end, the water surface and energy are based on critical depth over the weir.

BRIDGE OUTPUT Profile #100-YR

```

*****
* E.G. US. (ft) * 259.28 * Element *Inside BR US *Inside BR DS *
* W.S. US. (ft) * 258.70 * E.G. Elev (ft) * 259.28 * 258.45 *
* Q Total (cfs) * 3270.00 * W.S. Elev (ft) * 258.70 * 257.13 *
* Q Bridge (cfs) * 1959.08 * Crit W.S. (ft) * 256.28 * 255.99 *
* Q Weir (cfs) * 1310.93 * Max Chl Dpth (ft) * 12.31 * 10.32 *
* Weir Sta Lft (ft) * 10.16 * Vel Total (ft/s) * 7.16 * 6.81 *
* Weir Sta Rgt (ft) * 124.59 * Flow Area (sq ft) * 456.85 * 480.23 *
* Weir Submerg * 0.26 * Froude # Chl * 0.51 * 0.59 *
* Weir Max Depth (ft) * 5.59 * Specif Force (cu ft) * 2783.33 * 2317.47 *
* Min El Weir Flow (ft) * 253.70 * Hydr Depth (ft) * 6.70 * 7.39 *
* Min El Prs (ft) * 255.00 * W.P. Total (ft) * 154.60 * 134.09 *
* Delta EG (ft) * 1.18 * Conv. Total (cfs) * * *
* Delta WS (ft) * 2.34 * Top Width (ft) * 68.16 * 67.37 *
* BR Open Area (sq ft) * 179.01 * Frctn Loss (ft) * * *
* BR Open Vel (ft/s) * 10.94 * C & E Loss (ft) * * *
* Coef of Q * * Shear Total (lb/sq ft) * * *
* Br Sel Method * Press/Weir * Power Total (lb/ft s) * 0.00 * 0.00 *
*****

```

Note: The downstream water surface is above the minimum elevation required for orifice flow. The orifice flow equation was used for pressure flow.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: For the cross section inside the bridge at the upstream end, the water surface and energy have been projected from the upstream cross section. The selected bridge modeling method does not compute answers inside the bridge.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: For the cross section inside the bridge at the downstream end, the water surface and energy are based on critical depth over the weir.

BRIDGE OUTPUT Profile #6HR OBS

```

*****
* E.G. US. (ft) * 256.11 * Element *Inside BR US *Inside BR DS *
* W.S. US. (ft) * 255.60 * E.G. Elev (ft) * 256.11 * 255.30 *
* Q Total (cfs) * 1318.00 * W.S. Elev (ft) * 255.60 * 255.03 *
* Q Bridge (cfs) * 1197.68 * Crit W.S. (ft) * 252.21 * 252.24 *
* Q Weir (cfs) * 120.32 * Max Chl Dpth (ft) * 9.21 * 8.22 *
* Weir Sta Lft (ft) * 11.15 * Vel Total (ft/s) * 5.30 * 4.88 *
* Weir Sta Rgt (ft) * 116.88 * Flow Area (sq ft) * 248.60 * 269.90 *
* Weir Submerg * 0.00 * Froude # Chl * 0.36 * 0.40 *
* Weir Max Depth (ft) * 2.42 * Specif Force (cu ft) * 1085.89 * 955.26 *
* Min El Weir Flow (ft) * 253.70 * Hydr Depth (ft) * 4.87 * 4.99 *
* Min El Prs (ft) * 255.00 * W.P. Total (ft) * 128.51 * 118.90 *
* Delta EG (ft) * 1.61 * Conv. Total (cfs) * * *
* Delta WS (ft) * 3.36 * Top Width (ft) * 51.07 * 56.43 *
* BR Open Area (sq ft) * 179.01 * Frctn Loss (ft) * * *
* BR Open Vel (ft/s) * 6.69 * C & E Loss (ft) * * *
* Coef of Q * * Shear Total (lb/sq ft) * * *
* Br Sel Method * Press/Weir * Power Total (lb/ft s) * 0.00 * 0.00 *
*****

```

Warning: The pure energy/weir calculations did not converge within the given number of iterations.

Note: The downstream water surface is below the minimum elevation for pressure flow. The sluice gate equations were used for pressure flow.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: For the cross section inside the bridge at the upstream end, the water surface and energy have been projected from the upstream cross section. The selected bridge modeling method does not compute answers inside the bridge.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: For the cross section inside the bridge at the downstream end, the water surface and energy are based on critical depth over the weir.

BRIDGE OUTPUT Profile #24HR OBS

* E.G. US. (ft) * 256.78 * Element *Inside BR US *Inside BR DS *
* W.S. US. (ft) * 256.12 * E.G. Elev (ft) * 256.78 * 256.07 *
* Q Total (cfs) * 1815.00 * W.S. Elev (ft) * 256.12 * 255.46 *
* Q Bridge (cfs) * 1527.07 * Crit W.S. (ft) * 253.28 * 253.36 *
* Q Weir (cfs) * 287.94 * Max Chl Dpth (ft) * 9.73 * 8.65 *
* Weir Sta Lft (ft) * 10.94 * Vel Total (ft/s) * 6.24 * 5.80 *
* Weir Sta Rgt (ft) * 119.83 * Flow Area (sq ft) * 290.83 * 312.78 *
* Weir Submerg * 0.00 * Froude # Chl * 0.41 * 0.48 *
* Weir Max Depth (ft) * 3.10 * Specif Force (cu ft) * 1369.19 * 1230.19 *
* Min El Weir Flow (ft) * 253.70 * Hydr Depth (ft) * 4.79 * 5.69 *
* Min El Prs (ft) * 255.00 * W.P. Total (ft) * 139.59 * 120.73 *
* Delta EG (ft) * 0.72 * Conv. Total (cfs) * * *
* Delta WS (ft) * 2.72 * Top Width (ft) * 60.78 * 57.36 *
* BR Open Area (sq ft) * 179.01 * Frctn Loss (ft) * * *
* BR Open Vel (ft/s) * 8.53 * C & E Loss (ft) * * *
* Coef of Q * * Shear Total (lb/sq ft) * * *
* Br Sel Method * Press/Weir * Power Total (lb/ft s) * 0.00 * 0.00 *

Note: The downstream water surface is below the minimum elevation for pressure flow. The sluice gate equations were used for pressure flow.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: For the cross section inside the bridge at the upstream end, the water surface and energy have been projected from the upstream cross section. The selected bridge modeling method does not compute answers inside the bridge.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: For the cross section inside the bridge at the downstream end, the water surface and energy are based on critical depth over the weir.

CROSS SECTION

RIVER: hudson
REACH: main RS: 31

INPUT

Description:

Station Elevation Data num= 28
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev

0 265.97 10.7 260.17 11.79 255.21 15.21 254.22 19.1 254.07
19.19 253.84 28.59 254.27 39.3 254.7 50.59 254.7 54.49 254.58
56.09 254.29 57.57 254.47 58.16 254.71 82.38 255.45 86.44 255.21
87.14 251.02 87.29 249.71 87.53 246.88 95.77 246.81 99.73 246.85
103.43 246.88 104.83 247.39 107.58 249.58 108.86 250.5 112.96 253.59
114.18 255.6 121.03 255.92 134 261.71

Manning's n Values num= 5
Sta n Val Sta n Val Sta n Val Sta n Val Sta n Val

0 .045 15.21 .02 58.16 .045 86.44 .035 112.96 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
86.44 112.96 95.55 97.06 99 .1 .3
Ineffective Flow num= 1
Sta L Sta R Elev Permanent
65.65 86.44 265 F

CROSS SECTION OUTPUT Profile #2-YR

* E.G. Elev (ft) * 251.05 * Element * Left OB * Channel * Right OB *

* Vel Head (ft)	* 1.30	* Wt. n-Val.	*	* 0.035	*	*
* W.S. Elev (ft)	* 249.75	* Reach Len. (ft)	* 95.55	* 97.06	* 99.00	*
* Crit W.S. (ft)	* 249.75	* Flow Area (sq ft)	*	* 53.59	*	*
* E.G. Slope (ft/ft)	*0.016015	* Area (sq ft)	*	* 53.59	*	*
* Q Total (cfs)	* 491.00	* Flow (cfs)	*	* 491.00	*	*
* Top Width (ft)	* 20.52	* Top Width (ft)	*	* 20.52	*	*
* Vel Total (ft/s)	* 9.16	* Avg. Vel. (ft/s)	*	* 9.16	*	*
* Max Chl Dpth (ft)	* 2.94	* Hydr. Depth (ft)	*	* 2.61	*	*
* Conv. Total (cfs)	* 3879.9	* Conv. (cfs)	*	* 3879.9	*	*
* Length Wtd. (ft)	* 97.06	* Wetted Per. (ft)	*	* 24.07	*	*
* Min Ch El (ft)	* 246.81	* Shear (lb/sq ft)	*	* 2.23	*	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 134.00	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 1.16	* Cum Volume (acre-ft)	* 0.42	* 3.18	* 0.05	*
* C & E Loss (ft)	* 0.10	* Cum SA (acres)	* 0.55	* 1.21	* 0.15	*

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 254.21	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 2.18	* Wt. n-Val.	*	* 0.035	*	*
* W.S. Elev (ft)	* 252.03	* Reach Len. (ft)	* 95.55	* 97.06	* 99.00	*
* Crit W.S. (ft)	* 252.03	* Flow Area (sq ft)	*	* 104.33	*	*
* E.G. Slope (ft/ft)	*0.014936	* Area (sq ft)	*	* 104.33	*	*
* Q Total (cfs)	* 1237.00	* Flow (cfs)	*	* 1237.00	*	*
* Top Width (ft)	* 23.92	* Top Width (ft)	*	* 23.92	*	*
* Vel Total (ft/s)	* 11.86	* Avg. Vel. (ft/s)	*	* 11.86	*	*
* Max Chl Dpth (ft)	* 5.22	* Hydr. Depth (ft)	*	* 4.36	*	*
* Conv. Total (cfs)	* 10121.7	* Conv. (cfs)	*	* 10121.7	*	*
* Length Wtd. (ft)	* 97.05	* Wetted Per. (ft)	*	* 30.20	*	*
* Min Ch El (ft)	* 246.81	* Shear (lb/sq ft)	*	* 3.22	*	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 134.00	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.85	* Cum Volume (acre-ft)	* 2.15	* 6.35	* 1.66	*
* C & E Loss (ft)	* 0.39	* Cum SA (acres)	* 1.28	* 1.57	* 1.64	*

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 257.17	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 1.47	* Wt. n-Val.	* 0.021	* 0.035	* 0.100	*
* W.S. Elev (ft)	* 255.70	* Reach Len. (ft)	* 95.55	* 97.06	* 99.00	*
* Crit W.S. (ft)	* 255.70	* Flow Area (sq ft)	* 64.44	* 199.11	* 1.44	*
* E.G. Slope (ft/ft)	*0.006024	* Area (sq ft)	* 74.31	* 199.11	* 1.44	*
* Q Total (cfs)	* 2442.00	* Flow (cfs)	* 390.23	* 2050.98	* 0.79	*
* Top Width (ft)	* 104.54	* Top Width (ft)	* 74.76	* 26.52	* 3.26	*
* Vel Total (ft/s)	* 9.22	* Avg. Vel. (ft/s)	* 6.06	* 10.30	* 0.55	*
* Max Chl Dpth (ft)	* 8.89	* Hydr. Depth (ft)	* 1.19	* 7.51	* 0.44	*

* Conv. Total (cfs)	* 31463.3	* Conv. (cfs)	* 5027.8	* 26425.4	* 10.2	*
* Length Wtd. (ft)	* 96.84	* Wetted Per. (ft)	* 54.77	* 36.02	* 4.40	*
* Min Ch El (ft)	* 246.81	* Shear (lb/sq ft)	* 0.44	* 2.08	* 0.12	*
* Alpha	* 1.12	* Stream Power (lb/ft s)	* 134.00	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.65	* Cum Volume (acre-ft)	* 4.37	* 9.02	* 4.21	*
* C & E Loss (ft)	* 0.02	* Cum SA (acres)	* 1.87	* 1.61	* 2.22	*

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 258.09	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 1.73	* Wt. n-Val.	* 0.022	* 0.035	* 0.100	*
* W.S. Elev (ft)	* 256.37	* Reach Len. (ft)	* 95.55	* 97.06	* 99.00	*
* Crit W.S. (ft)	* 256.37	* Flow Area (sq ft)	* 100.69	* 216.89	* 6.54	*
* E.G. Slope (ft/ft)	* 0.006402	* Area (sq ft)	* 124.50	* 216.89	* 6.54	*
* Q Total (cfs)	* 3270.00	* Flow (cfs)	* 825.88	* 2438.38	* 5.74	*
* Top Width (ft)	* 110.49	* Top Width (ft)	* 74.90	* 26.52	* 9.07	*
* Vel Total (ft/s)	* 10.09	* Avg. Vel. (ft/s)	* 8.20	* 11.24	* 0.88	*
* Max Chl Dpth (ft)	* 9.56	* Hydr. Depth (ft)	* 1.86	* 8.18	* 0.72	*
* Conv. Total (cfs)	* 40869.6	* Conv. (cfs)	* 10322.2	* 30475.7	* 71.7	*
* Length Wtd. (ft)	* 96.68	* Wetted Per. (ft)	* 55.45	* 36.02	* 10.30	*
* Min Ch El (ft)	* 246.81	* Shear (lb/sq ft)	* 0.73	* 2.41	* 0.25	*
* Alpha	* 1.09	* Stream Power (lb/ft s)	* 134.00	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.68	* Cum Volume (acre-ft)	* 5.65	* 10.38	* 5.61	*
* C & E Loss (ft)	* 0.00	* Cum SA (acres)	* 2.08	* 1.63	* 2.55	*

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #6HR OBS

* E.G. Elev (ft)	* 254.49	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 2.26	* Wt. n-Val.	*	* 0.035	*	*
* W.S. Elev (ft)	* 252.23	* Reach Len. (ft)	* 95.55	* 97.06	* 99.00	*
* Crit W.S. (ft)	* 252.23	* Flow Area (sq ft)	*	* 109.26	*	*
* E.G. Slope (ft/ft)	* 0.014891	* Area (sq ft)	*	* 109.26	*	*
* Q Total (cfs)	* 1318.00	* Flow (cfs)	*	* 1318.00	*	*
* Top Width (ft)	* 24.22	* Top Width (ft)	*	* 24.22	*	*
* Vel Total (ft/s)	* 12.06	* Avg. Vel. (ft/s)	*	* 12.06	*	*
* Max Chl Dpth (ft)	* 5.42	* Hydr. Depth (ft)	*	* 4.51	*	*
* Conv. Total (cfs)	* 10800.6	* Conv. (cfs)	*	* 10800.6	*	*
* Length Wtd. (ft)	* 97.05	* Wetted Per. (ft)	*	* 30.75	*	*
* Min Ch El (ft)	* 246.81	* Shear (lb/sq ft)	*	* 3.30	*	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 134.00	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.86	* Cum Volume (acre-ft)	* 2.33	* 6.62	* 1.90	*
* C & E Loss (ft)	* 0.41	* Cum SA (acres)	* 1.34	* 1.58	* 1.69	*

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft)      * 256.07 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 2.66  * Wt. n-Val.      *         * 0.035  *         *
* W.S. Elev (ft)     * 253.40 * Reach Len. (ft) * 95.55  * 97.06  * 99.00  *
* Crit W.S. (ft)     * 253.40 * Flow Area (sq ft) *         * 138.54 *         *
* E.G. Slope (ft/ft) * 0.014558 * Area (sq ft)    *         * 138.54 *         *
* Q Total (cfs)      * 1815.00 * Flow (cfs)      *         * 1815.00 *         *
* Top Width (ft)     * 25.97  * Top Width (ft)  *         * 25.97  *         *
* Vel Total (ft/s)   * 13.10  * Avg. Vel. (ft/s) *         * 13.10  *         *
* Max Chl Dpth (ft)  * 6.59   * Hydr. Depth (ft) *         * 5.34   *         *
* Conv. Total (cfs)  * 15042.9 * Conv. (cfs)     *         * 15042.9 *         *
* Length Wtd. (ft)  * 97.01  * Wetted Per. (ft) *         * 33.87  *         *
* Min Ch El (ft)     * 246.81 * Shear (lb/sq ft) *         * 3.72   *         *
* Alpha              * 1.00   * Stream Power (lb/ft s) * 134.00 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 0.93   * Cum Volume (acre-ft) * 3.27  * 7.74  * 2.95  *
* C & E Loss (ft)   * 0.46   * Cum SA (acres)   * 1.67  * 1.60  * 1.87  *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: hudson

REACH: main RS: 30

INPUT

Description:

```

Station Elevation Data      num=      26
Sta   Elev   Sta   Elev   Sta   Elev   Sta   Elev   Sta   Elev
*****
   0   261.9   8.71  261.46  10.94  261.11  20.78  255.45  29.7  250.65
  33.4  250.57  33.51  250.33  42.38  250.72   53.4  251.15  64.42  250.86
  68.5  250.72  70.19  250.5   71.48  250.68   72.13  250.92  85.33  250.3
 118.15  253.54  118.2  248.77  118.26  245.77  127.23  243.69  127.46  243.63
 130.64  244.4  132.33  245.89  137.14  248.9   142.04  252.09  145.58  254.31
 152.9  256.12

```

Manning's n Values

```

num=      5
Sta   n Val   Sta   n Val   Sta   n Val   Sta   n Val   Sta   n Val
*****
   0   .045   29.7   .02  85.33   .045  118.15   .035  142.04   .1

```

```

Bank Sta: Left   Right   Lengths: Left Channel   Right   Coeff Contr.   Expan.
          118.15  142.04          69.42  70.58  71.76          .1          .3

```

```

Ineffective Flow      num=      1
Sta L   Sta R   Elev   Permanent

```

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft) * 249.56 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.97 * Wt. n-Val. * * 0.035 * *
* W.S. Elev (ft) * 248.59 * Reach Len. (ft) * 69.42 * 70.58 * 71.76 *
* Crit W.S. (ft) * 247.96 * Flow Area (sq ft) * * 62.03 * *
* E.G. Slope (ft/ft) * 0.009196 * Area (sq ft) * * 62.03 * *
* Q Total (cfs) * 491.00 * Flow (cfs) * * 491.00 * *
* Top Width (ft) * 18.44 * Top Width (ft) * * 18.44 * *
* Vel Total (ft/s) * 7.92 * Avg. Vel. (ft/s) * * 7.92 * *
* Max Chl Dpth (ft) * 4.96 * Hydr. Depth (ft) * * 3.36 * *
* Conv. Total (cfs) * 5120.1 * Conv. (cfs) * * 5120.1 * *
* Length Wtd. (ft) * 70.58 * Wetted Per. (ft) * * 22.88 * *
* Min Ch El (ft) * 243.63 * Shear (lb/sq ft) * * 1.56 * *
* Alpha * 1.00 * Stream Power (lb/ft s) * 152.90 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.62 * Cum Volume (acre-ft) * 0.42 * 3.05 * 0.05 *
* C & E Loss (ft) * 0.13 * Cum SA (acres) * 0.55 * 1.16 * 0.15 *
*****
    
```

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft) * 252.81 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 2.07 * Wt. n-Val. * * 0.022 * 0.035 * *
* W.S. Elev (ft) * 250.74 * Reach Len. (ft) * 69.42 * 70.58 * 71.76 *
* Crit W.S. (ft) * 251.58 * Flow Area (sq ft) * * 5.69 * 105.20 * *
* E.G. Slope (ft/ft) * 0.013416 * Area (sq ft) * * 5.76 * 105.20 * *
* Q Total (cfs) * 1237.00 * Flow (cfs) * * 15.00 * 1222.00 * *
* Top Width (ft) * 52.27 * Top Width (ft) * * 30.49 * 21.78 * *
* Vel Total (ft/s) * 11.16 * Avg. Vel. (ft/s) * * 2.63 * 11.62 * *
* Max Chl Dpth (ft) * 7.11 * Hydr. Depth (ft) * * 0.19 * 4.83 * *
* Conv. Total (cfs) * 10679.6 * Conv. (cfs) * * 129.5 * 10550.1 * *
* Length Wtd. (ft) * 70.56 * Wetted Per. (ft) * * 29.60 * 28.97 * *
* Min Ch El (ft) * 243.63 * Shear (lb/sq ft) * * 0.16 * 3.04 * *
* Alpha * 1.07 * Stream Power (lb/ft s) * 152.90 * 0.00 * 0.00 *
* Frctn Loss (ft) * 1.37 * Cum Volume (acre-ft) * * 2.15 * 6.12 * 1.66 *
* C & E Loss (ft) * 0.03 * Cum SA (acres) * * 1.24 * 1.52 * 1.64 *
*****
    
```

Warning: Divided flow computed for this cross-section.
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft) * 255.77 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 4.41 * Wt. n-Val. * * 0.021 * 0.035 * *
* W.S. Elev (ft) * 251.36 * Reach Len. (ft) * 69.42 * 70.58 * 71.76 *
* Crit W.S. (ft) * 252.55 * Flow Area (sq ft) * * 37.37 * 119.19 * *
* E.G. Slope (ft/ft) * 0.028790 * Area (sq ft) * * 40.16 * 119.19 * *
* Q Total (cfs) * 2442.00 * Flow (cfs) * * 323.56 * 2118.44 * *
* Top Width (ft) * 90.49 * Top Width (ft) * * 67.73 * 22.75 * *
* Vel Total (ft/s) * 15.60 * Avg. Vel. (ft/s) * * 8.66 * 17.77 * *
* Max Chl Dpth (ft) * 7.73 * Hydr. Depth (ft) * * 0.62 * 5.24 * *
* Conv. Total (cfs) * 14392.1 * Conv. (cfs) * * 1906.9 * 12485.2 * *
* Length Wtd. (ft) * 70.33 * Wetted Per. (ft) * * 60.68 * 30.76 * *
* Min Ch El (ft) * 243.63 * Shear (lb/sq ft) * * 1.11 * 6.97 * *
* Alpha * 1.17 * Stream Power (lb/ft s) * 152.90 * 0.00 * 0.00 *
* Frctn Loss (ft) * 1.10 * Cum Volume (acre-ft) * * 4.25 * 8.67 * 4.21 *
* C & E Loss (ft) * 0.29 * Cum SA (acres) * * 1.71 * 1.56 * 2.22 *
*****
    
```

Warning: Divided flow computed for this cross-section.
 Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
 This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```
*****
* E.G. Elev (ft)      * 256.61 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 4.81  * Wt. n-Val.      * 0.021  * 0.035  *         *
* W.S. Elev (ft)     * 251.80 * Reach Len. (ft) * 69.42  * 70.58  * 71.76  *
* Crit W.S. (ft)     * 253.11 * Flow Area (sq ft) * 64.10  * 129.37 *         *
* E.G. Slope (ft/ft) * 0.030858 * Area (sq ft)    * 71.17  * 129.37 *         *
* Q Total (cfs)      * 3270.00 * Flow (cfs)      * 821.74 * 2448.26 *         *
* Top Width (ft)     * 96.45  * Top Width (ft)  * 73.02  * 23.43  *         *
* Vel Total (ft/s)   * 16.90  * Avg. Vel. (ft/s) * 12.82  * 18.92  *         *
* Max Chl Dpth (ft) * 8.17   * Hydr. Depth (ft) * 1.05   * 5.52   *         *
* Conv. Total (cfs)  * 18615.2 * Conv. (cfs)     * 4677.9 * 13937.2 *         *
* Length Wtd. (ft)  * 70.18  * Wetted Per. (ft) * 61.61  * 32.00  *         *
* Min Ch El (ft)    * 243.63 * Shear (lb/sq ft) * 2.00   * 7.79   *         *
* Alpha             * 1.08   * Stream Power (lb/ft s) * 152.90 * 0.00   * 0.00   *
* Frctn Loss (ft)   * 1.17   * Cum Volume (acre-ft) * 5.44   * 10.00  * 5.60   *
* C & E Loss (ft)   * 0.31   * Cum SA (acres)   * 1.92   * 1.57   * 2.54   *
*****
```

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

```
*****
* E.G. Elev (ft)      * 253.06 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 2.28  * Wt. n-Val.      * 0.022  * 0.035  *         *
* W.S. Elev (ft)     * 250.78 * Reach Len. (ft) * 69.42  * 70.58  * 71.76  *
* Crit W.S. (ft)     * 251.67 * Flow Area (sq ft) * 7.10   * 106.18 *         *
* E.G. Slope (ft/ft) * 0.014734 * Area (sq ft)    * 7.22   * 106.18 *         *
* Q Total (cfs)      * 1318.00 * Flow (cfs)      * 21.22  * 1296.78 *         *
* Top Width (ft)     * 56.43  * Top Width (ft)  * 34.58  * 21.85  *         *
* Vel Total (ft/s)   * 11.64  * Avg. Vel. (ft/s) * 2.99   * 12.21  *         *
* Max Chl Dpth (ft) * 7.15   * Hydr. Depth (ft) * 0.22   * 4.86   *         *
* Conv. Total (cfs)  * 10858.2 * Conv. (cfs)     * 174.8  * 10683.4 *         *
* Length Wtd. (ft)  * 70.55  * Wetted Per. (ft) * 33.25  * 29.10  *         *
* Min Ch El (ft)    * 243.63 * Shear (lb/sq ft) * 0.20   * 3.36   *         *
* Alpha             * 1.09   * Stream Power (lb/ft s) * 152.90 * 0.00   * 0.00   *
* Frctn Loss (ft)   * 1.44   * Cum Volume (acre-ft) * 2.33   * 6.38   * 1.90   *
* C & E Loss (ft)   * 0.00   * Cum SA (acres)   * 1.30   * 1.52   * 1.69   *
*****
```

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```
*****
* E.G. Elev (ft)      * 254.34 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 3.21  * Wt. n-Val.      * 0.022  * 0.035  *         *
* W.S. Elev (ft)     * 251.13 * Reach Len. (ft) * 69.42  * 70.58  * 71.76  *
* Crit W.S. (ft)     * 252.09 * Flow Area (sq ft) * 23.26  * 113.88 *         *
* E.G. Slope (ft/ft) * 0.020693 * Area (sq ft)    * 24.55  * 113.88 *         *
* Q Total (cfs)      * 1815.00 * Flow (cfs)      * 125.96 * 1689.04 *         *
* Top Width (ft)     * 85.93  * Top Width (ft)  * 63.54  * 22.39  *         *
* Vel Total (ft/s)   * 13.24  * Avg. Vel. (ft/s) * 5.42   * 14.83  *         *
```



```

* Max Chl Dpth (ft)      * 7.50 * Hydr. Depth (ft)      * 0.40 * 5.09 *
* Conv. Total (cfs)     * 12617.3 * Conv. (cfs)         * 875.6 * 11741.6 *
* Length Wtd. (ft)     * 70.45 * Wetted Per. (ft)   * 58.82 * 30.09 *
* Min Ch El (ft)       * 243.63 * Shear (lb/sq ft)   * 0.51 * 4.89 *
* Alpha                 * 1.18 * Stream Power (lb/ft s) * 152.90 * 0.00 *
* Frctn Loss (ft)      * 1.67 * Cum Volume (acre-ft) * 3.24 * 7.46 *
* C & E Loss (ft)      * 0.05 * Cum SA (acres)     * 1.60 * 1.55 *
*****

```

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main RS: 29

INPUT

Description:

```

Station Elevation Data      num=      25
Sta      Elev      Sta      Elev      Sta      Elev      Sta      Elev      Sta      Elev
*****
0         261      17.86  252.38      26.6   250.54      34.72  249.13      38.62  248.41
46.69  248.68      57.55  249.04      68.41  249.12      72.61  249.1       75.04  249.07
76.3   249.08      83.12  249.4       114.42 249.03      115.16 250.46      124.07 250.44
124.13 251       125.22 246.94      126.17 242.79      129.62 242.7       131.16 242.71
133.3  242.72     141.03 245.06      144.33 247.85      148.3   250.68      159.15 258.51

```

```

Manning's n Values      num=      5
Sta      n Val      Sta      n Val      Sta      n Val      Sta      n Val      Sta      n Val
*****
0         .045     34.72     .02     83.12     .045     124.13     .05     148.3     .1

```

```

Bank Sta: Left  Right  Lengths: Left Channel  Right  Coeff Contr.  Expan.
          124.13  148.3          57  58.22  61.16          .1          .3

```

```

Ineffective Flow      num=      1
Sta L  Sta R  Elev  Permanent
93.91  122.11  260      F

```

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft)      * 248.81 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.54 * Wt. n-Val.       *         * 0.050 *         *
* W.S. Elev (ft)     * 248.27 * Reach Len. (ft)  * 57.00 * 58.22 * 61.16 *
* Crit W.S. (ft)     * 246.55 * Flow Area (sq ft) *         * 82.97 *         *
* E.G. Slope (ft/ft) * 0.008391 * Area (sq ft)    *         * 82.97 *         *
* Q Total (cfs)      * 491.00 * Flow (cfs)      *         * 491.00 *         *
* Top Width (ft)     * 20.06 * Top Width (ft)  *         * 20.06 *         *
* Vel Total (ft/s)   * 5.92 * Avg. Vel. (ft/s) *         * 5.92 *         *
* Max Chl Dpth (ft) * 5.57 * Hydr. Depth (ft) *         * 4.14 *         *
* Conv. Total (cfs) * 5360.0 * Conv. (cfs)     *         * 5360.0 *         *
* Length Wtd. (ft)  * 58.17 * Wetted Per. (ft) *         * 25.89 *         *
* Min Ch El (ft)    * 242.70 * Shear (lb/sq ft) *         * 1.68 *         *
* Alpha             * 1.00 * Stream Power (lb/ft s) * 159.15 * 0.00 * 0.00 *
* Frctn Loss (ft)  * 0.24 * Cum Volume (acre-ft) * 0.42 * 2.93 * 0.05 *
* C & E Loss (ft)  * 0.07 * Cum SA (acres)  * 0.55 * 1.13 * 0.15 *
*****

```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)      * 251.34 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 2.42 * Wt. n-Val.       * 0.020 * 0.050 *         *
* W.S. Elev (ft)     * 248.92 * Reach Len. (ft)  * 57.00 * 58.22 * 61.16 *
* Crit W.S. (ft)     * 249.82 * Flow Area (sq ft) * 4.52 * 96.25 *         *

```

```

* E.G. Slope (ft/ft)      *0.034072 * Area (sq ft)          * 4.52 * 96.25 *
* Q Total (cfs)          * 1237.00 * Flow (cfs)            * 24.68 * 1212.32 *
* Top Width (ft)         * 39.04 * Top Width (ft)        * 17.91 * 21.13 *
* Vel Total (ft/s)       * 12.28 * Avg. Vel. (ft/s)     * 5.46 * 12.59 *
* Max Chl Dpth (ft)     * 6.22 * Hydr. Depth (ft)     * 0.25 * 4.55 *
* Conv. Total (cfs)     * 6701.5 * Conv. (cfs)          * 133.7 * 6567.8 *
* Length Wtd. (ft)      * 57.69 * Wetted Per. (ft)     * 17.96 * 27.67 *
* Min Ch El (ft)        * 242.70 * Shear (lb/sq ft)     * 0.53 * 7.40 *
* Alpha                  * 1.04 * Stream Power (lb/ft s) * 159.15 * 0.00 *
* Frctn Loss (ft)       * 1.43 * Cum Volume (acre-ft) * 2.14 * 5.95 *
* C & E Loss (ft)       * 0.04 * Cum SA (acres)       * 1.21 * 1.48 *
*****

```

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)         * 253.03 * Element               * Left OB * Channel * Right OB *
* Vel Head (ft)         * 3.11 * Wt. n-Val.           * 0.021 * 0.050 *
* W.S. Elev (ft)        * 249.91 * Reach Len. (ft)      * 57.00 * 58.22 * 61.16 *
* Crit W.S. (ft)        * 250.81 * Flow Area (sq ft)    * 54.99 * 118.17 *
* E.G. Slope (ft/ft)    *0.039594 * Area (sq ft)        * 70.82 * 118.17 *
* Q Total (cfs)         * 2442.00 * Flow (cfs)           * 715.17 * 1726.83 *
* Top Width (ft)        * 107.47 * Top Width (ft)       * 84.67 * 22.80 *
* Vel Total (ft/s)      * 14.10 * Avg. Vel. (ft/s)     * 13.00 * 14.61 *
* Max Chl Dpth (ft)     * 7.21 * Hydr. Depth (ft)     * 0.86 * 5.18 *
* Conv. Total (cfs)     * 12272.4 * Conv. (cfs)          * 3594.1 * 8678.3 *
* Length Wtd. (ft)     * 57.49 * Wetted Per. (ft)     * 63.85 * 30.42 *
* Min Ch El (ft)        * 242.70 * Shear (lb/sq ft)     * 2.13 * 9.60 *
* Alpha                 * 1.01 * Stream Power (lb/ft s) * 159.15 * 0.00 *
* Frctn Loss (ft)       * 2.36 * Cum Volume (acre-ft) * 4.16 * 8.47 *
* C & E Loss (ft)       * 0.39 * Cum SA (acres)       * 1.59 * 1.52 *
*****

```

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)         * 253.91 * Element               * Left OB * Channel * Right OB *
* Vel Head (ft)         * 3.47 * Wt. n-Val.           * 0.022 * 0.050 *
* W.S. Elev (ft)        * 250.44 * Reach Len. (ft)      * 57.00 * 58.22 * 61.16 *
* Crit W.S. (ft)        * 251.47 * Flow Area (sq ft)    * 89.40 * 130.43 *
* E.G. Slope (ft/ft)    *0.034880 * Area (sq ft)        * 116.36 * 130.43 *
* Q Total (cfs)         * 3270.00 * Flow (cfs)           * 1417.93 * 1852.07 *
* Top Width (ft)        * 111.86 * Top Width (ft)       * 88.18 * 23.68 *
* Vel Total (ft/s)      * 14.88 * Avg. Vel. (ft/s)     * 15.86 * 14.20 *
* Max Chl Dpth (ft)     * 7.74 * Hydr. Depth (ft)     * 1.34 * 5.51 *
* Conv. Total (cfs)     * 17508.9 * Conv. (cfs)          * 7592.2 * 9916.7 *
* Length Wtd. (ft)     * 57.43 * Wetted Per. (ft)     * 67.14 * 31.87 *
* Min Ch El (ft)        * 242.70 * Shear (lb/sq ft)     * 2.90 * 8.91 *
* Alpha                 * 1.01 * Stream Power (lb/ft s) * 159.15 * 0.00 *
* Frctn Loss (ft)       * 2.30 * Cum Volume (acre-ft) * 5.29 * 9.78 *
* C & E Loss (ft)       * 0.40 * Cum SA (acres)       * 1.79 * 1.53 *
*****

```

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

```
*****
* E.G. Elev (ft)      * 251.53 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 2.45  * Wt. n-Val.      * 0.020 * 0.050 *
* W.S. Elev (ft)     * 249.08 * Reach Len. (ft) * 57.00 * 58.22 * 61.16 *
* Crit W.S. (ft)     * 249.90 * Flow Area (sq ft) * 7.97 * 99.70 *
* E.G. Slope (ft/ft) * 0.033998 * Area (sq ft) * 8.06 * 99.70 *
* Q Total (cfs)      * 1318.00 * Flow (cfs) * 47.49 * 1270.51 *
* Top Width (ft)     * 54.64 * Top Width (ft) * 33.23 * 21.41 *
* Vel Total (ft/s)   * 12.24 * Avg. Vel. (ft/s) * 5.96 * 12.74 *
* Max Chl Dpth (ft) * 6.38  * Hydr. Depth (ft) * 0.27 * 4.66 *
* Conv. Total (cfs) * 7148.0 * Conv. (cfs) * 257.6 * 6890.5 *
* Length Wtd. (ft)  * 57.66 * Wetted Per. (ft) * 29.26 * 28.11 *
* Min Ch El (ft)    * 242.70 * Shear (lb/sq ft) * 0.58 * 7.53 *
* Alpha             * 1.05  * Stream Power (lb/ft s) * 159.15 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 1.51  * Cum Volume (acre-ft) * 2.31 * 6.21 * 1.90 *
* C & E Loss (ft)   * 0.02  * Cum SA (acres) * 1.25 * 1.49 * 1.69 *
*****
```

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```
*****
* E.G. Elev (ft)      * 252.27 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 2.74  * Wt. n-Val.      * 0.020 * 0.050 *
* W.S. Elev (ft)     * 249.53 * Reach Len. (ft) * 57.00 * 58.22 * 61.16 *
* Crit W.S. (ft)     * 250.30 * Flow Area (sq ft) * 30.89 * 109.51 *
* E.G. Slope (ft/ft) * 0.037846 * Area (sq ft) * 38.67 * 109.51 *
* Q Total (cfs)      * 1815.00 * Flow (cfs) * 292.15 * 1522.85 *
* Top Width (ft)     * 104.41 * Top Width (ft) * 82.25 * 22.16 *
* Vel Total (ft/s)   * 12.93 * Avg. Vel. (ft/s) * 9.46 * 13.91 *
* Max Chl Dpth (ft) * 6.83  * Hydr. Depth (ft) * 0.50 * 4.94 *
* Conv. Total (cfs) * 9329.6 * Conv. (cfs) * 1501.7 * 7827.9 *
* Length Wtd. (ft)  * 57.56 * Wetted Per. (ft) * 61.60 * 29.36 *
* Min Ch El (ft)    * 242.70 * Shear (lb/sq ft) * 1.18 * 8.81 *
* Alpha             * 1.06  * Stream Power (lb/ft s) * 159.15 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 1.93  * Cum Volume (acre-ft) * 3.19 * 7.28 * 2.95 *
* C & E Loss (ft)   * 0.14  * Cum SA (acres) * 1.48 * 1.51 * 1.87 *
*****
```

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main RS: 28

INPUT

Description:

Station Elevation Data		num= 23	
Sta	Elev	Sta	Elev
0	264.37	23.62	258.39
75.84	247.3	94.09	247.92
136.72	248.93	162.62	248.9
164.27	242.97	171.24	242.92
192.33	250.44	199.04	253.27

Manning's n Values		num= 5	
Sta	n Val	Sta	n Val
0	.045	71.83	.02
111.03	.045	163.74	.035
192.33	.1		

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	163.74	192.33		46	46.77	46.35		.1	.3

```

Ineffective Flow      num=      2
  Sta L   Sta R   Elev Permanent
  25.38  50.22   260         F
  124.9  163.74  260         F
Blocked Obstructions num=      1
  Sta L   Sta R   Elev
*****
  50.22  61.56   260

```

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft)      * 248.50 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.31  * Wt. n-Val.      * 0.020  * 0.035  *         *
* W.S. Elev (ft)     * 248.19 * Reach Len. (ft) * 46.00  * 46.77  * 46.35  *
* Crit W.S. (ft)     * 246.16 * Flow Area (sq ft) * 19.68  * 96.39  *         *
* E.G. Slope (ft/ft) * 0.002465 * Area (sq ft)    * 19.68  * 96.39  *         *
* Q Total (cfs)      * 491.00 * Flow (cfs)      * 44.09  * 446.91 *         *
* Top Width (ft)     * 66.92 * Top Width (ft)  * 43.47  * 23.45  *         *
* Vel Total (ft/s)   * 4.23  * Avg. Vel. (ft/s) * 2.24  * 4.64  *         *
* Max Chl Dpth (ft) * 5.28  * Hydr. Depth (ft) * 0.45  * 4.11  *         *
* Conv. Total (cfs)  * 9889.1 * Conv. (cfs)     * 888.0  * 9001.1 *         *
* Length Wtd. (ft)  * 46.66 * Wetted Per. (ft) * 43.74  * 29.55  *         *
* Min Ch El (ft)    * 242.91 * Shear (lb/sq ft) * 0.07  * 0.50  *         *
* Alpha             * 1.12  * Stream Power (lb/ft s) * 209.04 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 0.08  * Cum Volume (acre-ft) * 0.41  * 2.81  * 0.05  *
* C & E Loss (ft)   * 0.04  * Cum SA (acres)   * 0.52  * 1.10  * 0.15  *
*****

```

Warning: Divided flow computed for this cross-section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)      * 250.54 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.28  * Wt. n-Val.      * 0.023  * 0.035  *         *
* W.S. Elev (ft)     * 250.26 * Reach Len. (ft) * 46.00  * 46.77  * 46.35  *
* Crit W.S. (ft)     * 248.85 * Flow Area (sq ft) * 141.70 * 149.69 *         *
* E.G. Slope (ft/ft) * 0.001484 * Area (sq ft)    * 194.68 * 149.69 *         *
* Q Total (cfs)      * 1237.00 * Flow (cfs)      * 609.11 * 627.89 *         *
* Top Width (ft)     * 130.35 * Top Width (ft)  * 102.18 * 28.17  *         *
* Vel Total (ft/s)   * 4.25  * Avg. Vel. (ft/s) * 4.30  * 4.19  *         *
* Max Chl Dpth (ft) * 7.35  * Hydr. Depth (ft) * 2.24  * 5.31  *         *
* Conv. Total (cfs)  * 32115.8 * Conv. (cfs)     * 15814.2 * 16301.6 *         *
* Length Wtd. (ft)  * 46.38 * Wetted Per. (ft) * 64.23 * 36.44  *         *
* Min Ch El (ft)    * 242.91 * Shear (lb/sq ft) * 0.20  * 0.38  *         *
* Alpha             * 1.00  * Stream Power (lb/ft s) * 209.04 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 0.05  * Cum Volume (acre-ft) * 2.01  * 5.79  * 1.66  *
* C & E Loss (ft)   * 0.03  * Cum SA (acres)   * 1.13  * 1.45  * 1.64  *
*****

```

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)      * 252.32 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.50  * Wt. n-Val.      * 0.024  * 0.035  * 0.100  *
* W.S. Elev (ft)     * 251.82 * Reach Len. (ft) * 46.00  * 46.77  * 46.35  *
* Crit W.S. (ft)     * 249.89 * Flow Area (sq ft) * 241.01 * 194.48 * 2.27  *
* E.G. Slope (ft/ft) * 0.001585 * Area (sq ft)    * 354.88 * 194.48 * 2.27  *
* Q Total (cfs)      * 2442.00 * Flow (cfs)      * 1445.27 * 995.74 * 0.99  *
* Top Width (ft)     * 134.05 * Top Width (ft)  * 102.18 * 28.59  * 3.28  *
* Vel Total (ft/s)   * 5.58  * Avg. Vel. (ft/s) * 6.00  * 5.12  * 0.44  *
* Max Chl Dpth (ft) * 8.91  * Hydr. Depth (ft) * 3.80  * 6.80  * 0.69  *
* Conv. Total (cfs)  * 61333.3 * Conv. (cfs)     * 36299.3 * 25009.0 * 25.0  *
* Length Wtd. (ft)  * 46.30 * Wetted Per. (ft) * 65.80 * 36.89  * 3.56  *
* Min Ch El (ft)    * 242.91 * Shear (lb/sq ft) * 0.36  * 0.52  * 0.06  *
* Alpha             * 1.03  * Stream Power (lb/ft s) * 209.04 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 0.06  * Cum Volume (acre-ft) * 3.88  * 8.26  * 4.21  *
* C & E Loss (ft)   * 0.04  * Cum SA (acres)   * 1.47  * 1.49  * 2.21  *
*****

```

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)      * 253.30 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.65  * Wt. n-Val.      * 0.024  * 0.035  * 0.100  *
* W.S. Elev (ft)     * 252.65 * Reach Len. (ft) * 46.00  * 46.77  * 46.35  *
* Crit W.S. (ft)     * 250.47 * Flow Area (sq ft) * 293.31 * 218.08 * 5.79  *
* E.G. Slope (ft/ft) * 0.001672 * Area (sq ft)    * 440.13 * 218.08 * 5.79  *
* Q Total (cfs)      * 3270.00 * Flow (cfs)      * 2028.63 * 1237.82 * 3.56  *
* Top Width (ft)     * 138.70 * Top Width (ft)  * 104.87 * 28.59  * 5.24  *
* Vel Total (ft/s)   * 6.32  * Avg. Vel. (ft/s) * 6.92  * 5.68  * 0.61  *
* Max Chl Dpth (ft)  * 9.74  * Hydr. Depth (ft) * 4.63  * 7.63  * 1.10  *
* Conv. Total (cfs)  * 79967.9 * Conv. (cfs)     * 49610.1 * 30270.8 * 87.0  *
* Length Wtd. (ft)   * 46.28 * Wetted Per. (ft) * 66.62 * 36.89 * 5.69  *
* Min Ch El (ft)     * 242.91 * Shear (lb/sq ft) * 0.46  * 0.62  * 0.11  *
* Alpha              * 1.05  * Stream Power (lb/ft s) * 209.04 * 0.00  * 0.00  *
* Frctn Loss (ft)    * 0.07  * Cum Volume (acre-ft) * 4.92  * 9.55  * 5.60  *
* C & E Loss (ft)    * 0.06  * Cum SA (acres)   * 1.67  * 1.50  * 2.54  *
*****

```

Warning: Divided flow computed for this cross-section.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

```

*****
* E.G. Elev (ft)      * 250.68 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.29  * Wt. n-Val.      * 0.023  * 0.035  * 0.100  *
* W.S. Elev (ft)     * 250.39 * Reach Len. (ft) * 46.00  * 46.77  * 46.35  *
* Crit W.S. (ft)     * 248.93 * Flow Area (sq ft) * 149.97 * 153.39 * 0.49  *
* E.G. Slope (ft/ft) * 0.001491 * Area (sq ft)    * 208.02 * 153.39 * 0.49  *
* Q Total (cfs)      * 1318.00 * Flow (cfs)      * 666.33 * 651.67 * 0.13  *
* Top Width (ft)     * 130.65 * Top Width (ft)  * 102.18 * 28.47  * 1.52  *
* Vel Total (ft/s)   * 4.34  * Avg. Vel. (ft/s) * 4.44  * 4.25  * 0.26  *
* Max Chl Dpth (ft)  * 7.48  * Hydr. Depth (ft) * 2.37  * 5.39  * 0.32  *
* Conv. Total (cfs)  * 34137.2 * Conv. (cfs)     * 17258.5 * 16878.7 * 3.2  *
* Length Wtd. (ft)   * 46.37 * Wetted Per. (ft) * 64.36 * 36.76  * 1.65  *
* Min Ch El (ft)     * 242.91 * Shear (lb/sq ft) * 0.22  * 0.39  * 0.03  *
* Alpha              * 1.00  * Stream Power (lb/ft s) * 209.04 * 0.00  * 0.00  *
* Frctn Loss (ft)    * 0.05  * Cum Volume (acre-ft) * 2.17  * 6.04  * 2.95  *
* C & E Loss (ft)    * 0.03  * Cum SA (acres)   * 1.16  * 1.46  * 1.87  *
*****

```

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft)      * 251.46 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.38  * Wt. n-Val.      * 0.024  * 0.035  * 0.100  *
* W.S. Elev (ft)     * 251.08 * Reach Len. (ft) * 46.00  * 46.77  * 46.35  *
* Crit W.S. (ft)     * 249.39 * Flow Area (sq ft) * 194.06 * 173.29 * 0.49  *
* E.G. Slope (ft/ft) * 0.001528 * Area (sq ft)    * 279.15 * 173.29 * 0.49  *
* Q Total (cfs)      * 1815.00 * Flow (cfs)      * 1008.18 * 806.69 * 0.13  *
* Top Width (ft)     * 132.29 * Top Width (ft)  * 102.18 * 28.59  * 1.52  *
* Vel Total (ft/s)   * 4.93  * Avg. Vel. (ft/s) * 5.20  * 4.66  * 0.26  *
* Max Chl Dpth (ft)  * 8.17  * Hydr. Depth (ft) * 3.06  * 6.06  * 0.32  *
* Conv. Total (cfs)  * 46425.3 * Conv. (cfs)     * 25788.0 * 20634.1 * 3.2  *
* Length Wtd. (ft)   * 46.33 * Wetted Per. (ft) * 65.05 * 36.89  * 1.65  *
* Min Ch El (ft)     * 242.91 * Shear (lb/sq ft) * 0.28  * 0.45  * 0.03  *
* Alpha              * 1.01  * Stream Power (lb/ft s) * 209.04 * 0.00  * 0.00  *
* Frctn Loss (ft)    * 0.06  * Cum Volume (acre-ft) * 2.98  * 7.09  * 2.95  *
* C & E Loss (ft)    * 0.03  * Cum SA (acres)   * 1.36  * 1.48  * 1.87  *
*****

```

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main RS: 27

INPUT

Description:

Station Elevation Data num= 25
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev

```

*****
0 255.09 20 249.09 33.99 247.99 38.71 247.58 38.75 247.85
39.31 247.8 39.44 247.14 43.43 246.84 60.68 247.42 71.39 247.31
72.7 247.26 73.42 247.77 126.3 247.56 126.61 247.89 126.74 247.92
127.57 244.53 128.15 242.33 131.06 242.08 133 241.75 133.14 241.73
135.18 242.19 140.09 243.34 145.42 244.45 149.99 248.38 161 257.81

```

```

Manning's n Values      num=      5
Sta  n Val      Sta  n Val      Sta  n Val      Sta  n Val      Sta  n Val
*****
0      .045  38.71      .02  73.42      .045  126.74      .035  149.99      .1

```

```

Bank Sta: Left  Right      Lengths: Left Channel  Right      Coeff Contr.  Expan.
          126.74  149.99          60.75   61.7   65.02          .1          .3
Ineffective Flow      num=      1
          Sta L   Sta R   Elev  Permanent
          95.87  126.74  255      F
Blocked Obstructions      num=      1
          Sta L   Sta R   Elev
*****
          0      20      255

```

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft)      * 248.38 * Element      * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.18  * Wt. n-Val.   * 0.022  * 0.035  *          *
* W.S. Elev (ft)      * 248.20 * Reach Len. (ft) * 60.75 * 61.70 * 65.02 *
* Crit W.S. (ft)      * 245.73 * Flow Area (sq ft) * 46.82 * 105.37 *          *
* E.G. Slope (ft/ft) * 0.001375 * Area (sq ft) * 64.49 * 105.37 *          *
* Q Total (cfs)      * 491.00 * Flow (cfs) * 100.04 * 390.96 *          *
* Top Width (ft)      * 118.39 * Top Width (ft) * 95.36 * 23.03 *          *
* Vel Total (ft/s)    * 3.23  * Avg. Vel. (ft/s) * 2.14 * 3.71 *          *
* Max Chl Dpth (ft)  * 6.47  * Hydr. Depth (ft) * 0.73 * 4.57 *          *
* Conv. Total (cfs)   * 13243.0 * Conv. (cfs) * 2698.3 * 10544.8 *          *
* Length Wtd. (ft)   * 61.43 * Wetted Per. (ft) * 65.48 * 29.12 *          *
* Min Ch El (ft)     * 241.73 * Shear (lb/sq ft) * 0.06 * 0.31 *          *
* Alpha              * 1.14  * Stream Power (lb/ft s) * 161.00 * 0.00 * 0.00 *
* Frctn Loss (ft)    * 0.07  * Cum Volume (acre-ft) * 0.36 * 2.71 * 0.05 *
* C & E Loss (ft)    * 0.02  * Cum SA (acres) * 0.44 * 1.08 * 0.15 *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)      * 250.46 * Element      * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.20  * Wt. n-Val.   * 0.026  * 0.035  * 0.100 *
* W.S. Elev (ft)      * 250.26 * Reach Len. (ft) * 60.75 * 61.70 * 65.02 *
* Crit W.S. (ft)      * 248.43 * Flow Area (sq ft) * 198.51 * 153.40 * 2.07 *
* E.G. Slope (ft/ft) * 0.000907 * Area (sq ft) * 279.97 * 153.40 * 2.07 *
* Q Total (cfs)      * 1237.00 * Flow (cfs) * 646.37 * 589.89 * 0.74 *
* Top Width (ft)      * 132.19 * Top Width (ft) * 106.74 * 23.25 * 2.20 *
* Vel Total (ft/s)    * 3.49  * Avg. Vel. (ft/s) * 3.26 * 3.85 * 0.36 *
* Max Chl Dpth (ft)  * 8.53  * Hydr. Depth (ft) * 2.62 * 6.60 * 0.94 *
* Conv. Total (cfs)   * 41082.1 * Conv. (cfs) * 21466.8 * 19590.8 * 24.5 *
* Length Wtd. (ft)   * 61.16 * Wetted Per. (ft) * 78.07 * 29.40 * 2.89 *
* Min Ch El (ft)     * 241.73 * Shear (lb/sq ft) * 0.14 * 0.30 * 0.04 *
* Alpha              * 1.03  * Stream Power (lb/ft s) * 161.00 * 0.00 * 0.00 *
* Frctn Loss (ft)    * 0.04  * Cum Volume (acre-ft) * 1.76 * 5.62 * 1.66 *
* C & E Loss (ft)    * 0.02  * Cum SA (acres) * 1.02 * 1.42 * 1.64 *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)      * 252.22 * Element      * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.35  * Wt. n-Val.   * 0.027  * 0.035  * 0.100 *
* W.S. Elev (ft)      * 251.86 * Reach Len. (ft) * 60.75 * 61.70 * 65.02 *
* Crit W.S. (ft)      * 249.48 * Flow Area (sq ft) * 319.93 * 190.61 * 7.08 *
* E.G. Slope (ft/ft) * 0.001103 * Area (sq ft) * 450.80 * 190.61 * 7.08 *
* Q Total (cfs)      * 2442.00 * Flow (cfs) * 1503.20 * 934.59 * 4.21 *
* Top Width (ft)      * 134.06 * Top Width (ft) * 106.74 * 23.25 * 4.07 *
* Vel Total (ft/s)    * 4.72  * Avg. Vel. (ft/s) * 4.70 * 4.90 * 0.59 *
* Max Chl Dpth (ft)  * 10.13 * Hydr. Depth (ft) * 4.22 * 8.20 * 1.74 *
* Conv. Total (cfs)   * 73514.8 * Conv. (cfs) * 45252.7 * 28135.4 * 126.7 *
* Length Wtd. (ft)   * 61.08 * Wetted Per. (ft) * 79.67 * 29.40 * 5.35 *

```

* Min Ch El (ft)	* 241.73	* Shear (lb/sq ft)	* 0.28	* 0.45	* 0.09
* Alpha	* 1.02	* Stream Power (lb/ft s)	* 161.00	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.06	* Cum Volume (acre-ft)	* 3.45	* 8.06	* 4.20
* C & E Loss (ft)	* 0.03	* Cum SA (acres)	* 1.36	* 1.46	* 2.21

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 253.18	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.47	* Wt. n-Val.	* 0.027	* 0.035	* 0.100
* W.S. Elev (ft)	* 252.71	* Reach Len. (ft)	* 60.75	* 61.70	* 65.02
* Crit W.S. (ft)	* 250.04	* Flow Area (sq ft)	* 384.40	* 210.36	* 10.95
* E.G. Slope (ft/ft)	* 0.001212	* Area (sq ft)	* 541.49	* 210.36	* 10.95
* Q Total (cfs)	* 3270.00	* Flow (cfs)	* 2107.66	* 1154.45	* 7.90
* Top Width (ft)	* 135.05	* Top Width (ft)	* 106.74	* 23.25	* 5.06
* Vel Total (ft/s)	* 5.40	* Avg. Vel. (ft/s)	* 5.48	* 5.49	* 0.72
* Max Chl Dpth (ft)	* 10.98	* Hydr. Depth (ft)	* 5.07	* 9.05	* 2.17
* Conv. Total (cfs)	* 93929.9	* Conv. (cfs)	* 60541.8	* 33161.3	* 226.8
* Length Wtd. (ft)	* 61.06	* Wetted Per. (ft)	* 80.52	* 29.40	* 6.66
* Min Ch El (ft)	* 241.73	* Shear (lb/sq ft)	* 0.36	* 0.54	* 0.12
* Alpha	* 1.03	* Stream Power (lb/ft s)	* 161.00	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.06	* Cum Volume (acre-ft)	* 4.40	* 9.32	* 5.59
* C & E Loss (ft)	* 0.04	* Cum SA (acres)	* 1.56	* 1.47	* 2.53

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

* E.G. Elev (ft)	* 250.60	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.21	* Wt. n-Val.	* 0.026	* 0.035	* 0.100
* W.S. Elev (ft)	* 250.39	* Reach Len. (ft)	* 60.75	* 61.70	* 65.02
* Crit W.S. (ft)	* 248.51	* Flow Area (sq ft)	* 208.56	* 156.48	* 2.37
* E.G. Slope (ft/ft)	* 0.000920	* Area (sq ft)	* 294.11	* 156.48	* 2.37
* Q Total (cfs)	* 1318.00	* Flow (cfs)	* 702.77	* 614.34	* 0.89
* Top Width (ft)	* 132.34	* Top Width (ft)	* 106.74	* 23.25	* 2.35
* Vel Total (ft/s)	* 3.59	* Avg. Vel. (ft/s)	* 3.37	* 3.93	* 0.38
* Max Chl Dpth (ft)	* 8.66	* Hydr. Depth (ft)	* 2.75	* 6.73	* 1.01
* Conv. Total (cfs)	* 43445.8	* Conv. (cfs)	* 23165.8	* 20250.6	* 29.4
* Length Wtd. (ft)	* 61.15	* Wetted Per. (ft)	* 78.20	* 29.40	* 3.10
* Min Ch El (ft)	* 241.73	* Shear (lb/sq ft)	* 0.15	* 0.31	* 0.04
* Alpha	* 1.03	* Stream Power (lb/ft s)	* 161.00	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.05	* Cum Volume (acre-ft)	* 1.91	* 5.88	* 1.90
* C & E Loss (ft)	* 0.02	* Cum SA (acres)	* 1.05	* 1.43	* 1.69

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

* E.G. Elev (ft)	* 251.37	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.27	* Wt. n-Val.	* 0.027	* 0.035	* 0.100
* W.S. Elev (ft)	* 251.10	* Reach Len. (ft)	* 60.75	* 61.70	* 65.02
* Crit W.S. (ft)	* 248.99	* Flow Area (sq ft)	* 262.37	* 172.97	* 4.33
* E.G. Slope (ft/ft)	* 0.001010	* Area (sq ft)	* 369.81	* 172.97	* 4.33
* Q Total (cfs)	* 1815.00	* Flow (cfs)	* 1052.39	* 760.52	* 2.09
* Top Width (ft)	* 133.17	* Top Width (ft)	* 106.74	* 23.25	* 3.18
* Vel Total (ft/s)	* 4.13	* Avg. Vel. (ft/s)	* 4.01	* 4.40	* 0.48
* Max Chl Dpth (ft)	* 9.37	* Hydr. Depth (ft)	* 3.46	* 7.44	* 1.36
* Conv. Total (cfs)	* 57110.8	* Conv. (cfs)	* 33114.5	* 23930.5	* 65.8
* Length Wtd. (ft)	* 61.11	* Wetted Per. (ft)	* 78.91	* 29.40	* 4.19
* Min Ch El (ft)	* 241.73	* Shear (lb/sq ft)	* 0.21	* 0.37	* 0.07
* Alpha	* 1.02	* Stream Power (lb/ft s)	* 161.00	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.05	* Cum Volume (acre-ft)	* 2.64	* 6.90	* 2.95
* C & E Loss (ft)	* 0.02	* Cum SA (acres)	* 1.25	* 1.45	* 1.87

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main

RS: 26

INPUT

Description:

Station Elevation Data num= 36

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	257.78	20	251.78	20.48	251.76	20.58	250.83	24.3	250.68
24.56	249.63	29.3	248.97	33.54	247.03	37.14	246.75	37.25	246.32
40	246.47	53.02	246.87	67.72	246.7	69.59	246.62	71.15	246.17
71.18	247.08	74.6	247.24	97.24	247.51	107.98	247.72	111.72	247.58
112.26	248.1	112.8	247.58	114	243.79	115.64	239.33	116.82	240.91
117.57	241.91	118.99	240.94	125.05	242.14	126.06	243.1	129.39	244.4
134.13	247.88	136.05	249.09	136.62	250.19	137.14	250.23	142.14	250.89
152.72	258.34								

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	33.54	.02	74.6	.045	112.8	.035	134.13	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

112.8	134.13	83.06	84.96	87.67	.1	.3
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Blocked Obstructions num= 1

Sta L	Sta R	Elev
0	20	260

CROSS SECTION OUTPUT Profile #2-YR

* E.G. Elev (ft)	* 248.29	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.10	* Wt. n-Val.	* 0.023	* 0.035	* 0.100
* W.S. Elev (ft)	* 248.19	* Reach Len. (ft)	* 83.06	* 84.96	* 87.67
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 87.62	* 108.43	* 0.07
* E.G. Slope (ft/ft)	* 0.000842	* Area (sq ft)	* 87.62	* 108.43	* 0.07
* Q Total (cfs)	* 491.00	* Flow (cfs)	* 181.11	* 309.88	* 0.01
* Top Width (ft)	* 103.60	* Top Width (ft)	* 81.79	* 21.33	* 0.49
* Vel Total (ft/s)	* 2.50	* Avg. Vel. (ft/s)	* 2.07	* 2.86	* 0.11
* Max Chl Dpth (ft)	* 8.86	* Hydr. Depth (ft)	* 1.07	* 5.08	* 0.15
* Conv. Total (cfs)	* 16917.8	* Conv. (cfs)	* 6240.3	* 10677.2	* 0.3
* Length Wtd. (ft)	* 84.50	* Wetted Per. (ft)	* 83.77	* 30.70	* 0.57
* Min Ch El (ft)	* 239.33	* Shear (lb/sq ft)	* 0.06	* 0.19	* 0.01
* Alpha	* 1.07	* Stream Power (lb/ft s)	* 152.72	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.05	* Cum Volume (acre-ft)	* 0.26	* 2.56	* 0.05
* C & E Loss (ft)	* 0.01	* Cum SA (acres)	* 0.32	* 1.05	* 0.14

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 250.39	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.14	* Wt. n-Val.	* 0.026	* 0.035	* 0.100
* W.S. Elev (ft)	* 250.26	* Reach Len. (ft)	* 83.06	* 84.96	* 87.67
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 264.63	* 152.64	* 3.79
* E.G. Slope (ft/ft)	* 0.000596	* Area (sq ft)	* 264.63	* 152.64	* 3.79
* Q Total (cfs)	* 1237.00	* Flow (cfs)	* 774.95	* 460.78	* 1.27
* Top Width (ft)	* 112.95	* Top Width (ft)	* 88.40	* 21.33	* 3.23
* Vel Total (ft/s)	* 2.94	* Avg. Vel. (ft/s)	* 2.93	* 3.02	* 0.34
* Max Chl Dpth (ft)	* 10.93	* Hydr. Depth (ft)	* 2.99	* 7.16	* 1.17
* Conv. Total (cfs)	* 50686.3	* Conv. (cfs)	* 31753.7	* 18880.5	* 52.1
* Length Wtd. (ft)	* 84.04	* Wetted Per. (ft)	* 91.09	* 30.70	* 4.25
* Min Ch El (ft)	* 239.33	* Shear (lb/sq ft)	* 0.11	* 0.18	* 0.03
* Alpha	* 1.02	* Stream Power (lb/ft s)	* 152.72	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.05	* Cum Volume (acre-ft)	* 1.38	* 5.41	* 1.65
* C & E Loss (ft)	* 0.00	* Cum SA (acres)	* 0.88	* 1.39	* 1.63

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 252.13	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.26	* Wt. n-Val.	* 0.027	* 0.035	* 0.100
* W.S. Elev (ft)	* 251.87	* Reach Len. (ft)	* 83.06	* 84.96	* 87.67
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 411.91	* 187.12	* 15.91
* E.G. Slope (ft/ft)	* 0.000753	* Area (sq ft)	* 411.91	* 187.12	* 15.91
* Q Total (cfs)	* 2442.00	* Flow (cfs)	* 1706.37	* 727.23	* 8.41
* Top Width (ft)	* 123.54	* Top Width (ft)	* 92.80	* 21.33	* 9.41


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* Vel Total (ft/s) * 3.97 * Avg. Vel. (ft/s) * 4.14 * 3.89 * 0.53 *
* Max Chl Dpth (ft) * 12.54 * Hydr. Depth (ft) * 4.44 * 8.77 * 1.69 *
* Conv. Total (cfs) * 89018.2 * Conv. (cfs) * 62202.1 * 26509.7 * 306.4 *
* Length Wtd. (ft) * 83.85 * Wetted Per. (ft) * 96.75 * 30.70 * 10.78 *
* Min Ch El (ft) * 239.33 * Shear (lb/sq ft) * 0.20 * 0.29 * 0.07 *
* Alpha * 1.05 * Stream Power (lb/ft s) * 152.72 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.06 * Cum Volume (acre-ft) * 2.85 * 7.79 * 4.19 *
* C & E Loss (ft) * 0.00 * Cum SA (acres) * 1.22 * 1.43 * 2.20 *
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CROSS SECTION OUTPUT Profile #100-YR

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*****
* E.G. Elev (ft) * 253.08 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.34 * Wt. n-Val. * 0.027 * 0.035 * 0.100 *
* W.S. Elev (ft) * 252.74 * Reach Len. (ft) * 83.06 * 84.96 * 87.67 *
* Crit W.S. (ft) * * Flow Area (sq ft) * 492.24 * 205.58 * 24.59 *
* E.G. Slope (ft/ft) * 0.000829 * Area (sq ft) * 492.24 * 205.58 * 24.59 *
* Q Total (cfs) * 3270.00 * Flow (cfs) * 2360.33 * 892.96 * 16.70 *
* Top Width (ft) * 124.77 * Top Width (ft) * 92.80 * 21.33 * 10.64 *
* Vel Total (ft/s) * 4.53 * Avg. Vel. (ft/s) * 4.80 * 4.34 * 0.68 *
* Max Chl Dpth (ft) * 13.41 * Hydr. Depth (ft) * 5.30 * 9.64 * 2.31 *
* Conv. Total (cfs) * 113560.6 * Conv. (cfs) * 81969.6 * 31010.9 * 580.1 *
* Length Wtd. (ft) * 83.79 * Wetted Per. (ft) * 97.62 * 30.70 * 12.29 *
* Min Ch El (ft) * 239.33 * Shear (lb/sq ft) * 0.26 * 0.35 * 0.10 *
* Alpha * 1.06 * Stream Power (lb/ft s) * 152.72 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.06 * Cum Volume (acre-ft) * 3.68 * 9.03 * 5.56 *
* C & E Loss (ft) * 0.00 * Cum SA (acres) * 1.42 * 1.44 * 2.52 *
*****

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CROSS SECTION OUTPUT Profile #6HR OBS

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*****
* E.G. Elev (ft) * 250.54 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.14 * Wt. n-Val. * 0.026 * 0.035 * 0.100 *
* W.S. Elev (ft) * 250.39 * Reach Len. (ft) * 83.06 * 84.96 * 87.67 *
* Crit W.S. (ft) * * Flow Area (sq ft) * 276.39 * 155.48 * 4.28 *
* E.G. Slope (ft/ft) * 0.000608 * Area (sq ft) * 276.39 * 155.48 * 4.28 *
* Q Total (cfs) * 1318.00 * Flow (cfs) * 836.71 * 479.93 * 1.37 *
* Top Width (ft) * 113.99 * Top Width (ft) * 88.43 * 21.33 * 4.23 *
* Vel Total (ft/s) * 3.02 * Avg. Vel. (ft/s) * 3.03 * 3.09 * 0.32 *
* Max Chl Dpth (ft) * 11.06 * Hydr. Depth (ft) * 3.13 * 7.29 * 1.01 *
* Conv. Total (cfs) * 53467.1 * Conv. (cfs) * 33942.5 * 19469.1 * 55.5 *
* Length Wtd. (ft) * 84.01 * Wetted Per. (ft) * 91.22 * 30.70 * 5.27 *
* Min Ch El (ft) * 239.33 * Shear (lb/sq ft) * 0.11 * 0.19 * 0.03 *
* Alpha * 1.02 * Stream Power (lb/ft s) * 152.72 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.05 * Cum Volume (acre-ft) * 1.51 * 5.66 * 1.89 *
* C & E Loss (ft) * 0.00 * Cum SA (acres) * 0.91 * 1.40 * 1.68 *
*****

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CROSS SECTION OUTPUT Profile #24HR OBS

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*****
* E.G. Elev (ft) * 251.30 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.19 * Wt. n-Val. * 0.026 * 0.035 * 0.100 *
* W.S. Elev (ft) * 251.11 * Reach Len. (ft) * 83.06 * 84.96 * 87.67 *
* Crit W.S. (ft) * * Flow Area (sq ft) * 340.88 * 170.71 * 9.09 *
* E.G. Slope (ft/ft) * 0.000683 * Area (sq ft) * 340.88 * 170.71 * 9.09 *
* Q Total (cfs) * 1815.00 * Flow (cfs) * 1217.06 * 594.50 * 3.44 *
* Top Width (ft) * 121.90 * Top Width (ft) * 92.25 * 21.33 * 8.32 *
* Vel Total (ft/s) * 3.49 * Avg. Vel. (ft/s) * 3.57 * 3.48 * 0.38 *
* Max Chl Dpth (ft) * 11.78 * Hydr. Depth (ft) * 3.70 * 8.00 * 1.09 *
* Conv. Total (cfs) * 69456.7 * Conv. (cfs) * 46574.5 * 22750.4 * 131.8 *
* Length Wtd. (ft) * 83.92 * Wetted Per. (ft) * 95.52 * 30.70 * 9.45 *
* Min Ch El (ft) * 239.33 * Shear (lb/sq ft) * 0.15 * 0.24 * 0.04 *
* Alpha * 1.03 * Stream Power (lb/ft s) * 152.72 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.05 * Cum Volume (acre-ft) * 2.15 * 6.66 * 2.94 *
* C & E Loss (ft) * 0.00 * Cum SA (acres) * 1.11 * 1.42 * 1.86 *
*****

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CROSS SECTION

RIVER: hudson
REACH: main RS: 25

INPUT

Description:

Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	255.25	50	250.34	65.47	250.35	81.44	249.54	86.03	247.3

89.33	247.2	89.41	246.92	102.47	247.31	117.22	247.27	131.96	247.57
134.13	247.31	136.41	247.39	137.44	248.18	137.82	248.22	138.14	244.16
138.35	239.92	139.66	239.76	146.05	239.32	146.16	239.32	151.12	239.56
153.23	240.93	160.29	244.16	166.89	247.11	173.09	248.75	184.32	251.72
186.91	252.67	194.32	256.17						

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.02	131.96	.045	137.82	.035	166.89	.1

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	137.82	166.89		29.59	30.248	33.09	.1 .3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
18	68	260	F
184.35	189.68	265	F

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft)          * 248.24 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.08  * Wt. n-Val.      * 0.021  * 0.035  * 0.100  *
* W.S. Elev (ft)         * 248.16 * Reach Len. (ft) * 29.59  * 30.25  * 33.09  *
* Crit W.S. (ft)         * 242.87 * Flow Area (sq ft) * 44.93  * 185.07 * 2.08  *
* E.G. Slope (ft/ft)     * 0.000379 * Area (sq ft) * 44.93  * 185.07 * 2.08  *
* Q Total (cfs)          * 491.00 * Flow (cfs)      * 55.47  * 435.15 * 0.38  *
* Top Width (ft)         * 86.17  * Top Width (ft)  * 53.14  * 29.07  * 3.96  *
* Vel Total (ft/s)       * 2.12  * Avg. Vel. (ft/s) * 1.23  * 2.35  * 0.18  *
* Max Chl Dpth (ft)      * 8.84  * Hydr. Depth (ft) * 0.85  * 6.37  * 0.52  *
* Conv. Total (cfs)      * 25224.1 * Conv. (cfs)     * 2849.6 * 22354.9 * 19.6  *
* Length Wtd. (ft)       * 30.18  * Wetted Per. (ft) * 53.84  * 38.57  * 4.10  *
* Min Ch El (ft)         * 239.32 * Shear (lb/sq ft) * 0.02  * 0.11  * 0.01  *
* Alpha                  * 1.13  * Stream Power (lb/ft s) * 194.32 * 0.00  * 0.00  *
* Frctn Loss (ft)        * 0.00  * Cum Volume (acre-ft) * 0.13  * 2.27  * 0.05  *
* C & E Loss (ft)        * 0.02  * Cum SA (acres)   * 0.19  * 1.00  * 0.14  *
*****

```

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)          * 250.35 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.14  * Wt. n-Val.      * 0.021  * 0.035  * 0.100  *
* W.S. Elev (ft)         * 250.21 * Reach Len. (ft) * 29.59  * 30.25  * 33.09  *
* Crit W.S. (ft)         * 245.28 * Flow Area (sq ft) * 162.77 * 244.59 * 18.11  *
* E.G. Slope (ft/ft)     * 0.000491 * Area (sq ft) * 162.77 * 244.59 * 18.11  *
* Q Total (cfs)          * 1237.00 * Flow (cfs)      * 441.33 * 787.87 * 7.81  *
* Top Width (ft)         * 110.28 * Top Width (ft)  * 69.50  * 29.07  * 11.70  *
* Vel Total (ft/s)       * 2.91  * Avg. Vel. (ft/s) * 2.71  * 3.22  * 0.43  *
* Max Chl Dpth (ft)      * 10.89  * Hydr. Depth (ft) * 2.34  * 8.41  * 1.55  *
* Conv. Total (cfs)      * 55803.2 * Conv. (cfs)     * 19909.1 * 35541.9 * 352.1  *
* Length Wtd. (ft)       * 29.99  * Wetted Per. (ft) * 70.55  * 38.63  * 12.11  *
* Min Ch El (ft)         * 239.32 * Shear (lb/sq ft) * 0.07  * 0.19  * 0.05  *
* Alpha                  * 1.09  * Stream Power (lb/ft s) * 194.32 * 0.00  * 0.00  *
* Frctn Loss (ft)        * 0.01  * Cum Volume (acre-ft) * 0.97  * 5.02  * 1.63  *
* C & E Loss (ft)        * 0.01  * Cum SA (acres)   * 0.73  * 1.34  * 1.62  *
*****

```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)          * 252.07 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.28  * Wt. n-Val.      * 0.021  * 0.035  * 0.100  *
* W.S. Elev (ft)         * 251.79 * Reach Len. (ft) * 29.59  * 30.25  * 33.09  *
* Crit W.S. (ft)         * 248.60 * Flow Area (sq ft) * 273.24 * 290.59 * 41.36  *
* E.G. Slope (ft/ft)     * 0.000651 * Area (sq ft) * 310.04 * 290.59 * 41.36  *
* Q Total (cfs)          * 2442.00 * Flow (cfs)      * 1206.41 * 1208.35 * 27.24  *
* Top Width (ft)         * 149.25 * Top Width (ft)  * 102.56 * 29.07  * 17.62  *
* Vel Total (ft/s)       * 4.04  * Avg. Vel. (ft/s) * 4.42  * 4.16  * 0.66  *

```

* Max Chl Dpth (ft)	* 12.47	* Hydr. Depth (ft)	* 3.91	* 10.00	* 2.37	*
* Conv. Total (cfs)	* 95724.3	* Conv. (cfs)	* 47290.2	* 47366.3	* 1067.8	*
* Length Wtd. (ft)	* 29.91	* Wetted Per. (ft)	* 70.86	* 38.63	* 18.06	*
* Min Ch El (ft)	* 239.32	* Shear (lb/sq ft)	* 0.16	* 0.31	* 0.09	*
* Alpha	* 1.12	* Stream Power (lb/ft s)	* 194.32	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.02	* Cum Volume (acre-ft)	* 2.16	* 7.32	* 4.13	*
* C & E Loss (ft)	* 0.01	* Cum SA (acres)	* 1.03	* 1.38	* 2.17	*

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 253.01	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 0.39	* Wt. n-Val.	* 0.021	* 0.035	* 0.100	*
* W.S. Elev (ft)	* 252.62	* Reach Len. (ft)	* 29.59	* 30.25	* 33.09	*
* Crit W.S. (ft)	* 249.22	* Flow Area (sq ft)	* 331.52	* 314.86	* 55.93	*
* E.G. Slope (ft/ft)	* 0.000727	* Area (sq ft)	* 399.19	* 314.86	* 57.02	*
* Q Total (cfs)	* 3270.00	* Flow (cfs)	* 1762.38	* 1460.00	* 47.62	*
* Top Width (ft)	* 160.03	* Top Width (ft)	* 111.06	* 29.07	* 19.89	*
* Vel Total (ft/s)	* 4.66	* Avg. Vel. (ft/s)	* 5.32	* 4.64	* 0.85	*
* Max Chl Dpth (ft)	* 13.30	* Hydr. Depth (ft)	* 4.75	* 10.83	* 3.20	*
* Conv. Total (cfs)	* 121258.8	* Conv. (cfs)	* 65353.1	* 54139.9	* 1765.9	*
* Length Wtd. (ft)	* 29.89	* Wetted Per. (ft)	* 70.86	* 38.63	* 18.06	*
* Min Ch El (ft)	* 239.32	* Shear (lb/sq ft)	* 0.21	* 0.37	* 0.14	*
* Alpha	* 1.15	* Stream Power (lb/ft s)	* 194.32	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.03	* Cum Volume (acre-ft)	* 2.83	* 8.52	* 5.48	*
* C & E Loss (ft)	* 0.02	* Cum SA (acres)	* 1.22	* 1.39	* 2.49	*

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

* E.G. Elev (ft)	* 250.49	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 0.15	* Wt. n-Val.	* 0.021	* 0.035	* 0.100	*
* W.S. Elev (ft)	* 250.34	* Reach Len. (ft)	* 29.59	* 30.25	* 33.09	*
* Crit W.S. (ft)	* 245.50	* Flow Area (sq ft)	* 171.94	* 248.41	* 19.69	*
* E.G. Slope (ft/ft)	* 0.000505	* Area (sq ft)	* 172.07	* 248.41	* 19.69	*
* Q Total (cfs)	* 1318.00	* Flow (cfs)	* 489.20	* 819.95	* 8.84	*
* Top Width (ft)	* 113.37	* Top Width (ft)	* 72.09	* 29.07	* 12.20	*
* Vel Total (ft/s)	* 3.00	* Avg. Vel. (ft/s)	* 2.85	* 3.30	* 0.45	*
* Max Chl Dpth (ft)	* 11.02	* Hydr. Depth (ft)	* 2.46	* 8.55	* 1.61	*
* Conv. Total (cfs)	* 58625.1	* Conv. (cfs)	* 21759.8	* 36471.9	* 393.4	*
* Length Wtd. (ft)	* 29.98	* Wetted Per. (ft)	* 70.86	* 38.63	* 12.62	*
* Min Ch El (ft)	* 239.32	* Shear (lb/sq ft)	* 0.08	* 0.20	* 0.05	*
* Alpha	* 1.09	* Stream Power (lb/ft s)	* 194.32	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.01	* Cum Volume (acre-ft)	* 1.08	* 5.26	* 1.87	*
* C & E Loss (ft)	* 0.01	* Cum SA (acres)	* 0.76	* 1.35	* 1.67	*

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

* E.G. Elev (ft)	* 251.25	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 0.21	* Wt. n-Val.	* 0.021	* 0.035	* 0.100	*
* W.S. Elev (ft)	* 251.04	* Reach Len. (ft)	* 29.59	* 30.25	* 33.09	*
* Crit W.S. (ft)	* 246.67	* Flow Area (sq ft)	* 220.92	* 268.81	* 29.18	*
* E.G. Slope (ft/ft)	* 0.000580	* Area (sq ft)	* 236.04	* 268.81	* 29.18	*
* Q Total (cfs)	* 1815.00	* Flow (cfs)	* 797.54	* 1001.46	* 16.00	*
* Top Width (ft)	* 138.86	* Top Width (ft)	* 94.93	* 29.07	* 14.85	*
* Vel Total (ft/s)	* 3.50	* Avg. Vel. (ft/s)	* 3.61	* 3.73	* 0.55	*
* Max Chl Dpth (ft)	* 11.72	* Hydr. Depth (ft)	* 3.16	* 9.25	* 1.96	*
* Conv. Total (cfs)	* 75390.2	* Conv. (cfs)	* 33127.6	* 41597.9	* 664.8	*
* Length Wtd. (ft)	* 29.94	* Wetted Per. (ft)	* 70.86	* 38.63	* 15.36	*
* Min Ch El (ft)	* 239.32	* Shear (lb/sq ft)	* 0.11	* 0.25	* 0.07	*

```

* Alpha * 1.09 * Stream Power (lb/ft s) * 194.32 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.02 * Cum Volume (acre-ft) * 1.60 * 6.23 * 2.90 *
* C & E Loss (ft) * 0.00 * Cum SA (acres) * 0.94 * 1.37 * 1.84 *
*****

```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
REACH: main RS: 24

INPUT

Description:

```

Station Elevation Data num= 26
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
*****
0 254.15 60 249.15 72.46 248.78 93.03 247.76 97.13 247.24
109.77 247.72 125.05 247.56 126.78 247.48 128.29 247.42 129 247.97
134.47 248.34 134.6 249.05 135.81 248.92 136.29 242.7 136.51 238.47
137.41 237.99 142.41 237.72 142.42 237.71 147.58 238.1 148.73 238.76
148.9 242.62 149.32 249.18 149.64 249.21 149.95 249.15 171.17 251.7
181.17 253.7

```

```

Manning's n Values num= 4
Sta n Val Sta n Val Sta n Val Sta n Val
*****
0 .02 129 .045 135.81 .035 149.95 .1

```

```

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
135.81 149.32 56.73 43.07 39.13 .1 .3

```

```

Ineffective Flow num= 1
Sta L Sta R Elev Permanent
0 70.7 260 F

```

```

Blocked Obstructions num= 1
Sta L Sta R Elev
*****
171.7 181.17 260

```

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft) * 248.21 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.00 * Wt. n-Val. * 0.020 * 0.035 * *
* W.S. Elev (ft) * 248.21 * Reach Len. (ft) * 56.73 * 43.07 * 39.13 *
* Crit W.S. (ft) * 238.38 * Flow Area (sq ft) * 25.92 * 130.38 * *
* E.G. Slope (ft/ft) * 0.000002 * Area (sq ft) * 25.92 * 130.38 * *
* Q Total (cfs) * 21.00 * Flow (cfs) * 1.76 * 19.24 * *
* Top Width (ft) * 61.91 * Top Width (ft) * 48.52 * 13.39 * *
* Vel Total (ft/s) * 0.13 * Avg. Vel. (ft/s) * 0.07 * 0.15 * *
* Max Chl Dpth (ft) * 10.50 * Hydr. Depth (ft) * 0.53 * 9.74 * *
* Conv. Total (cfs) * 15486.6 * Conv. (cfs) * 1296.2 * 14190.4 * *
* Length Wtd. (ft) * 43.30 * Wetted Per. (ft) * 48.77 * 31.77 * *
* Min Ch El (ft) * 237.71 * Shear (lb/sq ft) * 0.00 * 0.00 * *
* Alpha * 1.13 * Stream Power (lb/ft s) * 181.17 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.00 * Cum Volume (acre-ft) * 0.11 * 2.16 * 0.05 *
* C & E Loss (ft) * 0.01 * Cum SA (acres) * 0.16 * 0.98 * 0.14 *
*****

```

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft) * 250.32 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.10 * Wt. n-Val. * 0.021 * 0.035 * 0.076 *
* W.S. Elev (ft) * 250.23 * Reach Len. (ft) * 56.73 * 43.07 * 39.13 *
* Crit W.S. (ft) * 242.91 * Flow Area (sq ft) * 151.80 * 157.59 * 5.47 *
* E.G. Slope (ft/ft) * 0.000411 * Area (sq ft) * 171.95 * 157.59 * 5.47 *
* Q Total (cfs) * 767.00 * Flow (cfs) * 384.28 * 381.20 * 1.53 *
* Top Width (ft) * 111.81 * Top Width (ft) * 88.72 * 13.51 * 9.58 *

```

* Vel Total (ft/s)	* 2.44	* Avg. Vel. (ft/s)	* 2.53	* 2.42	* 0.28	*
* Max Chl Dpth (ft)	* 12.52	* Hydr. Depth (ft)	* 2.33	* 11.66	* 0.57	*
* Conv. Total (cfs)	* 37829.5	* Conv. (cfs)	* 18953.0	* 18801.2	* 75.3	*
* Length Wtd. (ft)	* 46.18	* Wetted Per. (ft)	* 65.98	* 33.45	* 9.65	*
* Min Ch El (ft)	* 237.71	* Shear (lb/sq ft)	* 0.06	* 0.12	* 0.01	*
* Alpha	* 1.03	* Stream Power (lb/ft s)	* 181.17	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.05	* Cum Volume (acre-ft)	* 0.86	* 4.88	* 1.62	*
* C & E Loss (ft)	* 0.06	* Cum SA (acres)	* 0.68	* 1.33	* 1.61	*

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 252.04	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 0.34	* Wt. n-Val.	* 0.021	* 0.035	* 0.087	*
* W.S. Elev (ft)	* 251.70	* Reach Len. (ft)	* 56.73	* 43.07	* 39.13	*
* Crit W.S. (ft)	* 249.18	* Flow Area (sq ft)	* 247.75	* 177.50	* 28.62	*
* E.G. Slope (ft/ft)	* 0.000891	* Area (sq ft)	* 315.72	* 177.50	* 28.62	*
* Q Total (cfs)	* 1972.00	* Flow (cfs)	* 1269.89	* 684.40	* 17.71	*
* Top Width (ft)	* 141.75	* Top Width (ft)	* 106.40	* 13.51	* 21.84	*
* Vel Total (ft/s)	* 4.34	* Avg. Vel. (ft/s)	* 5.13	* 3.86	* 0.62	*
* Max Chl Dpth (ft)	* 13.99	* Hydr. Depth (ft)	* 3.81	* 13.14	* 1.31	*
* Conv. Total (cfs)	* 66053.7	* Conv. (cfs)	* 42536.1	* 22924.4	* 593.3	*
* Length Wtd. (ft)	* 47.44	* Wetted Per. (ft)	* 65.98	* 33.45	* 22.00	*
* Min Ch El (ft)	* 237.71	* Shear (lb/sq ft)	* 0.21	* 0.30	* 0.07	*
* Alpha	* 1.17	* Stream Power (lb/ft s)	* 181.17	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.08	* Cum Volume (acre-ft)	* 1.95	* 7.16	* 4.10	*
* C & E Loss (ft)	* 0.08	* Cum SA (acres)	* 0.96	* 1.36	* 2.16	*

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 252.97	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 0.54	* Wt. n-Val.	* 0.021	* 0.035	* 0.089	*
* W.S. Elev (ft)	* 252.42	* Reach Len. (ft)	* 56.73	* 43.07	* 39.13	*
* Crit W.S. (ft)	* 249.76	* Flow Area (sq ft)	* 294.84	* 187.27	* 44.78	*
* E.G. Slope (ft/ft)	* 0.001139	* Area (sq ft)	* 395.80	* 187.27	* 44.78	*
* Q Total (cfs)	* 2800.00	* Flow (cfs)	* 1914.81	* 846.01	* 39.18	*
* Top Width (ft)	* 150.97	* Top Width (ft)	* 115.08	* 13.51	* 22.38	*
* Vel Total (ft/s)	* 5.31	* Avg. Vel. (ft/s)	* 6.49	* 4.52	* 0.88	*
* Max Chl Dpth (ft)	* 14.71	* Hydr. Depth (ft)	* 4.53	* 13.86	* 2.00	*
* Conv. Total (cfs)	* 82958.9	* Conv. (cfs)	* 56732.3	* 25065.6	* 1161.0	*
* Length Wtd. (ft)	* 47.78	* Wetted Per. (ft)	* 65.98	* 33.45	* 23.17	*
* Min Ch El (ft)	* 237.71	* Shear (lb/sq ft)	* 0.32	* 0.40	* 0.14	*
* Alpha	* 1.24	* Stream Power (lb/ft s)	* 181.17	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.09	* Cum Volume (acre-ft)	* 2.56	* 8.35	* 5.44	*
* C & E Loss (ft)	* 0.09	* Cum SA (acres)	* 1.15	* 1.37	* 2.47	*

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

* E.G. Elev (ft)	* 250.46	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 0.11	* Wt. n-Val.	* 0.021	* 0.035	* 0.077	*
* W.S. Elev (ft)	* 250.35	* Reach Len. (ft)	* 56.73	* 43.07	* 39.13	*
* Crit W.S. (ft)	* 243.25	* Flow Area (sq ft)	* 160.06	* 159.30	* 6.75	*
* E.G. Slope (ft/ft)	* 0.000451	* Area (sq ft)	* 183.30	* 159.30	* 6.75	*

```

* Q Total (cfs)          * 848.00 * Flow (cfs)           * 439.29 * 406.64 * 2.07 *
* Top Width (ft)        * 114.38 * Top Width (ft)       * 90.24 * 13.51 * 10.64 *
* Vel Total (ft/s)      * 2.60 * Avg. Vel. (ft/s)     * 2.74 * 2.55 * 0.31 *
* Max Chl Dpth (ft)    * 12.64 * Hydr. Depth (ft)     * 2.46 * 11.79 * 0.63 *
* Conv. Total (cfs)     * 39921.2 * Conv. (cfs)          * 20680.4 * 19143.2 * 97.6 *
* Length Wtd. (ft)     * 46.33 * Wetted Per. (ft)     * 65.98 * 33.45 * 10.72 *
* Min Ch El (ft)       * 237.71 * Shear (lb/sq ft)     * 0.07 * 0.13 * 0.02 *
* Alpha                 * 1.04 * Stream Power (lb/ft s) * 181.17 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 0.05 * Cum Volume (acre-ft) * 0.96 * 5.12 * 1.86 *
* C & E Loss (ft)      * 0.06 * Cum SA (acres)       * 0.71 * 1.33 * 1.66 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft)        * 251.23 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)         * 0.21 * Wt. n-Val.           * 0.021 * 0.035 * 0.083 *
* W.S. Elev (ft)        * 251.02 * Reach Len. (ft)      * 56.73 * 43.07 * 39.13 *
* Crit W.S. (ft)        * 245.14 * Flow Area (sq ft)    * 203.67 * 168.35 * 15.74 *
* E.G. Slope (ft/ft)    * 0.000668 * Area (sq ft)         * 246.44 * 168.35 * 15.74 *
* Q Total (cfs)         * 1345.00 * Flow (cfs)           * 795.29 * 542.49 * 7.22 *
* Top Width (ft)        * 128.00 * Top Width (ft)       * 98.28 * 13.51 * 16.21 *
* Vel Total (ft/s)      * 3.47 * Avg. Vel. (ft/s)     * 3.90 * 3.22 * 0.46 *
* Max Chl Dpth (ft)    * 13.31 * Hydr. Depth (ft)     * 3.13 * 12.46 * 0.97 *
* Conv. Total (cfs)     * 52039.5 * Conv. (cfs)          * 30770.5 * 20989.6 * 279.4 *
* Length Wtd. (ft)     * 46.99 * Wetted Per. (ft)     * 65.98 * 33.45 * 16.33 *
* Min Ch El (ft)       * 237.71 * Shear (lb/sq ft)     * 0.13 * 0.21 * 0.04 *
* Alpha                 * 1.10 * Stream Power (lb/ft s) * 181.17 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 0.07 * Cum Volume (acre-ft) * 1.43 * 6.08 * 2.89 *
* C & E Loss (ft)      * 0.07 * Cum SA (acres)       * 0.87 * 1.35 * 1.82 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main RS: 23

INPUT

Description:

```

Station Elevation Data num= 19
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
*****
0 254.07 15.27 252.06 55.01 251.27 84.23 250.85 85.26 252.54
95.97 251.03 137.5 248.34 155.94 247.85 164.02 247.66 175.66 248.1
191.18 247.93 191.2 247.93 192.2 247.92 193.74 247.81 194.32 247.97
201.36 248.28 223.71 250.13 236.5 251.33 259.04 252.83

```

```

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
*****
0 .045 15.27 .02 201.36 .065

```

```

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
137.5 175.66 137.63 144.4 148.07 .1 .3
Ineffective Flow num= 3
Sta L Sta R Elev Permanent
41.6 98 260 F
98 123.5 260 F
236.2 259.04 260 F

```

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft)        * 248.20 * Element              * Left OB * Channel * Right OB *

```

```

* Vel Head (ft)          * 0.09 * Wt. n-Val.          * 0.020 * 0.020 *
* W.S. Elev (ft)        * 248.11 * Reach Len. (ft)    * 137.63 * 144.40 * 148.07 *
* Crit W.S. (ft)        * 248.11 * Flow Area (sq ft)  * 6.81 * 2.39 *
* E.G. Slope (ft/ft)    * 0.008263 * Area (sq ft)      * 6.81 * 2.39 *
* Q Total (cfs)         * 21.00 * Flow (cfs)         * 17.32 * 3.68 *
* Top Width (ft)        * 51.34 * Top Width (ft)     * 29.50 * 21.84 *
* Vel Total (ft/s)      * 2.28 * Avg. Vel. (ft/s)   * 2.54 * 1.54 *
* Max Chl Dpth (ft)     * 0.45 * Hydr. Depth (ft)   * 0.23 * 0.11 *
* Conv. Total (cfs)     * 231.0 * Conv. (cfs)        * 190.5 * 40.5 *
* Length Wtd. (ft)      * 144.75 * Wetted Per. (ft)   * 29.51 * 21.87 *
* Min Ch El (ft)        * 247.66 * Shear (lb/sq ft)   * 0.12 * 0.06 *
* Alpha                 * 1.10 * Stream Power (lb/ft s) * 259.04 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.00 * Cum Volume (acre-ft) * 0.09 * 2.09 * 0.05 *
* C & E Loss (ft)       * 0.03 * Cum SA (acres)     * 0.13 * 0.96 * 0.13 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)        * 250.22 * Element            * Left OB * Channel * Right OB *
* Vel Head (ft)         * 0.65 * Wt. n-Val.         * 0.020 * 0.020 * 0.022 *
* W.S. Elev (ft)        * 249.56 * Reach Len. (ft)    * 137.63 * 144.40 * 148.07 *
* Crit W.S. (ft)        * 249.56 * Flow Area (sq ft)  * 10.80 * 61.33 * 49.42 *
* E.G. Slope (ft/ft)    * 0.004871 * Area (sq ft)      * 11.58 * 61.33 * 49.42 *
* Q Total (cfs)         * 767.00 * Flow (cfs)         * 47.02 * 436.23 * 283.75 *
* Top Width (ft)        * 98.29 * Top Width (ft)     * 18.91 * 38.16 * 41.22 *
* Vel Total (ft/s)      * 6.31 * Avg. Vel. (ft/s)   * 4.35 * 7.11 * 5.74 *
* Max Chl Dpth (ft)     * 1.90 * Hydr. Depth (ft)   * 0.77 * 1.61 * 1.20 *
* Conv. Total (cfs)     * 10989.7 * Conv. (cfs)        * 673.7 * 6250.3 * 4065.6 *
* Length Wtd. (ft)      * 144.87 * Wetted Per. (ft)   * 14.03 * 38.18 * 41.31 *
* Min Ch El (ft)        * 247.66 * Shear (lb/sq ft)   * 0.23 * 0.49 * 0.36 *
* Alpha                 * 1.06 * Stream Power (lb/ft s) * 259.04 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.06 * Cum Volume (acre-ft) * 0.74 * 4.77 * 1.60 *
* C & E Loss (ft)       * 0.17 * Cum SA (acres)     * 0.61 * 1.30 * 1.59 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)        * 251.88 * Element            * Left OB * Channel * Right OB *
* Vel Head (ft)         * 1.16 * Wt. n-Val.         * 0.020 * 0.020 * 0.024 *
* W.S. Elev (ft)        * 250.72 * Reach Len. (ft)    * 137.63 * 144.40 * 148.07 *
* Crit W.S. (ft)        * 250.72 * Flow Area (sq ft)  * 27.02 * 105.56 * 105.06 *
* E.G. Slope (ft/ft)    * 0.004482 * Area (sq ft)      * 43.86 * 105.56 * 105.06 *
* Q Total (cfs)         * 1972.00 * Flow (cfs)         * 208.09 * 1034.34 * 729.57 *

```

* Top Width (ft)	* 129.34	* Top Width (ft)	* 36.80	* 38.16	* 54.38	*
* Vel Total (ft/s)	* 8.30	* Avg. Vel. (ft/s)	* 7.70	* 9.80	* 6.94	*
* Max Chl Dpth (ft)	* 3.06	* Hydr. Depth (ft)	* 1.93	* 2.77	* 1.93	*
* Conv. Total (cfs)	* 29457.1	* Conv. (cfs)	* 3108.4	* 15450.6	* 10898.1	*
* Length Wtd. (ft)	* 144.76	* Wetted Per. (ft)	* 14.03	* 38.18	* 54.52	*
* Min Ch El (ft)	* 247.66	* Shear (lb/sq ft)	* 0.54	* 0.77	* 0.54	*
* Alpha	* 1.08	* Stream Power (lb/ft s)	* 259.04	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.13	* Cum Volume (acre-ft)	* 1.72	* 7.02	* 4.04	*
* C & E Loss (ft)	* 0.28	* Cum SA (acres)	* 0.87	* 1.34	* 2.12	*

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 252.78	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 1.42	* Wt. n-Val.	* 0.020	* 0.020	* 0.025	*
* W.S. Elev (ft)	* 251.37	* Reach Len. (ft)	* 137.63	* 144.40	* 148.07	*
* Crit W.S. (ft)	* 251.37	* Flow Area (sq ft)	* 36.02	* 130.08	* 142.17	*
* E.G. Slope (ft/ft)	* 0.004263	* Area (sq ft)	* 79.47	* 130.08	* 142.19	*
* Q Total (cfs)	* 2800.00	* Flow (cfs)	* 327.58	* 1428.69	* 1043.73	*
* Top Width (ft)	* 177.83	* Top Width (ft)	* 78.28	* 38.16	* 61.38	*
* Vel Total (ft/s)	* 9.08	* Avg. Vel. (ft/s)	* 9.10	* 10.98	* 7.34	*
* Max Chl Dpth (ft)	* 3.71	* Hydr. Depth (ft)	* 2.57	* 3.41	* 2.35	*
* Conv. Total (cfs)	* 42885.1	* Conv. (cfs)	* 5017.3	* 21882.0	* 15985.8	*
* Length Wtd. (ft)	* 144.75	* Wetted Per. (ft)	* 14.03	* 38.18	* 60.70	*
* Min Ch El (ft)	* 247.66	* Shear (lb/sq ft)	* 0.68	* 0.91	* 0.62	*
* Alpha	* 1.11	* Stream Power (lb/ft s)	* 259.04	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.16	* Cum Volume (acre-ft)	* 2.25	* 8.19	* 5.36	*
* C & E Loss (ft)	* 0.32	* Cum SA (acres)	* 1.02	* 1.35	* 2.43	*

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

* E.G. Elev (ft)	* 250.35	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 0.70	* Wt. n-Val.	* 0.020	* 0.020	* 0.022	*
* W.S. Elev (ft)	* 249.66	* Reach Len. (ft)	* 137.63	* 144.40	* 148.07	*
* Crit W.S. (ft)	* 249.66	* Flow Area (sq ft)	* 12.11	* 64.91	* 53.34	*
* E.G. Slope (ft/ft)	* 0.004838	* Area (sq ft)	* 13.42	* 64.91	* 53.34	*
* Q Total (cfs)	* 848.00	* Flow (cfs)	* 56.74	* 477.87	* 313.39	*
* Top Width (ft)	* 100.87	* Top Width (ft)	* 20.36	* 38.16	* 42.35	*
* Vel Total (ft/s)	* 6.50	* Avg. Vel. (ft/s)	* 4.69	* 7.36	* 5.88	*


```

* Max Chl Dpth (ft)      * 2.00 * Hydr. Depth (ft)      * 0.87 * 1.70 * 1.26 *
* Conv. Total (cfs)     * 12192.0 * Conv. (cfs)          * 815.8 * 6870.4 * 4505.7 *
* Length Wtd. (ft)     * 144.85 * Wetted Per. (ft)    * 14.03 * 38.18 * 42.44 *
* Min Ch El (ft)       * 247.66 * Shear (lb/sq ft)    * 0.26 * 0.51 * 0.38 *
* Alpha                 * 1.06 * Stream Power (lb/ft s) * 259.04 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 0.07 * Cum Volume (acre-ft) * 0.83 * 5.01 * 1.83 *
* C & E Loss (ft)      * 0.18 * Cum SA (acres)      * 0.63 * 1.31 * 1.63 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft)        * 251.09 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)        * 0.92  * Wt. n-Val.          * 0.020  * 0.020  * 0.023  *
* W.S. Elev (ft)       * 250.17 * Reach Len. (ft)     * 137.63 * 144.40 * 148.07 *
* Crit W.S. (ft)      * 250.17 * Flow Area (sq ft)   * 19.32  * 84.56  * 76.75  *
* E.G. Slope (ft/ft)   * 0.004648 * Area (sq ft)       * 25.95  * 84.56  * 76.75  *
* Q Total (cfs)        * 1345.00 * Flow (cfs)         * 121.13 * 727.81 * 496.05 *
* Top Width (ft)       * 114.98 * Top Width (ft)     * 28.31  * 38.16  * 48.51  *
* Vel Total (ft/s)     * 7.45  * Avg. Vel. (ft/s)   * 6.27  * 8.61  * 6.46  *
* Max Chl Dpth (ft)    * 2.51  * Hydr. Depth (ft)   * 1.38  * 2.22  * 1.58  *
* Conv. Total (cfs)    * 19728.6 * Conv. (cfs)        * 1776.8 * 10675.7 * 7276.2 *
* Length Wtd. (ft)    * 144.80 * Wetted Per. (ft)   * 14.03  * 38.18  * 48.62  *
* Min Ch El (ft)      * 247.66 * Shear (lb/sq ft)   * 0.40  * 0.64  * 0.46  *
* Alpha                * 1.06  * Stream Power (lb/ft s) * 259.04 * 0.00  * 0.00  *
* Frctn Loss (ft)     * 0.10  * Cum Volume (acre-ft) * 1.25  * 5.96  * 2.84  *
* C & E Loss (ft)     * 0.23  * Cum SA (acres)     * 0.79  * 1.33  * 1.80  *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main

RS: 22

INPUT

Description:

```

Station Elevation Data      num=      19
  Sta   Elev   Sta   Elev   Sta   Elev   Sta   Elev   Sta   Elev
*****
    0  250.46   10  248.96   38.8  247.46   41.23  247.16   67.56  245.11
  69.74  244.24  88.51  243.41  131.51  242.21  173.95  244.31  187.66  245.29

```

205 246.52 209.72 246.55 227.37 247.13 246.92 246.89 248.31 246.92
249.03 247.41 256.37 249.28 259.86 252.92 263.46 253.75

Manning's n Values num= 2
Sta n Val Sta n Val

0 .02 249.03 .065

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
69.74 173.95 64.31 54.94 42.91 .1 .3
Ineffective Flow num= 1
Sta L Sta R Elev Permanent
69.74 105 255 F
Blocked Obstructions num= 1
Sta L Sta R Elev

10 38.8 260

CROSS SECTION OUTPUT Profile #2-YR

* E.G. Elev (ft) * 245.45 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.00 * Wt. n-Val. * 0.020 * 0.020 * 0.020 *
* W.S. Elev (ft) * 245.45 * Reach Len. (ft) * 64.31 * 54.94 * 42.91 *
* Crit W.S. (ft) * 242.72 * Flow Area (sq ft) * 2.44 * 169.09 * 9.11 *
* E.G. Slope (ft/ft) * 0.000001 * Area (sq ft) * 2.44 * 237.06 * 9.11 *
* Q Total (cfs) * 21.00 * Flow (cfs) * 0.08 * 20.50 * 0.42 *
* Top Width (ft) * 126.75 * Top Width (ft) * 6.56 * 104.21 * 15.98 *
* Vel Total (ft/s) * 0.12 * Avg. Vel. (ft/s) * 0.03 * 0.12 * 0.05 *
* Max Chl Dpth (ft) * 3.24 * Hydr. Depth (ft) * 0.37 * 2.45 * 0.57 *
* Conv. Total (cfs) * 23388.6 * Conv. (cfs) * 92.0 * 22832.3 * 464.3 *
* Length Wtd. (ft) * 54.60 * Wetted Per. (ft) * 6.74 * 69.01 * 16.02 *
* Min Ch El (ft) * 242.21 * Shear (lb/sq ft) * 0.00 * 0.00 * 0.00 *
* Alpha * 1.07 * Stream Power (lb/ft s) * 263.46 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.00 * Cum Volume (acre-ft) * 0.08 * 1.69 * 0.03 *
* C & E Loss (ft) * 0.00 * Cum SA (acres) * 0.12 * 0.74 * 0.06 *

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft) * 247.29 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.07 * Wt. n-Val. * 0.020 * 0.020 * 0.020 *
* W.S. Elev (ft) * 247.21 * Reach Len. (ft) * 64.31 * 54.94 * 42.91 *
* Crit W.S. (ft) * 244.57 * Flow Area (sq ft) * 33.94 * 290.63 * 70.05 *
* E.G. Slope (ft/ft) * 0.000143 * Area (sq ft) * 33.94 * 420.74 * 70.05 *
* Q Total (cfs) * 767.00 * Flow (cfs) * 33.38 * 674.08 * 59.54 *
* Top Width (ft) * 207.94 * Top Width (ft) * 28.94 * 104.21 * 74.79 *
* Vel Total (ft/s) * 1.94 * Avg. Vel. (ft/s) * 0.98 * 2.32 * 0.85 *
* Max Chl Dpth (ft) * 5.00 * Hydr. Depth (ft) * 1.17 * 4.22 * 0.94 *
* Conv. Total (cfs) * 64070.0 * Conv. (cfs) * 2788.4 * 56307.9 * 4973.6 *
* Length Wtd. (ft) * 54.44 * Wetted Per. (ft) * 29.19 * 69.01 * 74.97 *
* Min Ch El (ft) * 242.21 * Shear (lb/sq ft) * 0.01 * 0.04 * 0.01 *
* Alpha * 1.28 * Stream Power (lb/ft s) * 263.46 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.01 * Cum Volume (acre-ft) * 0.67 * 3.97 * 1.39 *
* C & E Loss (ft) * 0.00 * Cum SA (acres) * 0.53 * 1.07 * 1.39 *

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft) * 248.40 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.23 * Wt. n-Val. * 0.020 * 0.020 * 0.020 *
* W.S. Elev (ft) * 248.17 * Reach Len. (ft) * 64.31 * 54.94 * 42.91 *
* Crit W.S. (ft) * 246.02 * Flow Area (sq ft) * 63.29 * 356.58 * 142.97 *
* E.G. Slope (ft/ft) * 0.000369 * Area (sq ft) * 63.29 * 520.43 * 142.97 *
* Q Total (cfs) * 1972.00 * Flow (cfs) * 142.55 * 1520.59 * 308.87 *
* Top Width (ft) * 213.21 * Top Width (ft) * 30.94 * 104.21 * 78.06 *
* Vel Total (ft/s) * 3.50 * Avg. Vel. (ft/s) * 2.25 * 4.26 * 2.16 *
* Max Chl Dpth (ft) * 5.96 * Hydr. Depth (ft) * 2.05 * 5.17 * 1.83 *
* Conv. Total (cfs) * 102685.6 * Conv. (cfs) * 7422.8 * 79179.6 * 16083.2 *

```

* Length Wtd. (ft)      * 53.77 * Wetted Per. (ft)      * 31.92 * 69.01 * 78.40 *
* Min Ch El (ft)       * 242.21 * Shear (lb/sq ft)     * 0.05 * 0.12 * 0.04 *
* Alpha                * 1.23 * Stream Power (lb/ft s) * 263.46 * 0.00 * 0.00 *
* Frctn Loss (ft)     * 0.02 * Cum Volume (acre-ft) * 1.55 * 5.98 * 3.62 *
* C & E Loss (ft)     * 0.00 * Cum SA (acres)       * 0.76 * 1.10 * 1.90 *
*****

```

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)       * 249.01 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)       * 0.34 * Wt. n-Val.          * 0.020 * 0.020 * 0.020 *
* W.S. Elev (ft)      * 248.67 * Reach Len. (ft)     * 64.31 * 54.94 * 42.91 *
* Crit W.S. (ft)      * 246.78 * Flow Area (sq ft)   * 78.66 * 390.82 * 182.22 *
* E.G. Slope (ft/ft)  * 0.000489 * Area (sq ft)       * 78.66 * 572.17 * 182.22 *
* Q Total (cfs)       * 2800.00 * Flow (cfs)         * 233.47 * 2040.88 * 525.65 *
* Top Width (ft)     * 215.16 * Top Width (ft)     * 30.94 * 104.21 * 80.01 *
* Vel Total (ft/s)    * 4.30 * Avg. Vel. (ft/s)   * 2.97 * 5.22 * 2.88 *
* Max Chl Dpth (ft)  * 6.46 * Hydr. Depth (ft)   * 2.54 * 5.67 * 2.28 *
* Conv. Total (cfs)   * 126564.9 * Conv. (cfs)        * 10553.3 * 92251.2 * 23760.4 *
* Length Wtd. (ft)   * 53.54 * Wetted Per. (ft)   * 32.41 * 69.01 * 80.41 *
* Min Ch El (ft)     * 242.21 * Shear (lb/sq ft)   * 0.07 * 0.17 * 0.07 *
* Alpha              * 1.20 * Stream Power (lb/ft s) * 263.46 * 0.00 * 0.00 *
* Frctn Loss (ft)    * 0.03 * Cum Volume (acre-ft) * 2.00 * 7.02 * 4.81 *
* C & E Loss (ft)    * 0.01 * Cum SA (acres)     * 0.85 * 1.11 * 2.19 *
*****

```

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

```

*****
* E.G. Elev (ft)       * 247.38 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)       * 0.09 * Wt. n-Val.          * 0.020 * 0.020 * 0.020 *
* W.S. Elev (ft)      * 247.30 * Reach Len. (ft)     * 64.31 * 54.94 * 42.91 *
* Crit W.S. (ft)      * 244.69 * Flow Area (sq ft)   * 36.34 * 296.28 * 76.18 *
* E.G. Slope (ft/ft)  * 0.000160 * Area (sq ft)       * 36.34 * 429.28 * 76.18 *
* Q Total (cfs)       * 848.00 * Flow (cfs)         * 38.99 * 736.63 * 72.38 *
* Top Width (ft)     * 208.73 * Top Width (ft)     * 29.61 * 104.21 * 74.91 *
* Vel Total (ft/s)    * 2.07 * Avg. Vel. (ft/s)   * 1.07 * 2.49 * 0.95 *
* Max Chl Dpth (ft)  * 5.09 * Hydr. Depth (ft)   * 1.23 * 4.30 * 1.02 *
* Conv. Total (cfs)   * 66936.0 * Conv. (cfs)        * 3077.8 * 58144.8 * 5713.3 *
* Length Wtd. (ft)   * 54.38 * Wetted Per. (ft)   * 29.86 * 69.01 * 75.12 *
* Min Ch El (ft)     * 242.21 * Shear (lb/sq ft)   * 0.01 * 0.04 * 0.01 *
* Alpha              * 1.28 * Stream Power (lb/ft s) * 263.46 * 0.00 * 0.00 *
* Frctn Loss (ft)    * 0.01 * Cum Volume (acre-ft) * 0.75 * 4.19 * 1.61 *
* C & E Loss (ft)    * 0.00 * Cum SA (acres)     * 0.55 * 1.07 * 1.43 *
*****

```

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft)       * 247.88 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)       * 0.15 * Wt. n-Val.          * 0.020 * 0.020 * 0.020 *
* W.S. Elev (ft)      * 247.72 * Reach Len. (ft)     * 64.31 * 54.94 * 42.91 *
* Crit W.S. (ft)      * 245.32 * Flow Area (sq ft)   * 49.51 * 325.87 * 108.59 *
* E.G. Slope (ft/ft)  * 0.000260 * Area (sq ft)       * 49.51 * 474.01 * 108.59 *
* Q Total (cfs)       * 1345.00 * Flow (cfs)         * 80.27 * 1099.13 * 165.60 *
* Top Width (ft)     * 211.47 * Top Width (ft)     * 30.94 * 104.21 * 76.32 *
* Vel Total (ft/s)    * 2.78 * Avg. Vel. (ft/s)   * 1.62 * 3.37 * 1.52 *
* Max Chl Dpth (ft)  * 5.51 * Hydr. Depth (ft)   * 1.60 * 4.73 * 1.42 *
* Conv. Total (cfs)   * 83387.3 * Conv. (cfs)        * 4976.3 * 68143.9 * 10267.1 *
* Length Wtd. (ft)   * 54.06 * Wetted Per. (ft)   * 31.47 * 69.01 * 76.60 *
* Min Ch El (ft)     * 242.21 * Shear (lb/sq ft)   * 0.03 * 0.08 * 0.02 *
* Alpha              * 1.26 * Stream Power (lb/ft s) * 263.46 * 0.00 * 0.00 *
* Frctn Loss (ft)    * 0.02 * Cum Volume (acre-ft) * 1.14 * 5.03 * 2.53 *
* C & E Loss (ft)    * 0.00 * Cum SA (acres)     * 0.69 * 1.09 * 1.58 *
*****

```

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
 REACH: main RS: 21

INPUT

Description:

Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	249.42	10.57	248.36	13.32	247.71	16.3	247.83	26.72	247.43
78.36	244.83	131.7	244.06	176.63	243.25	179.14	242.74	180.46	242.71
182.19	243.5	198.52	244.18	198.53	244.18	202.29	244.34	234.93	246.54
235.11	246.71	238.89	246.66	238.97	246.53	256.85	247.09	273.74	246.59
275.05	246.55	275.75	247.11	280.06	248.2	280.44	251.57	281.22	251.84
281.48	252.03	288.6	253.57						

Manning's n Values num= 2

Sta	n	Sta	n
0	.02	275.05	.065

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

131.7	198.53	58.42	63.24	66.37	.1	.3
-------	--------	-------	-------	-------	----	----

Ineffective Flow num= 3

Sta L	Sta R	Elev	Permanent
21.5	35.5	260	F
81	93.3	260	F
93.3	131	260	F

CROSS SECTION OUTPUT Profile #2-YR

* E.G. Elev (ft)	* 245.45	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.00	* Wt. n-Val.	* 0.020	* 0.020	* 0.020
* W.S. Elev (ft)	* 245.45	* Reach Len. (ft)	* 58.42	* 63.24	* 66.37
* Crit W.S. (ft)	* 243.61	* Flow Area (sq ft)	* 6.48	* 120.81	* 13.63
* E.G. Slope (ft/ft)	* 0.000002	* Area (sq ft)	* 57.47	* 120.81	* 13.63
* Q Total (cfs)	* 21.00	* Flow (cfs)	* 0.39	* 19.47	* 1.14
* Top Width (ft)	* 152.74	* Top Width (ft)	* 65.67	* 66.83	* 20.24
* Vel Total (ft/s)	* 0.15	* Avg. Vel. (ft/s)	* 0.06	* 0.16	* 0.08
* Max Chl Dpth (ft)	* 2.74	* Hydr. Depth (ft)	* 0.41	* 1.81	* 0.67
* Conv. Total (cfs)	* 14332.0	* Conv. (cfs)	* 267.4	* 13287.8	* 776.8
* Length Wtd. (ft)	* 63.28	* Wetted Per. (ft)	* 15.68	* 67.07	* 20.28
* Min Ch El (ft)	* 242.71	* Shear (lb/sq ft)	* 0.00	* 0.00	* 0.00
* Alpha	* 1.10	* Stream Power (lb/ft s)	* 288.60	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.00	* Cum Volume (acre-ft)	* 0.04	* 1.46	* 0.02
* C & E Loss (ft)	* 0.01	* Cum SA (acres)	* 0.06	* 0.63	* 0.05

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 247.28	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.08	* Wt. n-Val.	* 0.020	* 0.020	* 0.020
* W.S. Elev (ft)	* 247.20	* Reach Len. (ft)	* 58.42	* 63.24	* 66.37
* Crit W.S. (ft)	* 245.25	* Flow Area (sq ft)	* 63.86	* 237.76	* 84.80
* E.G. Slope (ft/ft)	* 0.000204	* Area (sq ft)	* 202.79	* 237.76	* 84.80
* Q Total (cfs)	* 767.00	* Flow (cfs)	* 84.11	* 587.12	* 95.77
* Top Width (ft)	* 244.83	* Top Width (ft)	* 100.42	* 66.83	* 77.58
* Vel Total (ft/s)	* 1.98	* Avg. Vel. (ft/s)	* 1.32	* 2.47	* 1.13
* Max Chl Dpth (ft)	* 4.49	* Hydr. Depth (ft)	* 1.38	* 3.56	* 1.09
* Conv. Total (cfs)	* 53649.7	* Conv. (cfs)	* 5883.2	* 41067.4	* 6699.1
* Length Wtd. (ft)	* 63.54	* Wetted Per. (ft)	* 46.25	* 67.07	* 78.02
* Min Ch El (ft)	* 242.71	* Shear (lb/sq ft)	* 0.02	* 0.05	* 0.01
* Alpha	* 1.27	* Stream Power (lb/ft s)	* 288.60	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.04	* Cum Volume (acre-ft)	* 0.49	* 3.56	* 1.32
* C & E Loss (ft)	* 0.04	* Cum SA (acres)	* 0.44	* 0.96	* 1.32

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```
*****
* E.G. Elev (ft)      * 248.38 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.22  * Wt. n-Val.      * 0.020  * 0.020  * 0.020  *
* W.S. Elev (ft)     * 248.16 * Reach Len. (ft) * 58.42  * 63.24  * 66.37  *
* Crit W.S. (ft)     * 246.49 * Flow Area (sq ft) * 111.95 * 301.80 * 160.96 *
* E.G. Slope (ft/ft) * 0.000447 * Area (sq ft)    * 309.97 * 301.80 * 160.96 *
* Q Total (cfs)      * 1972.00 * Flow (cfs)      * 277.78 * 1292.14 * 402.08 *
* Top Width (ft)     * 268.48 * Top Width (ft)  * 120.28 * 66.83  * 81.37  *
* Vel Total (ft/s)   * 3.43  * Avg. Vel. (ft/s) * 2.48   * 4.28   * 2.50   *
* Max Chl Dpth (ft) * 5.45  * Hydr. Depth (ft) * 1.99   * 4.52   * 1.98   *
* Conv. Total (cfs)  * 93267.1 * Conv. (cfs)     * 13137.8 * 61112.8 * 19016.5 *
* Length Wtd. (ft)  * 63.46 * Wetted Per. (ft) * 56.39  * 67.07  * 81.93  *
* Min Ch El (ft)    * 242.71 * Shear (lb/sq ft) * 0.06   * 0.13   * 0.05   *
* Alpha             * 1.20  * Stream Power (lb/ft s) * 288.60 * 0.00   * 0.00   *
* Frctn Loss (ft)   * 0.07  * Cum Volume (acre-ft) * 1.27   * 5.47   * 3.47   *
* C & E Loss (ft)   * 0.05  * Cum SA (acres)   * 0.65   * 0.99   * 1.82   *
*****
```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```
*****
* E.G. Elev (ft)      * 248.97 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.31  * Wt. n-Val.      * 0.020  * 0.020  * 0.020  *
* W.S. Elev (ft)     * 248.66 * Reach Len. (ft) * 58.42  * 63.24  * 66.37  *
* Crit W.S. (ft)     * 247.28 * Flow Area (sq ft) * 141.13 * 335.50 * 202.08 *
* E.G. Slope (ft/ft) * 0.000555 * Area (sq ft)    * 371.41 * 335.50 * 202.08 *
* Q Total (cfs)      * 2800.00 * Flow (cfs)      * 435.54 * 1718.00 * 646.46 *
* Top Width (ft)     * 272.56 * Top Width (ft)  * 124.15 * 66.83  * 81.58  *
* Vel Total (ft/s)   * 4.13  * Avg. Vel. (ft/s) * 3.09   * 5.12   * 3.20   *
* Max Chl Dpth (ft) * 5.95  * Hydr. Depth (ft) * 2.35   * 5.02   * 2.48   *
* Conv. Total (cfs)  * 118818.3 * Conv. (cfs)     * 18482.4 * 72903.4 * 27432.5 *
* Length Wtd. (ft)  * 63.40 * Wetted Per. (ft) * 60.30  * 67.07  * 82.56  *
* Min Ch El (ft)    * 242.71 * Shear (lb/sq ft) * 0.08   * 0.17   * 0.08   *
* Alpha             * 1.17  * Stream Power (lb/ft s) * 288.60 * 0.00   * 0.00   *
* Frctn Loss (ft)   * 0.08  * Cum Volume (acre-ft) * 1.67   * 6.45   * 4.62   *
* C & E Loss (ft)   * 0.06  * Cum SA (acres)   * 0.73   * 1.00   * 2.11   *
*****
```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

```
*****
* E.G. Elev (ft)      * 247.37 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.09  * Wt. n-Val.      * 0.020  * 0.020  * 0.020  *
* W.S. Elev (ft)     * 247.28 * Reach Len. (ft) * 58.42  * 63.24  * 66.37  *
* Crit W.S. (ft)     * 245.36 * Flow Area (sq ft) * 67.66  * 243.25 * 91.18  *
* E.G. Slope (ft/ft) * 0.000224 * Area (sq ft)    * 211.11 * 243.25 * 91.18  *
* Q Total (cfs)      * 848.00 * Flow (cfs)      * 96.89  * 638.16 * 112.95 *
* Top Width (ft)     * 246.79 * Top Width (ft)  * 102.06 * 66.83  * 77.90  *
* Vel Total (ft/s)   * 2.11  * Avg. Vel. (ft/s) * 1.43   * 2.62   * 1.24   *
* Max Chl Dpth (ft) * 4.57  * Hydr. Depth (ft) * 1.46   * 3.64   * 1.17   *
* Conv. Total (cfs)  * 56687.0 * Conv. (cfs)     * 6477.2 * 42659.5 * 7550.3 *
* Length Wtd. (ft)  * 63.54 * Wetted Per. (ft) * 46.25  * 67.07  * 78.36  *
* Min Ch El (ft)    * 242.71 * Shear (lb/sq ft) * 0.02   * 0.05   * 0.02   *
* Alpha             * 1.26  * Stream Power (lb/ft s) * 288.60 * 0.00   * 0.00   *
* Frctn Loss (ft)   * 0.04  * Cum Volume (acre-ft) * 0.57   * 3.77   * 1.53   *
* C & E Loss (ft)   * 0.04  * Cum SA (acres)   * 0.46   * 0.96   * 1.36   *
*****
```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```
*****
* E.G. Elev (ft)      * 247.86 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.15  * Wt. n-Val.      * 0.020  * 0.020  * 0.020  *
* W.S. Elev (ft)     * 247.71 * Reach Len. (ft) * 58.42  * 63.24  * 66.37  *
* Crit W.S. (ft)     * 245.93 * Flow Area (sq ft) * 87.60  * 271.97 * 125.03 *
* E.G. Slope (ft/ft) * 0.000333 * Area (sq ft)    * 257.05 * 271.97 * 125.03 *
* Q Total (cfs)      * 1345.00 * Flow (cfs)      * 176.42 * 937.73 * 230.85 *
* Top Width (ft)     * 258.85 * Top Width (ft)  * 112.41 * 66.83  * 79.60  *
* Vel Total (ft/s)   * 2.78  * Avg. Vel. (ft/s) * 2.01  * 3.45  * 1.85  *
* Max Chl Dpth (ft) * 5.00  * Hydr. Depth (ft) * 1.81  * 4.07  * 1.57  *
* Conv. Total (cfs)  * 73697.0 * Conv. (cfs)     * 9666.8 * 51381.1 * 12649.1 *
* Length Wtd. (ft)  * 63.49 * Wetted Per. (ft) * 48.47 * 67.07 * 80.11 *
* Min Ch El (ft)    * 242.71 * Shear (lb/sq ft) * 0.04  * 0.08  * 0.03  *
* Alpha             * 1.22  * Stream Power (lb/ft s) * 288.60 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 0.05  * Cum Volume (acre-ft) * 0.91  * 4.56  * 2.41  *
* C & E Loss (ft)   * 0.04  * Cum SA (acres)   * 0.59  * 0.98  * 1.51  *
*****
```

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main RS: 20

INPUT

Description:

```
Station Elevation Data      num=      19
  Sta   Elev   Sta   Elev   Sta   Elev   Sta   Elev   Sta   Elev
*****
   0   250.1  27.97 246.72 66.05 246.66 146.74 246.48 188.12 244.94
 205.56 245.09 206.64 245.08 207.66 245.42 207.74 245.42 240.48 246.54
 266.2 246.35 270.04 246.11 270.1 245.88 288 246.13 304.71 245.49
 306.15 245.36 306.76 245.54 311.69 246.58 322.54 252.8
```

```
Manning's n Values      num=      4
  Sta   n Val   Sta   n Val   Sta   n Val   Sta   n Val
*****
   0     .02  207.66   .045  266.2   .02  306.76   .065
```

```
Bank Sta: Left   Right   Lengths: Left Channel   Right   Coeff Contr.   Expan.
          146.74  240.48          50.4  50.32          50          .1          .3
```

```
Ineffective Flow      num=      1
  Sta L   Sta R   Elev Permanent
 239.6   255.3   260      F
```

```
Blocked Obstructions  num=      1
  Sta L   Sta R   Elev
*****
   66   146.7   260
```

CROSS SECTION OUTPUT Profile #2-YR

```
*****
* E.G. Elev (ft)      * 245.44 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.12  * Wt. n-Val.      *          * 0.020  *          *
* W.S. Elev (ft)     * 245.32 * Reach Len. (ft) * 50.40  * 50.32  * 50.00  *
* Crit W.S. (ft)     * 245.32 * Flow Area (sq ft) *          * 7.49  *          *
* E.G. Slope (ft/ft) * 0.008821 * Area (sq ft)    *          * 7.49  *          *
* Q Total (cfs)      * 21.00 * Flow (cfs)      *          * 21.00 *          *
* Top Width (ft)     * 29.34 * Top Width (ft)  *          * 29.34 *          *
* Vel Total (ft/s)   * 2.80  * Avg. Vel. (ft/s) *          * 2.80  *          *
* Max Chl Dpth (ft) * 0.38  * Hydr. Depth (ft) *          * 0.26  *          *
* Conv. Total (cfs)  * 223.6 * Conv. (cfs)     *          * 223.6 *          *
* Length Wtd. (ft)  * 50.23 * Wetted Per. (ft) *          * 29.38 *          *
* Min Ch El (ft)    * 244.94 * Shear (lb/sq ft) *          * 0.14  *          *
* Alpha             * 1.00  * Stream Power (lb/ft s) * 322.54 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 0.54  * Cum Volume (acre-ft) * 0.00  * 1.37  * 0.01  *
* C & E Loss (ft)   * 0.00  * Cum SA (acres)   * 0.02  * 0.56  * 0.03  *
*****
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
 Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)      * 247.21 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.43  * Wt. n-Val.      * 0.020  * 0.022  * 0.022  *
* W.S. Elev (ft)     * 246.78 * Reach Len. (ft) * 50.40  * 50.32  * 50.00  *
* Crit W.S. (ft)     * 246.78 * Flow Area (sq ft) * 3.29  * 104.15 * 42.61  *
* E.G. Slope (ft/ft) * 0.005751 * Area (sq ft)    * 3.29  * 104.37 * 46.91  *
* Q Total (cfs)      * 767.00 * Flow (cfs)      * 3.58  * 576.49 * 186.93 *
* Top Width (ft)     * 203.82 * Top Width (ft)  * 38.53  * 93.74  * 71.55  *
* Vel Total (ft/s)   * 5.11  * Avg. Vel. (ft/s) * 1.09  * 5.54  * 4.39  *
* Max Chl Dpth (ft)  * 1.84  * Hydr. Depth (ft) * 0.09  * 1.12  * 0.75  *
* Conv. Total (cfs)  * 10114.3 * Conv. (cfs)     * 47.2  * 7602.1 * 2465.0 *
* Length Wtd. (ft)   * 50.19 * Wetted Per. (ft) * 38.95  * 92.96  * 57.12  *
* Min Ch El (ft)     * 244.94 * Shear (lb/sq ft) * 0.03  * 0.40  * 0.27  *
* Alpha              * 1.06  * Stream Power (lb/ft s) * 322.54 * 0.00  * 0.00  *
* Frctn Loss (ft)    * 0.30  * Cum Volume (acre-ft) * 0.35  * 3.31  * 1.22  *
* C & E Loss (ft)    * 0.00  * Cum SA (acres)   * 0.34  * 0.84  * 1.20  *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
 Warning: Divided flow computed for this cross-section.
 Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)      * 248.26 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.73  * Wt. n-Val.      * 0.020  * 0.023  * 0.023  *
* W.S. Elev (ft)     * 247.53 * Reach Len. (ft) * 50.40  * 50.32  * 50.00  *
* Crit W.S. (ft)     * 247.53 * Flow Area (sq ft) * 34.56  * 173.87 * 85.69  *
* E.G. Slope (ft/ft) * 0.005577 * Area (sq ft)    * 34.56  * 174.76 * 101.13 *
* Q Total (cfs)      * 1972.00 * Flow (cfs)      * 159.03 * 1268.93 * 544.04 *
* Top Width (ft)     * 211.35 * Top Width (ft)  * 44.75  * 93.74  * 72.86  *
* Vel Total (ft/s)   * 6.70  * Avg. Vel. (ft/s) * 4.60  * 7.30  * 6.35  *
* Max Chl Dpth (ft)  * 2.59  * Hydr. Depth (ft) * 0.77  * 1.87  * 1.48  *
* Conv. Total (cfs)  * 26406.4 * Conv. (cfs)     * 2129.5 * 16991.8 * 7285.0 *
* Length Wtd. (ft)   * 50.21 * Wetted Per. (ft) * 46.71  * 92.96  * 58.63  *
* Min Ch El (ft)     * 244.94 * Shear (lb/sq ft) * 0.26  * 0.65  * 0.51  *
* Alpha              * 1.05  * Stream Power (lb/ft s) * 322.54 * 0.00  * 0.00  *
* Frctn Loss (ft)    * 0.29  * Cum Volume (acre-ft) * 1.04  * 5.12  * 3.27  *
* C & E Loss (ft)    * 0.00  * Cum SA (acres)   * 0.54  * 0.88  * 1.70  *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
 Warning: Divided flow computed for this cross-section.
 Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)      * 248.83 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.91  * Wt. n-Val.      * 0.020  * 0.023  * 0.023  *
* W.S. Elev (ft)     * 247.92 * Reach Len. (ft) * 50.40  * 50.32  * 50.00  *
* Crit W.S. (ft)     * 247.92 * Flow Area (sq ft) * 52.95  * 210.69 * 108.84 *
*****

```

```

* E.G. Slope (ft/ft)      *0.005473 * Area (sq ft)          * 52.95 * 211.92 * 130.16 *
* Q Total (cfs)          * 2800.00 * Flow (cfs)            * 304.60 * 1709.69 * 785.71 *
* Top Width (ft)         * 215.32 * Top Width (ft)        * 48.03 * 93.74 * 73.55 *
* Vel Total (ft/s)       * 7.52   * Avg. Vel. (ft/s)     * 5.75 * 8.11 * 7.22 *
* Max Chl Dpth (ft)     * 2.98   * Hydr. Depth (ft)    * 1.10 * 2.27 * 1.85 *
* Conv. Total (cfs)     * 37848.4 * Conv. (cfs)          * 4117.3 * 23110.4 * 10620.7 *
* Length Wtd. (ft)      * 50.22 * Wetted Per. (ft)     * 50.81 * 92.96 * 59.43 *
* Min Ch El (ft)        * 244.94 * Shear (lb/sq ft)    * 0.36 * 0.77 * 0.63 *
* Alpha                  * 1.03   * Stream Power (lb/ft s) * 322.54 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.29   * Cum Volume (acre-ft) * 1.39 * 6.06 * 4.36 *
* C & E Loss (ft)       * 0.01   * Cum SA (acres)      * 0.62 * 0.89 * 2.00 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

```

*****
* E.G. Elev (ft)         * 247.29 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)         * 0.45  * Wt. n-Val.             * 0.020 * 0.023 * 0.022 *
* W.S. Elev (ft)        * 246.85 * Reach Len. (ft)        * 50.40 * 50.32 * 50.00 *
* Crit W.S. (ft)        * 246.85 * Flow Area (sq ft)      * 6.08 * 110.82 * 46.68 *
* E.G. Slope (ft/ft)    *0.005603 * Area (sq ft)          * 6.08 * 111.10 * 52.06 *
* Q Total (cfs)         * 848.00 * Flow (cfs)            * 9.72 * 626.22 * 212.06 *
* Top Width (ft)        * 204.54 * Top Width (ft)        * 39.13 * 93.74 * 71.68 *
* Vel Total (ft/s)      * 5.18   * Avg. Vel. (ft/s)     * 1.60 * 5.65 * 4.54 *
* Max Chl Dpth (ft)     * 1.91   * Hydr. Depth (ft)    * 0.16 * 1.19 * 0.82 *
* Conv. Total (cfs)     * 11329.3 * Conv. (cfs)          * 129.8 * 8366.4 * 2833.1 *
* Length Wtd. (ft)      * 50.20 * Wetted Per. (ft)     * 39.69 * 92.96 * 57.27 *
* Min Ch El (ft)        * 244.94 * Shear (lb/sq ft)    * 0.05 * 0.42 * 0.29 *
* Alpha                  * 1.07   * Stream Power (lb/ft s) * 322.54 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.29   * Cum Volume (acre-ft) * 0.43 * 3.51 * 1.42 *
* C & E Loss (ft)       * 0.00   * Cum SA (acres)      * 0.36 * 0.85 * 1.24 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft)         * 247.76 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)         * 0.57  * Wt. n-Val.             * 0.020 * 0.023 * 0.022 *
* W.S. Elev (ft)        * 247.19 * Reach Len. (ft)        * 50.40 * 50.32 * 50.00 *
* Crit W.S. (ft)        * 247.19 * Flow Area (sq ft)      * 19.93 * 142.55 * 66.21 *
* E.G. Slope (ft/ft)    *0.005488 * Area (sq ft)          * 19.93 * 143.13 * 76.65 *
* Q Total (cfs)         * 1345.00 * Flow (cfs)            * 66.12 * 918.65 * 360.24 *
* Top Width (ft)        * 207.97 * Top Width (ft)        * 41.95 * 93.74 * 72.27 *
* Vel Total (ft/s)      * 5.88   * Avg. Vel. (ft/s)     * 3.32 * 6.44 * 5.44 *
* Max Chl Dpth (ft)     * 2.25   * Hydr. Depth (ft)    * 0.48 * 1.54 * 1.15 *
* Conv. Total (cfs)     * 18155.1 * Conv. (cfs)          * 892.5 * 12400.1 * 4862.5 *
* Length Wtd. (ft)      * 50.20 * Wetted Per. (ft)     * 43.22 * 92.96 * 57.96 *
* Min Ch El (ft)        * 244.94 * Shear (lb/sq ft)    * 0.16 * 0.53 * 0.39 *
* Alpha                  * 1.06   * Stream Power (lb/ft s) * 322.54 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.29   * Cum Volume (acre-ft) * 0.72 * 4.26 * 2.26 *
* C & E Loss (ft)       * 0.01   * Cum SA (acres)      * 0.49 * 0.87 * 1.39 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
 REACH: main RS: 19

INPUT

Description:

Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	249.17	10.14	247.21	40.08	245.78	63.51	245.96	144.43	245.9
152.09	245.89	186.64	245.23	206.02	245.14	207.02	245.12	208.03	245.52
210.09	245.43	210.11	245.43	237.84	244.21	277.45	244.92	281.37	244.84
281.48	244.67	299.96	244.83	317.01	244.17	318.45	244.1	319.17	244.64
322.71	245.07	324.29	246.01	334.19	254.28				

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.02	208.03	.045	277.45	.02	319.17	.065

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 208.03 277.45 54.63 54.11 54.18 .1 .3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
63.5	144.4	260

CROSS SECTION OUTPUT Profile #2-YR

* E.G. Elev (ft)	* 244.76	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.18	* Wt. n-Val.	*	* 0.045	* 0.020
* W.S. Elev (ft)	* 244.58	* Reach Len. (ft)	* 54.63	* 54.11	* 54.18
* Crit W.S. (ft)	* 244.62	* Flow Area (sq ft)	*	* 5.28	* 2.92
* E.G. Slope (ft/ft)	* 0.023265	* Area (sq ft)	*	* 5.28	* 2.92
* Q Total (cfs)	* 21.00	* Flow (cfs)	*	* 8.58	* 12.42
* Top Width (ft)	* 41.38	* Top Width (ft)	*	* 28.80	* 12.58
* Vel Total (ft/s)	* 2.56	* Avg. Vel. (ft/s)	*	* 1.63	* 4.25
* Max Chl Dpth (ft)	* 0.48	* Hydr. Depth (ft)	*	* 0.18	* 0.23
* Conv. Total (cfs)	* 137.7	* Conv. (cfs)	*	* 56.3	* 81.4
* Length Wtd. (ft)	* 54.13	* Wetted Per. (ft)	*	* 28.81	* 12.75
* Min Ch El (ft)	* 244.21	* Shear (lb/sq ft)	*	* 0.27	* 0.33
* Alpha	* 1.79	* Stream Power (lb/ft s)	* 334.19	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.68	* Cum Volume (acre-ft)	* 0.00	* 1.36	* 0.01
* C & E Loss (ft)	* 0.01	* Cum SA (acres)	* 0.02	* 0.53	* 0.02

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Program found supercritical flow starting at this cross section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 246.63	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 1.06	* Wt. n-Val.	* 0.020	* 0.045	* 0.021
* W.S. Elev (ft)	* 245.57	* Reach Len. (ft)	* 54.63	* 54.11	* 54.18
* Crit W.S. (ft)	* 245.96	* Flow Area (sq ft)	* 11.35	* 61.11	* 42.07
* E.G. Slope (ft/ft)	* 0.022986	* Area (sq ft)	* 11.35	* 61.11	* 42.07
* Q Total (cfs)	* 767.00	* Flow (cfs)	* 55.69	* 280.91	* 430.40
* Top Width (ft)	* 154.95	* Top Width (ft)	* 39.42	* 69.42	* 46.11
* Vel Total (ft/s)	* 6.70	* Avg. Vel. (ft/s)	* 4.91	* 4.60	* 10.23
* Max Chl Dpth (ft)	* 1.47	* Hydr. Depth (ft)	* 0.29	* 0.88	* 0.91
* Conv. Total (cfs)	* 5059.0	* Conv. (cfs)	* 367.3	* 1852.8	* 2838.8
* Length Wtd. (ft)	* 54.15	* Wetted Per. (ft)	* 39.50	* 69.46	* 46.56
* Min Ch El (ft)	* 244.21	* Shear (lb/sq ft)	* 0.41	* 1.26	* 1.30
* Alpha	* 1.52	* Stream Power (lb/ft s)	* 334.19	* 0.00	* 0.00

```

* Frctn Loss (ft)      * 0.51 * Cum Volume (acre-ft) * 0.34 * 3.21 * 1.17 *
* C & E Loss (ft)     * 0.06 * Cum SA (acres) * 0.30 * 0.75 * 1.13 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Program found supercritical flow starting at this cross section.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)      * 247.72 * Element * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.48 * Wt. n-Val. * 0.020 * 0.045 * 0.021 *
* W.S. Elev (ft)     * 246.23 * Reach Len. (ft) * 54.63 * 54.11 * 54.18 *
* Crit W.S. (ft)     * 246.69 * Flow Area (sq ft) * 58.81 * 106.81 * 72.77 *
* E.G. Slope (ft/ft) * 0.017456 * Area (sq ft) * 58.81 * 106.81 * 72.77 *
* Q Total (cfs)      * 1972.00 * Flow (cfs) * 439.93 * 620.80 * 911.27 *
* Top Width (ft)     * 213.05 * Top Width (ft) * 96.53 * 69.42 * 47.11 *
* Vel Total (ft/s)   * 8.27 * Avg. Vel. (ft/s) * 7.48 * 5.81 * 12.52 *
* Max Chl Dpth (ft) * 2.13 * Hydr. Depth (ft) * 0.61 * 1.54 * 1.54 *
* Conv. Total (cfs) * 14925.5 * Conv. (cfs) * 3329.7 * 4698.7 * 6897.2 *
* Length Wtd. (ft)  * 54.19 * Wetted Per. (ft) * 97.23 * 69.46 * 47.76 *
* Min Ch El (ft)    * 244.21 * Shear (lb/sq ft) * 0.66 * 1.68 * 1.66 *
* Alpha              * 1.40 * Stream Power (lb/ft s) * 334.19 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 0.46 * Cum Volume (acre-ft) * 0.99 * 4.96 * 3.17 *
* C & E Loss (ft)   * 0.08 * Cum SA (acres) * 0.46 * 0.78 * 1.63 *
*****

```

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Program found supercritical flow starting at this cross section.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)      * 248.29 * Element * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.76 * Wt. n-Val. * 0.020 * 0.045 * 0.021 *
* W.S. Elev (ft)     * 246.54 * Reach Len. (ft) * 54.63 * 54.11 * 54.18 *
* Crit W.S. (ft)     * 247.05 * Flow Area (sq ft) * 89.02 * 127.85 * 87.10 *
* E.G. Slope (ft/ft) * 0.016498 * Area (sq ft) * 89.02 * 127.85 * 87.10 *
* Q Total (cfs)      * 2800.00 * Flow (cfs) * 800.97 * 814.41 * 1184.62 *
* Top Width (ft)     * 219.76 * Top Width (ft) * 102.87 * 69.42 * 47.47 *
* Vel Total (ft/s)   * 9.21 * Avg. Vel. (ft/s) * 9.00 * 6.37 * 13.60 *
* Max Chl Dpth (ft) * 2.44 * Hydr. Depth (ft) * 0.87 * 1.84 * 1.83 *
* Conv. Total (cfs) * 21799.2 * Conv. (cfs) * 6235.9 * 6340.6 * 9222.8 *
* Length Wtd. (ft)  * 54.21 * Wetted Per. (ft) * 104.19 * 69.46 * 48.23 *
* Min Ch El (ft)    * 244.21 * Shear (lb/sq ft) * 0.88 * 1.90 * 1.86 *
* Alpha              * 1.33 * Stream Power (lb/ft s) * 334.19 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 0.44 * Cum Volume (acre-ft) * 1.31 * 5.86 * 4.24 *
* C & E Loss (ft)   * 0.09 * Cum SA (acres) * 0.53 * 0.79 * 1.93 *
*****

```

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Program found supercritical flow starting at this cross section.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

```

*****
* E.G. Elev (ft)      * 246.73 * Element * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.10 * Wt. n-Val. * 0.020 * 0.045 * 0.021 *
* W.S. Elev (ft)     * 245.63 * Reach Len. (ft) * 54.63 * 54.11 * 54.18 *
* Crit W.S. (ft)     * 246.02 * Flow Area (sq ft) * 13.79 * 65.24 * 44.81 *
* E.G. Slope (ft/ft) * 0.022173 * Area (sq ft) * 13.79 * 65.24 * 44.81 *
* Q Total (cfs)      * 848.00 * Flow (cfs) * 71.92 * 307.68 * 468.41 *

```

```

* Top Width (ft)          * 158.16 * Top Width (ft)          * 42.53 * 69.42 * 46.21 *
* Vel Total (ft/s)       * 6.85 * Avg. Vel. (ft/s)       * 5.21 * 4.72 * 10.45 *
* Max Chl Dpth (ft)     * 1.53 * Hydr. Depth (ft)      * 0.32 * 0.94 * 0.97 *
* Conv. Total (cfs)      * 5694.8 * Conv. (cfs)           * 483.0 * 2066.2 * 3145.6 *
* Length Wtd. (ft)      * 54.15 * Wetted Per. (ft)      * 42.61 * 69.46 * 46.68 *
* Min Ch El (ft)        * 244.21 * Shear (lb/sq ft)      * 0.45 * 1.30 * 1.33 *
* Alpha                  * 1.51 * Stream Power (lb/ft s) * 334.19 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.50 * Cum Volume (acre-ft)  * 0.41 * 3.41 * 1.36 *
* C & E Loss (ft)       * 0.07 * Cum SA (acres)        * 0.32 * 0.75 * 1.18 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Program found supercritical flow starting at this cross section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft)         * 247.23 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)         * 1.27 * Wt. n-Val.             * 0.020 * 0.045 * 0.021 *
* W.S. Elev (ft)        * 245.96 * Reach Len. (ft)       * 54.63 * 54.11 * 54.18 *
* Crit W.S. (ft)        * 246.33 * Flow Area (sq ft)     * 33.11 * 87.76 * 59.89 *
* E.G. Slope (ft/ft)    * 0.018620 * Area (sq ft)          * 33.11 * 87.76 * 59.89 *
* Q Total (cfs)         * 1345.00 * Flow (cfs)            * 196.11 * 462.16 * 686.73 *
* Top Width (ft)        * 206.74 * Top Width (ft)        * 90.57 * 69.42 * 46.75 *
* Vel Total (ft/s)      * 7.44 * Avg. Vel. (ft/s)      * 5.92 * 5.27 * 11.47 *
* Max Chl Dpth (ft)    * 1.86 * Hydr. Depth (ft)      * 0.37 * 1.26 * 1.28 *
* Conv. Total (cfs)     * 9856.9 * Conv. (cfs)           * 1437.2 * 3386.9 * 5032.7 *
* Length Wtd. (ft)     * 54.17 * Wetted Per. (ft)      * 90.72 * 69.46 * 47.31 *
* Min Ch El (ft)       * 244.21 * Shear (lb/sq ft)      * 0.42 * 1.47 * 1.47 *
* Alpha                 * 1.48 * Stream Power (lb/ft s) * 334.19 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 0.46 * Cum Volume (acre-ft)  * 0.69 * 4.12 * 2.18 *
* C & E Loss (ft)      * 0.07 * Cum SA (acres)        * 0.41 * 0.77 * 1.32 *
*****

```

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Program found supercritical flow starting at this cross section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
REACH: main RS: 18

INPUT

Description:

Station Elevation Data num= 31

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	246.82	32.11	245.59	51.75	245.87	132.72	245.92	152.37	245.71
172.73	245.31	190.25	244.44	196.83	244.75	197.88	244.81	198.85	245.1
203.97	244.42	212.3	243.32	216.07	241.33	218.3	240.17	224.65	239.93
227.6	240.96	258.5	240.69	271.3	241.06	279.1	241.91	279.34	243.72
281.3	243.82	281.39	243.65	285.08	243.75	289.1	243.99	289.2	243.77
307.48	244.13	323.92	243.45	325.33	243.32	325.82	243.89	331.71	243.83
339.55	248.25								

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.02	198.85	.045	285.08	.02	325.82	.065

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
216.07 271.3 42.13 39.37 34.94 .1 .3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
51.7	132.7	260

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft)      * 241.52 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.13  * Wt. n-Val.      *      *      *      *
* W.S. Elev (ft)     * 240.38 * Reach Len. (ft) * 42.13 * 39.37 * 34.94 *
* Crit W.S. (ft)     * 240.80 * Flow Area (sq ft) *      * 2.46 *      *
* E.G. Slope (ft/ft) * 0.333309 * Area (sq ft) *      * 2.46 *      *
* Q Total (cfs)      * 21.00 * Flow (cfs)      *      * 21.00 *      *
* Top Width (ft)     * 8.06  * Top Width (ft)  *      * 8.06 *      *
* Vel Total (ft/s)   * 8.54  * Avg. Vel. (ft/s) *      * 8.54 *      *
* Max Chl Dpth (ft) * 0.45  * Hydr. Depth (ft) *      * 0.30 *      *
* Conv. Total (cfs)  * 36.4  * Conv. (cfs)     *      * 36.4 *      *
* Length Wtd. (ft)  * 39.37 * Wetted Per. (ft) *      * 8.19 *      *
* Min Ch El (ft)     * 239.93 * Shear (lb/sq ft) *      * 6.24 *      *
* Alpha              * 1.00  * Stream Power (lb/ft s) * 339.55 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 3.15  * Cum Volume (acre-ft) * 0.00 * 1.36 * 0.00 *
* C & E Loss (ft)   * 0.10  * Cum SA (acres)   * 0.02 * 0.50 * 0.02 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)      * 244.11 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 2.27  * Wt. n-Val.      *      * 0.045 * 0.045 *
* W.S. Elev (ft)     * 241.84 * Reach Len. (ft) * 42.13 * 39.37 * 34.94 *
* Crit W.S. (ft)     * 242.49 * Flow Area (sq ft) * 0.24 * 61.44 * 2.77 *
* E.G. Slope (ft/ft) * 0.119668 * Area (sq ft) * 0.24 * 61.44 * 2.77 *
* Q Total (cfs)      * 767.00 * Flow (cfs)      * 1.02 * 749.22 * 16.76 *
* Top Width (ft)     * 63.32 * Top Width (ft)  * 0.96 * 55.23 * 7.13 *
* Vel Total (ft/s)   * 11.90 * Avg. Vel. (ft/s) * 4.21 * 12.19 * 6.06 *
* Max Chl Dpth (ft) * 1.91  * Hydr. Depth (ft) * 0.25 * 1.11 * 0.39 *
* Conv. Total (cfs)  * 2217.2 * Conv. (cfs)     * 3.0 * 2165.8 * 48.4 *
* Length Wtd. (ft)  * 39.32 * Wetted Per. (ft) * 1.09 * 55.70 * 7.17 *
* Min Ch El (ft)     * 239.93 * Shear (lb/sq ft) * 1.67 * 8.24 * 2.88 *
* Alpha              * 1.03  * Stream Power (lb/ft s) * 339.55 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 2.41  * Cum Volume (acre-ft) * 0.34 * 3.14 * 1.14 *
* C & E Loss (ft)   * 0.12  * Cum SA (acres)   * 0.27 * 0.67 * 1.10 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)      * 246.00 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 2.91  * Wt. n-Val.      *      * 0.045 * 0.045 *
* W.S. Elev (ft)     * 243.09 * Reach Len. (ft) * 42.13 * 39.37 * 34.94 *
* Crit W.S. (ft)     * 244.35 * Flow Area (sq ft) * 2.95 * 130.87 * 12.64 *
* E.G. Slope (ft/ft) * 0.057254 * Area (sq ft) * 2.95 * 130.87 * 12.64 *
* Q Total (cfs)      * 1972.00 * Flow (cfs)      * 19.72 * 1827.40 * 124.88 *
* Top Width (ft)     * 66.53 * Top Width (ft)  * 3.34 * 55.23 * 7.96 *
* Vel Total (ft/s)   * 13.47 * Avg. Vel. (ft/s) * 6.69 * 13.96 * 9.88 *
* Max Chl Dpth (ft) * 3.16  * Hydr. Depth (ft) * 0.88 * 2.37 * 1.59 *
* Conv. Total (cfs)  * 8241.5 * Conv. (cfs)     * 82.4 * 7637.1 * 521.9 *
* Length Wtd. (ft)  * 39.24 * Wetted Per. (ft) * 3.78 * 55.70 * 9.04 *
* Min Ch El (ft)     * 239.93 * Shear (lb/sq ft) * 2.79 * 8.40 * 5.00 *
* Alpha              * 1.03  * Stream Power (lb/ft s) * 339.55 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 1.57  * Cum Volume (acre-ft) * 0.95 * 4.81 * 3.12 *
* C & E Loss (ft)   * 0.14  * Cum SA (acres)   * 0.40 * 0.71 * 1.60 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-YR

```
*****
* E.G. Elev (ft)      * 246.88 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 2.89  * Wt. n-Val.      * 0.045  * 0.045  * 0.041  *
* W.S. Elev (ft)     * 243.99 * Reach Len. (ft) * 42.13  * 39.37  * 34.94  *
* Crit W.S. (ft)     * 244.97 * Flow Area (sq ft) * 7.97  * 180.32 * 28.38  *
* E.G. Slope (ft/ft) * 0.038219 * Area (sq ft)    * 7.97  * 180.32 * 28.38  *
* Q Total (cfs)      * 2800.00 * Flow (cfs)      * 46.16  * 2547.39 * 206.45 *
* Top Width (ft)     * 114.18 * Top Width (ft)  * 8.84  * 55.23  * 50.11  *
* Vel Total (ft/s)   * 12.92  * Avg. Vel. (ft/s) * 5.79  * 14.13  * 7.28  *
* Max Chl Dpth (ft) * 4.06   * Hydr. Depth (ft) * 0.90  * 3.26   * 0.57  *
* Conv. Total (cfs) * 14322.5 * Conv. (cfs)     * 236.1  * 13030.4 * 1056.0 *
* Length Wtd. (ft)  * 39.23  * Wetted Per. (ft) * 9.37  * 55.70  * 52.32  *
* Min Ch El (ft)    * 239.93 * Shear (lb/sq ft) * 2.03  * 7.72   * 1.29  *
* Alpha             * 1.11   * Stream Power (lb/ft s) * 339.55 * 0.00   * 0.00  *
* Frctn Loss (ft)   * 1.30   * Cum Volume (acre-ft) * 1.24  * 5.67   * 4.17  *
* C & E Loss (ft)   * 0.11   * Cum SA (acres)    * 0.46  * 0.72   * 1.87  *
*****
```

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #6HR OBS

```
*****
* E.G. Elev (ft)      * 244.29 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 2.37  * Wt. n-Val.      * 0.045  * 0.045  * 0.045  *
* W.S. Elev (ft)     * 241.92 * Reach Len. (ft) * 42.13  * 39.37  * 34.94  *
* Crit W.S. (ft)     * 242.60 * Flow Area (sq ft) * 0.33  * 66.07  * 3.40  *
* E.G. Slope (ft/ft) * 0.113858 * Area (sq ft)    * 0.33  * 66.07  * 3.40  *
* Q Total (cfs)      * 848.00 * Flow (cfs)      * 1.50  * 824.86 * 21.63  *
* Top Width (ft)     * 64.15 * Top Width (ft)  * 1.12  * 55.23  * 7.80  *
* Vel Total (ft/s)   * 12.15  * Avg. Vel. (ft/s) * 4.55  * 12.49  * 6.37  *
* Max Chl Dpth (ft) * 1.99   * Hydr. Depth (ft) * 0.30  * 1.20   * 0.44  *
* Conv. Total (cfs) * 2513.1 * Conv. (cfs)     * 4.5   * 2444.6 * 64.1  *
* Length Wtd. (ft)  * 39.32  * Wetted Per. (ft) * 1.26  * 55.70  * 7.86  *
* Min Ch El (ft)    * 239.93 * Shear (lb/sq ft) * 1.86  * 8.43   * 3.07  *
* Alpha             * 1.03   * Stream Power (lb/ft s) * 339.55 * 0.00   * 0.00  *
* Frctn Loss (ft)   * 2.31   * Cum Volume (acre-ft) * 0.41  * 3.33   * 1.33  *
* C & E Loss (ft)   * 0.13   * Cum SA (acres)    * 0.29  * 0.68   * 1.14  *
*****
```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #24HR OBS

```
*****
* E.G. Elev (ft)      * 245.20 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 2.78  * Wt. n-Val.      * 0.045  * 0.045  * 0.045  *
* W.S. Elev (ft)     * 242.42 * Reach Len. (ft) * 42.13  * 39.37  * 34.94  *
* Crit W.S. (ft)     * 243.24 * Flow Area (sq ft) * 1.13  * 93.66  * 7.31  *
* E.G. Slope (ft/ft) * 0.084883 * Area (sq ft)    * 1.13  * 93.66  * 7.31  *
* Q Total (cfs)      * 1345.00 * Flow (cfs)      * 6.65  * 1274.05 * 64.30  *
* Top Width (ft)     * 65.16  * Top Width (ft)  * 2.06  * 55.23  * 7.87  *
* Vel Total (ft/s)   * 13.17  * Avg. Vel. (ft/s) * 5.91  * 13.60  * 8.80  *
* Max Chl Dpth (ft) * 2.49   * Hydr. Depth (ft) * 0.54  * 1.70   * 0.93  *
* Conv. Total (cfs) * 4616.5 * Conv. (cfs)     * 22.8  * 4373.0 * 220.7  *
* Length Wtd. (ft)  * 39.27  * Wetted Per. (ft) * 2.33  * 55.70  * 8.36  *
* Min Ch El (ft)    * 239.93 * Shear (lb/sq ft) * 2.55  * 8.91   * 4.63  *
* Alpha             * 1.03   * Stream Power (lb/ft s) * 339.55 * 0.00   * 0.00  *
*****
```

```

* Frctn Loss (ft)          * 1.87 * Cum Volume (acre-ft) * 0.67 * 4.01 * 2.14 *
* C & E Loss (ft)        * 0.15 * Cum SA (acres) * 0.35 * 0.69 * 1.29 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: hudson
REACH: main RS: 17

INPUT

Description:

Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	252.24	12.81	247.24	56.13	245.07	104.92	245.75	151.7	245.72
168.34	245.52	192.81	244.77	207.92	244	215.57	244.35	216.66	244.41
217.68	244.68	225.05	242.81	225.06	242.81	238.84	239.3	254.52	235.88
289.73	236.34	309.99	238.95	310.85	243.86	311.68	243.91	311.94	243.91
318.01	243.69	321.94	243.72	322.08	243.45	340.96	243.87	357.56	243.17
359.08	243.09	359.79	243.66	369.5	244.6	379.14	250.3		

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	217.68	.045	321.94	.02
				359.79	.065

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

	238.84	309.99	35.27	34.43	33.28	.1	.3
--	--------	--------	-------	-------	-------	----	----

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
79.3	143.2	255	F

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft)          * 236.43 * Element * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.13 * Wt. n-Val. * * 0.045 * *
* W.S. Elev (ft)         * 236.30 * Reach Len. (ft) * 35.27 * 34.43 * 33.28 *
* Crit W.S. (ft)         * 236.32 * Flow Area (sq ft) * * 7.20 * *
* E.G. Slope (ft/ft)     * 0.062321 * Area (sq ft) * * 7.20 * *
* Q Total (cfs)          * 21.00 * Flow (cfs) * * 21.00 * *
* Top Width (ft)         * 34.18 * Top Width (ft) * * 34.18 * *
* Vel Total (ft/s)       * 2.92 * Avg. Vel. (ft/s) * * 2.92 * *
* Max Chl Dpth (ft)     * 0.42 * Hydr. Depth (ft) * * 0.21 * *
* Conv. Total (cfs)      * 84.1 * Conv. (cfs) * * 84.1 * *
* Length Wtd. (ft)      * 34.43 * Wetted Per. (ft) * * 34.23 * *
* Min Ch El (ft)        * 235.88 * Shear (lb/sq ft) * * 0.82 * *
* Alpha                  * 1.00 * Stream Power (lb/ft s) * 379.14 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 4.78 * Cum Volume (acre-ft) * 0.00 * 1.35 * 0.00 *
* C & E Loss (ft)       * 0.30 * Cum SA (acres) * 0.02 * 0.49 * 0.02 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)          * 239.79 * Element * Left OB * Channel * Right OB *
* Vel Head (ft)          * 2.21 * Wt. n-Val. * * 0.045 * *
* W.S. Elev (ft)         * 237.58 * Reach Len. (ft) * 35.27 * 34.43 * 33.28 *
* Crit W.S. (ft)         * 238.28 * Flow Area (sq ft) * * 64.35 * *
* E.G. Slope (ft/ft)     * 0.100334 * Area (sq ft) * * 64.35 * *

```

```

* Q Total (cfs)          * 767.00 * Flow (cfs)           *          * 767.00 *          *
* Top Width (ft)        * 52.63 * Top Width (ft)       *          * 52.63 *          *
* Vel Total (ft/s)      * 11.92 * Avg. Vel. (ft/s)     *          * 11.92 *          *
* Max Chl Dpth (ft)    * 1.70 * Hydr. Depth (ft)    *          * 1.22 *          *
* Conv. Total (cfs)     * 2421.4 * Conv. (cfs)         *          * 2421.4 *          *
* Length Wtd. (ft)     * 34.43 * Wetted Per. (ft)    *          * 52.89 *          *
* Min Ch El (ft)       * 235.88 * Shear (lb/sq ft)    *          * 7.62 *          *
* Alpha                * 1.00 * Stream Power (lb/ft s) * 379.14 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 4.30 * Cum Volume (acre-ft) * 0.34 * 3.08 * 1.14 *
* C & E Loss (ft)      * 0.02 * Cum SA (acres)      * 0.27 * 0.62 * 1.10 *
*****

```

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)        * 242.80 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)        * 4.29  * Wt. n-Val.          *          * 0.045 *          *
* W.S. Elev (ft)       * 238.51 * Reach Len. (ft)     * 35.27 * 34.43 * 33.28 *
* Crit W.S. (ft)       * 239.76 * Flow Area (sq ft)   *          * 118.61 *          *
* E.G. Slope (ft/ft)   * 0.112599 * Area (sq ft)       *          * 118.61 *          *
* Q Total (cfs)        * 1972.00 * Flow (cfs)         *          * 1972.00 *          *
* Top Width (ft)       * 64.11 * Top Width (ft)      *          * 64.11 *          *
* Vel Total (ft/s)     * 16.63 * Avg. Vel. (ft/s)    *          * 16.63 *          *
* Max Chl Dpth (ft)    * 2.63 * Hydr. Depth (ft)    *          * 1.85 *          *
* Conv. Total (cfs)    * 5876.8 * Conv. (cfs)         *          * 5876.8 *          *
* Length Wtd. (ft)    * 34.43 * Wetted Per. (ft)    *          * 64.53 *          *
* Min Ch El (ft)      * 235.88 * Shear (lb/sq ft)    *          * 12.92 *          *
* Alpha                * 1.00 * Stream Power (lb/ft s) * 379.14 * 0.00 * 0.00 *
* Frctn Loss (ft)     * 3.06 * Cum Volume (acre-ft) * 0.95 * 4.70 * 3.11 *
* C & E Loss (ft)     * 0.14 * Cum SA (acres)      * 0.39 * 0.65 * 1.60 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)        * 244.27 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)        * 5.26  * Wt. n-Val.          *          * 0.045 * 0.000 *
* W.S. Elev (ft)       * 239.01 * Reach Len. (ft)     * 35.27 * 34.43 * 33.28 *
* Crit W.S. (ft)       * 240.54 * Flow Area (sq ft)   *          * 152.19 * 0.00 *
* E.G. Slope (ft/ft)   * 0.110908 * Area (sq ft)       *          * 152.19 * 0.00 *
* Q Total (cfs)        * 2800.00 * Flow (cfs)         *          * 2800.00 * 0.00 *
* Top Width (ft)       * 69.83 * Top Width (ft)      *          * 69.82 * 0.01 *
* Vel Total (ft/s)     * 18.40 * Avg. Vel. (ft/s)    *          * 18.40 * 0.33 *
* Max Chl Dpth (ft)    * 3.13 * Hydr. Depth (ft)    *          * 2.18 * 0.03 *
* Conv. Total (cfs)    * 8407.7 * Conv. (cfs)         *          * 8407.7 * 0.0 *
* Length Wtd. (ft)    * 34.43 * Wetted Per. (ft)    *          * 70.33 * 0.06 *
* Min Ch El (ft)      * 235.88 * Shear (lb/sq ft)    *          * 14.98 *          *
* Alpha                * 1.00 * Stream Power (lb/ft s) * 379.14 * 0.00 * 0.00 *
* Frctn Loss (ft)     * 2.38 * Cum Volume (acre-ft) * 1.24 * 5.52 * 4.16 *
* C & E Loss (ft)     * 0.24 * Cum SA (acres)      * 0.46 * 0.66 * 1.85 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

```

*****
* E.G. Elev (ft)      * 240.05 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 2.39  * Wt. n-Val.      *         *         *         *
* W.S. Elev (ft)     * 237.66 * Reach Len. (ft) * 35.27  * 34.43 * 33.28 *
* Crit W.S. (ft)     * 238.41 * Flow Area (sq ft) *         * 68.35 *         *
* E.G. Slope (ft/ft) * 0.102679 * Area (sq ft)    *         * 68.35 *         *
* Q Total (cfs)      * 848.00 * Flow (cfs)      *         * 848.00 *         *
* Top Width (ft)     * 53.56 * Top Width (ft)  *         * 53.56 *         *
* Vel Total (ft/s)   * 12.41 * Avg. Vel. (ft/s) *         * 12.41 *         *
* Max Chl Dpth (ft)  * 1.78  * Hydr. Depth (ft) *         * 1.28  *         *
* Conv. Total (cfs)  * 2646.4 * Conv. (cfs)     *         * 2646.4 *         *
* Length Wtd. (ft)   * 34.43 * Wetted Per. (ft) *         * 53.84 *         *
* Min Ch El (ft)     * 235.88 * Shear (lb/sq ft) *         * 8.14  *         *
* Alpha              * 1.00  * Stream Power (lb/ft s) * 379.14 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 4.25  * Cum Volume (acre-ft) * 0.41  * 3.26 * 1.33 *
* C & E Loss (ft)   * 0.00  * Cum SA (acres)   * 0.29  * 0.63 * 1.14 *
*****

```

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft)      * 241.39 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 3.32  * Wt. n-Val.      *         * 0.045 *         *
* W.S. Elev (ft)     * 238.08 * Reach Len. (ft) * 35.27  * 34.43 * 33.28 *
* Crit W.S. (ft)     * 239.10 * Flow Area (sq ft) *         * 92.03 *         *
* E.G. Slope (ft/ft) * 0.108567 * Area (sq ft)    *         * 92.03 *         *
* Q Total (cfs)      * 1345.00 * Flow (cfs)      *         * 1345.00 *         *
* Top Width (ft)     * 58.77 * Top Width (ft)  *         * 58.77 *         *
* Vel Total (ft/s)   * 14.61 * Avg. Vel. (ft/s) *         * 14.61 *         *
* Max Chl Dpth (ft)  * 2.20  * Hydr. Depth (ft) *         * 1.57  *         *
* Conv. Total (cfs)  * 4082.0 * Conv. (cfs)     *         * 4082.0 *         *
* Length Wtd. (ft)   * 34.43 * Wetted Per. (ft) *         * 59.12 *         *
* Min Ch El (ft)     * 235.88 * Shear (lb/sq ft) *         * 10.55 *         *
* Alpha              * 1.00  * Stream Power (lb/ft s) * 379.14 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 3.76  * Cum Volume (acre-ft) * 0.67  * 3.93 * 2.14 *
* C & E Loss (ft)   * 0.05  * Cum SA (acres)   * 0.35  * 0.64 * 1.29 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main RS: 16

INPUT

Description:

Station Elevation Data		num= 27	
Sta	Elev	Sta	Elev
0	248.66	8.9	247.05
140.24	243.5	146.88	243.78
158.54	241.29	169.54	237.49
252.43	237.59	253.5	243.26
268.04	243.16	287.05	243.44
315.76	243.99	328.57	251.36

Manning's n Values		num= 5	
Sta	n Val	Sta	n Val
0	.02	140.24	.045
148.99	.045	263.92	.02
305.78	.065		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	169.54	252.43	60.38	60.35	62.62	.1	.3	

Ineffective Flow		num= 2	
Sta L	Sta R	Elev	Permanent
18	57.42	255	F

CROSS SECTION OUTPUT Profile #2-YR

```
*****
* E.G. Elev (ft)          * 233.98 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.19  * Wt. n-Val.      *         * 0.045  *         *
* W.S. Elev (ft)         * 233.79 * Reach Len. (ft) * 60.38  * 60.35  * 62.62  *
* Crit W.S. (ft)         * 233.84 * Flow Area (sq ft) *         * 6.07   *         *
* E.G. Slope (ft/ft)     * 0.081924 * Area (sq ft)   *         * 6.07   *         *
* Q Total (cfs)          * 21.00  * Flow (cfs)      *         * 21.00  *         *
* Top Width (ft)         * 27.29  * Top Width (ft)  *         * 27.29  *         *
* Vel Total (ft/s)       * 3.46   * Avg. Vel. (ft/s) *         * 3.46   *         *
* Max Chl Dpth (ft)     * 0.44   * Hydr. Depth (ft) *         * 0.22   *         *
* Conv. Total (cfs)     * 73.4   * Conv. (cfs)     *         * 73.4   *         *
* Length Wtd. (ft)      * 60.35  * Wetted Per. (ft) *         * 27.35  *         *
* Min Ch El (ft)        * 233.35 * Shear (lb/sq ft) *         * 1.13   *         *
* Alpha                  * 1.00   * Stream Power (lb/ft s) * 328.57 * 0.00  * 0.00  *
* Frctn Loss (ft)       * 2.45   * Cum Volume (acre-ft) * 0.00  * 1.35  * 0.00  *
* C & E Loss (ft)       * 0.01   * Cum SA (acres)   * 0.02  * 0.46  * 0.02  *
*****
```

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```
*****
* E.G. Elev (ft)          * 237.25 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 1.75   * Wt. n-Val.      *         * 0.045  *         *
* W.S. Elev (ft)         * 235.50 * Reach Len. (ft) * 60.38  * 60.35  * 62.62  *
* Crit W.S. (ft)         * 235.99 * Flow Area (sq ft) *         * 72.30  *         *
* E.G. Slope (ft/ft)     * 0.051235 * Area (sq ft)   *         * 93.04  *         *
* Q Total (cfs)          * 767.00 * Flow (cfs)      *         * 767.00 *         *
* Top Width (ft)         * 64.50  * Top Width (ft)  *         * 64.50  *         *
* Vel Total (ft/s)       * 10.61  * Avg. Vel. (ft/s) *         * 10.61  *         *
* Max Chl Dpth (ft)     * 2.15   * Hydr. Depth (ft) *         * 1.70   *         *
* Conv. Total (cfs)     * 3388.5 * Conv. (cfs)     *         * 3388.5 *         *
* Length Wtd. (ft)      * 60.35  * Wetted Per. (ft) *         * 42.76  *         *
* Min Ch El (ft)        * 233.35 * Shear (lb/sq ft) *         * 5.41   *         *
* Alpha                  * 1.00   * Stream Power (lb/ft s) * 328.57 * 0.00  * 0.00  *
* Frctn Loss (ft)       * 2.40   * Cum Volume (acre-ft) * 0.34  * 3.02  * 1.14  *
* C & E Loss (ft)       * 0.14   * Cum SA (acres)   * 0.27  * 0.58  * 1.10  *
*****
```

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```
*****
* E.G. Elev (ft)          * 240.11 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 3.15   * Wt. n-Val.      *         * 0.045  *         *
* W.S. Elev (ft)         * 236.96 * Reach Len. (ft) * 60.38  * 60.35  * 62.62  *
* Crit W.S. (ft)         * 237.85 * Flow Area (sq ft) *         * 138.56 *         *
* E.G. Slope (ft/ft)     * 0.045939 * Area (sq ft)   *         * 197.33 *         *
* Q Total (cfs)          * 1972.00 * Flow (cfs)      *         * 1972.00 *         *
* Top Width (ft)         * 77.76  * Top Width (ft)  *         * 77.76  *         *
* Vel Total (ft/s)       * 14.23  * Avg. Vel. (ft/s) *         * 14.23  *         *
* Max Chl Dpth (ft)     * 3.61   * Hydr. Depth (ft) *         * 2.88   *         *
* Conv. Total (cfs)     * 9200.6 * Conv. (cfs)     *         * 9200.6 *         *
* Length Wtd. (ft)      * 60.35  * Wetted Per. (ft) *         * 48.59  *         *
* Min Ch El (ft)        * 233.35 * Shear (lb/sq ft) *         * 8.18   *         *
* Alpha                  * 1.00   * Stream Power (lb/ft s) * 328.57 * 0.00  * 0.00  *
* Frctn Loss (ft)       * 2.36   * Cum Volume (acre-ft) * 0.95  * 4.57  * 3.11  *
* C & E Loss (ft)       * 0.34   * Cum SA (acres)   * 0.39  * 0.60  * 1.60  *
*****
```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```
*****
* E.G. Elev (ft)      * 241.61 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 3.85  * Wt. n-Val.      * 0.045  * 0.045  *         *
* W.S. Elev (ft)     * 237.76 * Reach Len. (ft) * 60.38  * 60.35  * 62.62  *
* Crit W.S. (ft)     * 238.84 * Flow Area (sq ft) * 0.10  * 177.83 *         *
* E.G. Slope (ft/ft) * 0.042648 * Area (sq ft)    * 0.10  * 261.60 * 0.00  *
* Q Total (cfs)      * 2800.00 * Flow (cfs)      * 0.18  * 2799.82 *         *
* Top Width (ft)     * 83.70  * Top Width (ft)  * 0.77  * 82.89  * 0.03  *
* Vel Total (ft/s)   * 15.74  * Avg. Vel. (ft/s) * 1.72  * 15.74  *         *
* Max Chl Dpth (ft)  * 4.41   * Hydr. Depth (ft) * 0.13  * 3.55   *         *
* Conv. Total (cfs)  * 13558.4 * Conv. (cfs)     * 0.9   * 13557.5 *         *
* Length Wtd. (ft)  * 60.35  * Wetted Per. (ft) * 0.82  * 50.69  *         *
* Min Ch El (ft)    * 233.35 * Shear (lb/sq ft) * 0.34  * 9.34   *         *
* Alpha             * 1.00   * Stream Power (lb/ft s) * 328.57 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 2.24   * Cum Volume (acre-ft) * 1.24  * 5.35  * 4.16  *
* C & E Loss (ft)   * 0.42   * Cum SA (acres)   * 0.45  * 0.60  * 1.85  *
*****
```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

```
*****
* E.G. Elev (ft)      * 237.48 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.86  * Wt. n-Val.      * 0.045  * 0.045  *         *
* W.S. Elev (ft)     * 235.62 * Reach Len. (ft) * 60.38  * 60.35  * 62.62  *
* Crit W.S. (ft)     * 236.14 * Flow Area (sq ft) * 0.10  * 77.45  *         *
* E.G. Slope (ft/ft) * 0.050545 * Area (sq ft)    * 0.10  * 100.91 *         *
* Q Total (cfs)      * 848.00 * Flow (cfs)      * 0.18  * 848.00 *         *
* Top Width (ft)     * 65.92  * Top Width (ft)  * 0.77  * 65.92  *         *
* Vel Total (ft/s)   * 10.95  * Avg. Vel. (ft/s) * 1.72  * 10.95  *         *
* Max Chl Dpth (ft)  * 2.27   * Hydr. Depth (ft) * 0.13  * 1.80   *         *
* Conv. Total (cfs)  * 3771.9 * Conv. (cfs)     * 0.9   * 3771.9 *         *
* Length Wtd. (ft)  * 60.35  * Wetted Per. (ft) * 0.82  * 43.24  *         *
* Min Ch El (ft)    * 233.35 * Shear (lb/sq ft) * 0.34  * 5.65   *         *
* Alpha             * 1.00   * Stream Power (lb/ft s) * 328.57 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 2.40   * Cum Volume (acre-ft) * 0.41  * 3.20  * 1.33  *
* C & E Loss (ft)   * 0.16   * Cum SA (acres)   * 0.29  * 0.58  * 1.14  *
*****
```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```
*****
* E.G. Elev (ft)      * 238.76 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 2.49  * Wt. n-Val.      * 0.045  * 0.045  *         *
* W.S. Elev (ft)     * 236.27 * Reach Len. (ft) * 60.38  * 60.35  * 62.62  *
* Crit W.S. (ft)     * 236.97 * Flow Area (sq ft) * 0.10  * 106.18 *         *
* E.G. Slope (ft/ft) * 0.048013 * Area (sq ft)    * 0.10  * 145.62 *         *
* Q Total (cfs)      * 1345.00 * Flow (cfs)      * 0.18  * 1345.00 *         *
* Top Width (ft)     * 71.65  * Top Width (ft)  * 0.77  * 71.65  *         *
* Vel Total (ft/s)   * 12.67  * Avg. Vel. (ft/s) * 1.72  * 12.67  *         *
* Max Chl Dpth (ft)  * 2.92   * Hydr. Depth (ft) * 0.13  * 2.34   *         *
* Conv. Total (cfs)  * 6138.2 * Conv. (cfs)     * 0.9   * 6138.2 *         *
* Length Wtd. (ft)  * 60.35  * Wetted Per. (ft) * 0.82  * 45.83  *         *
* Min Ch El (ft)    * 233.35 * Shear (lb/sq ft) * 0.34  * 6.94   *         *
* Alpha             * 1.00   * Stream Power (lb/ft s) * 328.57 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 2.39   * Cum Volume (acre-ft) * 0.67  * 3.83  * 2.14  *
* C & E Loss (ft)   * 0.25   * Cum SA (acres)   * 0.35  * 0.59  * 1.29  *
*****
```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
 This may indicate the need for additional cross sections.
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
 REACH: main RS: 15

INPUT

Description:

Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	251.16	30.88	248.27	57.65	245.5	102.63	242.6	103.28	242.94
103.77	242.55	106.54	242.28	119.76	238.62	126.62	236.72	146.13	232.44
171.15	231.06	189.12	231.6	220.29	233.79	241.23	235.96	241.87	243.3
248.42	243.04	251.36	242.84	255.24	242.9	255.42	242.71	275.46	242.93
292.11	242.43	293.55	242.38	294.28	242.88	302.64	243.5	312.17	251.33

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.02	106.54	.045	241.87	.045	251.36	.02	294.28	.065

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

146.13	220.29	55.51	47.74	42.02	.1	.3
--------	--------	-------	-------	-------	----	----

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
198.33	242	255	F

CROSS SECTION OUTPUT Profile #2-YR

* E.G. Elev (ft)	* 231.72	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.13	* Wt. n-Val.	* 55.51	* 47.74	* 42.02
* W.S. Elev (ft)	* 231.59	* Reach Len. (ft)	* 7.20	* 7.20	* 7.20
* Crit W.S. (ft)	* 231.59	* Flow Area (sq ft)	* 21.00	* 21.00	* 21.00
* E.G. Slope (ft/ft)	* 0.046047	* Area (sq ft)	* 27.20	* 27.20	* 27.20
* Q Total (cfs)	* 21.00	* Flow (cfs)	* 2.92	* 2.92	* 2.92
* Top Width (ft)	* 27.20	* Top Width (ft)	* 0.53	* 0.26	* 0.26
* Vel Total (ft/s)	* 2.92	* Avg. Vel. (ft/s)	* 97.9	* 97.9	* 97.9
* Max Chl Dpth (ft)	* 0.53	* Hydr. Depth (ft)	* 47.71	* 27.22	* 27.22
* Conv. Total (cfs)	* 97.9	* Conv. (cfs)	* 231.06	* 0.76	* 0.76
* Length Wtd. (ft)	* 47.71	* Wetted Per. (ft)	* 1.00	* Stream Power (lb/ft s)	* 312.17
* Min Ch El (ft)	* 231.06	* Shear (lb/sq ft)	* 0.00	* 0.00	* 0.00
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 0.09	* Cum Volume (acre-ft)	* 0.00
* Frctn Loss (ft)	* 0.09	* Cum Volume (acre-ft)	* 0.00	* 1.34	* 0.00
* C & E Loss (ft)	* 0.00	* Cum SA (acres)	* 0.02	* 0.42	* 0.02

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 234.49	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 1.21	* Wt. n-Val.	* 0.045	* 0.045	* 0.045

```

* W.S. Elev (ft)          * 233.29 * Reach Len. (ft)        * 55.51 * 47.74 * 42.02 *
* Crit W.S. (ft)         * 233.53 * Flow Area (sq ft)     * 1.63 * 86.10 * *
* E.G. Slope (ft/ft)     * 0.036848 * Area (sq ft)          * 1.63 * 93.78 * *
* Q Total (cfs)          * 767.00 * Flow (cfs)            * 5.73 * 761.27 * *
* Top Width (ft)         * 70.83 * Top Width (ft)        * 3.85 * 66.98 * *
* Vel Total (ft/s)       * 8.74 * Avg. Vel. (ft/s)      * 3.51 * 8.84 * *
* Max Chl Dpth (ft)      * 2.23 * Hydr. Depth (ft)     * 0.42 * 1.65 * *
* Conv. Total (cfs)      * 3995.7 * Conv. (cfs)           * 29.8 * 3965.8 * *
* Length Wtd. (ft)       * 47.10 * Wetted Per. (ft)     * 3.95 * 52.27 * *
* Min Ch El (ft)         * 231.06 * Shear (lb/sq ft)     * 0.95 * 3.79 * *
* Alpha                  * 1.02 * Stream Power (lb/ft s) * 312.17 * 0.00 * 0.00 *
* Frctn Loss (ft)        * 2.60 * Cum Volume (acre-ft) * 0.34 * 2.89 * 1.14 *
* C & E Loss (ft)        * 0.16 * Cum SA (acres)       * 0.27 * 0.48 * 1.10 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)          * 237.21 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)          * 2.92 * Wt. n-Val.             * 0.045 * 0.045 * *
* W.S. Elev (ft)         * 234.29 * Reach Len. (ft)        * 55.51 * 47.74 * 42.02 *
* Crit W.S. (ft)         * 235.15 * Flow Area (sq ft)     * 7.81 * 138.61 * *
* E.G. Slope (ft/ft)     * 0.047907 * Area (sq ft)          * 7.81 * 166.56 * 1.21 *
* Q Total (cfs)          * 1972.00 * Flow (cfs)            * 52.79 * 1919.21 * *
* Top Width (ft)         * 87.44 * Top Width (ft)        * 8.44 * 74.16 * 4.84 *
* Vel Total (ft/s)       * 13.47 * Avg. Vel. (ft/s)      * 6.76 * 13.85 * *
* Max Chl Dpth (ft)      * 3.23 * Hydr. Depth (ft)     * 0.93 * 2.66 * *
* Conv. Total (cfs)      * 9009.7 * Conv. (cfs)           * 241.2 * 8768.5 * *
* Length Wtd. (ft)       * 46.79 * Wetted Per. (ft)     * 8.64 * 52.27 * *
* Min Ch El (ft)         * 231.06 * Shear (lb/sq ft)     * 2.70 * 7.93 * *
* Alpha                  * 1.04 * Stream Power (lb/ft s) * 312.17 * 0.00 * 0.00 *
* Frctn Loss (ft)        * 2.83 * Cum Volume (acre-ft) * 0.94 * 4.32 * 3.11 *
* C & E Loss (ft)        * 0.07 * Cum SA (acres)       * 0.39 * 0.49 * 1.59 *
*****

```

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)          * 238.78 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)          * 3.96 * Wt. n-Val.             * 0.045 * 0.045 * *
* W.S. Elev (ft)         * 234.82 * Reach Len. (ft)        * 55.51 * 47.74 * 42.02 *
* Crit W.S. (ft)         * 236.03 * Flow Area (sq ft)     * 12.91 * 166.20 * *
* E.G. Slope (ft/ft)     * 0.051499 * Area (sq ft)          * 12.91 * 205.76 * 5.12 *
* Q Total (cfs)          * 2800.00 * Flow (cfs)            * 106.95 * 2693.05 * *
* Top Width (ft)         * 94.95 * Top Width (ft)        * 10.85 * 74.16 * 9.94 *
* Vel Total (ft/s)       * 15.63 * Avg. Vel. (ft/s)      * 8.28 * 16.20 * *
* Max Chl Dpth (ft)      * 3.76 * Hydr. Depth (ft)     * 1.19 * 3.18 * *
* Conv. Total (cfs)      * 12338.4 * Conv. (cfs)           * 471.3 * 11867.2 * *
* Length Wtd. (ft)       * 46.73 * Wetted Per. (ft)     * 11.11 * 52.27 * *
* Min Ch El (ft)         * 231.06 * Shear (lb/sq ft)     * 3.74 * 10.22 * *
* Alpha                  * 1.04 * Stream Power (lb/ft s) * 312.17 * 0.00 * 0.00 *
* Frctn Loss (ft)        * 2.82 * Cum Volume (acre-ft) * 1.23 * 5.03 * 4.15 *
* C & E Loss (ft)        * 0.01 * Cum SA (acres)       * 0.45 * 0.49 * 1.84 *
*****

```

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

```

*****
* E.G. Elev (ft)          * 234.70 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)          * 1.33 * Wt. n-Val.             * 0.045 * 0.045 * *
* W.S. Elev (ft)         * 233.37 * Reach Len. (ft)        * 55.51 * 47.74 * 42.02 *
* Crit W.S. (ft)         * 233.66 * Flow Area (sq ft)     * 1.98 * 90.64 * *

```

```

* E.G. Slope (ft/ft)      *0.037855 * Area (sq ft)          * 1.98 * 99.65 *
* Q Total (cfs)          * 848.00 * Flow (cfs)            * 7.53 * 840.47 *
* Top Width (ft)        * 72.47 * Top Width (ft)        * 4.25 * 68.22 *
* Vel Total (ft/s)      * 9.16 * Avg. Vel. (ft/s)     * 3.80 * 9.27 *
* Max Chl Dpth (ft)     * 2.31 * Hydr. Depth (ft)     * 0.47 * 1.74 *
* Conv. Total (cfs)     * 4358.5 * Conv. (cfs)          * 38.7 * 4319.7 *
* Length Wtd. (ft)     * 47.06 * Wetted Per. (ft)     * 4.35 * 52.27 *
* Min Ch El (ft)        * 231.06 * Shear (lb/sq ft)     * 1.08 * 4.10 *
* Alpha                  * 1.02 * Stream Power (lb/ft s) * 312.17 * 0.00 *
* Frctn Loss (ft)      * 2.63 * Cum Volume (acre-ft) * 0.40 * 3.06 *
* C & E Loss (ft)       * 0.16 * Cum SA (acres)       * 0.28 * 0.49 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft)        * 235.88 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)        * 2.05 * Wt. n-Val.           * 0.045 * 0.045 *
* W.S. Elev (ft)       * 233.82 * Reach Len. (ft)      * 55.51 * 47.74 * 42.02 *
* Crit W.S. (ft)       * 234.37 * Flow Area (sq ft)    * 4.36 * 114.16 *
* E.G. Slope (ft/ft)   * 0.043395 * Area (sq ft)         * 4.36 * 131.83 * 0.01 *
* Q Total (cfs)        * 1345.00 * Flow (cfs)           * 23.09 * 1321.91 *
* Top Width (ft)       * 80.78 * Top Width (ft)       * 6.30 * 74.16 * 0.32 *
* Vel Total (ft/s)     * 11.35 * Avg. Vel. (ft/s)     * 5.30 * 11.58 *
* Max Chl Dpth (ft)    * 2.76 * Hydr. Depth (ft)     * 0.69 * 2.19 *
* Conv. Total (cfs)    * 6456.6 * Conv. (cfs)          * 110.8 * 6345.8 *
* Length Wtd. (ft)    * 46.90 * Wetted Per. (ft)     * 6.45 * 52.27 *
* Min Ch El (ft)       * 231.06 * Shear (lb/sq ft)     * 1.83 * 5.92 *
* Alpha                * 1.03 * Stream Power (lb/ft s) * 312.17 * 0.00 * 0.00 *
* Frctn Loss (ft)     * 2.75 * Cum Volume (acre-ft) * 0.67 * 3.64 * 2.14 *
* C & E Loss (ft)     * 0.13 * Cum SA (acres)       * 0.35 * 0.49 * 1.29 *
*****

```

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
REACH: main RS: 14

INPUT

Description:

Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	248.1	14.71	237.72	23.72	228.98	25.86	226.84	28.49	222.9
38.71	224.14	42.25	224.21	50.16	224.37	55.6	228.96	71.32	229.8
113.72	230.51	160.05	232.96	160.35	232.96	186.93	237.56	188.11	241.98
189.39	242.3	193.37	242.37	197.27	242.28	197.37	242.11	217.75	242.56
234.11	241.83	235.6	241.71	236.27	242.26	242.78	242.92	249.14	247.54
255.21	248.57	259.08	250.56						

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	28.49	.035	55.6	.045	186.93	.05	193.37	.02
236.27	.1								

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
23.72 55.6 32.61 35.44 36.08 .1 .3

Ineffective Flow num= 1
Sta L Sta R Elev Permanent
147.8 188 255 F

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft)        * 229.77 * Element              * Left OB * Channel * Right OB *

```

```

* Vel Head (ft) * 0.15 * Wt. n-Val. * 0.100 * 0.052 * 0.045 *
* W.S. Elev (ft) * 229.62 * Reach Len. (ft) * 32.61 * 35.44 * 36.08 *
* Crit W.S. (ft) * 226.31 * Flow Area (sq ft) * 0.21 * 155.89 * 4.03 *
* E.G. Slope (ft/ft) *0.001743 * Area (sq ft) * 0.21 * 155.89 * 4.03 *
* Q Total (cfs) * 491.00 * Flow (cfs) * 0.05 * 488.31 * 2.64 *
* Top Width (ft) * 44.82 * Top Width (ft) * 0.66 * 31.88 * 12.28 *
* Vel Total (ft/s) * 3.07 * Avg. Vel. (ft/s) * 0.23 * 3.13 * 0.66 *
* Max Chl Dpth (ft) * 6.72 * Hydr. Depth (ft) * 0.32 * 4.89 * 0.33 *
* Conv. Total (cfs) * 11759.7 * Conv. (cfs) * 1.2 * 11695.3 * 63.3 *
* Length Wtd. (ft) * 35.44 * Wetted Per. (ft) * 0.91 * 36.63 * 12.30 *
* Min Ch El (ft) * 222.90 * Shear (lb/sq ft) * 0.02 * 0.46 * 0.04 *
* Alpha * 1.04 * Stream Power (lb/ft s) * 259.08 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.14 * Cum Volume (acre-ft) * 0.00 * 1.25 * 0.00 *
* C & E Loss (ft) * 0.08 * Cum SA (acres) * 0.02 * 0.39 * 0.01 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Manning's n values were composited to a single value in the main channel.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft) * 232.04 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.25 * Wt. n-Val. * 0.100 * 0.052 * 0.045 *
* W.S. Elev (ft) * 231.78 * Reach Len. (ft) * 32.61 * 35.44 * 36.08 *
* Crit W.S. (ft) * 228.26 * Flow Area (sq ft) * 4.05 * 224.96 * 122.13 *
* E.G. Slope (ft/ft) *0.002121 * Area (sq ft) * 4.05 * 224.96 * 122.13 *
* Q Total (cfs) * 1237.00 * Flow (cfs) * 2.78 * 992.53 * 241.69 *
* Top Width (ft) * 116.96 * Top Width (ft) * 2.89 * 31.88 * 82.19 *
* Vel Total (ft/s) * 3.52 * Avg. Vel. (ft/s) * 0.69 * 4.41 * 1.98 *
* Max Chl Dpth (ft) * 8.88 * Hydr. Depth (ft) * 1.40 * 7.06 * 1.49 *
* Conv. Total (cfs) * 26861.7 * Conv. (cfs) * 60.4 * 21553.0 * 5248.3 *
* Length Wtd. (ft) * 35.50 * Wetted Per. (ft) * 4.03 * 36.63 * 82.25 *
* Min Ch El (ft) * 222.90 * Shear (lb/sq ft) * 0.13 * 0.81 * 0.20 *
* Alpha * 1.32 * Stream Power (lb/ft s) * 259.08 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.15 * Cum Volume (acre-ft) * 0.33 * 2.72 * 1.08 *
* C & E Loss (ft) * 0.11 * Cum SA (acres) * 0.26 * 0.43 * 1.06 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Manning's n values were composited to a single value in the main channel.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft) * 233.61 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.40 * Wt. n-Val. * 0.100 * 0.052 * 0.045 *
* W.S. Elev (ft) * 233.21 * Reach Len. (ft) * 32.61 * 35.44 * 36.08 *
* Crit W.S. (ft) * 231.23 * Flow Area (sq ft) * 9.22 * 270.42 * 250.94 *
* E.G. Slope (ft/ft) *0.002866 * Area (sq ft) * 9.22 * 270.42 * 258.21 *
* Q Total (cfs) * 2442.00 * Flow (cfs) * 9.68 * 1568.05 * 864.27 *
* Top Width (ft) * 142.43 * Top Width (ft) * 4.36 * 31.88 * 106.19 *
* Vel Total (ft/s) * 4.60 * Avg. Vel. (ft/s) * 1.05 * 5.80 * 3.44 *
* Max Chl Dpth (ft) * 10.31 * Hydr. Depth (ft) * 2.11 * 8.48 * 2.72 *
* Conv. Total (cfs) * 45614.9 * Conv. (cfs) * 180.9 * 29290.1 * 16144.0 *
* Length Wtd. (ft) * 35.60 * Wetted Per. (ft) * 6.07 * 36.63 * 92.28 *
* Min Ch El (ft) * 222.90 * Shear (lb/sq ft) * 0.27 * 1.32 * 0.49 *
* Alpha * 1.22 * Stream Power (lb/ft s) * 259.08 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.15 * Cum Volume (acre-ft) * 0.93 * 4.08 * 2.99 *
* C & E Loss (ft) * 0.08 * Cum SA (acres) * 0.38 * 0.43 * 1.54 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Manning's n values were composited to a single value in the main channel.
 Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```
*****
* E.G. Elev (ft)      * 234.37 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.51  * Wt. n-Val.      * 0.100  * 0.052  * 0.045  *
* W.S. Elev (ft)     * 233.86 * Reach Len. (ft) * 32.61  * 35.44  * 36.08  *
* Crit W.S. (ft)     * 232.00 * Flow Area (sq ft) * 12.26  * 291.10 * 310.75 *
* E.G. Slope (ft/ft) * 0.003357 * Area (sq ft)    * 12.26  * 291.10 * 328.31 *
* Q Total (cfs)      * 3270.00 * Flow (cfs)      * 15.34  * 1918.88 * 1335.78 *
* Top Width (ft)     * 146.84 * Top Width (ft)  * 5.03   * 31.88  * 109.94 *
* Vel Total (ft/s)   * 5.32  * Avg. Vel. (ft/s) * 1.25   * 6.59   * 4.30   *
* Max Chl Dpth (ft)  * 10.96 * Hydr. Depth (ft) * 2.44   * 9.13   * 3.37   *
* Conv. Total (cfs)  * 56436.8 * Conv. (cfs)     * 264.7  * 33117.9 * 23054.2 *
* Length Wtd. (ft)  * 35.64 * Wetted Per. (ft) * 7.01   * 36.63  * 92.28  *
* Min Ch El (ft)     * 222.90 * Shear (lb/sq ft) * 0.37   * 1.67   * 0.71   *
* Alpha              * 1.17  * Stream Power (lb/ft s) * 259.08 * 0.00   * 0.00   *
* Frctn Loss (ft)   * 0.17  * Cum Volume (acre-ft) * 1.22   * 4.76   * 3.99   *
* C & E Loss (ft)   * 0.08  * Cum SA (acres)   * 0.44   * 0.43   * 1.78   *
*****
```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Manning's n values were composited to a single value in the main channel.
 Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

```
*****
* E.G. Elev (ft)      * 232.18 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.26  * Wt. n-Val.      * 0.100  * 0.052  * 0.045  *
* W.S. Elev (ft)     * 231.92 * Reach Len. (ft) * 32.61  * 35.44  * 36.08  *
* Crit W.S. (ft)     * 228.43 * Flow Area (sq ft) * 4.44   * 229.18 * 133.17 *
* E.G. Slope (ft/ft) * 0.002178 * Area (sq ft)    * 4.44   * 229.18 * 133.17 *
* Q Total (cfs)      * 1318.00 * Flow (cfs)      * 3.19   * 1037.48 * 277.33 *
* Top Width (ft)     * 119.60 * Top Width (ft)  * 3.03   * 31.88  * 84.69  *
* Vel Total (ft/s)   * 3.59  * Avg. Vel. (ft/s) * 0.72   * 4.53   * 2.08   *
* Max Chl Dpth (ft)  * 9.02  * Hydr. Depth (ft) * 1.47   * 7.19   * 1.57   *
* Conv. Total (cfs)  * 28241.6 * Conv. (cfs)     * 68.3   * 22230.8 * 5942.6 *
* Length Wtd. (ft)  * 35.51 * Wetted Per. (ft) * 4.22   * 36.63  * 84.76  *
* Min Ch El (ft)     * 222.90 * Shear (lb/sq ft) * 0.14   * 0.85   * 0.21   *
* Alpha              * 1.32  * Stream Power (lb/ft s) * 259.08 * 0.00   * 0.00   *
* Frctn Loss (ft)   * 0.14  * Cum Volume (acre-ft) * 0.40   * 2.88   * 1.27   *
* C & E Loss (ft)   * 0.09  * Cum SA (acres)   * 0.28   * 0.43   * 1.10   *
*****
```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Manning's n values were composited to a single value in the main channel.
 Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```
*****
* E.G. Elev (ft)      * 232.91 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.32  * Wt. n-Val.      * 0.100  * 0.052  * 0.045  *
* W.S. Elev (ft)     * 232.59 * Reach Len. (ft) * 32.61  * 35.44  * 36.08  *
* Crit W.S. (ft)     * 229.53 * Flow Area (sq ft) * 6.73   * 250.80 * 194.21 *
* E.G. Slope (ft/ft) * 0.002475 * Area (sq ft)    * 6.73   * 250.80 * 194.96 *
* Q Total (cfs)      * 1815.00 * Flow (cfs)      * 5.92   * 1285.18 * 523.91 *
* Top Width (ft)     * 133.13 * Top Width (ft)  * 3.73   * 31.88  * 97.52  *
* Vel Total (ft/s)   * 4.02  * Avg. Vel. (ft/s) * 0.88   * 5.12   * 2.70   *
* Max Chl Dpth (ft)  * 9.69  * Hydr. Depth (ft) * 1.81   * 7.87   * 2.11   *
* Conv. Total (cfs)  * 36485.9 * Conv. (cfs)     * 118.9  * 25835.1 * 10531.8 *
* Length Wtd. (ft)  * 35.56 * Wetted Per. (ft) * 5.19   * 36.63  * 92.28  *
* Min Ch El (ft)     * 222.90 * Shear (lb/sq ft) * 0.20   * 1.06   * 0.33   *
* Alpha              * 1.28  * Stream Power (lb/ft s) * 259.08 * 0.00   * 0.00   *
* Frctn Loss (ft)   * 0.15  * Cum Volume (acre-ft) * 0.66   * 3.43   * 2.04   *
*****
```

* C & E Loss (ft) * 0.08 * Cum SA (acres) * 0.34 * 0.43 * 1.24 *

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
 This may indicate the need for additional cross sections.
 Note: Manning's n values were composited to a single value in the main channel.
 Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
 REACH: main RS: 13

INPUT

Description:

Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	241.96	14.55	230.95	32.96	227.31	36.62	225.36	41.86	224.74
42.53	224.66	46.66	225.42	50.53	227.84	56.2	227.42	61.55	230.48
83.14	230.27	114.16	230.85	147.33	231.62	165.36	233	196.3	242.62
199.29	241.9	203.15	241.91	203.26	241.69	211.59	241.93	222.67	242.05
233.56	241.54	240.52	241.08	241.1	241.66	251.87	250.04		

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	14.55	.035	61.55	.045	199.29	.02	241.1	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

14.55	61.55	36.53	35.61	35.05	.1	.3
-------	-------	-------	-------	-------	----	----

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
157.7	165.4	255	F

Blocked Obstructions num= 1

Sta L	Sta R	Elev
165.4	196.3	255

CROSS SECTION OUTPUT Profile #2-YR

* E.G. Elev (ft)	* 229.55	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.96	* Wt. n-Val.	*	* 0.035	*
* W.S. Elev (ft)	* 228.59	* Reach Len. (ft)	* 36.53	* 35.61	* 35.05
* Crit W.S. (ft)	* 228.57	* Flow Area (sq ft)	*	* 62.59	*
* E.G. Slope (ft/ft)	* 0.014862	* Area (sq ft)	*	* 62.59	*
* Q Total (cfs)	* 491.00	* Flow (cfs)	*	* 491.00	*
* Top Width (ft)	* 31.79	* Top Width (ft)	*	* 31.79	*
* Vel Total (ft/s)	* 7.85	* Avg. Vel. (ft/s)	*	* 7.85	*
* Max Chl Dpth (ft)	* 3.93	* Hydr. Depth (ft)	*	* 1.97	*
* Conv. Total (cfs)	* 4027.5	* Conv. (cfs)	*	* 4027.5	*
* Length Wtd. (ft)	* 35.61	* Wetted Per. (ft)	*	* 33.54	*
* Min Ch El (ft)	* 224.66	* Shear (lb/sq ft)	*	* 1.73	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 251.87	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.24	* Cum Volume (acre-ft)	* 0.00	* 1.16	* 0.00
* C & E Loss (ft)	* 0.19	* Cum SA (acres)	* 0.02	* 0.36	* 0.01

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
 This may indicate the need for additional cross sections.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 231.78	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 1.33	* Wt. n-Val.	*	* 0.035	* 0.045
* W.S. Elev (ft)	* 230.45	* Reach Len. (ft)	* 36.53	* 35.61	* 35.05
* Crit W.S. (ft)	* 230.34	* Flow Area (sq ft)	*	* 133.40	* 2.61
* E.G. Slope (ft/ft)	* 0.011787	* Area (sq ft)	*	* 133.40	* 2.61

* Q Total (cfs)	* 1237.00	* Flow (cfs)	*	* 1235.11	*	1.89	*
* Top Width (ft)	* 72.98	* Top Width (ft)	*	* 44.44	*	28.54	*
* Vel Total (ft/s)	* 9.10	* Avg. Vel. (ft/s)	*	* 9.26	*	0.73	*
* Max Chl Dpth (ft)	* 5.79	* Hydr. Depth (ft)	*	* 3.00	*	0.09	*
* Conv. Total (cfs)	* 11393.8	* Conv. (cfs)	*	* 11376.3	*	17.4	*
* Length Wtd. (ft)	* 35.60	* Wetted Per. (ft)	*	* 46.86	*	28.54	*
* Min Ch El (ft)	* 224.66	* Shear (lb/sq ft)	*	* 2.09	*	0.07	*
* Alpha	* 1.03	* Stream Power (lb/ft s)	* 251.87	* 0.00	*	0.00	*
* Frctn Loss (ft)	* 0.19	* Cum Volume (acre-ft)	* 0.33	* 2.57	*	1.03	*
* C & E Loss (ft)	* 0.25	* Cum SA (acres)	* 0.26	* 0.40	*	1.01	*

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 233.37	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 1.22	* Wt. n-Val.	* 0.100	* 0.035	* 0.045	*
* W.S. Elev (ft)	* 232.15	* Reach Len. (ft)	* 36.53	* 35.61	* 35.05	*
* Crit W.S. (ft)	* 232.15	* Flow Area (sq ft)	* 0.95	* 212.48	* 119.70	*
* E.G. Slope (ft/ft)	* 0.007327	* Area (sq ft)	* 0.95	* 212.48	* 119.70	*
* Q Total (cfs)	* 2442.00	* Flow (cfs)	* 0.74	* 2040.15	* 401.11	*
* Top Width (ft)	* 141.27	* Top Width (ft)	* 1.58	* 47.00	* 92.69	*
* Vel Total (ft/s)	* 7.33	* Avg. Vel. (ft/s)	* 0.78	* 9.60	* 3.35	*
* Max Chl Dpth (ft)	* 7.49	* Hydr. Depth (ft)	* 0.60	* 4.52	* 1.29	*
* Conv. Total (cfs)	* 28529.0	* Conv. (cfs)	* 8.6	* 23834.3	* 4686.0	*
* Length Wtd. (ft)	* 35.52	* Wetted Per. (ft)	* 1.99	* 49.48	* 92.72	*
* Min Ch El (ft)	* 224.66	* Shear (lb/sq ft)	* 0.22	* 1.96	* 0.59	*
* Alpha	* 1.47	* Stream Power (lb/ft s)	* 251.87	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.20	* Cum Volume (acre-ft)	* 0.93	* 3.88	* 2.83	*
* C & E Loss (ft)	* 0.09	* Cum SA (acres)	* 0.38	* 0.40	* 1.46	*

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 234.12	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 1.35	* Wt. n-Val.	* 0.100	* 0.035	* 0.045	*
* W.S. Elev (ft)	* 232.76	* Reach Len. (ft)	* 36.53	* 35.61	* 35.05	*
* Crit W.S. (ft)	* 232.76	* Flow Area (sq ft)	* 2.17	* 241.38	* 178.34	*
* E.G. Slope (ft/ft)	* 0.007255	* Area (sq ft)	* 2.17	* 241.38	* 179.14	*
* Q Total (cfs)	* 3270.00	* Flow (cfs)	* 2.22	* 2510.78	* 757.00	*
* Top Width (ft)	* 150.11	* Top Width (ft)	* 2.40	* 47.00	* 100.72	*
* Vel Total (ft/s)	* 7.75	* Avg. Vel. (ft/s)	* 1.02	* 10.40	* 4.24	*
* Max Chl Dpth (ft)	* 8.10	* Hydr. Depth (ft)	* 0.91	* 5.14	* 1.85	*
* Conv. Total (cfs)	* 38390.0	* Conv. (cfs)	* 26.0	* 29476.7	* 8887.2	*
* Length Wtd. (ft)	* 35.48	* Wetted Per. (ft)	* 3.01	* 49.48	* 96.20	*
* Min Ch El (ft)	* 224.66	* Shear (lb/sq ft)	* 0.33	* 2.21	* 0.84	*
* Alpha	* 1.45	* Stream Power (lb/ft s)	* 251.87	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.19	* Cum Volume (acre-ft)	* 1.21	* 4.54	* 3.78	*
* C & E Loss (ft)	* 0.12	* Cum SA (acres)	* 0.43	* 0.40	* 1.69	*

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

```
*****
* E.G. Elev (ft)      * 231.94 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.21  * Wt. n-Val.      *         * 0.035  * 0.045  *
* W.S. Elev (ft)     * 230.74 * Reach Len. (ft) * 36.53  * 35.61  * 35.05  *
* Crit W.S. (ft)     * 230.74 * Flow Area (sq ft) *         * 146.26 * 13.66  *
* E.G. Slope (ft/ft) * 0.009997 * Area (sq ft)    *         * 146.26 * 13.66  *
* Q Total (cfs)      * 1318.00 * Flow (cfs)      *         * 1298.10 * 19.90  *
* Top Width (ft)     * 92.50  * Top Width (ft)  *         * 45.92  * 46.58  *
* Vel Total (ft/s)   * 8.24  * Avg. Vel. (ft/s) *         * 8.88   * 1.46   *
* Max Chl Dpth (ft)  * 6.08  * Hydr. Depth (ft) *         * 3.18   * 0.29   *
* Conv. Total (cfs)  * 13182.2 * Conv. (cfs)     *         * 12983.2 * 199.0  *
* Length Wtd. (ft)   * 35.59  * Wetted Per. (ft) *         * 48.38  * 46.58  *
* Min Ch El (ft)     * 224.66 * Shear (lb/sq ft) *         * 1.89   * 0.18   *
* Alpha              * 1.14  * Stream Power (lb/ft s) * 251.87 * 0.00  * 0.00  *
* Frctn Loss (ft)    * 0.19  * Cum Volume (acre-ft) * 0.40  * 2.73  * 1.21  *
* C & E Loss (ft)    * 0.20  * Cum SA (acres)   * 0.28  * 0.40  * 1.04  *
*****
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```
*****
* E.G. Elev (ft)      * 232.69 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.17  * Wt. n-Val.      * 0.100  * 0.035  * 0.045  *
* W.S. Elev (ft)     * 231.52 * Reach Len. (ft) * 36.53  * 35.61  * 35.05  *
* Crit W.S. (ft)     * 231.52 * Flow Area (sq ft) * 0.21  * 182.77 * 63.87  *
* E.G. Slope (ft/ft) * 0.007964 * Area (sq ft)    * 0.21  * 182.77 * 63.87  *
* Q Total (cfs)      * 1815.00 * Flow (cfs)      * 0.10  * 1654.69 * 160.20  *
* Top Width (ft)     * 129.06 * Top Width (ft)  * 0.75  * 47.00  * 81.31  *
* Vel Total (ft/s)   * 7.35  * Avg. Vel. (ft/s) * 0.49  * 9.05  * 2.51  *
* Max Chl Dpth (ft)  * 6.86  * Hydr. Depth (ft) * 0.28  * 3.89  * 0.79  *
* Conv. Total (cfs)  * 20338.6 * Conv. (cfs)     * 1.2  * 18542.2 * 1795.2  *
* Length Wtd. (ft)   * 35.56 * Wetted Per. (ft) * 0.94  * 49.48  * 81.33  *
* Min Ch El (ft)     * 224.66 * Shear (lb/sq ft) * 0.11  * 1.84  * 0.39  *
* Alpha              * 1.39  * Stream Power (lb/ft s) * 251.87 * 0.00  * 0.00  *
* Frctn Loss (ft)    * 0.21  * Cum Volume (acre-ft) * 0.66  * 3.26  * 1.94  *
* C & E Loss (ft)    * 0.11  * Cum SA (acres)   * 0.34  * 0.40  * 1.16  *
*****
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main

RS: 12

INPUT

Description:

Station Elevation Data num= 27

Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev

0	235.97	4.29	233.19	9.01	229.89	17.76	227.7	28.61	225.14
36.48	224.53	37.83	224.73	40.71	225.18	43.81	227.25	55.11	226.71
56.34	228.17	57.5	230.17	63.19	230.16	87.64	229.97	122.51	230.61
158.38	231.61	163.21	231.75	184.45	232.71	185.11	234.3	200.8	234.38
201.16	240.02	206.05	240.52	209.96	240.56	228.22	240.92	246.17	240.16
246.99	240.76	255.05	247.12						

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	9.01	.035	57.5	.045	206.05	.02	246.99	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 9.01 57.5 43.41 42.27 41.38 .1 .3

Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 179.23 201.87 250 F

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft) * 229.12 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.33 * Wt. n-Val. * * 0.035 * *
* W.S. Elev (ft) * 228.79 * Reach Len. (ft) * 43.41 * 42.27 * 41.38 *
* Crit W.S. (ft) * 227.82 * Flow Area (sq ft) * * 105.95 * *
* E.G. Slope (ft/ft) * 0.003856 * Area (sq ft) * * 105.95 * *
* Q Total (cfs) * 491.00 * Flow (cfs) * * 491.00 * *
* Top Width (ft) * 43.28 * Top Width (ft) * * 43.28 * *
* Vel Total (ft/s) * 4.63 * Avg. Vel. (ft/s) * * 4.63 * *
* Max Chl Dpth (ft) * 4.26 * Hydr. Depth (ft) * * 2.45 * *
* Conv. Total (cfs) * 7906.6 * Conv. (cfs) * * 7906.6 * *
* Length Wtd. (ft) * 42.27 * Wetted Per. (ft) * * 45.46 * *
* Min Ch El (ft) * 224.53 * Shear (lb/sq ft) * * 0.56 * *
* Alpha * 1.00 * Stream Power (lb/ft s) * 255.05 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.28 * Cum Volume (acre-ft) * 0.00 * 1.09 * 0.00 *
* C & E Loss (ft) * 0.08 * Cum SA (acres) * 0.02 * 0.33 * 0.01 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft) * 231.34 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.51 * Wt. n-Val. * 0.100 * 0.035 * 0.045 *
* W.S. Elev (ft) * 230.83 * Reach Len. (ft) * 43.41 * 42.27 * 41.38 *
* Crit W.S. (ft) * 229.31 * Flow Area (sq ft) * 0.64 * 202.19 * 42.42 *
* E.G. Slope (ft/ft) * 0.003073 * Area (sq ft) * 0.64 * 202.19 * 42.42 *
* Q Total (cfs) * 1237.00 * Flow (cfs) * 0.28 * 1182.67 * 54.06 *
* Top Width (ft) * 122.85 * Top Width (ft) * 1.35 * 48.49 * 73.02 *
* Vel Total (ft/s) * 5.04 * Avg. Vel. (ft/s) * 0.44 * 5.85 * 1.27 *
* Max Chl Dpth (ft) * 6.30 * Hydr. Depth (ft) * 0.47 * 4.17 * 0.58 *
* Conv. Total (cfs) * 22313.7 * Conv. (cfs) * 5.0 * 21333.6 * 975.1 *
* Length Wtd. (ft) * 42.23 * Wetted Per. (ft) * 1.65 * 51.60 * 73.03 *
* Min Ch El (ft) * 224.53 * Shear (lb/sq ft) * 0.07 * 0.75 * 0.11 *
* Alpha * 1.29 * Stream Power (lb/ft s) * 255.05 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.18 * Cum Volume (acre-ft) * 0.33 * 2.43 * 1.01 *
* C & E Loss (ft) * 0.04 * Cum SA (acres) * 0.26 * 0.36 * 0.97 *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft) * 232.79 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.91 * Wt. n-Val. * 0.100 * 0.035 * 0.045 *
* W.S. Elev (ft) * 231.88 * Reach Len. (ft) * 43.41 * 42.27 * 41.38 *
* Crit W.S. (ft) * 231.35 * Flow Area (sq ft) * 2.82 * 252.71 * 137.83 *
* E.G. Slope (ft/ft) * 0.004522 * Area (sq ft) * 2.82 * 252.71 * 137.83 *
* Q Total (cfs) * 2442.00 * Flow (cfs) * 2.45 * 2080.58 * 358.96 *
* Top Width (ft) * 159.81 * Top Width (ft) * 2.84 * 48.49 * 108.48 *
* Vel Total (ft/s) * 6.21 * Avg. Vel. (ft/s) * 0.87 * 8.23 * 2.60 *
* Max Chl Dpth (ft) * 7.35 * Hydr. Depth (ft) * 0.99 * 5.21 * 1.27 *
* Conv. Total (cfs) * 36315.4 * Conv. (cfs) * 36.5 * 30940.7 * 5338.2 *

```

```

* Length Wtd. (ft)      * 42.09 * Wetted Per. (ft)      * 3.46 * 51.60 * 108.51 *
* Min Ch El (ft)       * 224.53 * Shear (lb/sq ft)     * 0.23 * 1.38 * 0.36 *
* Alpha                * 1.52 * Stream Power (lb/ft s) * 255.05 * 0.00 * 0.00 *
* Frctn Loss (ft)     * 0.17 * Cum Volume (acre-ft) * 0.92 * 3.69 * 2.73 *
* C & E Loss (ft)     * 0.06 * Cum SA (acres)       * 0.38 * 0.36 * 1.38 *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)       * 233.59 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)       * 0.94 * Wt. n-Val.           * 0.100 * 0.035 * 0.045 *
* W.S. Elev (ft)      * 232.65 * Reach Len. (ft)     * 43.41 * 42.27 * 41.38 *
* Crit W.S. (ft)     * 232.09 * Flow Area (sq ft)   * 5.45 * 290.30 * 228.21 *
* E.G. Slope (ft/ft)  * 0.004188 * Area (sq ft)       * 5.45 * 290.30 * 228.56 *
* Q Total (cfs)       * 3270.00 * Flow (cfs)         * 5.69 * 2522.97 * 741.34 *
* Top Width (ft)     * 178.07 * Top Width (ft)     * 3.95 * 48.49 * 125.63 *
* Vel Total (ft/s)   * 6.24 * Avg. Vel. (ft/s)   * 1.04 * 8.69 * 3.25 *
* Max Chl Dpth (ft)  * 8.12 * Hydr. Depth (ft)   * 1.38 * 5.99 * 1.87 *
* Conv. Total (cfs)  * 50526.4 * Conv. (cfs)        * 87.9 * 38983.7 * 11454.8 *
* Length Wtd. (ft)   * 42.02 * Wetted Per. (ft)   * 4.82 * 51.60 * 121.77 *
* Min Ch El (ft)     * 224.53 * Shear (lb/sq ft)   * 0.30 * 1.47 * 0.49 *
* Alpha              * 1.56 * Stream Power (lb/ft s) * 255.05 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 0.16 * Cum Volume (acre-ft) * 1.21 * 4.32 * 3.62 *
* C & E Loss (ft)   * 0.08 * Cum SA (acres)     * 0.43 * 0.36 * 1.60 *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

```

*****
* E.G. Elev (ft)       * 231.46 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)       * 0.54 * Wt. n-Val.           * 0.100 * 0.035 * 0.045 *
* W.S. Elev (ft)      * 230.91 * Reach Len. (ft)     * 43.41 * 42.27 * 41.38 *
* Crit W.S. (ft)     * 229.45 * Flow Area (sq ft)   * 0.75 * 206.15 * 48.50 *
* E.G. Slope (ft/ft)  * 0.003219 * Area (sq ft)       * 0.75 * 206.15 * 48.50 *
* Q Total (cfs)       * 1318.00 * Flow (cfs)         * 0.36 * 1250.26 * 67.38 *
* Top Width (ft)     * 125.90 * Top Width (ft)     * 1.47 * 48.49 * 75.95 *
* Vel Total (ft/s)   * 5.16 * Avg. Vel. (ft/s)   * 0.47 * 6.06 * 1.39 *
* Max Chl Dpth (ft)  * 6.38 * Hydr. Depth (ft)   * 0.51 * 4.25 * 0.64 *
* Conv. Total (cfs)  * 23228.5 * Conv. (cfs)        * 6.3 * 22034.7 * 1187.6 *
* Length Wtd. (ft)   * 42.22 * Wetted Per. (ft)   * 1.79 * 51.60 * 75.96 *
* Min Ch El (ft)     * 224.53 * Shear (lb/sq ft)   * 0.08 * 0.80 * 0.13 *
* Alpha              * 1.31 * Stream Power (lb/ft s) * 255.05 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 0.18 * Cum Volume (acre-ft) * 0.40 * 2.58 * 1.18 *
* C & E Loss (ft)   * 0.04 * Cum SA (acres)     * 0.28 * 0.36 * 1.00 *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft)       * 232.05 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)       * 0.80 * Wt. n-Val.           * 0.100 * 0.035 * 0.045 *
* W.S. Elev (ft)      * 231.26 * Reach Len. (ft)     * 43.41 * 42.27 * 41.38 *
* Crit W.S. (ft)     * 230.51 * Flow Area (sq ft)   * 1.33 * 222.69 * 76.50 *
* E.G. Slope (ft/ft)  * 0.004397 * Area (sq ft)       * 1.33 * 222.69 * 76.50 *
* Q Total (cfs)       * 1815.00 * Flow (cfs)         * 0.89 * 1661.75 * 152.35 *
* Top Width (ft)     * 138.63 * Top Width (ft)     * 1.95 * 48.49 * 88.19 *
* Vel Total (ft/s)   * 6.04 * Avg. Vel. (ft/s)   * 0.67 * 7.46 * 1.99 *
* Max Chl Dpth (ft)  * 6.73 * Hydr. Depth (ft)   * 0.68 * 4.59 * 0.87 *
* Conv. Total (cfs)  * 27371.6 * Conv. (cfs)        * 13.5 * 25060.6 * 2297.6 *
* Length Wtd. (ft)   * 42.16 * Wetted Per. (ft)   * 2.38 * 51.60 * 88.20 *
* Min Ch El (ft)     * 224.53 * Shear (lb/sq ft)   * 0.15 * 1.18 * 0.24 *
* Alpha              * 1.41 * Stream Power (lb/ft s) * 255.05 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 0.20 * Cum Volume (acre-ft) * 0.66 * 3.09 * 1.88 *
* C & E Loss (ft)   * 0.01 * Cum SA (acres)     * 0.34 * 0.36 * 1.10 *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
REACH: main RS: 11

INPUT

Description:

Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	245.96	10.1	239.95	27.61	230.25	50	227.94	56.91	224.69
62.67	224.26	62.68	224.25	63.08	224.22	69.01	224.83	75.79	227.38
81.94	229.34	113.15	229.54	159.41	229.57	197.32	230.73	229.05	232.56
241.65	238.86	245.59	238.88	245.71	238.5	252.11	238.68	263.49	238.91
274.3	238.47	281.62	238.2	282.41	238.74	288.52	243.68	297.15	245.07

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	50	.035	81.94	.045	229.05	.05	241.65	.02
282.41	.1								

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	50	81.94		42.45	41.39	40	.1 .3

CROSS SECTION OUTPUT Profile #2-YR

* E.G. Elev (ft)	* 228.76	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 1.12	* Wt. n-Val.	* 0.035		
* W.S. Elev (ft)	* 227.64	* Reach Len. (ft)	* 42.45	* 41.39	* 40.00
* Crit W.S. (ft)	* 227.64	* Flow Area (sq ft)		* 57.92	
* E.G. Slope (ft/ft)	* 0.014548	* Area (sq ft)		* 57.92	
* Q Total (cfs)	* 491.00	* Flow (cfs)		* 491.00	
* Top Width (ft)	* 25.98	* Top Width (ft)		* 25.98	
* Vel Total (ft/s)	* 8.48	* Avg. Vel. (ft/s)		* 8.48	
* Max Chl Dpth (ft)	* 3.42	* Hydr. Depth (ft)		* 2.23	
* Conv. Total (cfs)	* 4070.8	* Conv. (cfs)		* 4070.8	
* Length Wtd. (ft)	* 41.39	* Wetted Per. (ft)		* 27.20	
* Min Ch El (ft)	* 224.22	* Shear (lb/sq ft)		* 1.93	
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 297.15	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.46	* Cum Volume (acre-ft)	* 0.00	* 1.01	* 0.00
* C & E Loss (ft)	* 0.10	* Cum SA (acres)	* 0.02	* 0.30	* 0.01

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 231.12	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.96	* Wt. n-Val.	* 0.100	* 0.035	* 0.045
* W.S. Elev (ft)	* 230.16	* Reach Len. (ft)	* 42.45	* 41.39	* 40.00
* Crit W.S. (ft)	* 230.16	* Flow Area (sq ft)	* 23.93	* 133.79	* 56.34
* E.G. Slope (ft/ft)	* 0.005994	* Area (sq ft)	* 23.93	* 133.79	* 56.34
* Q Total (cfs)	* 1237.00	* Flow (cfs)	* 29.42	* 1107.19	* 100.39
* Top Width (ft)	* 150.29	* Top Width (ft)	* 21.54	* 31.94	* 96.82
* Vel Total (ft/s)	* 5.78	* Avg. Vel. (ft/s)	* 1.23	* 8.28	* 1.78
* Max Chl Dpth (ft)	* 5.94	* Hydr. Depth (ft)	* 1.11	* 4.19	* 0.58
* Conv. Total (cfs)	* 15977.5	* Conv. (cfs)	* 380.0	* 14300.8	* 1296.6
* Length Wtd. (ft)	* 41.26	* Wetted Per. (ft)	* 21.65	* 33.49	* 96.83
* Min Ch El (ft)	* 224.22	* Shear (lb/sq ft)	* 0.41	* 1.50	* 0.22
* Alpha	* 1.84	* Stream Power (lb/ft s)	* 297.15	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.20	* Cum Volume (acre-ft)	* 0.32	* 2.27	* 0.96
* C & E Loss (ft)	* 0.09	* Cum SA (acres)	* 0.25	* 0.32	* 0.89

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50-YR

```
*****
* E.G. Elev (ft)      * 232.55 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.72  * Wt. n-Val.      * 0.100  * 0.035  * 0.045  *
* W.S. Elev (ft)     * 231.84 * Reach Len. (ft) * 42.45  * 41.39  * 40.00  *
* Crit W.S. (ft)     *      * Flow Area (sq ft) * 63.63  * 187.24 * 254.78 *
* E.G. Slope (ft/ft) * 0.003794 * Area (sq ft)    * 63.63  * 187.24 * 254.78 *
* Q Total (cfs)      * 2442.00 * Flow (cfs)      * 106.38 * 1542.63 * 792.99 *
* Top Width (ft)     * 191.74 * Top Width (ft)  * 25.25  * 31.94  * 134.55 *
* Vel Total (ft/s)   * 4.83  * Avg. Vel. (ft/s) * 1.67  * 8.24  * 3.11  *
* Max Chl Dpth (ft)  * 7.62  * Hydr. Depth (ft) * 2.52  * 5.86  * 1.89  *
* Conv. Total (cfs)  * 39643.7 * Conv. (cfs)     * 1726.9 * 25043.2 * 12873.5 *
* Length Wtd. (ft)   * 40.97  * Wetted Per. (ft) * 25.78  * 33.49  * 134.60 *
* Min Ch El (ft)     * 224.22 * Shear (lb/sq ft) * 0.58  * 1.32  * 0.45  *
* Alpha              * 1.98  * Stream Power (lb/ft s) * 297.15 * 0.00  * 0.00  *
* Frctn Loss (ft)    * 0.11  * Cum Volume (acre-ft) * 0.89  * 3.48  * 2.54  *
* C & E Loss (ft)    * 0.09  * Cum SA (acres)   * 0.36  * 0.32  * 1.26  *
*****
```

CROSS SECTION OUTPUT Profile #100-YR

```
*****
* E.G. Elev (ft)      * 233.36 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.68  * Wt. n-Val.      * 0.100  * 0.035  * 0.045  *
* W.S. Elev (ft)     * 232.67 * Reach Len. (ft) * 42.45  * 41.39  * 40.00  *
* Crit W.S. (ft)     *      * Flow Area (sq ft) * 85.40  * 213.97 * 373.34 *
* E.G. Slope (ft/ft) * 0.003302 * Area (sq ft)    * 85.40  * 213.97 * 373.34 *
* Q Total (cfs)      * 3270.00 * Flow (cfs)      * 155.16 * 1797.37 * 1317.46 *
* Top Width (ft)     * 206.04 * Top Width (ft)  * 26.76  * 31.94  * 147.33 *
* Vel Total (ft/s)   * 4.86  * Avg. Vel. (ft/s) * 1.82  * 8.40  * 3.53  *
* Max Chl Dpth (ft)  * 8.45  * Hydr. Depth (ft) * 3.19  * 6.70  * 2.53  *
* Conv. Total (cfs)  * 56907.8 * Conv. (cfs)     * 2700.3 * 31279.7 * 22927.8 *
* Length Wtd. (ft)   * 40.88  * Wetted Per. (ft) * 27.51  * 33.49  * 147.43 *
* Min Ch El (ft)     * 224.22 * Shear (lb/sq ft) * 0.64  * 1.32  * 0.52  *
* Alpha              * 1.86  * Stream Power (lb/ft s) * 297.15 * 0.00  * 0.00  *
* Frctn Loss (ft)    * 0.10  * Cum Volume (acre-ft) * 1.16  * 4.08  * 3.33  *
* C & E Loss (ft)    * 0.07  * Cum SA (acres)   * 0.42  * 0.32  * 1.47  *
*****
```

CROSS SECTION OUTPUT Profile #6HR OBS

```
*****
* E.G. Elev (ft)      * 231.24 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.94  * Wt. n-Val.      * 0.100  * 0.035  * 0.045  *
* W.S. Elev (ft)     * 230.30 * Reach Len. (ft) * 42.45  * 41.39  * 40.00  *
* Crit W.S. (ft)     * 230.30 * Flow Area (sq ft) * 26.89  * 138.06 * 69.58  *
* E.G. Slope (ft/ft) * 0.005799 * Area (sq ft)    * 26.89  * 138.06 * 69.58  *
* Q Total (cfs)      * 1318.00 * Flow (cfs)      * 34.15  * 1147.56 * 136.29 *
* Top Width (ft)     * 155.60 * Top Width (ft)  * 22.47  * 31.94  * 101.19 *
* Vel Total (ft/s)   * 5.62  * Avg. Vel. (ft/s) * 1.27  * 8.31  * 1.96  *
* Max Chl Dpth (ft)  * 6.08  * Hydr. Depth (ft) * 1.20  * 4.32  * 0.69  *
* Conv. Total (cfs)  * 17308.1 * Conv. (cfs)     * 448.5  * 15069.8 * 1789.8 *
* Length Wtd. (ft)   * 41.22  * Wetted Per. (ft) * 22.60  * 33.49  * 101.20 *
* Min Ch El (ft)     * 224.22 * Shear (lb/sq ft) * 0.43  * 1.49  * 0.25  *
* Alpha              * 1.92  * Stream Power (lb/ft s) * 297.15 * 0.00  * 0.00  *
* Frctn Loss (ft)    * 0.17  * Cum Volume (acre-ft) * 0.38  * 2.41  * 1.13  *
* C & E Loss (ft)    * 0.12  * Cum SA (acres)   * 0.27  * 0.32  * 0.91  *
*****
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #24HR OBS

```
*****
* E.G. Elev (ft)      * 231.84 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.91  * Wt. n-Val.      * 0.100  * 0.035  * 0.045  *
* W.S. Elev (ft)     * 230.93 * Reach Len. (ft) * 42.45  * 41.39  * 40.00  *
* Crit W.S. (ft)     * 230.86 * Flow Area (sq ft) * 41.55  * 158.38 * 140.27 *
* E.G. Slope (ft/ft) * 0.005267 * Area (sq ft)    * 41.55  * 158.38 * 140.27 *
* Q Total (cfs)      * 1815.00 * Flow (cfs)      * 64.76  * 1374.97 * 375.28 *
* Top Width (ft)     * 174.44 * Top Width (ft)  * 23.62  * 31.94  * 118.88 *
* Vel Total (ft/s)   * 5.34  * Avg. Vel. (ft/s) * 1.56  * 8.68  * 2.68  *
* Max Chl Dpth (ft)  * 6.71  * Hydr. Depth (ft) * 1.76  * 4.96  * 1.18  *
* Conv. Total (cfs)  * 25008.9 * Conv. (cfs)     * 892.3  * 18945.7 * 5171.0 *
* Length Wtd. (ft)   * 41.09  * Wetted Per. (ft) * 23.92  * 33.49  * 118.91 *
*****
```

```

* Min Ch El (ft)          * 224.22 * Shear (lb/sq ft)      * 0.57 * 1.56 * 0.39 *
* Alpha                  * 2.06 * Stream Power (lb/ft s) * 297.15 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.14 * Cum Volume (acre-ft)  * 0.64 * 2.91 * 1.78 *
* C & E Loss (ft)       * 0.15 * Cum SA (acres)        * 0.32 * 0.32 * 1.00 *
*****

```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: hudson
REACH: main RS: 10

INPUT

Description:

```

Station Elevation Data num= 27
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
*****
0 254.32 27.86 234.84 35.17 229.78 70.22 228.43 73.71 226.78
79.05 224.24 84.97 223.61 84.98 223.61 85.18 223.59 91.53 224.07
98.22 226.6 103.1 228.6 141.3 228.97 185.05 229.06 221.96 230.91
249.71 232.98 255.38 233.62 263.5 236.98 267.35 237.07 267.53 236.24
273.96 236.72 285.11 236.99 295.42 236.53 296.92 236.06 297.07 236.98
300.37 237.15 316.57 238.76

```

```

Manning's n Values num= 6
Sta n Val Sta n Val Sta n Val Sta n Val Sta n Val
*****
0 .1 27.86 .085 70.22 .035 103.1 .045 263.5 .02
300.37 .05

```

```

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
70.22 103.1 57.02 54.55 53 .1 .3

```

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft)          * 228.19 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.78 * Wt. n-Val.             * 0.085 * 0.035 * 0.045 *
* W.S. Elev (ft)         * 227.41 * Reach Len. (ft)       * 57.02 * 54.55 * 53.00 *
* Crit W.S. (ft)         * 226.97 * Flow Area (sq ft)     * 28.09 * 148.65 * 88.95 *
* E.G. Slope (ft/ft)     * 0.008789 * Area (sq ft)          * 28.09 * 148.65 * 88.95 *
* Q Total (cfs)          * 491.00 * Flow (cfs)            * 26.35 * 1039.59 * 171.06 *
* Top Width (ft)         * 27.80 * Top Width (ft)        * 35.23 * 32.88 * 98.83 *
* Vel Total (ft/s)       * 7.08 * Avg. Vel. (ft/s)      * 0.94 * 6.99 * 1.92 *
* Max Chl Dpth (ft)      * 3.82 * Hydr. Depth (ft)      * 0.80 * 4.52 * 0.90 *
* Conv. Total (cfs)      * 5237.3 * Conv. (cfs)           * 421.7 * 16636.6 * 2737.5 *
* Length Wtd. (ft)       * 54.55 * Wetted Per. (ft)      * 35.30 * 34.73 * 98.85 *
* Min Ch El (ft)         * 223.59 * Shear (lb/sq ft)      * 0.19 * 1.04 * 0.22 *
* Alpha                  * 1.00 * Stream Power (lb/ft s) * 316.57 * 0.00 * 0.00 *
* Frctn Loss (ft)        * 0.40 * Cum Volume (acre-ft)  * 0.00 * 0.95 * 0.00 *
* C & E Loss (ft)        * 0.03 * Cum SA (acres)        * 0.02 * 0.28 * 0.01 *
*****

```

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)          * 230.55 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.65 * Wt. n-Val.             * 0.085 * 0.035 * 0.045 *
* W.S. Elev (ft)         * 229.91 * Reach Len. (ft)       * 57.02 * 54.55 * 53.00 *
* Crit W.S. (ft)         * 229.55 * Flow Area (sq ft)     * 28.09 * 148.65 * 88.95 *
* E.G. Slope (ft/ft)     * 0.003905 * Area (sq ft)          * 28.09 * 148.65 * 88.95 *
* Q Total (cfs)          * 1237.00 * Flow (cfs)            * 26.35 * 1039.59 * 171.06 *
* Top Width (ft)         * 166.94 * Top Width (ft)        * 35.23 * 32.88 * 98.83 *
* Vel Total (ft/s)       * 4.66 * Avg. Vel. (ft/s)      * 0.94 * 6.99 * 1.92 *
* Max Chl Dpth (ft)      * 6.32 * Hydr. Depth (ft)      * 0.80 * 4.52 * 0.90 *
* Conv. Total (cfs)      * 19795.8 * Conv. (cfs)           * 421.7 * 16636.6 * 2737.5 *
* Length Wtd. (ft)       * 54.39 * Wetted Per. (ft)      * 35.30 * 34.73 * 98.85 *
* Min Ch El (ft)         * 223.59 * Shear (lb/sq ft)      * 0.19 * 1.04 * 0.22 *
* Alpha                  * 1.92 * Stream Power (lb/ft s) * 316.57 * 0.00 * 0.00 *
* Frctn Loss (ft)        * 0.16 * Cum Volume (acre-ft)  * 0.29 * 2.14 * 0.89 *
* C & E Loss (ft)        * 0.07 * Cum SA (acres)        * 0.22 * 0.29 * 0.80 *
*****

```

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)          * 232.35 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.42  * Wt. n-Val.      * 0.085  * 0.035  * 0.045  *
* W.S. Elev (ft)         * 231.93 * Reach Len. (ft) * 57.02  * 54.55  * 53.00  *
* Crit W.S. (ft)         *        * Flow Area (sq ft) * 102.44 * 215.28 * 326.74 *
* E.G. Slope (ft/ft)     * 0.002050 * Area (sq ft)    * 102.44 * 215.28 * 326.74 *
* Q Total (cfs)          * 2442.00 * Flow (cfs)      * 154.74 * 1396.30 * 890.96 *
* Top Width (ft)         * 203.60 * Top Width (ft)  * 38.16  * 32.88  * 132.56 *
* Vel Total (ft/s)       * 3.79  * Avg. Vel. (ft/s) * 1.51  * 6.49  * 2.73  *
* Max Chl Dpth (ft)      * 8.34  * Hydr. Depth (ft) * 2.68  * 6.55  * 2.46  *
* Conv. Total (cfs)      * 53934.7 * Conv. (cfs)     * 3417.7 * 30839.0 * 19677.9 *
* Length Wtd. (ft)       * 54.16  * Wetted Per. (ft) * 38.86  * 34.73  * 132.65 *
* Min Ch El (ft)        * 223.59 * Shear (lb/sq ft) * 0.34  * 0.79  * 0.32  *
* Alpha                  * 1.87  * Stream Power (lb/ft s) * 316.57 * 0.00  * 0.00  *
* Frctn Loss (ft)       * 0.10  * Cum Volume (acre-ft) * 0.81  * 3.29  * 2.27  *
* C & E Loss (ft)       * 0.02  * Cum SA (acres)   * 0.33  * 0.29  * 1.14  *
*****

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CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)          * 233.18 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.45  * Wt. n-Val.      * 0.085  * 0.035  * 0.045  *
* W.S. Elev (ft)         * 232.73 * Reach Len. (ft) * 57.02  * 54.55  * 53.00  *
* Crit W.S. (ft)         *        * Flow Area (sq ft) * 133.40 * 241.55 * 436.95 *
* E.G. Slope (ft/ft)     * 0.002014 * Area (sq ft)    * 133.40 * 241.55 * 436.95 *
* Q Total (cfs)          * 3270.00 * Flow (cfs)      * 232.56 * 1676.62 * 1360.82 *
* Top Width (ft)         * 215.47 * Top Width (ft)  * 39.31  * 32.88  * 143.28 *
* Vel Total (ft/s)       * 4.03  * Avg. Vel. (ft/s) * 1.74  * 6.94  * 3.11  *
* Max Chl Dpth (ft)      * 9.14  * Hydr. Depth (ft) * 3.39  * 7.35  * 3.05  *
* Conv. Total (cfs)      * 72872.9 * Conv. (cfs)     * 5182.8 * 37363.9 * 30326.2 *
* Length Wtd. (ft)       * 54.12  * Wetted Per. (ft) * 40.26  * 34.73  * 143.39 *
* Min Ch El (ft)        * 223.59 * Shear (lb/sq ft) * 0.42  * 0.87  * 0.38  *
* Alpha                  * 1.78  * Stream Power (lb/ft s) * 316.57 * 0.00  * 0.00  *
* Frctn Loss (ft)       * 0.10  * Cum Volume (acre-ft) * 1.06  * 3.86  * 2.96  *
* C & E Loss (ft)       * 0.01  * Cum SA (acres)   * 0.38  * 0.29  * 1.34  *
*****

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CROSS SECTION OUTPUT Profile #6HR OBS

```

*****
* E.G. Elev (ft)          * 230.74 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.54  * Wt. n-Val.      * 0.085  * 0.035  * 0.045  *
* W.S. Elev (ft)         * 230.20 * Reach Len. (ft) * 57.02  * 54.55  * 53.00  *
* Crit W.S. (ft)         * 229.69 * Flow Area (sq ft) * 38.44  * 158.26 * 118.66 *
* E.G. Slope (ft/ft)     * 0.003164 * Area (sq ft)    * 38.44  * 158.26 * 118.66 *
* Q Total (cfs)          * 1318.00 * Flow (cfs)      * 39.63  * 1038.77 * 239.61 *
* Top Width (ft)         * 173.19 * Top Width (ft)  * 35.65  * 32.88  * 104.66 *
* Vel Total (ft/s)       * 4.18  * Avg. Vel. (ft/s) * 1.03  * 6.56  * 2.02  *
* Max Chl Dpth (ft)      * 6.61  * Hydr. Depth (ft) * 1.08  * 4.81  * 1.13  *
* Conv. Total (cfs)      * 23429.6 * Conv. (cfs)     * 704.4  * 18465.8 * 4259.4 *
* Length Wtd. (ft)       * 54.34  * Wetted Per. (ft) * 35.81  * 34.73  * 104.69 *
* Min Ch El (ft)        * 223.59 * Shear (lb/sq ft) * 0.21  * 0.90  * 0.22  *
* Alpha                  * 1.99  * Stream Power (lb/ft s) * 316.57 * 0.00  * 0.00  *
* Frctn Loss (ft)       * 0.14  * Cum Volume (acre-ft) * 0.35  * 2.27  * 1.04  *
* C & E Loss (ft)       * 0.05  * Cum SA (acres)   * 0.24  * 0.29  * 0.82  *
*****

```

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft)          * 231.56 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.43  * Wt. n-Val.      * 0.085  * 0.035  * 0.045  *
* W.S. Elev (ft)         * 231.13 * Reach Len. (ft) * 57.02  * 54.55  * 53.00  *
* Crit W.S. (ft)         *        * Flow Area (sq ft) * 72.43  * 189.02 * 225.15 *
* E.G. Slope (ft/ft)     * 0.002283 * Area (sq ft)    * 72.43  * 189.02 * 225.15 *
* Q Total (cfs)          * 1815.00 * Flow (cfs)      * 93.91  * 1186.37 * 534.72 *
* Top Width (ft)         * 191.74 * Top Width (ft)  * 37.01  * 32.88  * 121.86 *
* Vel Total (ft/s)       * 3.73  * Avg. Vel. (ft/s) * 1.30  * 6.28  * 2.37  *
* Max Chl Dpth (ft)      * 7.54  * Hydr. Depth (ft) * 1.96  * 5.75  * 1.85  *
* Conv. Total (cfs)      * 37984.5 * Conv. (cfs)     * 1965.4 * 24828.4 * 11190.8 *
* Length Wtd. (ft)       * 54.23  * Wetted Per. (ft) * 37.45  * 34.73  * 121.92 *
* Min Ch El (ft)        * 223.59 * Shear (lb/sq ft) * 0.28  * 0.78  * 0.26  *
* Alpha                  * 1.98  * Stream Power (lb/ft s) * 316.57 * 0.00  * 0.00  *
* Frctn Loss (ft)       * 0.10  * Cum Volume (acre-ft) * 0.58  * 2.74  * 1.61  *
* C & E Loss (ft)       * 0.03  * Cum SA (acres)   * 0.29  * 0.29  * 0.89  *
*****

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CROSS SECTION

RIVER: hudson
REACH: main RS: 9

INPUT

Description:

Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	238.33	24.58	229.92	45.06	228.52	69.24	226.93	73.73	223.36
80	223.1	80.81	223.12	88.24	223.37	92.16	226.13	95.78	228.73
133.97	228.37	138.72	228.37	155.61	228.1	193.63	229.24	249.29	234.89
254.41	235.12	258.27	235.18	258.47	234.69	265.15	234.88	276.18	235.08
287.68	234.68	288.3	235.23	303.88	237.07				

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	45.06	.085	69.24	.035	95.78	.045	254.41	.02
288.3	.05								

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
69.24 95.78 55.45 51.85 50.87 .1 .3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
193.6	249.3	250

CROSS SECTION OUTPUT Profile #2-YR

* E.G. Elev (ft)	* 227.76	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.68	* Wt. n-Val.	* 0.085	* 0.035	* *
* W.S. Elev (ft)	* 227.08	* Reach Len. (ft)	* 55.45	* 51.85	* 50.87
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 0.16	* 74.19	* *
* E.G. Slope (ft/ft)	* 0.006211	* Area (sq ft)	* 0.16	* 74.19	* *
* Q Total (cfs)	* 491.00	* Flow (cfs)	* 0.04	* 490.96	* *
* Top Width (ft)	* 26.45	* Top Width (ft)	* 2.21	* 24.24	* *
* Vel Total (ft/s)	* 6.60	* Avg. Vel. (ft/s)	* 0.24	* 6.62	* *
* Max Chl Dpth (ft)	* 3.98	* Hydr. Depth (ft)	* 0.07	* 3.06	* *
* Conv. Total (cfs)	* 6230.0	* Conv. (cfs)	* 0.5	* 6229.5	* *
* Length Wtd. (ft)	* 51.85	* Wetted Per. (ft)	* 2.22	* 26.67	* *
* Min Ch El (ft)	* 223.10	* Shear (lb/sq ft)	* 0.03	* 1.08	* *
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 303.88	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.27	* Cum Volume (acre-ft)	* 0.00	* 0.86	* 0.00
* C & E Loss (ft)	* 0.04	* Cum SA (acres)	* 0.02	* 0.24	* 0.01

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 230.32	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.43	* Wt. n-Val.	* 0.086	* 0.035	* 0.045
* W.S. Elev (ft)	* 229.89	* Reach Len. (ft)	* 55.45	* 51.85	* 50.87
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 66.19	* 147.05	* 132.95
* E.G. Slope (ft/ft)	* 0.002397	* Area (sq ft)	* 66.19	* 147.05	* 132.95
* Q Total (cfs)	* 1237.00	* Flow (cfs)	* 82.80	* 891.69	* 262.51
* Top Width (ft)	* 168.62	* Top Width (ft)	* 44.26	* 26.54	* 97.82
* Vel Total (ft/s)	* 3.57	* Avg. Vel. (ft/s)	* 1.25	* 6.06	* 1.97
* Max Chl Dpth (ft)	* 6.79	* Hydr. Depth (ft)	* 1.50	* 5.54	* 1.36
* Conv. Total (cfs)	* 25267.0	* Conv. (cfs)	* 1691.2	* 18213.7	* 5362.0
* Length Wtd. (ft)	* 51.82	* Wetted Per. (ft)	* 44.36	* 29.51	* 98.49
* Min Ch El (ft)	* 223.10	* Shear (lb/sq ft)	* 0.22	* 0.75	* 0.20
* Alpha	* 2.15	* Stream Power (lb/ft s)	* 303.88	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.09	* Cum Volume (acre-ft)	* 0.23	* 1.95	* 0.76
* C & E Loss (ft)	* 0.05	* Cum SA (acres)	* 0.17	* 0.25	* 0.68

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 232.23	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.35	* Wt. n-Val.	* 0.089	* 0.035	* 0.045
* W.S. Elev (ft)	* 231.88	* Reach Len. (ft)	* 55.45	* 51.85	* 50.87
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 160.47	* 199.75	* 327.21
* E.G. Slope (ft/ft)	* 0.001648	* Area (sq ft)	* 160.47	* 199.75	* 327.21
* Q Total (cfs)	* 2442.00	* Flow (cfs)	* 246.26	* 1232.04	* 963.70
* Top Width (ft)	* 174.74	* Top Width (ft)	* 50.38	* 26.54	* 97.82
* Vel Total (ft/s)	* 3.55	* Avg. Vel. (ft/s)	* 1.53	* 6.17	* 2.95
* Max Chl Dpth (ft)	* 8.78	* Hydr. Depth (ft)	* 3.19	* 7.53	* 3.35
* Conv. Total (cfs)	* 60151.2	* Conv. (cfs)	* 6065.9	* 30347.6	* 23737.7

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* Length Wtd. (ft)      * 51.75 * Wetted Per. (ft)      * 50.81 * 29.51 * 100.48 *
* Min Ch El (ft)       * 223.10 * Shear (lb/sq ft)     * 0.32 * 0.70 * 0.34 *
* Alpha                * 1.81 * Stream Power (lb/ft s) * 303.88 * 0.00 * 0.00 *
* Frctn Loss (ft)     * 0.07 * Cum Volume (acre-ft) * 0.64 * 3.03 * 1.88 *
* C & E Loss (ft)     * 0.03 * Cum SA (acres)       * 0.27 * 0.25 * 1.00 *
*****

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CROSS SECTION OUTPUT Profile #100-YR

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*****
* E.G. Elev (ft)       * 233.07 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)       * 0.42 * Wt. n-Val.          * 0.089 * 0.035 * 0.045 *
* W.S. Elev (ft)     * 232.65 * Reach Len. (ft)     * 55.45 * 51.85 * 50.87 *
* Crit W.S. (ft)     *      * Flow Area (sq ft)   * 200.17 * 220.21 * 402.60 *
* E.G. Slope (ft/ft) * 0.001781 * Area (sq ft)       * 200.17 * 220.21 * 402.60 *
* Q Total (cfs)      * 3270.00 * Flow (cfs)         * 354.96 * 1506.80 * 1408.24 *
* Top Width (ft)     * 177.00 * Top Width (ft)     * 52.64 * 26.54 * 97.82 *
* Vel Total (ft/s)   * 3.97 * Avg. Vel. (ft/s)   * 1.77 * 6.84 * 3.50 *
* Max Chl Dpth (ft)  * 9.55 * Hydr. Depth (ft)   * 3.80 * 8.30 * 4.12 *
* Conv. Total (cfs)  * 77479.3 * Conv. (cfs)        * 8410.5 * 35702.1 * 33366.7 *
* Length Wtd. (ft)  * 51.75 * Wetted Per. (ft)   * 53.19 * 29.51 * 101.25 *
* Min Ch El (ft)     * 223.10 * Shear (lb/sq ft)   * 0.42 * 0.83 * 0.44 *
* Alpha              * 1.72 * Stream Power (lb/ft s) * 303.88 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 0.07 * Cum Volume (acre-ft) * 0.84 * 3.57 * 2.45 *
* C & E Loss (ft)   * 0.04 * Cum SA (acres)     * 0.32 * 0.25 * 1.19 *
*****

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CROSS SECTION OUTPUT Profile #6HR OBS

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*****
* E.G. Elev (ft)       * 230.55 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)       * 0.36 * Wt. n-Val.          * 0.087 * 0.035 * 0.045 *
* W.S. Elev (ft)     * 230.18 * Reach Len. (ft)     * 55.45 * 51.85 * 50.87 *
* Crit W.S. (ft)     *      * Flow Area (sq ft)   * 79.25 * 154.75 * 161.35 *
* E.G. Slope (ft/ft) * 0.002011 * Area (sq ft)       * 79.25 * 154.75 * 161.35 *
* Q Total (cfs)      * 1318.00 * Flow (cfs)         * 97.30 * 889.34 * 331.37 *
* Top Width (ft)     * 169.79 * Top Width (ft)     * 45.43 * 26.54 * 97.82 *
* Vel Total (ft/s)   * 3.33 * Avg. Vel. (ft/s)   * 1.23 * 5.75 * 2.05 *
* Max Chl Dpth (ft)  * 7.08 * Hydr. Depth (ft)   * 1.74 * 5.83 * 1.65 *
* Conv. Total (cfs)  * 29391.1 * Conv. (cfs)        * 2169.7 * 19832.0 * 7389.4 *
* Length Wtd. (ft)  * 51.80 * Wetted Per. (ft)   * 45.57 * 29.51 * 98.78 *
* Min Ch El (ft)     * 223.10 * Shear (lb/sq ft)   * 0.22 * 0.66 * 0.21 *
* Alpha              * 2.11 * Stream Power (lb/ft s) * 303.88 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 0.08 * Cum Volume (acre-ft) * 0.28 * 2.08 * 0.87 *
* C & E Loss (ft)   * 0.04 * Cum SA (acres)     * 0.18 * 0.25 * 0.69 *
*****

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CROSS SECTION OUTPUT Profile #24HR OBS

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*****
* E.G. Elev (ft)       * 231.43 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)       * 0.32 * Wt. n-Val.          * 0.088 * 0.035 * 0.045 *
* W.S. Elev (ft)     * 231.10 * Reach Len. (ft)     * 55.45 * 51.85 * 50.87 *
* Crit W.S. (ft)     *      * Flow Area (sq ft)   * 122.20 * 179.12 * 251.18 *
* E.G. Slope (ft/ft) * 0.001647 * Area (sq ft)       * 122.20 * 179.12 * 251.18 *
* Q Total (cfs)      * 1815.00 * Flow (cfs)         * 164.70 * 1027.07 * 623.24 *
* Top Width (ft)     * 172.47 * Top Width (ft)     * 48.11 * 26.54 * 97.82 *
* Vel Total (ft/s)   * 3.29 * Avg. Vel. (ft/s)   * 1.35 * 5.73 * 2.48 *
* Max Chl Dpth (ft)  * 8.00 * Hydr. Depth (ft)   * 2.54 * 6.75 * 2.57 *
* Conv. Total (cfs)  * 44720.5 * Conv. (cfs)        * 4058.0 * 25306.3 * 15356.2 *
* Length Wtd. (ft)  * 51.76 * Wetted Per. (ft)   * 48.41 * 29.51 * 99.70 *
* Min Ch El (ft)     * 223.10 * Shear (lb/sq ft)   * 0.26 * 0.62 * 0.26 *
* Alpha              * 1.94 * Stream Power (lb/ft s) * 303.88 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 0.07 * Cum Volume (acre-ft) * 0.45 * 2.51 * 1.32 *
* C & E Loss (ft)   * 0.03 * Cum SA (acres)     * 0.24 * 0.25 * 0.75 *
*****

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CROSS SECTION

RIVER: hudson
REACH: main RS: 8

INPUT

Description:

Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	232.66	10	231.25	20	230.58	45.39	228.78	62.29	226.96
73.22	226.75	78.86	222.87	84.37	222.42	85.34	222.48	91.4	222.85
93.16	222.95	100.51	227.98	129.11	227.53	173.64	228.25	221.13	229.38
256.1	234.43	261.75	233.86	265.78	233.85	265.89	233.49	272.62	233.6

283.68 233.78 295 233.52 295.71 234.03 308.74 235.94

Manning's n Values num= 5
Sta n Val Sta n Val Sta n Val Sta n Val Sta n Val
0 .1 73.22 .035 100.51 .045 261.75 .02 295 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
73.22 100.51 84.59 69.8 31.19 .1 .3
Blocked Obstructions num= 1
Sta L Sta R Elev
221.13 256.1 250

CROSS SECTION OUTPUT Profile #2-YR
* E.G. Elev (ft) * 227.44 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.53 * Wt. n-Val. * 0.100 * 0.035 * *
* W.S. Elev (ft) * 226.91 * Reach Len. (ft) * 84.59 * 69.80 * 31.19 *
* Crit W.S. (ft) * * * Flow Area (sq ft) * 0.66 * 83.91 * *
* E.G. Slope (ft/ft) * 0.004436 * Area (sq ft) * 0.66 * 83.91 * *
* Q Total (cfs) * 491.00 * Flow (cfs) * 0.12 * 490.88 * *
* Top Width (ft) * 34.05 * Top Width (ft) * 8.32 * 25.73 * *
* Vel Total (ft/s) * 5.81 * Avg. Vel. (ft/s) * 0.18 * 5.85 * *
* Max Chl Dpth (ft) * 4.49 * Hydr. Depth (ft) * 0.08 * 3.26 * *
* Conv. Total (cfs) * 7372.4 * Conv. (cfs) * 1.8 * 7370.6 * *
* Length Wtd. (ft) * 69.80 * Wetted Per. (ft) * 8.32 * 28.19 * *
* Min Ch El (ft) * 222.42 * Shear (lb/sq ft) * 0.02 * 0.82 * *
* Alpha * 1.02 * Stream Power (lb/ft s) * 308.74 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.26 * Cum Volume (acre-ft) * 0.00 * 0.77 * 0.00 *
* C & E Loss (ft) * 0.09 * Cum SA (acres) * 0.01 * 0.21 * 0.01 *

CROSS SECTION OUTPUT Profile #10-YR
* E.G. Elev (ft) * 230.18 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.27 * Wt. n-Val. * 0.100 * 0.035 * 0.045 *
* W.S. Elev (ft) * 229.91 * Reach Len. (ft) * 84.59 * 69.80 * 31.19 *
* Crit W.S. (ft) * * * Flow Area (sq ft) * 76.89 * 164.95 * 203.62 *
* E.G. Slope (ft/ft) * 0.001410 * Area (sq ft) * 76.89 * 164.95 * 203.62 *
* Q Total (cfs) * 1237.00 * Flow (cfs) * 62.33 * 817.75 * 356.92 *
* Top Width (ft) * 191.68 * Top Width (ft) * 43.77 * 27.29 * 120.62 *
* Vel Total (ft/s) * 2.78 * Avg. Vel. (ft/s) * 0.81 * 4.96 * 1.75 *
* Max Chl Dpth (ft) * 7.49 * Hydr. Depth (ft) * 1.76 * 6.04 * 1.69 *
* Conv. Total (cfs) * 32937.7 * Conv. (cfs) * 1659.7 * 21774.3 * 9503.7 *
* Length Wtd. (ft) * 58.41 * Wetted Per. (ft) * 43.91 * 30.09 * 121.17 *
* Min Ch El (ft) * 222.42 * Shear (lb/sq ft) * 0.15 * 0.48 * 0.15 *
* Alpha * 2.23 * Stream Power (lb/ft s) * 308.74 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.08 * Cum Volume (acre-ft) * 0.14 * 1.76 * 0.56 *
* C & E Loss (ft) * 0.03 * Cum SA (acres) * 0.12 * 0.22 * 0.55 *

CROSS SECTION OUTPUT Profile #50-YR
* E.G. Elev (ft) * 232.13 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.24 * Wt. n-Val. * 0.100 * 0.035 * 0.045 *
* W.S. Elev (ft) * 231.89 * Reach Len. (ft) * 84.59 * 69.80 * 31.19 *
* Crit W.S. (ft) * * * Flow Area (sq ft) * 190.13 * 218.92 * 442.14 *
* E.G. Slope (ft/ft) * 0.001068 * Area (sq ft) * 190.13 * 218.92 * 442.14 *
* Q Total (cfs) * 2442.00 * Flow (cfs) * 183.26 * 1140.28 * 1118.47 *
* Top Width (ft) * 215.65 * Top Width (ft) * 67.74 * 27.29 * 120.62 *
* Vel Total (ft/s) * 2.87 * Avg. Vel. (ft/s) * 0.96 * 5.21 * 2.53 *
* Max Chl Dpth (ft) * 9.47 * Hydr. Depth (ft) * 2.81 * 8.02 * 3.67 *
* Conv. Total (cfs) * 74738.0 * Conv. (cfs) * 5608.6 * 34898.5 * 34231.0 *
* Length Wtd. (ft) * 52.85 * Wetted Per. (ft) * 67.97 * 30.09 * 123.15 *
* Min Ch El (ft) * 222.42 * Shear (lb/sq ft) * 0.19 * 0.48 * 0.24 *
* Alpha * 1.90 * Stream Power (lb/ft s) * 308.74 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.06 * Cum Volume (acre-ft) * 0.42 * 2.78 * 1.43 *
* C & E Loss (ft) * 0.02 * Cum SA (acres) * 0.20 * 0.22 * 0.87 *

CROSS SECTION OUTPUT Profile #100-YR
* E.G. Elev (ft) * 232.96 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.29 * Wt. n-Val. * 0.100 * 0.035 * 0.045 *
* W.S. Elev (ft) * 232.67 * Reach Len. (ft) * 84.59 * 69.80 * 31.19 *
* Crit W.S. (ft) * * * Flow Area (sq ft) * 245.05 * 240.17 * 536.10 *
* E.G. Slope (ft/ft) * 0.001164 * Area (sq ft) * 245.05 * 240.17 * 536.10 *
* Q Total (cfs) * 3270.00 * Flow (cfs) * 277.21 * 1389.45 * 1603.34 *

```

* Top Width (ft)          * 221.13 * Top Width (ft)          * 73.22 * 27.29 * 120.62 *
* Vel Total (ft/s)       * 3.20  * Avg. Vel. (ft/s)       * 1.13  * 5.79  * 2.99  *
* Max Chl Dpth (ft)     * 10.25 * Hydr. Depth (ft)       * 3.35  * 8.80  * 4.44  *
* Conv. Total (cfs)     * 95850.7 * Conv. (cfs)           * 8125.6 * 40727.7 * 46997.4 *
* Length Wtd. (ft)      * 51.79 * Wetted Per. (ft)      * 73.51 * 30.09 * 123.93 *
* Min Ch El (ft)        * 222.42 * Shear (lb/sq ft)      * 0.24  * 0.58  * 0.31  *
* Alpha                  * 1.83  * Stream Power (lb/ft s) * 308.74 * 0.00  * 0.00  *
* Frctn Loss (ft)       * 0.07  * Cum Volume (acre-ft)  * 0.55  * 3.30  * 1.90  *
* C & E Loss (ft)       * 0.02  * Cum SA (acres)        * 0.24  * 0.22  * 1.07  *
*****

```

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION OUTPUT Profile #6HR OBS

```

*****
* E.G. Elev (ft)         * 230.43 * Element                 * Left OB * Channel * Right OB *
* Vel Head (ft)         * 0.23  * Wt. n-Val.             * 0.100  * 0.035  * 0.045  *
* W.S. Elev (ft)        * 230.19 * Reach Len. (ft)        * 84.59  * 69.80  * 31.19  *
* Crit W.S. (ft)        *         * Flow Area (sq ft)      * 89.80  * 172.65 * 237.66 *
* E.G. Slope (ft/ft)    * 0.001216 * Area (sq ft)          * 89.80  * 172.65 * 237.66 *
* Q Total (cfs)         * 1318.00 * Flow (cfs)             * 70.73  * 819.20 * 428.07 *
* Top Width (ft)        * 195.66 * Top Width (ft)         * 47.75  * 27.29  * 120.62 *
* Vel Total (ft/s)      * 2.64  * Avg. Vel. (ft/s)       * 0.79  * 4.74  * 1.80  *
* Max Chl Dpth (ft)     * 7.77  * Hydr. Depth (ft)       * 1.88  * 6.33  * 1.97  *
* Conv. Total (cfs)     * 37799.8 * Conv. (cfs)           * 2028.6 * 23494.4 * 12276.8 *
* Length Wtd. (ft)      * 57.22 * Wetted Per. (ft)      * 47.90  * 30.09  * 121.46 *
* Min Ch El (ft)        * 222.42 * Shear (lb/sq ft)      * 0.14  * 0.44  * 0.15  *
* Alpha                  * 2.17  * Stream Power (lb/ft s) * 308.74 * 0.00  * 0.00  *
* Frctn Loss (ft)       * 0.08  * Cum Volume (acre-ft)  * 0.17  * 1.88  * 0.64  *
* C & E Loss (ft)       * 0.02  * Cum SA (acres)        * 0.13  * 0.22  * 0.57  *
*****

```

CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft)         * 231.33 * Element                 * Left OB * Channel * Right OB *
* Vel Head (ft)         * 0.22  * Wt. n-Val.             * 0.100  * 0.035  * 0.045  *
* W.S. Elev (ft)        * 231.11 * Reach Len. (ft)        * 84.59  * 69.80  * 31.19  *
* Crit W.S. (ft)        *         * Flow Area (sq ft)      * 139.45 * 197.60 * 347.90 *
* E.G. Slope (ft/ft)    * 0.001048 * Area (sq ft)          * 139.45 * 197.60 * 347.90 *
* Q Total (cfs)         * 1815.00 * Flow (cfs)             * 116.09 * 952.49 * 746.42 *
* Top Width (ft)        * 208.99 * Top Width (ft)         * 61.08  * 27.29  * 120.62 *
* Vel Total (ft/s)      * 2.65  * Avg. Vel. (ft/s)       * 0.83  * 4.82  * 2.15  *
* Max Chl Dpth (ft)     * 8.69  * Hydr. Depth (ft)       * 2.28  * 7.24  * 2.88  *
* Conv. Total (cfs)     * 56060.8 * Conv. (cfs)           * 3585.8 * 29419.9 * 23055.1 *
* Length Wtd. (ft)      * 54.38 * Wetted Per. (ft)      * 61.26  * 30.09  * 122.37 *
* Min Ch El (ft)        * 222.42 * Shear (lb/sq ft)      * 0.15  * 0.43  * 0.19  *
* Alpha                  * 2.01  * Stream Power (lb/ft s) * 308.74 * 0.00  * 0.00  *
* Frctn Loss (ft)       * 0.06  * Cum Volume (acre-ft)  * 0.29  * 2.29  * 0.97  *
* C & E Loss (ft)       * 0.02  * Cum SA (acres)        * 0.17  * 0.22  * 0.63  *
*****

```

CROSS SECTION

RIVER: hudson

REACH: main RS: 7

INPUT

Description:

```

Station Elevation Data num= 33
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
*****
0 234.04 10 230.35 20.49 229.26 49.25 228.19 49.94 225.03
50.48 222.23 52 221.26 53.15 220.87 57.91 221.25 57.92 221.25
58.62 221.31 70.98 222.8 77.17 225.03 82.97 227.02 87.29 227.48
102.57 228.06 126.88 227.25 155.03 227.58 176.4 228.42 200.94 228.99
209.92 229.21 212.72 229.36 218.32 230.36 244.3 234 249.97 233.49
253.93 233.54 254.06 233.18 260.63 233.3 271.65 233.45 283.01 233.19
283.75 233.74 295.85 234.97 305.8 242.14

```

```

Manning's n Values num= 7
Sta n Val Sta n Val Sta n Val Sta n Val Sta n Val
*****
0 .1 49.25 .05 82.97 .1 102.57 .045 176.4 .05
249.97 .02 283.75 .05

```

```

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
          49.25 82.97 20.21 31 42.19 .1 .3
Blocked Obstructions num= 1

```

```

Sta L   Sta R   Elev
*****
191.3  244.3   250

```

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft)      * 227.09 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.23  * Wt. n-Val.      *         * 0.050 *         *
* W.S. Elev (ft)     * 226.85 * Reach Len. (ft) * 20.21  * 31.00 * 42.19 *
* Crit W.S. (ft)     *        * Flow Area (sq ft) *         * 130.39 *         *
* E.G. Slope (ft/ft) * 0.003280 * Area (sq ft)    *         * 130.39 *         *
* Q Total (cfs)      * 506.00 * Flow (cfs)      *         * 506.00 *         *
* Top Width (ft)     * 32.94 * Top Width (ft)  *         * 32.94 *         *
* Vel Total (ft/s)   * 3.88  * Avg. Vel. (ft/s) *         * 3.88 *         *
* Max Chl Dpth (ft) * 5.98  * Hydr. Depth (ft) *         * 3.96 *         *
* Conv. Total (cfs)  * 8835.8 * Conv. (cfs)     *         * 8835.8 *         *
* Length Wtd. (ft)  * 31.00 * Wetted Per. (ft) *         * 37.87 *         *
* Min Ch El (ft)    * 220.87 * Shear (lb/sq ft) *         * 0.70 *         *
* Alpha             * 1.00  * Stream Power (lb/ft s) * 305.80 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 0.06  * Cum Volume (acre-ft) * 0.00 * 0.59 * 0.00 *
* C & E Loss (ft)   * 0.00  * Cum SA (acres)   * 0.00 * 0.17 * 0.01 *
*****

```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)      * 230.06 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.15  * Wt. n-Val.      * 0.100  * 0.050 * 0.051 *
* W.S. Elev (ft)     * 229.91 * Reach Len. (ft) * 20.21  * 31.00 * 42.19 *
* Crit W.S. (ft)     *        * Flow Area (sq ft) * 35.96  * 233.08 * 229.20 *
* E.G. Slope (ft/ft) * 0.001437 * Area (sq ft)    * 35.96  * 233.08 * 229.20 *
* Q Total (cfs)      * 1297.00 * Flow (cfs)      * 20.61  * 853.78 * 422.60 *
* Top Width (ft)     * 177.02 * Top Width (ft)  * 34.97  * 33.72 * 108.33 *
* Vel Total (ft/s)   * 2.60  * Avg. Vel. (ft/s) * 0.57  * 3.66 * 1.84 *
* Max Chl Dpth (ft) * 9.04  * Hydr. Depth (ft) * 1.03  * 6.91 * 2.12 *
* Conv. Total (cfs)  * 34216.3 * Conv. (cfs)     * 543.8  * 22523.8 * 11148.8 *
* Length Wtd. (ft)  * 33.30 * Wetted Per. (ft) * 35.03  * 39.75 * 109.54 *
* Min Ch El (ft)    * 220.87 * Shear (lb/sq ft) * 0.09  * 0.53 * 0.19 *
* Alpha             * 1.47  * Stream Power (lb/ft s) * 305.80 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 0.05  * Cum Volume (acre-ft) * 0.03  * 1.45 * 0.41 *
* C & E Loss (ft)   * 0.02  * Cum SA (acres)   * 0.04  * 0.17 * 0.47 *
*****

```

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)      * 232.05 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.18  * Wt. n-Val.      * 0.100  * 0.050 * 0.051 *
* W.S. Elev (ft)     * 231.87 * Reach Len. (ft) * 20.21  * 31.00 * 42.19 *
* Crit W.S. (ft)     *        * Flow Area (sq ft) * 115.22 * 299.31 * 441.94 *
* E.G. Slope (ft/ft) * 0.001300 * Area (sq ft)    * 115.22 * 299.31 * 441.94 *
* Q Total (cfs)      * 2530.00 * Flow (cfs)      * 117.79 * 1232.08 * 1180.13 *
* Top Width (ft)     * 185.42 * Top Width (ft)  * 43.37  * 33.72 * 108.33 *
* Vel Total (ft/s)   * 2.95  * Avg. Vel. (ft/s) * 1.02  * 4.12 * 2.67 *
* Max Chl Dpth (ft) * 11.00 * Hydr. Depth (ft) * 2.66  * 8.88 * 4.08 *
* Conv. Total (cfs)  * 70165.6 * Conv. (cfs)     * 3266.6 * 34169.8 * 32729.2 *
* Length Wtd. (ft)  * 34.14 * Wetted Per. (ft) * 43.72  * 39.75 * 111.50 *
* Min Ch El (ft)    * 220.87 * Shear (lb/sq ft) * 0.21  * 0.61 * 0.32 *
* Alpha             * 1.33  * Stream Power (lb/ft s) * 305.80 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 0.06  * Cum Volume (acre-ft) * 0.12  * 2.37 * 1.11 *
* C & E Loss (ft)   * 0.05  * Cum SA (acres)   * 0.09  * 0.17 * 0.79 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)      * 232.87 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.23  * Wt. n-Val.      * 0.100  * 0.050 * 0.051 *
* W.S. Elev (ft)     * 232.64 * Reach Len. (ft) * 20.21  * 31.00 * 42.19 *
* Crit W.S. (ft)     *        * Flow Area (sq ft) * 149.38 * 325.25 * 525.29 *
* E.G. Slope (ft/ft) * 0.001503 * Area (sq ft)    * 149.38 * 325.25 * 525.29 *
* Q Total (cfs)      * 3396.00 * Flow (cfs)      * 188.91 * 1521.72 * 1685.37 *
* Top Width (ft)     * 187.50 * Top Width (ft)  * 45.45  * 33.72 * 108.33 *
* Vel Total (ft/s)   * 3.40  * Avg. Vel. (ft/s) * 1.26  * 4.68 * 3.21 *
* Max Chl Dpth (ft) * 11.77 * Hydr. Depth (ft) * 3.29  * 9.65 * 4.85 *

```

```

* Conv. Total (cfs)      * 87587.2 * Conv. (cfs)           * 4872.1 * 39247.1 * 43468.0 *
* Length Wtd. (ft)     * 34.26  * Wetted Per. (ft)     * 45.94 * 39.75 * 112.27 *
* Min Ch El (ft)       * 220.87 * Shear (lb/sq ft)     * 0.31 * 0.77 * 0.44 *
* Alpha                 * 1.30   * Stream Power (lb/ft s) * 305.80 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 0.07   * Cum Volume (acre-ft) * 0.17 * 2.85 * 1.52 *
* C & E Loss (ft)      * 0.08   * Cum SA (acres)       * 0.13 * 0.17 * 0.98 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #6HR OBS

```

*****
* E.G. Elev (ft)        * 230.33 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)         * 0.16  * Wt. n-Val.            * 0.100 * 0.050 * 0.051 *
* W.S. Elev (ft)        * 230.17 * Reach Len. (ft)       * 20.21 * 31.00 * 42.19 *
* Crit W.S. (ft)        *         * Flow Area (sq ft)     * 45.55 * 242.01 * 257.87 *
* E.G. Slope (ft/ft)    * 0.001418 * Area (sq ft)         * 45.55 * 242.01 * 257.87 *
* Q Total (cfs)         * 1441.00 * Flow (cfs)           * 28.97 * 902.97 * 509.06 *
* Top Width (ft)        * 179.57 * Top Width (ft)        * 37.52 * 33.72 * 108.33 *
* Vel Total (ft/s)      * 2.64   * Avg. Vel. (ft/s)     * 0.64 * 3.73 * 1.97 *
* Max Chl Dpth (ft)     * 9.30   * Hydr. Depth (ft)     * 1.21 * 7.18 * 2.38 *
* Conv. Total (cfs)     * 38267.5 * Conv. (cfs)          * 769.4 * 23979.4 * 13518.7 *
* Length Wtd. (ft)     * 33.47  * Wetted Per. (ft)     * 37.59 * 39.75 * 109.81 *
* Min Ch El (ft)       * 220.87 * Shear (lb/sq ft)     * 0.11 * 0.54 * 0.21 *
* Alpha                 * 1.45   * Stream Power (lb/ft s) * 305.80 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 0.05   * Cum Volume (acre-ft) * 0.04 * 1.55 * 0.46 *
* C & E Loss (ft)      * 0.03   * Cum SA (acres)       * 0.04 * 0.17 * 0.48 *
*****

```

CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft)        * 231.24 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)         * 0.16  * Wt. n-Val.            * 0.100 * 0.050 * 0.051 *
* W.S. Elev (ft)        * 231.09 * Reach Len. (ft)       * 20.21 * 31.00 * 42.19 *
* Crit W.S. (ft)        *         * Flow Area (sq ft)     * 82.17 * 272.97 * 357.33 *
* E.G. Slope (ft/ft)    * 0.001253 * Area (sq ft)         * 82.17 * 272.97 * 357.33 *
* Q Total (cfs)         * 1923.00 * Flow (cfs)           * 68.20 * 1037.55 * 817.25 *
* Top Width (ft)        * 183.30 * Top Width (ft)        * 41.25 * 33.72 * 108.33 *
* Vel Total (ft/s)      * 2.70   * Avg. Vel. (ft/s)     * 0.83 * 3.80 * 2.29 *
* Max Chl Dpth (ft)     * 10.22  * Hydr. Depth (ft)     * 1.99 * 8.10 * 3.30 *
* Conv. Total (cfs)     * 54317.5 * Conv. (cfs)          * 1926.5 * 29306.9 * 23084.2 *
* Length Wtd. (ft)     * 33.93  * Wetted Per. (ft)     * 41.46 * 39.75 * 110.72 *
* Min Ch El (ft)       * 220.87 * Shear (lb/sq ft)     * 0.16 * 0.54 * 0.25 *
* Alpha                 * 1.38   * Stream Power (lb/ft s) * 305.80 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 0.05   * Cum Volume (acre-ft) * 0.07 * 1.91 * 0.72 *
* C & E Loss (ft)      * 0.04   * Cum SA (acres)       * 0.07 * 0.17 * 0.54 *
*****

```

CROSS SECTION

RIVER: hudson
REACH: main RS: 6

INPUT

Description:

Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	232.81	5	230.96	33.91	229.84	59.4	227.76	60.24	222.1
63.1	220.81	66.12	220.29	66.23	220.27	69.39	220.61	76.64	221.39
91.29	227.87	96.51	227.85	109.84	226.87	129.26	226.95	146.31	227.92
180.09	228.74	190.82	229.33	212.5	233.18	218.13	232.45	222.02	232.45
222.21	232.15	228.69	232.32	239.79	232.57	251.13	232.34	251.79	232.87
264	234.33	274.08	241.19						

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	59.4	.035	91.29	.1	218.13	.02	251.79	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
59.4 91.29 19.21 30.14 38.14 .1 .3

Blocked Obstructions num= 1
Sta L Sta R Elev

159 208.5 250

CROSS SECTION OUTPUT Profile #2-YR

```
*****
* E.G. Elev (ft) * 227.02 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.23 * Wt. n-Val. * * * 0.035 * *
* W.S. Elev (ft) * 226.79 * Reach Len. (ft) * 19.21 * 30.14 * 38.14 *
* Crit W.S. (ft) * * * Flow Area (sq ft) * * * 131.52 * *
* E.G. Slope (ft/ft) * 0.001399 * Area (sq ft) * * * 131.52 * *
* Q Total (cfs) * 506.00 * Flow (cfs) * * * 506.00 * *
* Top Width (ft) * 29.31 * Top Width (ft) * * * 29.31 * *
* Vel Total (ft/s) * 3.85 * Avg. Vel. (ft/s) * * * 3.85 * *
* Max Chl Dpth (ft) * 6.52 * Hydr. Depth (ft) * * * 4.49 * *
* Conv. Total (cfs) * 13526.9 * Conv. (cfs) * * * 13526.9 * *
* Length Wtd. (ft) * 30.14 * Wetted Per. (ft) * * * 34.88 * *
* Min Ch El (ft) * 220.27 * Shear (lb/sq ft) * * * 0.33 * *
* Alpha * 1.00 * Stream Power (lb/ft s) * 274.08 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.06 * Cum Volume (acre-ft) * 0.00 * 0.50 * 0.00 *
* C & E Loss (ft) * 0.03 * Cum SA (acres) * 0.00 * 0.14 * 0.01 *
*****
```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-YR

```
*****
* E.G. Elev (ft) * 229.99 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.37 * Wt. n-Val. * 0.100 * 0.035 * 0.100 *
* W.S. Elev (ft) * 229.62 * Reach Len. (ft) * 19.21 * 30.14 * 38.14 *
* Crit W.S. (ft) * * * Flow Area (sq ft) * 21.15 * 220.26 * 148.68 *
* E.G. Slope (ft/ft) * 0.001466 * Area (sq ft) * 21.15 * 220.26 * 148.68 *
* Q Total (cfs) * 1297.00 * Flow (cfs) * 11.43 * 1144.68 * 140.88 *
* Top Width (ft) * 122.37 * Top Width (ft) * 22.77 * 31.89 * 67.71 *
* Vel Total (ft/s) * 3.32 * Avg. Vel. (ft/s) * 0.54 * 5.20 * 0.95 *
* Max Chl Dpth (ft) * 9.35 * Hydr. Depth (ft) * 0.93 * 6.91 * 2.20 *
* Conv. Total (cfs) * 33876.5 * Conv. (cfs) * 298.6 * 29898.1 * 3679.8 *
* Length Wtd. (ft) * 30.94 * Wetted Per. (ft) * 22.85 * 38.52 * 69.17 *
* Min Ch El (ft) * 220.27 * Shear (lb/sq ft) * 0.08 * 0.52 * 0.20 *
* Alpha * 2.17 * Stream Power (lb/ft s) * 274.08 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.08 * Cum Volume (acre-ft) * 0.02 * 1.28 * 0.23 *
* C & E Loss (ft) * 0.06 * Cum SA (acres) * 0.03 * 0.15 * 0.39 *
*****
```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-YR

```
*****
* E.G. Elev (ft) * 231.94 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.68 * Wt. n-Val. * 0.100 * 0.035 * 0.100 *
* W.S. Elev (ft) * 231.26 * Reach Len. (ft) * 19.21 * 30.14 * 38.14 *
* Crit W.S. (ft) * * * Flow Area (sq ft) * 87.84 * 272.70 * 260.04 *
* E.G. Slope (ft/ft) * 0.002223 * Area (sq ft) * 87.84 * 272.70 * 260.04 *
* Q Total (cfs) * 2530.00 * Flow (cfs) * 83.71 * 2012.61 * 433.68 *
* Top Width (ft) * 154.82 * Top Width (ft) * 55.22 * 31.89 * 67.71 *
* Vel Total (ft/s) * 4.08 * Avg. Vel. (ft/s) * 0.95 * 7.38 * 1.67 *
* Max Chl Dpth (ft) * 10.99 * Hydr. Depth (ft) * 1.59 * 8.55 * 3.84 *
* Conv. Total (cfs) * 53655.6 * Conv. (cfs) * 1775.3 * 42682.9 * 9197.5 *
* Length Wtd. (ft) * 32.07 * Wetted Per. (ft) * 55.38 * 38.52 * 70.81 *
* Min Ch El (ft) * 220.27 * Shear (lb/sq ft) * 0.22 * 0.98 * 0.51 *
* Alpha * 2.64 * Stream Power (lb/ft s) * 274.08 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.09 * Cum Volume (acre-ft) * 0.07 * 2.16 * 0.77 *
* C & E Loss (ft) * 0.02 * Cum SA (acres) * 0.07 * 0.15 * 0.70 *
*****
```

CROSS SECTION OUTPUT Profile #100-YR

```
*****
* E.G. Elev (ft) * 232.72 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 1.02 * Wt. n-Val. * 0.100 * 0.035 * 0.100 *
* W.S. Elev (ft) * 231.70 * Reach Len. (ft) * 19.21 * 30.14 * 38.14 *
* Crit W.S. (ft) * * * Flow Area (sq ft) * 112.02 * 286.52 * 289.39 *
* E.G. Slope (ft/ft) * 0.003212 * Area (sq ft) * 112.02 * 286.52 * 289.39 *
* Q Total (cfs) * 3396.00 * Flow (cfs) * 148.67 * 2626.90 * 620.43 *
* Top Width (ft) * 155.99 * Top Width (ft) * 56.39 * 31.89 * 67.71 *
*****
```

```

* Vel Total (ft/s)      * 4.94 * Avg. Vel. (ft/s)      * 1.33 * 9.17 * 2.14 *
* Max Chl Dpth (ft)    * 11.43 * Hydr. Depth (ft)     * 1.99 * 8.98 * 4.27 *
* Conv. Total (cfs)     * 59918.1 * Conv. (cfs)          * 2623.1 * 46348.3 * 10946.7 *
* Length Wtd. (ft)     * 32.18 * Wetted Per. (ft)     * 56.63 * 38.52 * 71.25 *
* Min Ch El (ft)       * 220.27 * Shear (lb/sq ft)     * 0.40 * 1.49 * 0.81 *
* Alpha                 * 2.71 * Stream Power (lb/ft s) * 274.08 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 0.13 * Cum Volume (acre-ft) * 0.11 * 2.63 * 1.13 *
* C & E Loss (ft)      * 0.03 * Cum SA (acres)       * 0.10 * 0.15 * 0.90 *
*****

```

CROSS SECTION OUTPUT Profile #6HR OBS

```

*****
* E.G. Elev (ft)       * 230.25 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)        * 0.41 * Wt. n-Val.           * 0.100 * 0.035 * 0.100 *
* W.S. Elev (ft)       * 229.84 * Reach Len. (ft)      * 19.21 * 30.14 * 38.14 *
* Crit W.S. (ft)       *          * Flow Area (sq ft)    * 26.46 * 227.28 * 163.59 *
* E.G. Slope (ft/ft)   * 0.001584 * Area (sq ft)         * 26.46 * 227.28 * 163.59 *
* Q Total (cfs)        * 1441.00 * Flow (cfs)           * 16.02 * 1253.63 * 171.35 *
* Top Width (ft)       * 125.07 * Top Width (ft)       * 25.47 * 31.89 * 67.71 *
* Vel Total (ft/s)     * 3.45 * Avg. Vel. (ft/s)     * 0.61 * 5.52 * 1.05 *
* Max Chl Dpth (ft)    * 9.57 * Hydr. Depth (ft)     * 1.04 * 7.13 * 2.42 *
* Conv. Total (cfs)    * 36211.9 * Conv. (cfs)          * 402.5 * 31503.5 * 4305.9 *
* Length Wtd. (ft)    * 31.04 * Wetted Per. (ft)     * 25.55 * 38.52 * 69.39 *
* Min Ch El (ft)       * 220.27 * Shear (lb/sq ft)     * 0.10 * 0.58 * 0.23 *
* Alpha                 * 2.23 * Stream Power (lb/ft s) * 274.08 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 0.08 * Cum Volume (acre-ft) * 0.02 * 1.38 * 0.25 *
* C & E Loss (ft)      * 0.07 * Cum SA (acres)       * 0.03 * 0.15 * 0.40 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft)       * 231.16 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)        * 0.51 * Wt. n-Val.           * 0.100 * 0.035 * 0.100 *
* W.S. Elev (ft)       * 230.64 * Reach Len. (ft)      * 19.21 * 30.14 * 38.14 *
* Crit W.S. (ft)       *          * Flow Area (sq ft)    * 55.38 * 253.00 * 218.20 *
* E.G. Slope (ft/ft)   * 0.001786 * Area (sq ft)         * 55.38 * 253.00 * 218.20 *
* Q Total (cfs)        * 1923.00 * Flow (cfs)           * 39.16 * 1591.97 * 291.87 *
* Top Width (ft)       * 145.86 * Top Width (ft)       * 46.26 * 31.89 * 67.71 *
* Vel Total (ft/s)     * 3.65 * Avg. Vel. (ft/s)     * 0.71 * 6.29 * 1.34 *
* Max Chl Dpth (ft)    * 10.37 * Hydr. Depth (ft)     * 1.20 * 7.93 * 3.22 *
* Conv. Total (cfs)    * 45499.2 * Conv. (cfs)          * 926.5 * 37666.8 * 6905.9 *
* Length Wtd. (ft)    * 31.81 * Wetted Per. (ft)     * 46.36 * 38.52 * 70.19 *
* Min Ch El (ft)       * 220.27 * Shear (lb/sq ft)     * 0.13 * 0.73 * 0.35 *
* Alpha                 * 2.48 * Stream Power (lb/ft s) * 274.08 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 0.08 * Cum Volume (acre-ft) * 0.04 * 1.72 * 0.44 *
* C & E Loss (ft)      * 0.02 * Cum SA (acres)       * 0.05 * 0.15 * 0.46 *
*****

```

CROSS SECTION

RIVER: hudson
REACH: main RS: 5

INPUT

Description:

Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	237.05	19.33	231.35	34.54	230.9	49.16	226.44	49.71	221.74
54.79	221.59	60	219.53	61.57	219.8	61.58	219.8	62.02	219.88
63.98	219.98	66.43	226.23	69.34	227.52	113.51	228.23	150.48	227.88
173.2	229.28	184.22	231	187	231.13	190.89	231.01	190.99	230.72
197.15	230.94	207.98	231.26	218.02	231.1	225.62	230.81	226.28	231.35
242.65	238.23	244.51	238.31						

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	49.16	.035	69.34	.045	150.48	.05	187	.02
226.28	.05								

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

49.16 66.43 33.07 34.23 33.12 .1 .3
 Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 138.5 173.2 240 F

CROSS SECTION OUTPUT Profile #2-YR

```
*****
* E.G. Elev (ft) * 226.94 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.48 * Wt. n-Val. * 0.000 * 0.035 * 0.035 *
* W.S. Elev (ft) * 226.46 * Reach Len. (ft) * 33.07 * 34.23 * 33.12 *
* Crit W.S. (ft) * 224.03 * Flow Area (sq ft) * 0.00 * 90.99 * 0.06 *
* E.G. Slope (ft/ft) * 0.003253 * Area (sq ft) * 0.00 * 90.99 * 0.06 *
* Q Total (cfs) * 506.00 * Flow (cfs) * 0.00 * 505.97 * 0.03 *
* Top Width (ft) * 17.83 * Top Width (ft) * 0.05 * 17.27 * 0.51 *
* Vel Total (ft/s) * 5.56 * Avg. Vel. (ft/s) * 0.03 * 5.56 * 0.53 *
* Max Chl Dpth (ft) * 6.93 * Hydr. Depth (ft) * 0.01 * 5.27 * 0.11 *
* Conv. Total (cfs) * 8871.9 * Conv. (cfs) * 0.0 * 8871.3 * 0.5 *
* Length Wtd. (ft) * 34.23 * Wetted Per. (ft) * 0.05 * 26.14 * 0.56 *
* Min Ch El (ft) * 219.53 * Shear (lb/sq ft) * * 0.71 * 0.02 *
* Alpha * 1.00 * Stream Power (lb/ft s) * 244.51 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.09 * Cum Volume (acre-ft) * 0.00 * 0.42 * 0.00 *
* C & E Loss (ft) * 0.04 * Cum SA (acres) * 0.00 * 0.13 * 0.01 *
*****
```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```
*****
* E.G. Elev (ft) * 229.85 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 1.02 * Wt. n-Val. * 0.100 * 0.035 * 0.043 *
* W.S. Elev (ft) * 228.83 * Reach Len. (ft) * 33.07 * 34.23 * 33.12 *
* Crit W.S. (ft) * 226.84 * Flow Area (sq ft) * 9.35 * 131.96 * 65.69 *
* E.G. Slope (ft/ft) * 0.004762 * Area (sq ft) * 9.35 * 131.96 * 83.66 *
* Q Total (cfs) * 1297.00 * Flow (cfs) * 10.47 * 1137.66 * 148.87 *
* Top Width (ft) * 124.54 * Top Width (ft) * 7.83 * 17.27 * 99.44 *
* Vel Total (ft/s) * 6.27 * Avg. Vel. (ft/s) * 1.12 * 8.62 * 2.27 *
* Max Chl Dpth (ft) * 9.30 * Hydr. Depth (ft) * 1.19 * 7.64 * 0.91 *
* Conv. Total (cfs) * 18795.4 * Conv. (cfs) * 151.8 * 16486.3 * 2157.3 *
* Length Wtd. (ft) * 34.16 * Wetted Per. (ft) * 8.18 * 26.14 * 72.35 *
* Min Ch El (ft) * 219.53 * Shear (lb/sq ft) * 0.34 * 1.50 * 0.27 *
* Alpha * 1.68 * Stream Power (lb/ft s) * 244.51 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.15 * Cum Volume (acre-ft) * 0.01 * 1.16 * 0.12 *
* C & E Loss (ft) * 0.03 * Cum SA (acres) * 0.02 * 0.13 * 0.31 *
*****
```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```
*****
* E.G. Elev (ft) * 231.83 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.85 * Wt. n-Val. * 0.100 * 0.035 * 0.044 *
* W.S. Elev (ft) * 230.98 * Reach Len. (ft) * 33.07 * 34.23 * 33.12 *
* Crit W.S. (ft) * 230.14 * Flow Area (sq ft) * 33.93 * 169.18 * 231.68 *
* E.G. Slope (ft/ft) * 0.003693 * Area (sq ft) * 33.93 * 169.18 * 322.78 *
* Q Total (cfs) * 2530.00 * Flow (cfs) * 46.60 * 1515.68 * 967.72 *
* Top Width (ft) * 164.84 * Top Width (ft) * 17.43 * 17.27 * 130.14 *
* Vel Total (ft/s) * 5.82 * Avg. Vel. (ft/s) * 1.37 * 8.96 * 4.18 *
* Max Chl Dpth (ft) * 11.45 * Hydr. Depth (ft) * 1.95 * 9.80 * 2.43 *
* Conv. Total (cfs) * 41635.0 * Conv. (cfs) * 766.8 * 24942.9 * 15925.4 *
* Length Wtd. (ft) * 33.90 * Wetted Per. (ft) * 18.09 * 26.14 * 96.11 *
* Min Ch El (ft) * 219.53 * Shear (lb/sq ft) * 0.43 * 1.49 * 0.56 *
* Alpha * 1.62 * Stream Power (lb/ft s) * 244.51 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.13 * Cum Volume (acre-ft) * 0.04 * 2.01 * 0.52 *
* C & E Loss (ft) * 0.03 * Cum SA (acres) * 0.05 * 0.13 * 0.62 *
*****
```

Warning: Divided flow computed for this cross-section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```
*****
* E.G. Elev (ft) * 232.56 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 1.28 * Wt. n-Val. * 0.100 * 0.035 * 0.044 *
* W.S. Elev (ft) * 231.28 * Reach Len. (ft) * 33.07 * 34.23 * 33.12 *
* Crit W.S. (ft) * 230.88 * Flow Area (sq ft) * 40.51 * 174.25 * 264.34 *
* E.G. Slope (ft/ft) * 0.005495 * Area (sq ft) * 40.51 * 174.25 * 365.62 *
*****
```

```

* Q Total (cfs)          * 3396.00 * Flow (cfs)           * 57.04 * 1942.23 * 1396.73 *
* Top Width (ft)        * 204.39 * Top Width (ft)       * 27.36 * 17.27 * 159.76 *
* Vel Total (ft/s)      * 7.09  * Avg. Vel. (ft/s)    * 1.41 * 11.15 * 5.28 *
* Max Chl Dpth (ft)    * 11.75 * Hydr. Depth (ft)    * 1.48 * 10.09 * 2.11 *
* Conv. Total (cfs)     * 45813.8 * Conv. (cfs)         * 769.5 * 26201.6 * 18842.6 *
* Length Wtd. (ft)     * 33.83 * Wetted Per. (ft)    * 28.03 * 26.14 * 125.87 *
* Min Ch El (ft)       * 219.53 * Shear (lb/sq ft)    * 0.50 * 2.29 * 0.72 *
* Alpha                 * 1.64  * Stream Power (lb/ft s) * 244.51 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 0.17  * Cum Volume (acre-ft) * 0.08 * 2.47 * 0.84 *
* C & E Loss (ft)      * 0.01  * Cum SA (acres)       * 0.09 * 0.13 * 0.80 *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

```

*****
* E.G. Elev (ft)        * 230.10 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)        * 1.14  * Wt. n-Val.           * 0.100 * 0.035 * 0.044 *
* W.S. Elev (ft)       * 228.95 * Reach Len. (ft)      * 33.07 * 34.23 * 33.12 *
* Crit W.S. (ft)       * 227.33 * Flow Area (sq ft)    * 10.36 * 134.14 * 74.76 *
* E.G. Slope (ft/ft)   * 0.005314 * Area (sq ft)         * 10.36 * 134.14 * 96.30 *
* Q Total (cfs)        * 1441.00 * Flow (cfs)           * 12.69 * 1234.95 * 193.37 *
* Top Width (ft)       * 126.99 * Top Width (ft)       * 8.24 * 17.27 * 101.48 *
* Vel Total (ft/s)     * 6.57  * Avg. Vel. (ft/s)    * 1.22 * 9.21 * 2.59 *
* Max Chl Dpth (ft)    * 9.42  * Hydr. Depth (ft)    * 1.26 * 7.77 * 1.04 *
* Conv. Total (cfs)    * 19768.1 * Conv. (cfs)         * 174.0 * 16941.3 * 2652.7 *
* Length Wtd. (ft)    * 34.15 * Wetted Per. (ft)    * 8.62 * 26.14 * 72.35 *
* Min Ch El (ft)       * 219.53 * Shear (lb/sq ft)    * 0.40 * 1.70 * 0.34 *
* Alpha                 * 1.70  * Stream Power (lb/ft s) * 244.51 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 0.17  * Cum Volume (acre-ft) * 0.01 * 1.26 * 0.14 *
* C & E Loss (ft)      * 0.01  * Cum SA (acres)       * 0.02 * 0.13 * 0.32 *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft)        * 231.06 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)        * 0.75  * Wt. n-Val.           * 0.100 * 0.035 * 0.044 *
* W.S. Elev (ft)       * 230.31 * Reach Len. (ft)      * 33.07 * 34.23 * 33.12 *
* Crit W.S. (ft)       * 229.51 * Flow Area (sq ft)    * 24.53 * 157.54 * 175.80 *
* E.G. Slope (ft/ft)   * 0.003366 * Area (sq ft)         * 24.53 * 157.54 * 243.49 *
* Q Total (cfs)        * 1923.00 * Flow (cfs)           * 31.88 * 1284.96 * 606.16 *
* Top Width (ft)       * 143.31 * Top Width (ft)       * 12.68 * 17.27 * 113.36 *
* Vel Total (ft/s)     * 5.37  * Avg. Vel. (ft/s)    * 1.30 * 8.16 * 3.45 *
* Max Chl Dpth (ft)    * 10.78 * Hydr. Depth (ft)    * 1.93 * 9.12 * 2.23 *
* Conv. Total (cfs)    * 33145.5 * Conv. (cfs)         * 549.4 * 22148.0 * 10448.0 *
* Length Wtd. (ft)    * 34.04 * Wetted Per. (ft)    * 13.26 * 26.14 * 79.02 *
* Min Ch El (ft)       * 219.53 * Shear (lb/sq ft)    * 0.39 * 1.27 * 0.47 *
* Alpha                 * 1.67  * Stream Power (lb/ft s) * 244.51 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 0.17  * Cum Volume (acre-ft) * 0.02 * 1.58 * 0.24 *
* C & E Loss (ft)      * 0.13  * Cum SA (acres)       * 0.04 * 0.13 * 0.38 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
REACH: main RS: 4

INPUT

Description:

```

Station Elevation Data num= 25
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
*****
0 236.53 25.81 231.56 34.44 227.61 36.43 225.45 40.94 219.23
43.91 218.9 46.89 219.58 48.04 219.84 56.6 224.71 62 228.28
77.44 229.09 101.22 231.33 123.11 228.43 154.18 229.18 167.64 229.57
171.48 229.63 171.59 229.32 177.83 229.47 188.28 229.72 198.64 229.54

```

206.83 229.21 207.55 229.77 218.65 234.17 221.38 234.44 232.87 234.82

Manning's n Values		num= 7		Sta n Val		Sta n Val		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	34.44	.035	62	.05	77.44	.045	167.64	.02
207.55	.05	218.65	.02						

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	34.44	62		47.24	49.31	53.94	.1 .3
Ineffective Flow	num= 1						
	Sta L	Sta R	Elev	Permanent			
	131	139.6	250	F			

CROSS SECTION OUTPUT Profile #2-YR

* E.G. Elev (ft)	* 226.80	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 0.34	* Wt. n-Val.	*	* 0.035	*	*
* W.S. Elev (ft)	* 226.47	* Reach Len. (ft)	* 47.24	* 49.31	* 53.94	*
* Crit W.S. (ft)	* 223.66	* Flow Area (sq ft)	*	* 108.59	*	*
* E.G. Slope (ft/ft)	* 0.002103	* Area (sq ft)	*	* 108.59	*	*
* Q Total (cfs)	* 506.00	* Flow (cfs)	*	* 506.00	*	*
* Top Width (ft)	* 23.76	* Top Width (ft)	*	* 23.76	*	*
* Vel Total (ft/s)	* 4.66	* Avg. Vel. (ft/s)	*	* 4.66	*	*
* Max Chl Dpth (ft)	* 7.57	* Hydr. Depth (ft)	*	* 4.57	*	*
* Conv. Total (cfs)	* 11034.9	* Conv. (cfs)	*	* 11034.9	*	*
* Length Wtd. (ft)	* 49.31	* Wetted Per. (ft)	*	* 29.32	*	*
* Min Ch El (ft)	* 218.90	* Shear (lb/sq ft)	*	* 0.49	*	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 232.87	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.06	* Cum Volume (acre-ft)	* 0.00	* 0.35	* 0.00	*
* C & E Loss (ft)	* 0.05	* Cum SA (acres)	* 0.00	* 0.11	* 0.01	*

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 229.67	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 0.91	* Wt. n-Val.	* 0.100	* 0.035	* 0.047	*
* W.S. Elev (ft)	* 228.76	* Reach Len. (ft)	* 47.24	* 49.31	* 53.94	*
* Crit W.S. (ft)	* 226.41	* Flow Area (sq ft)	* 1.46	* 168.83	* 4.55	*
* E.G. Slope (ft/ft)	* 0.003865	* Area (sq ft)	* 1.46	* 168.83	* 4.98	*
* Q Total (cfs)	* 1297.00	* Flow (cfs)	* 0.88	* 1292.79	* 3.34	*
* Top Width (ft)	* 55.70	* Top Width (ft)	* 2.52	* 27.56	* 25.62	*
* Vel Total (ft/s)	* 7.42	* Avg. Vel. (ft/s)	* 0.60	* 7.66	* 0.73	*
* Max Chl Dpth (ft)	* 9.86	* Hydr. Depth (ft)	* 0.58	* 6.13	* 0.23	*
* Conv. Total (cfs)	* 20862.1	* Conv. (cfs)	* 14.1	* 20794.3	* 53.7	*
* Length Wtd. (ft)	* 49.80	* Wetted Per. (ft)	* 2.77	* 34.17	* 19.69	*
* Min Ch El (ft)	* 218.90	* Shear (lb/sq ft)	* 0.13	* 1.19	* 0.06	*
* Alpha	* 1.06	* Stream Power (lb/ft s)	* 232.87	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.08	* Cum Volume (acre-ft)	* 0.01	* 1.04	* 0.09	*
* C & E Loss (ft)	* 0.20	* Cum SA (acres)	* 0.02	* 0.12	* 0.27	*

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 231.67	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 1.18	* Wt. n-Val.	* 0.100	* 0.035	* 0.036	*
* W.S. Elev (ft)	* 230.49	* Reach Len. (ft)	* 47.24	* 49.31	* 53.94	*
* Crit W.S. (ft)	* 230.49	* Flow Area (sq ft)	* 9.05	* 216.35	* 145.44	*
* E.G. Slope (ft/ft)	* 0.004302	* Area (sq ft)	* 9.05	* 216.35	* 160.61	*
* Q Total (cfs)	* 2530.00	* Flow (cfs)	* 10.56	* 2062.00	* 457.45	*
* Top Width (ft)	* 165.93	* Top Width (ft)	* 6.29	* 27.56	* 132.08	*
* Vel Total (ft/s)	* 6.82	* Avg. Vel. (ft/s)	* 1.17	* 9.53	* 3.15	*
* Max Chl Dpth (ft)	* 11.59	* Hydr. Depth (ft)	* 1.44	* 7.85	* 1.18	*
* Conv. Total (cfs)	* 38573.7	* Conv. (cfs)	* 160.9	* 31438.3	* 6974.5	*

```

* Length Wtd. (ft)      * 50.58 * Wetted Per. (ft)      * 6.92 * 34.17 * 124.28 *
* Min Ch El (ft)       * 218.90 * Shear (lb/sq ft)     * 0.35 * 1.70 * 0.31 *
* Alpha                * 1.63 * Stream Power (lb/ft s) * 232.87 * 0.00 * 0.00 *
* Frctn Loss (ft)     * 0.10 * Cum Volume (acre-ft) * 0.03 * 1.86 * 0.33 *
* C & E Loss (ft)     * 0.24 * Cum SA (acres)       * 0.04 * 0.12 * 0.52 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)      * 232.38 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)       * 1.26 * Wt. n-Val.           * 0.100 * 0.035 * 0.034 *
* W.S. Elev (ft)     * 231.12 * Reach Len. (ft)     * 47.24 * 49.31 * 53.94 *
* Crit W.S. (ft)     * 231.12 * Flow Area (sq ft)   * 13.47 * 233.80 * 227.77 *
* E.G. Slope (ft/ft) * 0.004561 * Area (sq ft)       * 13.47 * 233.80 * 248.39 *
* Q Total (cfs)      * 3396.00 * Flow (cfs)         * 18.47 * 2416.15 * 961.38 *
* Top Width (ft)     * 180.41 * Top Width (ft)     * 7.67 * 27.56 * 145.18 *
* Vel Total (ft/s)   * 7.15 * Avg. Vel. (ft/s)   * 1.37 * 10.33 * 4.22 *
* Max Chl Dpth (ft) * 12.22 * Hydr. Depth (ft)   * 1.76 * 8.48 * 1.67 *
* Conv. Total (cfs) * 50286.3 * Conv. (cfs)        * 273.5 * 35777.2 * 14235.6 *
* Length Wtd. (ft)  * 50.97 * Wetted Per. (ft)   * 8.44 * 34.17 * 137.57 *
* Min Ch El (ft)    * 218.90 * Shear (lb/sq ft)   * 0.45 * 1.95 * 0.47 *
* Alpha              * 1.59 * Stream Power (lb/ft s) * 232.87 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 0.12 * Cum Volume (acre-ft) * 0.06 * 2.31 * 0.61 *
* C & E Loss (ft)   * 0.24 * Cum SA (acres)     * 0.07 * 0.12 * 0.68 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

```

*****
* E.G. Elev (ft)      * 229.91 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)       * 1.10 * Wt. n-Val.           * 0.100 * 0.035 * 0.047 *
* W.S. Elev (ft)     * 228.82 * Reach Len. (ft)     * 47.24 * 49.31 * 53.94 *
* Crit W.S. (ft)     * 226.80 * Flow Area (sq ft)   * 1.59 * 170.23 * 5.58 *
* E.G. Slope (ft/ft) * 0.004633 * Area (sq ft)       * 1.59 * 170.23 * 6.36 *
* Q Total (cfs)      * 1441.00 * Flow (cfs)         * 1.07 * 1435.01 * 4.92 *
* Top Width (ft)     * 59.26 * Top Width (ft)     * 2.63 * 27.56 * 29.07 *
* Vel Total (ft/s)   * 8.12 * Avg. Vel. (ft/s)   * 0.68 * 8.43 * 0.88 *
* Max Chl Dpth (ft) * 9.92 * Hydr. Depth (ft)   * 0.60 * 6.18 * 0.27 *
* Conv. Total (cfs) * 21170.1 * Conv. (cfs)        * 15.8 * 21082.1 * 72.3 *
* Length Wtd. (ft)  * 49.86 * Wetted Per. (ft)   * 2.90 * 34.17 * 21.04 *
* Min Ch El (ft)    * 218.90 * Shear (lb/sq ft)   * 0.16 * 1.44 * 0.08 *
* Alpha              * 1.07 * Stream Power (lb/ft s) * 232.87 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 0.09 * Cum Volume (acre-ft) * 0.01 * 1.14 * 0.10 *
* C & E Loss (ft)   * 0.25 * Cum SA (acres)     * 0.02 * 0.12 * 0.28 *
*****

```

Warning: Divided flow computed for this cross-section.
 Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
 This may indicate the need for additional cross sections.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

 * E.G. Elev (ft) * 230.76 * Element * Left OB * Channel * Right OB *
 * Vel Head (ft) * 2.00 * Wt. n-Val. * 0.100 * 0.035 * 0.047 *
 * W.S. Elev (ft) * 228.76 * Reach Len. (ft) * 47.24 * 49.31 * 53.94 *
 * Crit W.S. (ft) * 227.93 * Flow Area (sq ft) * 1.44 * 168.65 * 4.42 *
 * E.G. Slope (ft/ft) * 0.008528 * Area (sq ft) * 1.44 * 168.65 * 4.81 *
 * Q Total (cfs) * 1923.00 * Flow (cfs) * 1.28 * 1916.96 * 4.76 *
 * Top Width (ft) * 55.24 * Top Width (ft) * 2.51 * 27.56 * 25.18 *
 * Vel Total (ft/s) * 11.02 * Avg. Vel. (ft/s) * 0.89 * 11.37 * 1.08 *
 * Max Chl Dpth (ft) * 9.86 * Hydr. Depth (ft) * 0.57 * 6.12 * 0.23 *
 * Conv. Total (cfs) * 20823.3 * Conv. (cfs) * 13.9 * 20757.8 * 51.6 *
 * Length Wtd. (ft) * 50.00 * Wetted Per. (ft) * 2.76 * 34.17 * 19.51 *
 * Min Ch El (ft) * 218.90 * Shear (lb/sq ft) * 0.28 * 2.63 * 0.12 *
 * Alpha * 1.06 * Stream Power (lb/ft s) * 232.87 * 0.00 * 0.00 *
 * Frctn Loss (ft) * 0.12 * Cum Volume (acre-ft) * 0.01 * 1.45 * 0.14 *
 * C & E Loss (ft) * 0.50 * Cum SA (acres) * 0.03 * 0.12 * 0.33 *

Warning: Divided flow computed for this cross-section.
 Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
 This may indicate the need for additional cross sections.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
 REACH: main RS: 3

INPUT

Description:

Station Elevation Data		num= 29							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	234.33	12.74	233.78	27.06	229.74	36.02	226.32	41.07	223.02
45.32	220.34	49.21	217.7	50.93	217.52	51.14	217.5	54.29	218.25
59.95	222.39	65.56	225.54	72.74	228.64	102.54	228.16	121.2	229.93
135.83	227.74	149.63	227.65	153.57	227.69	153.67	227.23	159.35	227.29
169.96	227.5	180.29	227.5	188.17	227.34	188.91	227.93	191.54	227.85
192.54	229.42	203.14	230.82	206.02	230.85	216.02	232.35		

Manning's n Values		num= 4					
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	36.02	.035	65.56	.045	149.63	.02

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	36.02	65.56		112.21	120.13	138.27		.3	.5

Ineffective Flow		num= 1	
Sta L	Sta R	Elev	Permanent
207.91	216.02	245	F

CROSS SECTION OUTPUT Profile #2-YR

 * E.G. Elev (ft) * 226.69 * Element * Left OB * Channel * Right OB *
 * Vel Head (ft) * 0.17 * Wt. n-Val. * 0.100 * 0.035 * 0.045 *
 * W.S. Elev (ft) * 226.52 * Reach Len. (ft) * 112.21 * 120.13 * 138.27 *
 * Crit W.S. (ft) * 222.42 * Flow Area (sq ft) * 0.05 * 153.04 * 1.12 *
 * E.G. Slope (ft/ft) * 0.000826 * Area (sq ft) * 0.05 * 153.04 * 1.12 *
 * Q Total (cfs) * 506.00 * Flow (cfs) * 0.00 * 505.37 * 0.62 *
 * Top Width (ft) * 32.35 * Top Width (ft) * 0.53 * 29.54 * 2.28 *
 * Vel Total (ft/s) * 3.28 * Avg. Vel. (ft/s) * 0.09 * 3.30 * 0.56 *
 * Max Chl Dpth (ft) * 9.02 * Hydr. Depth (ft) * 0.10 * 5.18 * 0.49 *
 * Conv. Total (cfs) * 17602.7 * Conv. (cfs) * 0.2 * 17580.8 * 21.7 *
 * Length Wtd. (ft) * 120.13 * Wetted Per. (ft) * 0.57 * 34.38 * 2.48 *

```

* Min Ch El (ft)      * 217.50 * Shear (lb/sq ft)      * 0.00 * 0.23 * 0.02 *
* Alpha              * 1.01  * Stream Power (lb/ft s) * 216.02 * 0.00 * 0.00 *
* Frctn Loss (ft)    *      * Cum Volume (acre-ft)  *      * 0.20 *      *
* C & E Loss (ft)    *      * Cum SA (acres)        * 0.00 * 0.08 * 0.00 *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)      * 229.40 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)       * 0.25  * Wt. n-Val.           * 0.100 * 0.035 * 0.026 *
* W.S. Elev (ft)      * 229.15 * Reach Len. (ft)      * 112.21 * 120.13 * 138.27 *
* Crit W.S. (ft)      * 225.08 * Flow Area (sq ft)    * 10.48 * 230.60 * 139.83 *
* E.G. Slope (ft/ft)  * 0.000850 * Area (sq ft)         * 10.48 * 230.60 * 139.83 *
* Q Total (cfs)       * 1297.00 * Flow (cfs)           * 5.46 * 1015.06 * 276.48 *
* Top Width (ft)      * 150.29 * Top Width (ft)       * 7.41 * 29.54 * 113.34 *
* Vel Total (ft/s)    * 3.41  * Avg. Vel. (ft/s)     * 0.52 * 4.40 * 1.98 *
* Max Chl Dpth (ft)   * 11.65 * Hydr. Depth (ft)     * 1.41 * 7.81 * 1.23 *
* Conv. Total (cfs)   * 44487.8 * Conv. (cfs)          * 187.5 * 34817.0 * 9483.4 *
* Length Wtd. (ft)    * 120.13 * Wetted Per. (ft)     * 7.93 * 34.38 * 115.43 *
* Min Ch El (ft)      * 217.50 * Shear (lb/sq ft)     * 0.07 * 0.36 * 0.06 *
* Alpha              * 1.38  * Stream Power (lb/ft s) * 216.02 * 0.00 * 0.00 *
* Frctn Loss (ft)    *      * Cum Volume (acre-ft) * 0.00 * 0.82 * 0.00 *
* C & E Loss (ft)    *      * Cum SA (acres)       * 0.01 * 0.08 * 0.18 *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)      * 230.84 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)       * 0.38  * Wt. n-Val.           * 0.100 * 0.035 * 0.028 *
* W.S. Elev (ft)      * 230.46 * Reach Len. (ft)      * 112.21 * 120.13 * 138.27 *
* Crit W.S. (ft)      * 228.63 * Flow Area (sq ft)    * 22.71 * 269.40 * 305.45 *
* E.G. Slope (ft/ft)  * 0.001203 * Area (sq ft)         * 22.71 * 269.40 * 305.45 *
* Q Total (cfs)       * 2530.00 * Flow (cfs)           * 17.67 * 1565.11 * 947.23 *
* Top Width (ft)      * 175.93 * Top Width (ft)       * 11.52 * 29.54 * 134.87 *
* Vel Total (ft/s)    * 4.23  * Avg. Vel. (ft/s)     * 0.78 * 5.81 * 3.10 *
* Max Chl Dpth (ft)   * 12.96 * Hydr. Depth (ft)     * 1.97 * 9.12 * 2.26 *
* Conv. Total (cfs)   * 72936.2 * Conv. (cfs)          * 509.4 * 45119.7 * 27307.1 *
* Length Wtd. (ft)    * 120.13 * Wetted Per. (ft)     * 12.25 * 34.38 * 137.27 *
* Min Ch El (ft)      * 217.50 * Shear (lb/sq ft)     * 0.14 * 0.59 * 0.17 *
* Alpha              * 1.37  * Stream Power (lb/ft s) * 216.02 * 0.00 * 0.00 *
* Frctn Loss (ft)    *      * Cum Volume (acre-ft) * 0.01 * 1.58 * 0.04 *
* C & E Loss (ft)    *      * Cum SA (acres)       * 0.03 * 0.08 * 0.35 *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)      * 231.63 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)       * 0.45  * Wt. n-Val.           * 0.100 * 0.035 * 0.029 *
* W.S. Elev (ft)      * 231.18 * Reach Len. (ft)      * 112.21 * 120.13 * 138.27 *
* Crit W.S. (ft)      * 229.41 * Flow Area (sq ft)    * 31.85 * 290.52 * 404.63 *
* E.G. Slope (ft/ft)  * 0.001345 * Area (sq ft)         * 31.85 * 290.52 * 404.63 *
* Q Total (cfs)       * 3396.00 * Flow (cfs)           * 28.82 * 1876.38 * 1490.80 *
* Top Width (ft)      * 186.23 * Top Width (ft)       * 14.05 * 29.54 * 142.64 *
* Vel Total (ft/s)    * 4.67  * Avg. Vel. (ft/s)     * 0.91 * 6.46 * 3.68 *
* Max Chl Dpth (ft)   * 13.68 * Hydr. Depth (ft)     * 2.27 * 9.83 * 2.84 *
* Conv. Total (cfs)   * 92603.2 * Conv. (cfs)          * 786.0 * 51165.7 * 40651.6 *
* Length Wtd. (ft)    * 120.13 * Wetted Per. (ft)     * 14.88 * 34.38 * 144.80 *
* Min Ch El (ft)      * 217.50 * Shear (lb/sq ft)     * 0.18 * 0.71 * 0.23 *
* Alpha              * 1.33  * Stream Power (lb/ft s) * 216.02 * 0.00 * 0.00 *
* Frctn Loss (ft)    *      * Cum Volume (acre-ft) * 0.03 * 2.01 * 0.20 *
* C & E Loss (ft)    *      * Cum SA (acres)       * 0.06 * 0.08 * 0.50 *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION OUTPUT Profile #6HR OBS

```

*****

```

```

* E.G. Elev (ft)          * 229.58 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.27  * Wt. n-Val.      * 0.100  * 0.035  * 0.026  *
* W.S. Elev (ft)         * 229.31 * Reach Len. (ft) * 112.21 * 120.13 * 138.27 *
* Crit W.S. (ft)         * 225.44 * Flow Area (sq ft) * 11.68  * 235.27 * 157.97 *
* E.G. Slope (ft/ft)     * 0.000923 * Area (sq ft)    * 11.68  * 235.27 * 157.97 *
* Q Total (cfs)          * 1441.00 * Flow (cfs)       * 6.58   * 1093.64 * 340.78 *
* Top Width (ft)         * 153.53 * Top Width (ft)   * 7.82   * 29.54  * 116.17 *
* Vel Total (ft/s)       * 3.56   * Avg. Vel. (ft/s) * 0.56   * 4.65   * 2.16   *
* Max Chl Dpth (ft)     * 11.81  * Hydr. Depth (ft) * 1.49   * 7.96   * 1.36   *
* Conv. Total (cfs)     * 47435.1 * Conv. (cfs)      * 216.7  * 36000.5 * 11217.8 *
* Length Wtd. (ft)     * 120.13 * Wetted Per. (ft) * 8.37   * 34.38  * 118.36 *
* Min Ch El (ft)        * 217.50 * Shear (lb/sq ft) * 0.08   * 0.39   * 0.08   *
* Alpha                  * 1.38   * Stream Power (lb/ft s) * 216.02 * 0.00   * 0.00   *
* Frctn Loss (ft)       *         * Cum Volume (acre-ft) * 0.00   * 0.91   * 0.00   *
* C & E Loss (ft)       *         * Cum SA (acres)    * 0.01   * 0.08   * 0.19   *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft)          * 230.14 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.34   * Wt. n-Val.      * 0.100  * 0.035  * 0.027  *
* W.S. Elev (ft)         * 229.80 * Reach Len. (ft) * 112.21 * 120.13 * 138.27 *
* Crit W.S. (ft)         * 226.46 * Flow Area (sq ft) * 15.84  * 249.77 * 217.66 *
* E.G. Slope (ft/ft)     * 0.001131 * Area (sq ft)    * 15.84  * 249.77 * 217.66 *
* Q Total (cfs)          * 1923.00 * Flow (cfs)       * 10.90  * 1337.63 * 574.47 *
* Top Width (ft)         * 166.25 * Top Width (ft)   * 9.16   * 29.54  * 127.55 *
* Vel Total (ft/s)       * 3.98   * Avg. Vel. (ft/s) * 0.69   * 5.36   * 2.64   *
* Max Chl Dpth (ft)     * 12.30  * Hydr. Depth (ft) * 1.73   * 8.46   * 1.71   *
* Conv. Total (cfs)     * 57181.1 * Conv. (cfs)      * 324.2  * 39774.8 * 17082.1 *
* Length Wtd. (ft)     * 120.13 * Wetted Per. (ft) * 9.80   * 34.38  * 129.90 *
* Min Ch El (ft)        * 217.50 * Shear (lb/sq ft) * 0.11   * 0.51   * 0.12   *
* Alpha                  * 1.39   * Stream Power (lb/ft s) * 216.02 * 0.00   * 0.00   *
* Frctn Loss (ft)       *         * Cum Volume (acre-ft) * 0.00   * 1.21   * 0.00   *
* C & E Loss (ft)       *         * Cum SA (acres)    * 0.02   * 0.08   * 0.23   *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CULVERT

RIVER: hudson
REACH: main RS: 2.5

INPUT

Description:
Distance from Upstream XS = 13
Deck/Roadway Width = 95
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates

num= 6		Sta Hi Cord Lo Cord				Sta Hi Cord Lo Cord				Sta Hi Cord Lo Cord			
25	229	33.33	229	41.09	228.5								
54.48	227.93	67.7	228	90	228								

Upstream Bridge Cross Section Data

Station Elevation Data num= 29									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	234.33	12.74	233.78	27.06	229.74	36.02	226.32	41.07	223.02
45.32	220.34	49.21	217.7	50.93	217.52	51.14	217.5	54.29	218.25
59.95	222.39	65.56	225.54	72.74	228.64	102.54	228.16	121.2	229.93
135.83	227.74	149.63	227.65	153.57	227.69	153.67	227.23	159.35	227.29
169.96	227.5	180.29	227.5	188.17	227.34	188.91	227.93	191.54	227.85
192.54	229.42	203.14	230.82	206.02	230.85	216.02	232.35		

Manning's n Values

num= 4							
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	36.02	.035	65.56	.045	149.63	.02

Bank Sta: Left Right Coeff Contr. Expan.
36.02 65.56 .3 .5
Ineffective Flow num= 1

```

Sta L   Sta R   Elev   Permanent
207.91 216.02   245     F

Downstream Deck/Roadway Coordinates
num= 7
Sta Hi Cord Lo Cord   Sta Hi Cord Lo Cord   Sta Hi Cord Lo Cord
*****
0      225           24    225           24.8    229
34.2   228.5       49  227.93       50    225
90     225

Downstream Bridge Cross Section Data
Station Elevation Data num= 25
Sta Elev   Sta Elev   Sta Elev   Sta Elev   Sta Elev
*****
0  227.98  20.1  224.25  30.05  222.24  30.41  219.53  30.82  217.54
31.07  215.18  39.03  214.76  40.17  214.78  46.05  214.86  46.12  217.7
46.53  219.53  47.08  222.67  75.26  224.24  87.23  224.69  122.58  225.91
127.5  225.75  127.65  225.43  133.54  225.65  143.95  225.88  153.46  225.71
159.5  225.41  160.11  225.99  160.7    226    161.7  228.68  177.81  229.82

Manning's n Values num= 4
Sta n Val   Sta n Val   Sta n Val   Sta n Val
*****
0  .045  31.07  .035  47.08  .045  122.58  .02

Bank Sta: Left Right   Coeff Contr.   Expan.
          30.41 46.53           .3           .5

Ineffective Flow num= 2
Sta L Sta R Elev Permanent
56.4  111.4  240     F
171.08 177.81  240     F

Blocked Obstructions num= 1
Sta L Sta R Elev
*****
14.6  21.6  230

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name Shape Rise Span
Culvert #1 Circular 8
FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 1 - Square edge entrance with headwall
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist Length Top n Bottom n Depth Blocked Entrance Loss Coef Exit Loss Coef
          13.5 94.77 .024 .024 0 .5 1
Upstream Elevation = 216.95
Centerline Station = 51.14
Downstream Elevation = 215.35
Centerline Station = 39.16

CULVERT OUTPUT Profile #2-YR Culv Group: Culvert #1
*****
* Q Culv Group (cfs) * 506.00 * Culv Full Len (ft) * *
* # Barrels * 1 * Culv Vel US (ft/s) * 13.12 *
* Q Barrel (cfs) * 506.00 * Culv Vel DS (ft/s) * 14.15 *
* E.G. US. (ft) * 226.70 * Culv Inv El Up (ft) * 216.95 *
* W.S. US. (ft) * 226.52 * Culv Inv El Dn (ft) * 215.35 *
* E.G. DS (ft) * 219.78 * Culv Frctn Ls (ft) * 1.54 *
* W.S. DS (ft) * 218.27 * Culv Exit Loss (ft) * 4.03 *
* Delta EG (ft) * 6.91 * Culv Entr Loss (ft) * 1.34 *
* Delta WS (ft) * 8.25 * Q Weir (cfs) * *
* E.G. IC (ft) * 226.28 * Weir Sta Lft (ft) * *
* E.G. OC (ft) * 226.70 * Weir Sta Rgt (ft) * *
* Culvert Control * Outlet * Weir Submerg * *
* Culv WS Inlet (ft) * 222.68 * Weir Max Depth (ft) * *
* Culv WS Outlet (ft) * 220.70 * Weir Avg Depth (ft) * *
* Culv Nml Depth (ft) * 5.35 * Weir Flow Area (sq ft) * *
* Culv Crt Depth (ft) * 5.73 * Min El Weir Flow (ft) * 227.24 *
*****

```


Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: During the supercritical calculations a hydraulic jump occurred at the outlet of (leaving) the culvert.

Warning: During the supercritical analysis, the program could not converge on a supercritical answer in the downstream cross section. The program used the solution with the least error.

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.

Note: The flow in the culvert is entirely supercritical.

```

CULVERT OUTPUT Profile #10-YR Culv Group: Culvert #1
*****
* Q Culv Group (cfs)      * 673.92 * Culv Full Len (ft)    *          *
* # Barrels              *      1 * Culv Vel US (ft/s)   * 13.41 *
* Q Barrel (cfs)         * 673.92 * Culv Vel DS (ft/s)   * 16.36 *
* E.G. US. (ft)          * 229.40 * Culv Inv El Up (ft)  * 216.95 *
* W.S. US. (ft)          * 229.15 * Culv Inv El Dn (ft)  * 215.35 *
* E.G. DS (ft)           * 223.90 * Culv Frctn Ls (ft)   * 2.39 *
* W.S. DS (ft)           * 220.98 * Culv Exit Loss (ft)  * 1.72 *
* Delta EG (ft)          * 5.50 * Culv Entr Loss (ft)  * 1.40 *
* Delta WS (ft)          * 8.17 * Q Weir (cfs)         * 623.08 *
* E.G. IC (ft)           * 229.40 * Weir Sta Lft (ft)    * 27.97 *
* E.G. OC (ft)           * 228.82 * Weir Sta Rgt (ft)    * 192.52 *
* Culvert Control        * Inlet  * Weir Submerg         * 0.00 *
* Culv WS Inlet (ft)     * 224.95 * Weir Max Depth (ft)  * 2.16 *
* Culv WS Outlet (ft)    * 221.46 * Weir Avg Depth (ft)  * 1.29 *
* Culv Nml Depth (ft)    * 6.99 * Weir Flow Area (sq ft) * 199.59 *
* Culv Crt Depth (ft)    * 6.57 * Min El Weir Flow (ft) * 227.24 *
*****

```

Warning: The flow through the culvert is supercritical. However, since there is flow over the road (weir flow), the program cannot determine if the downstream cross section should be subcritical or supercritical. The program used the downstream subcritical answer, even though it may not be valid.

Warning: During the supercritical analysis, the program could not converge on a supercritical answer in the downstream cross section. The program used the solution with the least error.

Note: The flow in the culvert is entirely supercritical.

```

CULVERT OUTPUT Profile #50-YR Culv Group: Culvert #1
*****
* Q Culv Group (cfs)      * 625.40 * Culv Full Len (ft)    * 94.77 *
* # Barrels              *      1 * Culv Vel US (ft/s)   * 12.44 *
* Q Barrel (cfs)         * 625.40 * Culv Vel DS (ft/s)   * 12.44 *
* E.G. US. (ft)          * 230.84 * Culv Inv El Up (ft)  * 216.95 *
* W.S. US. (ft)          * 230.46 * Culv Inv El Dn (ft)  * 215.35 *
* E.G. DS (ft)           * 228.12 * Culv Frctn Ls (ft)   * 1.52 *
* W.S. DS (ft)           * 225.07 * Culv Exit Loss (ft)  * 0.00 *
* Delta EG (ft)          * 2.72 * Culv Entr Loss (ft)  * 1.20 *
* Delta WS (ft)          * 5.39 * Q Weir (cfs)         * 1904.60 *
* E.G. IC (ft)           * 230.73 * Weir Sta Lft (ft)    * 23.14 *
* E.G. OC (ft)           * 230.84 * Weir Sta Rgt (ft)    * 205.64 *
* Culvert Control        * Outlet * Weir Submerg         * 0.00 *
* Culv WS Inlet (ft)     * 224.95 * Weir Max Depth (ft)  * 3.62 *
* Culv WS Outlet (ft)    * 223.35 * Weir Avg Depth (ft)  * 2.45 *
* Culv Nml Depth (ft)    *          * Weir Flow Area (sq ft) * 447.37 *
* Culv Crt Depth (ft)    * 6.36 * Min El Weir Flow (ft) * 227.24 *
*****

```

```

CULVERT OUTPUT Profile #100-YR Culv Group: Culvert #1
*****
* Q Culv Group (cfs)      * 564.75 * Culv Full Len (ft)    * 94.77 *
* # Barrels              *      1 * Culv Vel US (ft/s)   * 11.24 *
* Q Barrel (cfs)         * 564.75 * Culv Vel DS (ft/s)   * 11.24 *
* E.G. US. (ft)          * 231.63 * Culv Inv El Up (ft)  * 216.95 *
* W.S. US. (ft)          * 231.18 * Culv Inv El Dn (ft)  * 215.35 *
* E.G. DS (ft)           * 229.15 * Culv Frctn Ls (ft)   * 1.24 *
* W.S. DS (ft)           * 227.45 * Culv Exit Loss (ft)  * 0.26 *
* Delta EG (ft)          * 2.48 * Culv Entr Loss (ft)  * 0.98 *
* Delta WS (ft)          * 3.73 * Q Weir (cfs)         * 2831.25 *
* E.G. IC (ft)           * 231.49 * Weir Sta Lft (ft)    * 20.37 *
* E.G. OC (ft)           * 231.63 * Weir Sta Rgt (ft)    * 207.91 *
* Culvert Control        * Outlet * Weir Submerg         * 0.00 *
* Culv WS Inlet (ft)     * 224.95 * Weir Max Depth (ft)  * 4.40 *
* Culv WS Outlet (ft)    * 223.35 * Weir Avg Depth (ft)  * 3.16 *
* Culv Nml Depth (ft)    *          * Weir Flow Area (sq ft) * 592.49 *
*****

```

* Culv Crt Depth (ft) * 6.05 * Min El Weir Flow (ft) * 227.24 *

CULVERT OUTPUT Profile #6HR OBS Culv Group: Culvert #1

 * Q Culv Group (cfs) * 682.42 * Culv Full Len (ft) * * *
 * # Barrels * 1 * Culv Vel US (ft/s) * 13.58 *
 * Q Barrel (cfs) * 682.42 * Culv Vel DS (ft/s) * 16.50 *
 * E.G. US. (ft) * 229.58 * Culv Inv El Up (ft) * 216.95 *
 * W.S. US. (ft) * 229.31 * Culv Inv El Dn (ft) * 215.35 *
 * E.G. DS (ft) * 224.53 * Culv Frctn Ls (ft) * 2.43 *
 * W.S. DS (ft) * 221.40 * Culv Exit Loss (ft) * 1.18 *
 * Delta EG (ft) * 5.05 * Culv Entr Loss (ft) * 1.43 *
 * Delta WS (ft) * 7.91 * Q Weir (cfs) * 758.58 *
 * E.G. IC (ft) * 229.58 * Weir Sta Lft (ft) * 27.45 *
 * E.G. OC (ft) * 228.93 * Weir Sta Rgt (ft) * 193.82 *
 * Culvert Control * Inlet * Weir Submerg * 0.00 *
 * Culv WS Inlet (ft) * 224.95 * Weir Max Depth (ft) * 2.36 *
 * Culv WS Outlet (ft) * 221.48 * Weir Avg Depth (ft) * 1.44 *
 * Culv Nml Depth (ft) * 7.16 * Weir Flow Area (sq ft) * 230.67 *
 * Culv Crt Depth (ft) * 6.61 * Min El Weir Flow (ft) * 227.24 *

Warning: The flow through the culvert is supercritical. However, since there is flow over the road (weir flow), the program cannot determine if the downstream cross section should be subcritical or supercritical. The program used the downstream subcritical answer, even though it may not be valid.
 Warning: During the supercritical analysis, the program could not converge on a supercritical answer in the downstream cross section. The program used the solution with the least error.
 Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #24HR OBS Culv Group: Culvert #1

 * Q Culv Group (cfs) * 717.31 * Culv Full Len (ft) * 94.77 *
 * # Barrels * 1 * Culv Vel US (ft/s) * 14.27 *
 * Q Barrel (cfs) * 717.31 * Culv Vel DS (ft/s) * 14.27 *
 * E.G. US. (ft) * 230.14 * Culv Inv El Up (ft) * 216.95 *
 * W.S. US. (ft) * 229.80 * Culv Inv El Dn (ft) * 215.35 *
 * E.G. DS (ft) * 226.50 * Culv Frctn Ls (ft) * 2.00 *
 * W.S. DS (ft) * 223.40 * Culv Exit Loss (ft) * 0.06 *
 * Delta EG (ft) * 3.64 * Culv Entr Loss (ft) * 1.58 *
 * Delta WS (ft) * 6.40 * Q Weir (cfs) * 1205.69 *
 * E.G. IC (ft) * 230.15 * Weir Sta Lft (ft) * 25.63 *
 * E.G. OC (ft) * 230.14 * Weir Sta Rgt (ft) * 198.01 *
 * Culvert Control * Outlet * Weir Submerg * 0.00 *
 * Culv WS Inlet (ft) * 224.95 * Weir Max Depth (ft) * 2.91 *
 * Culv WS Outlet (ft) * 223.35 * Weir Avg Depth (ft) * 1.88 *
 * Culv Nml Depth (ft) * 8.00 * Weir Flow Area (sq ft) * 323.27 *
 * Culv Crt Depth (ft) * 6.75 * Min El Weir Flow (ft) * 227.24 *

Note: The normal depth exceeds the height of the culvert. The program assumes that the normal depth is equal to the height of the culvert.
 Note: During the supercritical calculations a hydraulic jump occurred inside of the culvert.
 Note: The culvert inlet is submerged and the culvert flows full over part or all of its length. Therefore, the culvert inlet equations are not valid and the supercritical result has been discarded. The outlet answer will be used.

CROSS SECTION

RIVER: hudson
 REACH: main RS: 2

INPUT

Description:

Station Elevation Data		num= 25									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	227.98	20.1	224.25	30.05	222.24	30.41	219.53	30.82	217.54		
31.07	215.18	39.03	214.76	40.17	214.78	46.05	214.86	46.12	217.7		
46.53	219.53	47.08	222.67	75.26	224.24	87.23	224.69	122.58	225.91		
127.5	225.75	127.65	225.43	133.54	225.65	143.95	225.88	153.46	225.71		
159.5	225.41	160.11	225.99	160.7	226	161.7	228.68	177.81	229.82		

Manning's n Values num= 4
 Sta n Val Sta n Val Sta n Val Sta n Val

 0 .045 31.07 .035 47.08 .045 122.58 .02

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 30.41 46.53 46.04 48.67 51.13 .3 .5

Ineffective Flow num= 2
 Sta L Sta R Elev Permanent
 56.4 111.4 240 F
 171.08 177.81 240 F

Blocked Obstructions num= 1
 Sta L Sta R Elev

 14.6 21.6 230

CROSS SECTION OUTPUT Profile #2-YR

 * E.G. Elev (ft) * 219.78 * Element * Left OB * Channel * Right OB *
 * Vel Head (ft) * 1.52 * Wt. n-Val. * * 0.037 * * *
 * W.S. Elev (ft) * 218.27 * Reach Len. (ft) * 46.04 * 48.67 * 51.13 *
 * Crit W.S. (ft) * 218.18 * Flow Area (sq ft) * * 51.23 * * *
 * E.G. Slope (ft/ft) * 0.018568 * Area (sq ft) * * 51.23 * * *
 * Q Total (cfs) * 506.00 * Flow (cfs) * * 506.00 * * *
 * Top Width (ft) * 15.58 * Top Width (ft) * * 15.58 * * *
 * Vel Total (ft/s) * 9.88 * Avg. Vel. (ft/s) * * 9.88 * * *
 * Max Chl Dpth (ft) * 3.51 * Hydr. Depth (ft) * * 3.29 * * *
 * Conv. Total (cfs) * 3713.4 * Conv. (cfs) * * 3713.4 * * *
 * Length Wtd. (ft) * 48.67 * Wetted Per. (ft) * * 21.53 * * *
 * Min Ch El (ft) * 214.76 * Shear (lb/sq ft) * * 2.76 * * *
 * Alpha * 1.00 * Stream Power (lb/ft s) * 177.81 * 0.00 * 0.00 *
 * Frctn Loss (ft) * 0.82 * Cum Volume (acre-ft) * * 0.06 * * *
 * C & E Loss (ft) * 0.10 * Cum SA (acres) * * 0.02 * * *

Note: Manning's n values were composited to a single value in the main channel.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #10-YR

 * E.G. Elev (ft) * 223.90 * Element * Left OB * Channel * Right OB *
 * Vel Head (ft) * 2.92 * Wt. n-Val. * 0.045 * 0.037 * 0.035 *
 * W.S. Elev (ft) * 220.98 * Reach Len. (ft) * 46.04 * 48.67 * 51.13 *
 * Crit W.S. (ft) * 220.98 * Flow Area (sq ft) * 0.14 * 94.56 * 0.18 *
 * E.G. Slope (ft/ft) * 0.018778 * Area (sq ft) * 0.14 * 94.56 * 0.18 *
 * Q Total (cfs) * 1297.00 * Flow (cfs) * 0.13 * 1296.60 * 0.27 *
 * Top Width (ft) * 16.57 * Top Width (ft) * 0.19 * 16.12 * 0.25 *
 * Vel Total (ft/s) * 13.67 * Avg. Vel. (ft/s) * 0.94 * 13.71 * 1.45 *
 * Max Chl Dpth (ft) * 6.22 * Hydr. Depth (ft) * 0.72 * 5.87 * 0.72 *
 * Conv. Total (cfs) * 9465.0 * Conv. (cfs) * 1.0 * 9462.1 * 1.9 *
 * Length Wtd. (ft) * 48.67 * Wetted Per. (ft) * 1.46 * 24.11 * 1.47 *
 * Min Ch El (ft) * 214.76 * Shear (lb/sq ft) * 0.11 * 4.60 * 0.15 *
 * Alpha * 1.01 * Stream Power (lb/ft s) * 177.81 * 0.00 * 0.00 *
 * Frctn Loss (ft) * 0.83 * Cum Volume (acre-ft) * 0.00 * 0.10 * 0.00 *
 * C & E Loss (ft) * 0.22 * Cum SA (acres) * 0.00 * 0.02 * 0.00 *

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Manning's n values were composited to a single value in the main channel.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50-YR

 * E.G. Elev (ft) * 228.12 * Element * Left OB * Channel * Right OB *
 * Vel Head (ft) * 3.05 * Wt. n-Val. * 0.045 * 0.037 * 0.044 *
 * W.S. Elev (ft) * 225.07 * Reach Len. (ft) * 46.04 * 48.67 * 51.13 *
 * Crit W.S. (ft) * 225.07 * Flow Area (sq ft) * 18.22 * 160.54 * 22.14 *

* E.G. Slope (ft/ft)	*0.010405	* Area (sq ft)	* 18.22	* 160.54	* 57.07	*
* Q Total (cfs)	* 2530.00	* Flow (cfs)	* 78.95	* 2332.15	* 118.90	*
* Top Width (ft)	* 76.66	* Top Width (ft)	* 8.81	* 16.12	* 51.73	*
* Vel Total (ft/s)	* 12.59	* Avg. Vel. (ft/s)	* 4.33	* 14.53	* 5.37	*
* Max Chl Dpth (ft)	* 10.31	* Hydr. Depth (ft)	* 2.07	* 9.96	* 2.24	*
* Conv. Total (cfs)	* 24803.0	* Conv. (cfs)	* 774.0	* 22863.4	* 1165.6	*
* Length Wtd. (ft)	* 48.73	* Wetted Per. (ft)	* 12.48	* 24.11	* 12.52	*
* Min Ch El (ft)	* 214.76	* Shear (lb/sq ft)	* 0.95	* 4.32	* 1.15	*
* Alpha	* 1.24	* Stream Power (lb/ft s)	* 177.81	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.39	* Cum Volume (acre-ft)	* 0.01	* 0.16	* 0.04	*
* C & E Loss (ft)	* 0.71	* Cum SA (acres)	* 0.01	* 0.02	* 0.06	*

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid

subcritical answer. The program

defaulted to critical depth.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 229.15	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 1.70	* Wt. n-Val.	* 0.045	* 0.037	* 0.030	*
* W.S. Elev (ft)	* 227.45	* Reach Len. (ft)	* 46.04	* 48.67	* 51.13	*
* Crit W.S. (ft)	* 227.45	* Flow Area (sq ft)	* 51.95	* 198.87	* 131.44	*
* E.G. Slope (ft/ft)	*0.005260	* Area (sq ft)	* 51.95	* 198.87	* 294.19	*
* Q Total (cfs)	* 3396.00	* Flow (cfs)	* 207.66	* 2369.40	* 818.94	*
* Top Width (ft)	* 151.38	* Top Width (ft)	* 20.55	* 16.12	* 114.71	*
* Vel Total (ft/s)	* 8.88	* Avg. Vel. (ft/s)	* 4.00	* 11.91	* 6.23	*
* Max Chl Dpth (ft)	* 12.69	* Hydr. Depth (ft)	* 2.53	* 12.34	* 2.20	*
* Conv. Total (cfs)	* 46823.6	* Conv. (cfs)	* 2863.2	* 32668.9	* 11291.5	*
* Length Wtd. (ft)	* 49.08	* Wetted Per. (ft)	* 28.97	* 24.11	* 63.83	*
* Min Ch El (ft)	* 214.76	* Shear (lb/sq ft)	* 0.59	* 2.71	* 0.68	*
* Alpha	* 1.39	* Stream Power (lb/ft s)	* 177.81	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.29	* Cum Volume (acre-ft)	* 0.03	* 0.19	* 0.20	*
* C & E Loss (ft)	* 0.10	* Cum SA (acres)	* 0.02	* 0.02	* 0.10	*

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid

subcritical answer. The program

defaulted to critical depth.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #6HR OBS

* E.G. Elev (ft)	* 224.53	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 3.14	* Wt. n-Val.	* 0.045	* 0.037	* 0.035	*
* W.S. Elev (ft)	* 221.40	* Reach Len. (ft)	* 46.04	* 48.67	* 51.13	*
* Crit W.S. (ft)	* 221.40	* Flow Area (sq ft)	* 0.23	* 101.32	* 0.31	*
* E.G. Slope (ft/ft)	*0.018405	* Area (sq ft)	* 0.23	* 101.32	* 0.31	*
* Q Total (cfs)	* 1441.00	* Flow (cfs)	* 0.26	* 1440.22	* 0.52	*
* Top Width (ft)	* 16.69	* Top Width (ft)	* 0.25	* 16.12	* 0.33	*
* Vel Total (ft/s)	* 14.15	* Avg. Vel. (ft/s)	* 1.11	* 14.22	* 1.70	*
* Max Chl Dpth (ft)	* 6.64	* Hydr. Depth (ft)	* 0.93	* 6.29	* 0.93	*
* Conv. Total (cfs)	* 10621.7	* Conv. (cfs)	* 1.9	* 10616.0	* 3.8	*
* Length Wtd. (ft)	* 48.67	* Wetted Per. (ft)	* 1.88	* 24.11	* 1.90	*
* Min Ch El (ft)	* 214.76	* Shear (lb/sq ft)	* 0.14	* 4.83	* 0.19	*

```

* Alpha * 1.01 * Stream Power (lb/ft s) * 177.81 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.82 * Cum Volume (acre-ft) * 0.00 * 0.11 * 0.00 *
* C & E Loss (ft) * 0.22 * Cum SA (acres) * 0.00 * 0.02 * 0.00 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft) * 226.50 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 3.11 * Wt. n-Val. * 0.045 * 0.037 * 0.043 *
* W.S. Elev (ft) * 223.40 * Reach Len. (ft) * 46.04 * 48.67 * 51.13 *
* Crit W.S. (ft) * 223.40 * Flow Area (sq ft) * 4.23 * 133.58 * 5.64 *
* E.G. Slope (ft/ft) * 0.012745 * Area (sq ft) * 4.23 * 133.58 * 6.03 *
* Q Total (cfs) * 1923.00 * Flow (cfs) * 9.83 * 1900.07 * 13.10 *
* Top Width (ft) * 35.84 * Top Width (ft) * 6.10 * 16.12 * 13.63 *
* Vel Total (ft/s) * 13.41 * Avg. Vel. (ft/s) * 2.32 * 14.22 * 2.32 *
* Max Chl Dpth (ft) * 8.64 * Hydr. Depth (ft) * 0.69 * 8.29 * 0.57 *
* Conv. Total (cfs) * 17033.5 * Conv. (cfs) * 87.1 * 16830.5 * 116.0 *
* Length Wtd. (ft) * 48.67 * Wetted Per. (ft) * 8.59 * 24.11 * 12.52 *
* Min Ch El (ft) * 214.76 * Shear (lb/sq ft) * 0.39 * 4.41 * 0.36 *
* Alpha * 1.11 * Stream Power (lb/ft s) * 177.81 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.41 * Cum Volume (acre-ft) * 0.00 * 0.14 * 0.00 *
* C & E Loss (ft) * 0.87 * Cum SA (acres) * 0.00 * 0.02 * 0.01 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: hudson

REACH: main

RS: 1

INPUT

Description:

```

Station Elevation Data num= 25
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
*****
0 230.14 25.94 222.15 37.57 221.8 42.97 220.18 43.67 218.62
44.08 217.3 45.37 214.42 51.45 214.18 52.87 214.13 61 214.53
62.45 217.58 63.27 219.47 63.72 220.69 65.96 220.54 105.43 221.17
130.89 223.8 152.14 226.21 154.82 225.97 160.48 226.02 170.65 226.19
180.49 226 187.04 225.77 187.73 226.32 190.41 226.66 200 229.64

```

Manning's n Values

num= 4

```

Sta n Val Sta n Val Sta n Val Sta n Val
*****

```

0 .045 45.37 .035 63.72 .02 190.41 .045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
43.67 63.27 0 0 0 .1 .3
Ineffective Flow num= 1
Sta L Sta R Elev Permanent
103.5 146.6 240 F

CROSS SECTION OUTPUT Profile #2-YR

* E.G. Elev (ft) * 218.86 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 1.31 * Wt. n-Val. * * 0.037 * *
* W.S. Elev (ft) * 217.55 * Reach Len. (ft) * * * *
* Crit W.S. (ft) * 217.41 * Flow Area (sq ft) * * 55.12 * *
* E.G. Slope (ft/ft) * 0.015405 * Area (sq ft) * * 55.12 * *
* Q Total (cfs) * 506.00 * Flow (cfs) * * 506.00 * *
* Top Width (ft) * 18.43 * Top Width (ft) * * 18.43 * *
* Vel Total (ft/s) * 9.18 * Avg. Vel. (ft/s) * * 9.18 * *
* Max Chl Dpth (ft) * 3.42 * Hydr. Depth (ft) * * 2.99 * *
* Conv. Total (cfs) * 4076.8 * Conv. (cfs) * * 4076.8 * *
* Length Wtd. (ft) * * * Wetted Per. (ft) * * 22.41 * *
* Min Ch El (ft) * 214.13 * Shear (lb/sq ft) * * 2.37 * *
* Alpha * 1.00 * Stream Power (lb/ft s) * 200.00 * 0.00 * 0.00 *
* Frctn Loss (ft) * * * Cum Volume (acre-ft) * * * *
* C & E Loss (ft) * * * Cum SA (acres) * * * *

Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft) * 222.67 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 3.43 * Wt. n-Val. * 0.045 * 0.037 * *
* W.S. Elev (ft) * 219.24 * Reach Len. (ft) * * * *
* Crit W.S. (ft) * 219.93 * Flow Area (sq ft) * 0.09 * 87.25 * *
* E.G. Slope (ft/ft) * 0.026222 * Area (sq ft) * 0.09 * 87.25 * *
* Q Total (cfs) * 1297.00 * Flow (cfs) * 0.12 * 1296.88 * *
* Top Width (ft) * 19.78 * Top Width (ft) * 0.28 * 19.50 * *
* Vel Total (ft/s) * 14.85 * Avg. Vel. (ft/s) * 1.35 * 14.86 * *
* Max Chl Dpth (ft) * 5.11 * Hydr. Depth (ft) * 0.31 * 4.47 * *
* Conv. Total (cfs) * 8009.6 * Conv. (cfs) * 0.7 * 8008.8 * *
* Length Wtd. (ft) * * * Wetted Per. (ft) * 0.68 * 25.37 * *
* Min Ch El (ft) * 214.13 * Shear (lb/sq ft) * 0.21 * 5.63 * *
* Alpha * 1.00 * Stream Power (lb/ft s) * 200.00 * 0.00 * 0.00 *
* Frctn Loss (ft) * 1.07 * Cum Volume (acre-ft) * * * *
* C & E Loss (ft) * 0.15 * Cum SA (acres) * * * *

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft) * 226.64 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 5.41 * Wt. n-Val. * 0.045 * 0.037 * 0.020 *
* W.S. Elev (ft) * 221.23 * Reach Len. (ft) * * * *
* Crit W.S. (ft) * 222.83 * Flow Area (sq ft) * 3.12 * 126.30 * 16.61 *
* E.G. Slope (ft/ft) * 0.026707 * Area (sq ft) * 3.12 * 126.30 * 16.78 *
* Q Total (cfs) * 2530.00 * Flow (cfs) * 11.75 * 2409.46 * 108.79 *
* Top Width (ft) * 66.56 * Top Width (ft) * 4.20 * 19.60 * 42.75 *
* Vel Total (ft/s) * 17.33 * Avg. Vel. (ft/s) * 3.76 * 19.08 * 6.55 *
* Max Chl Dpth (ft) * 7.10 * Hydr. Depth (ft) * 0.74 * 6.44 * 0.41 *
* Conv. Total (cfs) * 15481.3 * Conv. (cfs) * 71.9 * 14743.7 * 665.7 *
* Length Wtd. (ft) * * * Wetted Per. (ft) * 5.37 * 25.62 * 41.09 *
* Min Ch El (ft) * 214.13 * Shear (lb/sq ft) * 0.97 * 8.22 * 0.67 *
* Alpha * 1.16 * Stream Power (lb/ft s) * 200.00 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.77 * Cum Volume (acre-ft) * * * *
* C & E Loss (ft) * 0.71 * Cum SA (acres) * * * *

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: Program found supercritical flow starting at this cross section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)      * 227.50 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 5.57  * Wt. n-Val.      * 0.045  * 0.037  * 0.020  *
* W.S. Elev (ft)     * 221.93 * Reach Len. (ft) *         *         *         *
* Crit W.S. (ft)     * 223.51 * Flow Area (sq ft) * 7.12  * 139.98 * 44.70  *
* E.G. Slope (ft/ft) * 0.025722 * Area (sq ft)   * 7.12  * 139.98 * 48.99  *
* Q Total (cfs)      * 3396.00 * Flow (cfs)     * 27.17 * 2806.85 * 561.98 *
* Top Width (ft)     * 79.52  * Top Width (ft) * 10.41 * 19.60  * 49.51  *
* Vel Total (ft/s)   * 17.71  * Avg. Vel. (ft/s) * 3.81  * 20.05  * 12.57  *
* Max Chl Dpth (ft)  * 7.80   * Hydr. Depth (ft) * 0.68  * 7.14   * 1.11   *
* Conv. Total (cfs)  * 21174.7 * Conv. (cfs)    * 169.4 * 17501.3 * 3504.1 *
* Length Wtd. (ft)   *         * Wetted Per. (ft) * 11.66 * 25.62  * 41.09  *
* Min Ch El (ft)     * 214.13 * Shear (lb/sq ft) * 0.98  * 8.77   * 1.75   *
* Alpha              * 1.14   * Stream Power (lb/ft s) * 200.00 * 0.00  * 0.00  *
* Frctn Loss (ft)    * 0.49   * Cum Volume (acre-ft) *         *         *         *
* C & E Loss (ft)    * 1.16   * Cum SA (acres)   *         *         *         *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: Program found supercritical flow starting at this cross section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #6HR OBS

```

*****
* E.G. Elev (ft)      * 223.27 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 3.76   * Wt. n-Val.      * 0.045  * 0.037  * 0.000  *
* W.S. Elev (ft)     * 219.51 * Reach Len. (ft) *         *         *         *
* Crit W.S. (ft)     * 220.32 * Flow Area (sq ft) * 0.18  * 92.55  * 0.00   *
* E.G. Slope (ft/ft) * 0.026911 * Area (sq ft)   * 0.18  * 92.55  * 0.00   *
* Q Total (cfs)      * 1441.00 * Flow (cfs)     * 0.31  * 1440.69 * 0.00   *
* Top Width (ft)     * 20.01  * Top Width (ft) * 0.40  * 19.60  * 0.01   *
* Vel Total (ft/s)   * 15.54  * Avg. Vel. (ft/s) * 1.74  * 15.57  * 0.25   *
* Max Chl Dpth (ft)  * 5.38   * Hydr. Depth (ft) * 0.44  * 4.72   * 0.02   *
* Conv. Total (cfs)  * 8784.1 * Conv. (cfs)    * 1.9   * 8782.2 * 0.0    *
* Length Wtd. (ft)   *         * Wetted Per. (ft) * 0.98  * 25.62  * 0.04   *
* Min Ch El (ft)     * 214.13 * Shear (lb/sq ft) * 0.31  * 6.07   *         *
* Alpha              * 1.00   * Stream Power (lb/ft s) * 200.00 * 0.00  * 0.00   *
* Frctn Loss (ft)    * 1.07   * Cum Volume (acre-ft) *         *         *         *
* C & E Loss (ft)    * 0.19   * Cum SA (acres)   *         *         *         *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #24HR OBS

```

*****
* E.G. Elev (ft)      * 225.14 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 4.75  * Wt. n-Val.      * 0.045  * 0.037  * 0.035  *
* W.S. Elev (ft)     * 220.39 * Reach Len. (ft) *        *        *        *
* Crit W.S. (ft)     * 222.29 * Flow Area (sq ft) * 0.76  * 109.77 * 0.16  *
* E.G. Slope (ft/ft) * 0.027084 * Area (sq ft) * 0.76  * 109.77 * 0.16  *
* Q Total (cfs)      * 1923.00 * Flow (cfs) * 1.92  * 1920.76 * 0.32  *
* Top Width (ft)     * 21.33  * Top Width (ft) * 1.39  * 19.60  * 0.34  *
* Vel Total (ft/s)   * 17.37  * Avg. Vel. (ft/s) * 2.51  * 17.50  * 2.05  *
* Max Chl Dpth (ft) * 6.26   * Hydr. Depth (ft) * 0.55  * 5.60   * 0.46  *
* Conv. Total (cfs) * 11684.9 * Conv. (cfs) * 11.7  * 11671.3 * 1.9  *
* Length Wtd. (ft)  *        * Wetted Per. (ft) * 2.44  * 25.62  * 0.98  *
* Min Ch El (ft)    * 214.13 * Shear (lb/sq ft) * 0.53  * 7.24   * 0.27  *
* Alpha             * 1.01   * Stream Power (lb/ft s) * 200.00 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 0.87   * Cum Volume (acre-ft) *        *        *        *
* C & E Loss (ft)   * 0.49   * Cum SA (acres) *        *        *        *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

SUMMARY OF MANNING'S N VALUES

River:hudson

```

*****
* Reach      * River Sta. * n1 * n2 * n3 * n4 * n5 * n6 * n7 *
*****
*main      * 40         * .085 * .045 * .02 * .045 * .035 * .045 *
*main      * 39         * .045 * .02 * .035 * .045 * * *
*main      * 38         * .045 * .02 * .035 * .02 * .045 * .1 *
*main      * 37         * .045 * .02 * .035 * .045 * .02 * .1 *
*main      * 36         * .045 * .02 * .045 * .035 * .02 * .1 *
*main      * 35         * .045 * .02 * .045 * .035 * .1 * *
*main      * 34         * .045 * .02 * .045 * .05 * .045 * .1 *
*main      * 33         * .045 * .02 * .045 * .05 * .045 * .1 *
*main      * 32         * .045 * .02 * .045 * .05 * .1 * *
*main      * 31.5       * Bridge * * * * * * *
*main      * 31         * .045 * .02 * .045 * .035 * .1 * *
*main      * 30         * .045 * .02 * .045 * .035 * .1 * *
*main      * 29         * .045 * .02 * .045 * .05 * .1 * *
*main      * 28         * .045 * .02 * .045 * .035 * .1 * *
*main      * 27         * .045 * .02 * .045 * .035 * .1 * *
*main      * 26         * .045 * .02 * .045 * .035 * .1 * *
*main      * 25         * .02 * .045 * .035 * .1 * *
*main      * 24         * .02 * .045 * .035 * .1 * *
*main      * 23         * .045 * .02 * .065 * * *
*main      * 22         * .02 * .065 * * * *
*main      * 21         * .02 * .065 * * * *
*main      * 20         * .02 * .045 * .02 * .065 * *
*main      * 19         * .02 * .045 * .02 * .065 * *
*main      * 18         * .02 * .045 * .02 * .065 * *
*main      * 17         * .02 * .045 * .02 * .065 * *
*main      * 16         * .02 * .045 * .045 * .02 * .065 *
*main      * 15         * .02 * .045 * .045 * .02 * .065 *
*main      * 14         * .1 * .035 * .045 * .05 * .02 * .1 *
*main      * 13         * .1 * .035 * .045 * .02 * .1 *
*main      * 12         * .1 * .035 * .045 * .02 * .1 *
*main      * 11         * .1 * .035 * .045 * .05 * .02 * .1 *
*main      * 10         * .1 * .085 * .035 * .045 * .02 * .05 *
*main      * 9          * .1 * .085 * .035 * .045 * .02 * .05 *
*main      * 8          * .1 * .035 * .045 * .02 * .05 *
*main      * 7          * .1 * .05 * .1 * .045 * .05 * .02 * .05 *
*main      * 6          * .1 * .035 * .1 * .02 * .05 *
*main      * 5          * .1 * .035 * .045 * .05 * .02 * .05 *
*****

```



```

*main      *    4      *    .1*    .035*    .05*    .045*    .02*    .05*    .02*
*main      *    3      *    .1*    .035*    .045*    .02*    *      *      *
*main      *   2.5      *Culvert *      *      *      *      *      *
*main      *    2      *   .045*   .035*   .045*   .02*   *      *      *
*main      *    1      *   .045*   .035*   .02*   .045*   *      *      *
*****

```

SUMMARY OF REACH LENGTHS

River: hudson

```

*****
* Reach      * River Sta. * Left * Channel * Right *
*****
*main      *    40      *   93.6*   97.1*  92.95*
*main      *    39      *  113.96* 114.57* 114.59*
*main      *    38      *   50.64*   50.85*   51.22*
*main      *    37      *   63.51*   64.27*   60.78*
*main      *    36      *    34*   38.78*   43.34*
*main      *    35      *   69.27*   79.77*   85.15*
*main      *    34      *   59.8*   61.46*   61.27*
*main      *    33      *   21.85*   21.89*   21.7*
*main      *    32      *   24.44*   27.61*   26.31*
*main      *   31.5     *Bridge *      *      *
*main      *    31      *   95.55*   97.06*    99*
*main      *    30      *   69.42*   70.58*   71.76*
*main      *    29      *    57*   58.22*   61.16*
*main      *    28      *    46*   46.77*   46.35*
*main      *    27      *   60.75*   61.7*   65.02*
*main      *    26      *   83.06*   84.96*   87.67*
*main      *    25      *   29.59*  30.248*   33.09*
*main      *    24      *   56.73*   43.07*   39.13*
*main      *    23      *  137.63*  144.4*  148.07*
*main      *    22      *   64.31*   54.94*   42.91*
*main      *    21      *   58.42*   63.24*   66.37*
*main      *    20      *   50.4*   50.32*   50*
*main      *    19      *   54.63*   54.11*   54.18*
*main      *    18      *   42.13*   39.37*   34.94*
*main      *    17      *   35.27*   34.43*   33.28*
*main      *    16      *   60.38*   60.35*   62.62*
*main      *    15      *   55.51*   47.74*   42.02*
*main      *    14      *   32.61*   35.44*   36.08*
*main      *    13      *   36.53*   35.61*   35.05*
*main      *    12      *   43.41*   42.27*   41.38*
*main      *    11      *   42.45*   41.39*   40*
*main      *    10      *   57.02*   54.55*   53*
*main      *    9       *   55.45*   51.85*   50.87*
*main      *    8       *   84.59*   69.8*   31.19*
*main      *    7       *   20.21*    31*   42.19*
*main      *    6       *   19.21*   30.14*   38.14*
*main      *    5       *   33.07*   34.23*   33.12*
*main      *    4       *   47.24*   49.31*   53.94*
*main      *    3       *  112.21*  120.13*  138.27*
*main      *   2.5     *Culvert *      *      *
*main      *    2      *   46.04*   48.67*   51.13*
*main      *    1      *    0*    0*    0*
*****

```

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: hudson

```

*****
* Reach      * River Sta. * Contr. * Expan. *
*****
*main      *    40      *   .1*   .3*
*main      *    39      *   .1*   .3*
*main      *    38      *   .1*   .3*
*main      *    37      *   .1*   .3*
*main      *    36      *   .1*   .3*
*main      *    35      *   .1*   .3*
*main      *    34      *   .1*   .3*
*main      *    33      *   .3*   .5*
*main      *    32      *   .3*   .5*
*main      *   31.5     *Bridge *      *
*main      *    31      *   .1*   .3*
*main      *    30      *   .1*   .3*

```

```

*main      *    29      *      .1*      .3*
*main      *    28      *      .1*      .3*
*main      *    27      *      .1*      .3*
*main      *    26      *      .1*      .3*
*main      *    25      *      .1*      .3*
*main      *    24      *      .1*      .3*
*main      *    23      *      .1*      .3*
*main      *    22      *      .1*      .3*
*main      *    21      *      .1*      .3*
*main      *    20      *      .1*      .3*
*main      *    19      *      .1*      .3*
*main      *    18      *      .1*      .3*
*main      *    17      *      .1*      .3*
*main      *    16      *      .1*      .3*
*main      *    15      *      .1*      .3*
*main      *    14      *      .1*      .3*
*main      *    13      *      .1*      .3*
*main      *    12      *      .1*      .3*
*main      *    11      *      .1*      .3*
*main      *    10      *      .1*      .3*
*main      *     9      *      .1*      .3*
*main      *     8      *      .1*      .3*
*main      *     7      *      .1*      .3*
*main      *     6      *      .1*      .3*
*main      *     5      *      .1*      .3*
*main      *     4      *      .1*      .3*
*main      *     3      *      .3*      .5*
*main      *    2.5    *Culvert *      *
*main      *     2      *      .3*      .5*
*main      *     1      *      .1*      .3*
*****

```

Profile Output Table - Standard Table 1

* Reach	* River Sta	* Profile	* Q Total	* Min Ch El	* W.S. Elev	* Crit W.S.	* E.G. Elev	* E.G. Slope	* Vel Chnl	* Flow Area	* Top Width	* Froude #	* Chl *
*	*	*	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	*	*
* main	* 40	* 2-YR	* 436.00	* 256.38	* 260.12	* 259.87	* 261.15	* 0.011595	* 8.15	* 53.49	* 19.66	* 0.87	*
* main	* 40	* 10-YR	* 1121.00	* 256.38	* 263.13	* 263.13	* 263.96	* 0.005290	* 7.78	* 179.31	* 106.32	* 0.63	*
* main	* 40	* 50-YR	* 2176.00	* 256.38	* 264.12	* 264.12	* 265.18	* 0.006110	* 9.47	* 291.27	* 120.56	* 0.69	*
* main	* 40	* 100-YR	* 2936.00	* 256.38	* 264.63	* 264.63	* 265.87	* 0.006524	* 10.35	* 354.21	* 147.75	* 0.73	*
* main	* 40	* 6HR OBS	* 1169.00	* 256.38	* 263.20	* 263.20	* 264.03	* 0.005300	* 7.86	* 186.21	* 107.25	* 0.63	*
* main	* 40	* 24HR OBS	* 1598.00	* 256.38	* 263.66	* 263.66	* 264.57	* 0.005600	* 8.58	* 237.10	* 113.89	* 0.66	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 39	* 2-YR	* 436.00	* 254.87	* 258.75	* 258.66	* 259.86	* 0.015022	* 8.47	* 51.47	* 20.65	* 0.95	*
* main	* 39	* 10-YR	* 1121.00	* 254.87	* 261.12	* 260.79	* 262.97	* 0.012720	* 10.94	* 103.88	* 35.55	* 0.90	*
* main	* 39	* 50-YR	* 2176.00	* 254.87	* 262.37	* 263.00	* 264.30	* 0.012085	* 12.38	* 218.61	* 140.68	* 0.90	*
* main	* 39	* 100-YR	* 2936.00	* 254.87	* 262.73	* 263.41	* 264.91	* 0.013339	* 13.54	* 272.31	* 154.04	* 0.96	*
* main	* 39	* 6HR OBS	* 1169.00	* 254.87	* 261.14	* 262.20	* 263.13	* 0.013601	* 11.35	* 104.70	* 36.72	* 0.93	*
* main	* 39	* 24HR OBS	* 1598.00	* 254.87	* 261.96	* 262.62	* 263.75	* 0.011249	* 11.39	* 166.01	* 117.75	* 0.86	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 38	* 2-YR	* 436.00	* 254.31	* 257.59	*	* 258.43	* 0.009579	* 7.36	* 59.24	* 20.95	* 0.77	*
* main	* 38	* 10-YR	* 1121.00	* 254.31	* 260.78	* 259.26	* 261.81	* 0.005484	* 8.34	* 148.79	* 77.21	* 0.61	*
* main	* 38	* 50-YR	* 2176.00	* 254.31	* 262.21	* 262.21	* 263.19	* 0.004826	* 9.06	* 305.14	* 146.89	* 0.59	*
* main	* 38	* 100-YR	* 2936.00	* 254.31	* 262.72	* 262.72	* 263.79	* 0.005089	* 9.73	* 384.79	* 162.53	* 0.62	*
* main	* 38	* 6HR OBS	* 1169.00	* 254.31	* 261.28	* 259.36	* 261.99	* 0.003657	* 7.20	* 194.06	* 99.12	* 0.50	*
* main	* 38	* 24HR OBS	* 1598.00	* 254.31	* 261.25	* 261.56	* 262.61	* 0.007002	* 9.93	* 191.75	* 98.46	* 0.70	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 37	* 2-YR	* 491.00	* 253.19	* 257.26	* 256.22	* 258.00	* 0.006572	* 6.88	* 71.37	* 19.04	* 0.63	*
* main	* 37	* 10-YR	* 1237.00	* 253.19	* 259.87	* 258.64	* 261.42	* 0.008390	* 10.02	* 128.94	* 54.59	* 0.71	*
* main	* 37	* 50-YR	* 2442.00	* 253.19	* 261.32	* 261.68	* 262.83	* 0.007930	* 11.22	* 290.08	* 137.07	* 0.72	*
* main	* 37	* 100-YR	* 3270.00	* 253.19	* 261.86	* 262.14	* 263.42	* 0.007820	* 11.67	* 364.75	* 140.99	* 0.72	*
* main	* 37	* 6HR OBS	* 1318.00	* 253.19	* 260.34	* 258.86	* 261.67	* 0.006810	* 9.48	* 164.75	* 110.26	* 0.65	*
* main	* 37	* 24HR OBS	* 1815.00	* 253.19	* 260.90	* 261.26	* 262.26	* 0.007085	* 10.21	* 235.01	* 134.09	* 0.67	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 36	* 2-YR	* 491.00	* 252.84	* 256.00	* 256.00	* 257.30	* 0.016465	* 9.18	* 53.48	* 20.42	* 1.00	*
* main	* 36	* 10-YR	* 1237.00	* 252.84	* 258.24	* 258.24	* 260.61	* 0.016200	* 12.35	* 100.18	* 21.17	* 1.00	*
* main	* 36	* 50-YR	* 2442.00	* 252.84	* 260.25	* 260.89	* 262.20	* 0.010790	* 12.57	* 250.69	* 138.16	* 0.85	*
* main	* 36	* 100-YR	* 3270.00	* 252.84	* 260.68	* 261.29	* 262.78	* 0.011437	* 13.49	* 314.29	* 152.99	* 0.89	*
* main	* 36	* 6HR OBS	* 1318.00	* 252.84	* 258.45	* 258.45	* 260.92	* 0.016264	* 12.61	* 104.54	* 21.24	* 1.00	*
* main	* 36	* 24HR OBS	* 1815.00	* 252.84	* 259.78	* 260.44	* 261.66	* 0.010324	* 11.72	* 191.05	* 121.23	* 0.83	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 35	* 2-YR	* 491.00	* 252.21	* 254.70	* 255.16	* 256.43	* 0.028382	* 10.55	* 46.52	* 24.95	* 1.36	*
* main	* 35	* 10-YR	* 1237.00	* 252.21	* 255.96	* 257.08	* 259.58	* 0.036731	* 15.26	* 81.04	* 29.93	* 1.63	*
* main	* 35	* 50-YR	* 2442.00	* 252.21	* 258.61	* 259.68	* 261.60	* 0.015377	* 13.97	* 184.93	* 94.80	* 1.15	*
* main	* 35	* 100-YR	* 3270.00	* 252.21	* 259.37	* 260.27	* 262.23	* 0.013165	* 14.32	* 274.57	* 120.85	* 1.09	*
* main	* 35	* 6HR OBS	* 1318.00	* 252.21	* 256.06	* 257.25	* 259.86	* 0.037356	* 15.64	* 84.25	* 30.34	* 1.65	*
* main	* 35	* 24HR OBS	* 1815.00	* 252.21	* 257.06	* 258.24	* 260.84	* 0.028665	* 15.61	* 116.30	* 34.19	* 1.49	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 34	* 2-YR	* 491.00	* 248.88	* 251.78	* 252.16	* 253.40	* 0.052015	* 10.23	* 47.97	* 24.80	* 1.30	*
* main	* 34	* 10-YR	* 1237.00	* 248.88	* 253.61	* 254.13	* 256.17	* 0.040640	* 12.84	* 96.34	* 27.94	* 1.22	*
* main	* 34	* 50-YR	* 2442.00	* 248.88	* 255.41	* 256.40	* 259.57	* 0.042759	* 16.36	* 149.44	* 31.13	* 1.30	*
* main	* 34	* 100-YR	* 3270.00	* 248.88	* 257.49	* 258.63	* 260.85	* 0.022264	* 14.93	* 237.84	* 100.67	* 0.99	*
* main	* 34	* 6HR OBS	* 1318.00	* 248.88	* 255.73	* 254.31	* 256.80	* 0.010079	* 8.28	* 159.55	* 31.76	* 0.64	*
* main	* 34	* 24HR OBS	* 1815.00	* 248.88	* 256.21	* 255.30	* 257.90	* 0.014261	* 10.44	* 174.94	* 32.70	* 0.77	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 33	* 2-YR	* 491.00	* 246.48	* 251.17	* 250.02	* 251.75	* 0.009909	* 6.13	* 80.15	* 23.48	* 0.58	*
* main	* 33	* 10-YR	* 1237.00	* 246.48	* 254.12	* 252.24	* 255.08	* 0.008692	* 7.87	* 157.54	* 30.56	* 0.59	*
* main	* 33	* 50-YR	* 2442.00	* 246.48	* 257.29	* 254.77	* 258.27	* 0.005405	* 8.24	* 315.91	* 98.66	* 0.50	*
* main	* 33	* 100-YR	* 3270.00	* 246.48	* 258.58	* 257.37	* 259.52	* 0.003904	* 7.69	* 428.06	* 102.35	* 0.43	*

* main	* 33	* 6HR OBS	* 1318.00	* 246.48	* 255.61	* 252.45	* 256.28	* 0.004603	* 6.57	* 201.68	* 40.38	* 0.44
* main	* 33	* 24HR OBS	* 1815.00	* 246.48	* 256.03	* 253.56	* 257.13	* 0.007053	* 8.46	* 219.75	* 65.35	* 0.55
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 32	* 2-YR	* 491.00	* 246.39	* 250.96	* 249.85	* 251.52	* 0.009888	* 6.04	* 81.31	* 24.87	* 0.59
* main	* 32	* 10-YR	* 1237.00	* 246.39	* 254.00	* 252.02	* 254.84	* 0.008103	* 7.40	* 167.66	* 32.90	* 0.56
* main	* 32	* 50-YR	* 2442.00	* 246.39	* 257.43	* 254.50	* 257.97	* 0.002946	* 6.06	* 425.55	* 110.33	* 0.37
* main	* 32	* 100-YR	* 3270.00	* 246.39	* 258.70	* 256.60	* 259.28	* 0.002235	* 5.79	* 559.35	* 113.16	* 0.33
* main	* 32	* 6HR OBS	* 1318.00	* 246.39	* 255.60	* 252.22	* 256.11	* 0.003772	* 5.83	* 241.03	* 96.08	* 0.40
* main	* 32	* 24HR OBS	* 1815.00	* 246.39	* 256.12	* 253.28	* 256.78	* 0.004681	* 6.83	* 291.95	* 105.78	* 0.45
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 31.5	* Bridge	*	*	*	*	*	*	*	*	*	*
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 31	* 2-YR	* 491.00	* 246.81	* 249.75	* 249.75	* 251.05	* 0.016015	* 9.16	* 53.59	* 20.52	* 1.00
* main	* 31	* 10-YR	* 1237.00	* 246.81	* 252.03	* 252.03	* 254.21	* 0.014936	* 11.86	* 104.33	* 23.92	* 1.00
* main	* 31	* 50-YR	* 2442.00	* 246.81	* 255.70	* 255.70	* 257.17	* 0.006024	* 10.30	* 264.99	* 104.54	* 0.66
* main	* 31	* 100-YR	* 3270.00	* 246.81	* 256.37	* 256.37	* 258.09	* 0.006402	* 11.24	* 324.12	* 110.49	* 0.69
* main	* 31	* 6HR OBS	* 1318.00	* 246.81	* 252.23	* 252.23	* 254.49	* 0.014891	* 12.06	* 109.26	* 24.22	* 1.00
* main	* 31	* 24HR OBS	* 1815.00	* 246.81	* 253.40	* 253.40	* 256.07	* 0.014558	* 13.10	* 138.54	* 25.97	* 1.00
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 30	* 2-YR	* 491.00	* 243.63	* 248.59	* 247.96	* 249.56	* 0.009196	* 7.92	* 62.03	* 18.44	* 0.76
* main	* 30	* 10-YR	* 1237.00	* 243.63	* 250.74	* 251.58	* 252.81	* 0.013416	* 11.62	* 110.89	* 52.27	* 0.93
* main	* 30	* 50-YR	* 2442.00	* 243.63	* 251.36	* 252.55	* 255.77	* 0.028790	* 17.77	* 156.57	* 90.49	* 1.37
* main	* 30	* 100-YR	* 3270.00	* 243.63	* 251.80	* 253.11	* 256.61	* 0.030858	* 18.92	* 193.46	* 96.45	* 1.42
* main	* 30	* 6HR OBS	* 1318.00	* 243.63	* 250.78	* 251.67	* 253.06	* 0.014734	* 12.21	* 113.28	* 56.43	* 0.98
* main	* 30	* 24HR OBS	* 1815.00	* 243.63	* 251.13	* 252.09	* 254.34	* 0.020693	* 14.83	* 137.14	* 85.93	* 1.16
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 29	* 2-YR	* 491.00	* 242.70	* 248.27	* 246.55	* 248.81	* 0.008391	* 5.92	* 82.97	* 20.06	* 0.51
* main	* 29	* 10-YR	* 1237.00	* 242.70	* 248.92	* 249.82	* 251.34	* 0.034072	* 12.59	* 100.77	* 39.04	* 1.04
* main	* 29	* 50-YR	* 2442.00	* 242.70	* 249.91	* 250.81	* 253.03	* 0.039594	* 14.61	* 173.16	* 107.47	* 1.13
* main	* 29	* 100-YR	* 3270.00	* 242.70	* 250.44	* 251.47	* 253.91	* 0.034880	* 14.20	* 219.83	* 111.86	* 1.07
* main	* 29	* 6HR OBS	* 1318.00	* 242.70	* 249.08	* 249.90	* 251.53	* 0.033998	* 12.74	* 107.67	* 54.64	* 1.04
* main	* 29	* 24HR OBS	* 1815.00	* 242.70	* 249.53	* 250.30	* 252.27	* 0.037846	* 13.91	* 140.39	* 104.41	* 1.10
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 28	* 2-YR	* 491.00	* 242.91	* 248.19	* 246.16	* 248.50	* 0.002465	* 4.64	* 116.07	* 66.92	* 0.40
* main	* 28	* 10-YR	* 1237.00	* 242.91	* 250.26	* 248.85	* 250.54	* 0.001484	* 4.19	* 291.39	* 130.35	* 0.32
* main	* 28	* 50-YR	* 2442.00	* 242.91	* 251.82	* 249.89	* 252.32	* 0.001585	* 5.12	* 437.75	* 134.05	* 0.35
* main	* 28	* 100-YR	* 3270.00	* 242.91	* 252.65	* 250.47	* 253.30	* 0.001672	* 5.68	* 517.18	* 138.70	* 0.36
* main	* 28	* 6HR OBS	* 1318.00	* 242.91	* 250.39	* 248.93	* 250.68	* 0.001491	* 4.25	* 303.35	* 130.65	* 0.32
* main	* 28	* 24HR OBS	* 1815.00	* 242.91	* 251.08	* 249.39	* 251.46	* 0.001528	* 4.66	* 367.83	* 132.29	* 0.33
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 27	* 2-YR	* 491.00	* 241.73	* 248.20	* 245.73	* 248.38	* 0.001375	* 3.71	* 152.19	* 118.39	* 0.31
* main	* 27	* 10-YR	* 1237.00	* 241.73	* 250.26	* 248.43	* 250.46	* 0.000907	* 3.85	* 353.98	* 132.19	* 0.26
* main	* 27	* 50-YR	* 2442.00	* 241.73	* 251.86	* 249.48	* 252.22	* 0.001103	* 4.90	* 517.62	* 134.06	* 0.30
* main	* 27	* 100-YR	* 3270.00	* 241.73	* 252.71	* 250.04	* 253.18	* 0.001212	* 5.49	* 605.71	* 135.05	* 0.32
* main	* 27	* 6HR OBS	* 1318.00	* 241.73	* 250.39	* 248.51	* 250.60	* 0.000920	* 3.93	* 367.40	* 132.34	* 0.27
* main	* 27	* 24HR OBS	* 1815.00	* 241.73	* 251.10	* 248.99	* 251.37	* 0.001010	* 4.40	* 439.66	* 133.17	* 0.28
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 26	* 2-YR	* 491.00	* 239.33	* 248.19	*	* 248.29	* 0.000842	* 2.86	* 196.12	* 103.60	* 0.22
* main	* 26	* 10-YR	* 1237.00	* 239.33	* 250.26	*	* 250.39	* 0.000596	* 3.02	* 421.06	* 112.95	* 0.20
* main	* 26	* 50-YR	* 2442.00	* 239.33	* 251.87	*	* 252.13	* 0.000753	* 3.89	* 614.94	* 123.54	* 0.23
* main	* 26	* 100-YR	* 3270.00	* 239.33	* 252.74	*	* 253.08	* 0.000829	* 4.34	* 722.40	* 124.77	* 0.25
* main	* 26	* 6HR OBS	* 1318.00	* 239.33	* 250.39	*	* 250.54	* 0.000608	* 3.09	* 436.16	* 113.99	* 0.20
* main	* 26	* 24HR OBS	* 1815.00	* 239.33	* 251.11	*	* 251.30	* 0.000683	* 3.48	* 520.69	* 121.90	* 0.22
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 25	* 2-YR	* 491.00	* 239.32	* 248.16	* 242.87	* 248.24	* 0.000379	* 2.35	* 232.09	* 86.17	* 0.16
* main	* 25	* 10-YR	* 1237.00	* 239.32	* 250.21	* 245.28	* 250.35	* 0.000491	* 3.22	* 425.47	* 110.28	* 0.20
* main	* 25	* 50-YR	* 2442.00	* 239.32	* 251.79	* 248.60	* 252.07	* 0.000651	* 4.16	* 605.19	* 149.25	* 0.23
* main	* 25	* 100-YR	* 3270.00	* 239.32	* 252.62	* 249.22	* 253.01	* 0.000727	* 4.64	* 702.31	* 160.03	* 0.25
* main	* 25	* 6HR OBS	* 1318.00	* 239.32	* 250.34	* 245.50	* 250.49	* 0.000505	* 3.30	* 440.04	* 113.37	* 0.20

* main	* 25	* 24HR OBS	* 1815.00	* 239.32	* 251.04	* 246.67	* 251.25	* 0.000580	* 3.73	* 518.91	* 138.86	* 0.22
* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
* main	* 24	* 2-YR	* 21.00	* 237.71	* 248.21	* 238.38	* 248.21	* 0.000002	* 0.15	* 156.30	* 61.91	* 0.01
* main	* 24	* 10-YR	* 767.00	* 237.71	* 250.23	* 242.91	* 250.32	* 0.000411	* 2.42	* 314.86	* 111.81	* 0.12
* main	* 24	* 50-YR	* 1972.00	* 237.71	* 251.70	* 249.18	* 252.04	* 0.000891	* 3.86	* 453.87	* 141.75	* 0.19
* main	* 24	* 100-YR	* 2800.00	* 237.71	* 252.42	* 249.76	* 252.97	* 0.001139	* 4.52	* 526.88	* 150.97	* 0.21
* main	* 24	* 6HR OBS	* 848.00	* 237.71	* 250.35	* 243.25	* 250.46	* 0.000451	* 2.55	* 326.12	* 114.38	* 0.13
* main	* 24	* 24HR OBS	* 1345.00	* 237.71	* 251.02	* 245.14	* 251.23	* 0.000668	* 3.22	* 387.77	* 128.00	* 0.16
* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
* main	* 23	* 2-YR	* 21.00	* 247.66	* 248.11	* 248.11	* 248.20	* 0.008263	* 2.54	* 9.20	* 51.34	* 0.93
* main	* 23	* 10-YR	* 767.00	* 247.66	* 249.56	* 249.56	* 250.22	* 0.004871	* 7.11	* 121.54	* 98.29	* 0.99
* main	* 23	* 50-YR	* 1972.00	* 247.66	* 250.72	* 250.72	* 251.88	* 0.004482	* 9.80	* 237.65	* 129.34	* 1.04
* main	* 23	* 100-YR	* 2800.00	* 247.66	* 251.37	* 251.37	* 252.78	* 0.004263	* 10.98	* 308.26	* 177.83	* 1.05
* main	* 23	* 6HR OBS	* 848.00	* 247.66	* 249.66	* 249.66	* 250.35	* 0.004838	* 7.36	* 130.36	* 100.87	* 0.99
* main	* 23	* 24HR OBS	* 1345.00	* 247.66	* 250.17	* 250.17	* 251.09	* 0.004648	* 8.61	* 180.63	* 114.98	* 1.02
* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
* main	* 22	* 2-YR	* 21.00	* 242.21	* 245.45	* 242.72	* 245.45	* 0.000001	* 0.12	* 180.64	* 126.75	* 0.01
* main	* 22	* 10-YR	* 767.00	* 242.21	* 247.21	* 244.57	* 247.29	* 0.000143	* 2.32	* 394.61	* 207.94	* 0.20
* main	* 22	* 50-YR	* 1972.00	* 242.21	* 248.17	* 246.02	* 248.40	* 0.000369	* 4.26	* 562.85	* 213.21	* 0.33
* main	* 22	* 100-YR	* 2800.00	* 242.21	* 248.67	* 246.78	* 249.01	* 0.000489	* 5.22	* 651.69	* 215.16	* 0.39
* main	* 22	* 6HR OBS	* 848.00	* 242.21	* 247.30	* 244.69	* 247.38	* 0.000160	* 2.49	* 408.80	* 208.73	* 0.21
* main	* 22	* 24HR OBS	* 1345.00	* 242.21	* 247.72	* 245.32	* 247.88	* 0.000260	* 3.37	* 483.98	* 211.47	* 0.27
* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
* main	* 21	* 2-YR	* 21.00	* 242.71	* 245.45	* 243.61	* 245.45	* 0.000002	* 0.16	* 140.93	* 152.74	* 0.02
* main	* 21	* 10-YR	* 767.00	* 242.71	* 247.20	* 245.25	* 247.28	* 0.000204	* 2.47	* 386.43	* 244.83	* 0.23
* main	* 21	* 50-YR	* 1972.00	* 242.71	* 248.16	* 246.49	* 248.38	* 0.000447	* 4.28	* 574.71	* 268.48	* 0.36
* main	* 21	* 100-YR	* 2800.00	* 242.71	* 248.66	* 247.28	* 248.97	* 0.000555	* 5.12	* 678.70	* 272.56	* 0.40
* main	* 21	* 6HR OBS	* 848.00	* 242.71	* 247.28	* 245.36	* 247.37	* 0.000224	* 2.62	* 402.09	* 246.79	* 0.24
* main	* 21	* 24HR OBS	* 1345.00	* 242.71	* 247.71	* 245.93	* 247.86	* 0.000333	* 3.45	* 484.61	* 258.85	* 0.30
* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
* main	* 20	* 2-YR	* 21.00	* 244.94	* 245.32	* 245.32	* 245.44	* 0.008821	* 2.80	* 7.49	* 29.34	* 0.98
* main	* 20	* 10-YR	* 767.00	* 244.94	* 246.78	* 246.78	* 247.21	* 0.005751	* 5.54	* 150.05	* 203.82	* 0.92
* main	* 20	* 50-YR	* 1972.00	* 244.94	* 247.53	* 247.53	* 248.26	* 0.005577	* 7.30	* 294.13	* 211.35	* 0.94
* main	* 20	* 100-YR	* 2800.00	* 244.94	* 247.92	* 247.92	* 248.83	* 0.005473	* 8.11	* 372.48	* 215.32	* 0.95
* main	* 20	* 6HR OBS	* 848.00	* 244.94	* 246.85	* 246.85	* 247.29	* 0.005603	* 5.65	* 163.59	* 204.54	* 0.91
* main	* 20	* 24HR OBS	* 1345.00	* 244.94	* 247.19	* 247.19	* 247.76	* 0.005488	* 6.44	* 228.69	* 207.97	* 0.92
* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
* main	* 19	* 2-YR	* 21.00	* 244.21	* 244.58	* 244.62	* 244.76	* 0.023265	* 1.63	* 8.21	* 41.38	* 0.67
* main	* 19	* 10-YR	* 767.00	* 244.21	* 245.57	* 245.96	* 246.63	* 0.022986	* 4.60	* 114.53	* 154.95	* 0.86
* main	* 19	* 50-YR	* 1972.00	* 244.21	* 246.23	* 246.69	* 247.72	* 0.017456	* 5.81	* 238.38	* 213.05	* 0.83
* main	* 19	* 100-YR	* 2800.00	* 244.21	* 246.54	* 247.05	* 248.29	* 0.016498	* 6.37	* 303.97	* 219.76	* 0.83
* main	* 19	* 6HR OBS	* 848.00	* 244.21	* 245.63	* 246.02	* 246.73	* 0.022173	* 4.72	* 123.84	* 158.16	* 0.86
* main	* 19	* 24HR OBS	* 1345.00	* 244.21	* 245.96	* 246.33	* 247.23	* 0.018620	* 5.27	* 180.76	* 206.74	* 0.83
* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
* main	* 18	* 2-YR	* 21.00	* 239.93	* 240.38	* 240.80	* 241.52	* 0.333309	* 8.54	* 2.46	* 8.06	* 2.73
* main	* 18	* 10-YR	* 767.00	* 239.93	* 241.84	* 242.49	* 244.11	* 0.119668	* 12.19	* 64.45	* 63.32	* 2.04
* main	* 18	* 50-YR	* 1972.00	* 239.93	* 243.09	* 244.35	* 246.00	* 0.057254	* 13.96	* 146.45	* 66.53	* 1.60
* main	* 18	* 100-YR	* 2800.00	* 239.93	* 243.99	* 244.97	* 246.88	* 0.038219	* 14.13	* 216.66	* 114.18	* 1.38
* main	* 18	* 6HR OBS	* 848.00	* 239.93	* 241.92	* 242.60	* 244.29	* 0.113858	* 12.49	* 69.79	* 64.15	* 2.01
* main	* 18	* 24HR OBS	* 1345.00	* 239.93	* 242.42	* 243.24	* 245.20	* 0.084883	* 13.60	* 102.09	* 65.16	* 1.84
* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
* main	* 17	* 2-YR	* 21.00	* 235.88	* 236.30	* 236.32	* 236.43	* 0.062321	* 2.92	* 7.20	* 34.18	* 1.12
* main	* 17	* 10-YR	* 767.00	* 235.88	* 237.58	* 238.28	* 239.79	* 0.100334	* 11.92	* 64.35	* 52.63	* 1.90
* main	* 17	* 50-YR	* 1972.00	* 235.88	* 238.51	* 239.76	* 242.80	* 0.112599	* 16.63	* 118.61	* 64.11	* 2.15
* main	* 17	* 100-YR	* 2800.00	* 235.88	* 239.01	* 240.54	* 244.27	* 0.110908	* 18.40	* 152.19	* 69.83	* 2.20
* main	* 17	* 6HR OBS	* 848.00	* 235.88	* 237.66	* 238.41	* 240.05	* 0.102679	* 12.41	* 68.35	* 53.56	* 1.94
* main	* 17	* 24HR OBS	* 1345.00	* 235.88	* 238.08	* 239.10	* 241.39	* 0.108567	* 14.61	* 92.03	* 58.77	* 2.06
* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
* main	* 16	* 2-YR	* 21.00	* 233.35	* 233.79	* 233.84	* 233.98	* 0.081924	* 3.46	* 6.07	* 27.29	* 1.29

* main	* 16	* 10-YR	* 767.00	* 233.35	* 235.50	* 235.99	* 237.25	* 0.051235	* 10.61	* 72.30	* 64.50	* 1.43
* main	* 16	* 50-YR	* 1972.00	* 233.35	* 236.96	* 237.85	* 240.11	* 0.045939	* 14.23	* 138.56	* 77.76	* 1.48
* main	* 16	* 100-YR	* 2800.00	* 233.35	* 237.76	* 238.84	* 241.61	* 0.042648	* 15.74	* 177.94	* 83.70	* 1.47
* main	* 16	* 6HR OBS	* 848.00	* 233.35	* 235.62	* 236.14	* 237.48	* 0.050545	* 10.95	* 77.45	* 65.92	* 1.44
* main	* 16	* 24HR OBS	* 1345.00	* 233.35	* 236.27	* 236.97	* 238.76	* 0.048013	* 12.67	* 106.18	* 71.65	* 1.46
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 15	* 2-YR	* 21.00	* 231.06	* 231.59	* 231.59	* 231.72	* 0.046047	* 2.92	* 7.20	* 27.20	* 1.00
* main	* 15	* 10-YR	* 767.00	* 231.06	* 233.29	* 233.53	* 234.49	* 0.036848	* 8.84	* 87.73	* 70.83	* 1.21
* main	* 15	* 50-YR	* 1972.00	* 231.06	* 234.29	* 235.15	* 237.21	* 0.047907	* 13.85	* 146.42	* 87.44	* 1.50
* main	* 15	* 100-YR	* 2800.00	* 231.06	* 234.82	* 236.03	* 238.78	* 0.051499	* 16.20	* 179.11	* 94.95	* 1.60
* main	* 15	* 6HR OBS	* 848.00	* 231.06	* 233.37	* 233.66	* 234.70	* 0.037855	* 9.27	* 92.62	* 72.47	* 1.24
* main	* 15	* 24HR OBS	* 1345.00	* 231.06	* 233.82	* 234.37	* 235.88	* 0.043395	* 11.58	* 118.52	* 80.78	* 1.38
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 14	* 2-YR	* 491.00	* 222.90	* 229.62	* 226.31	* 229.77	* 0.001743	* 3.13	* 160.13	* 44.82	* 0.25
* main	* 14	* 10-YR	* 1237.00	* 222.90	* 231.78	* 228.26	* 232.04	* 0.002121	* 4.41	* 351.14	* 116.96	* 0.29
* main	* 14	* 50-YR	* 2442.00	* 222.90	* 233.21	* 231.23	* 233.61	* 0.002866	* 5.80	* 530.58	* 142.43	* 0.35
* main	* 14	* 100-YR	* 3270.00	* 222.90	* 233.86	* 232.00	* 234.37	* 0.003357	* 6.59	* 614.12	* 146.84	* 0.38
* main	* 14	* 6HR OBS	* 1318.00	* 222.90	* 231.92	* 228.43	* 232.18	* 0.002178	* 4.53	* 366.79	* 119.60	* 0.30
* main	* 14	* 24HR OBS	* 1815.00	* 222.90	* 232.59	* 229.53	* 232.91	* 0.002475	* 5.12	* 451.74	* 133.13	* 0.32
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 13	* 2-YR	* 491.00	* 224.66	* 228.59	* 228.57	* 229.55	* 0.014862	* 7.85	* 62.59	* 31.79	* 0.99
* main	* 13	* 10-YR	* 1237.00	* 224.66	* 230.45	* 230.34	* 231.78	* 0.011787	* 9.26	* 136.01	* 72.98	* 0.94
* main	* 13	* 50-YR	* 2442.00	* 224.66	* 232.15	* 232.15	* 233.37	* 0.007327	* 9.60	* 333.13	* 141.27	* 0.80
* main	* 13	* 100-YR	* 3270.00	* 224.66	* 232.76	* 232.76	* 234.12	* 0.007255	* 10.40	* 421.89	* 150.11	* 0.81
* main	* 13	* 6HR OBS	* 1318.00	* 224.66	* 230.74	* 230.74	* 231.94	* 0.009997	* 8.88	* 159.92	* 92.50	* 0.88
* main	* 13	* 24HR OBS	* 1815.00	* 224.66	* 231.52	* 231.52	* 232.69	* 0.007964	* 9.05	* 246.85	* 129.06	* 0.81
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 12	* 2-YR	* 491.00	* 224.53	* 228.79	* 227.82	* 229.12	* 0.003856	* 4.63	* 105.95	* 43.28	* 0.52
* main	* 12	* 10-YR	* 1237.00	* 224.53	* 230.83	* 229.31	* 231.34	* 0.003073	* 5.85	* 245.24	* 122.85	* 0.50
* main	* 12	* 50-YR	* 2442.00	* 224.53	* 231.88	* 231.35	* 232.79	* 0.004522	* 8.23	* 393.36	* 159.81	* 0.64
* main	* 12	* 100-YR	* 3270.00	* 224.53	* 232.65	* 232.09	* 233.59	* 0.004188	* 8.69	* 523.96	* 178.07	* 0.63
* main	* 12	* 6HR OBS	* 1318.00	* 224.53	* 230.91	* 229.45	* 231.46	* 0.003219	* 6.06	* 255.40	* 125.90	* 0.52
* main	* 12	* 24HR OBS	* 1815.00	* 224.53	* 231.26	* 230.51	* 232.05	* 0.004397	* 7.46	* 300.53	* 138.63	* 0.61
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 11	* 2-YR	* 491.00	* 224.22	* 227.64	* 227.64	* 228.76	* 0.014548	* 8.48	* 57.92	* 25.98	* 1.00
* main	* 11	* 10-YR	* 1237.00	* 224.22	* 230.16	* 230.16	* 231.12	* 0.005994	* 8.28	* 214.05	* 150.29	* 0.71
* main	* 11	* 50-YR	* 2442.00	* 224.22	* 231.84	*	* 232.55	* 0.003794	* 8.24	* 505.66	* 191.74	* 0.60
* main	* 11	* 100-YR	* 3270.00	* 224.22	* 232.67	*	* 233.36	* 0.003302	* 8.40	* 672.70	* 206.04	* 0.57
* main	* 11	* 6HR OBS	* 1318.00	* 224.22	* 230.30	* 230.30	* 231.24	* 0.005799	* 8.31	* 234.52	* 155.60	* 0.70
* main	* 11	* 24HR OBS	* 1815.00	* 224.22	* 230.93	* 230.86	* 231.84	* 0.005267	* 8.68	* 340.20	* 174.44	* 0.69
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 10	* 2-YR	* 491.00	* 223.59	* 227.41	* 226.97	* 228.19	* 0.008789	* 7.08	* 69.31	* 27.80	* 0.79
* main	* 10	* 10-YR	* 1237.00	* 223.59	* 229.91	* 229.55	* 230.55	* 0.003905	* 6.99	* 265.69	* 166.94	* 0.58
* main	* 10	* 50-YR	* 2442.00	* 223.59	* 231.93	*	* 232.35	* 0.002050	* 6.49	* 644.46	* 203.60	* 0.45
* main	* 10	* 100-YR	* 3270.00	* 223.59	* 232.73	*	* 233.18	* 0.002014	* 6.94	* 811.90	* 215.47	* 0.45
* main	* 10	* 6HR OBS	* 1318.00	* 223.59	* 230.20	* 229.69	* 230.74	* 0.003164	* 6.56	* 315.35	* 173.19	* 0.53
* main	* 10	* 24HR OBS	* 1815.00	* 223.59	* 231.13	*	* 231.56	* 0.002283	* 6.28	* 486.60	* 191.74	* 0.46
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 9	* 2-YR	* 491.00	* 223.10	* 227.08	*	* 227.76	* 0.006211	* 6.62	* 74.35	* 26.45	* 0.67
* main	* 9	* 10-YR	* 1237.00	* 223.10	* 229.89	*	* 230.32	* 0.002397	* 6.06	* 346.18	* 168.62	* 0.45
* main	* 9	* 50-YR	* 2442.00	* 223.10	* 231.88	*	* 232.23	* 0.001648	* 6.17	* 687.43	* 174.74	* 0.40
* main	* 9	* 100-YR	* 3270.00	* 223.10	* 232.65	*	* 233.07	* 0.001781	* 6.84	* 822.99	* 177.00	* 0.42
* main	* 9	* 6HR OBS	* 1318.00	* 223.10	* 230.18	*	* 230.55	* 0.002011	* 5.75	* 395.35	* 169.79	* 0.42
* main	* 9	* 24HR OBS	* 1815.00	* 223.10	* 231.10	*	* 231.43	* 0.001647	* 5.73	* 552.50	* 172.47	* 0.39
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 8	* 2-YR	* 491.00	* 222.42	* 226.91	*	* 227.44	* 0.004436	* 5.85	* 84.57	* 34.05	* 0.57
* main	* 8	* 10-YR	* 1237.00	* 222.42	* 229.91	*	* 230.18	* 0.001410	* 4.96	* 445.46	* 191.68	* 0.36
* main	* 8	* 50-YR	* 2442.00	* 222.42	* 231.89	*	* 232.13	* 0.001068	* 5.21	* 851.18	* 215.65	* 0.32
* main	* 8	* 100-YR	* 3270.00	* 222.42	* 232.67	*	* 232.96	* 0.001164	* 5.79	* 1021.33	* 221.13	* 0.34

* main	* 8	* 6HR OBS	* 1318.00	* 222.42	* 230.19	*	* 230.43	* 0.001216	* 4.74	* 500.11	* 195.66	* 0.33
* main	* 8	* 24HR OBS	* 1815.00	* 222.42	* 231.11	*	* 231.33	* 0.001048	* 4.82	* 684.95	* 208.99	* 0.32
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 7	* 2-YR	* 506.00	* 220.87	* 226.85	*	* 227.09	* 0.003280	* 3.88	* 130.39	* 32.94	* 0.34
* main	* 7	* 10-YR	* 1297.00	* 220.87	* 229.91	*	* 230.06	* 0.001437	* 3.66	* 498.25	* 177.02	* 0.25
* main	* 7	* 50-YR	* 2530.00	* 220.87	* 231.87	*	* 232.05	* 0.001300	* 4.12	* 856.47	* 185.42	* 0.24
* main	* 7	* 100-YR	* 3396.00	* 220.87	* 232.64	*	* 232.87	* 0.001503	* 4.68	* 999.92	* 187.50	* 0.27
* main	* 7	* 6HR OBS	* 1441.00	* 220.87	* 230.17	*	* 230.33	* 0.001418	* 3.73	* 545.43	* 179.57	* 0.25
* main	* 7	* 24HR OBS	* 1923.00	* 220.87	* 231.09	*	* 231.24	* 0.001253	* 3.80	* 712.47	* 183.30	* 0.24
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 6	* 2-YR	* 506.00	* 220.27	* 226.79	*	* 227.02	* 0.001399	* 3.85	* 131.52	* 29.31	* 0.32
* main	* 6	* 10-YR	* 1297.00	* 220.27	* 229.62	*	* 229.99	* 0.001466	* 5.20	* 390.09	* 122.37	* 0.35
* main	* 6	* 50-YR	* 2530.00	* 220.27	* 231.26	*	* 231.94	* 0.002223	* 7.38	* 620.59	* 154.82	* 0.44
* main	* 6	* 100-YR	* 3396.00	* 220.27	* 231.70	*	* 232.72	* 0.003212	* 9.17	* 687.93	* 155.99	* 0.54
* main	* 6	* 6HR OBS	* 1441.00	* 220.27	* 229.84	*	* 230.25	* 0.001584	* 5.52	* 417.33	* 125.07	* 0.36
* main	* 6	* 24HR OBS	* 1923.00	* 220.27	* 230.64	*	* 231.16	* 0.001786	* 6.29	* 526.58	* 145.86	* 0.39
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 5	* 2-YR	* 506.00	* 219.53	* 226.46	* 224.03	* 226.94	* 0.003253	* 5.56	* 91.04	* 17.83	* 0.43
* main	* 5	* 10-YR	* 1297.00	* 219.53	* 228.83	* 226.84	* 229.85	* 0.004762	* 8.62	* 207.00	* 124.54	* 0.55
* main	* 5	* 50-YR	* 2530.00	* 219.53	* 230.98	* 230.14	* 231.83	* 0.003693	* 8.96	* 434.80	* 164.84	* 0.50
* main	* 5	* 100-YR	* 3396.00	* 219.53	* 231.28	* 230.88	* 232.56	* 0.005495	* 11.15	* 479.10	* 204.39	* 0.62
* main	* 5	* 6HR OBS	* 1441.00	* 219.53	* 228.95	* 227.33	* 230.10	* 0.005314	* 9.21	* 219.25	* 126.99	* 0.58
* main	* 5	* 24HR OBS	* 1923.00	* 219.53	* 230.31	* 229.51	* 231.06	* 0.003366	* 8.16	* 357.87	* 143.31	* 0.48
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 4	* 2-YR	* 506.00	* 218.90	* 226.47	* 223.66	* 226.80	* 0.002103	* 4.66	* 108.59	* 23.76	* 0.38
* main	* 4	* 10-YR	* 1297.00	* 218.90	* 228.76	* 226.41	* 229.67	* 0.003865	* 7.66	* 174.83	* 55.70	* 0.55
* main	* 4	* 50-YR	* 2530.00	* 218.90	* 230.49	* 230.49	* 231.67	* 0.004302	* 9.53	* 370.84	* 165.93	* 0.60
* main	* 4	* 100-YR	* 3396.00	* 218.90	* 231.12	* 231.12	* 232.38	* 0.004561	* 10.33	* 475.04	* 180.41	* 0.63
* main	* 4	* 6HR OBS	* 1441.00	* 218.90	* 228.82	* 226.80	* 229.91	* 0.004633	* 8.43	* 177.39	* 59.26	* 0.60
* main	* 4	* 24HR OBS	* 1923.00	* 218.90	* 228.76	* 227.93	* 230.76	* 0.008528	* 11.37	* 174.51	* 55.24	* 0.81
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 3	* 2-YR	* 506.00	* 217.50	* 226.52	* 222.42	* 226.69	* 0.000826	* 3.30	* 154.21	* 32.35	* 0.26
* main	* 3	* 10-YR	* 1297.00	* 217.50	* 229.15	* 225.08	* 229.40	* 0.000850	* 4.40	* 380.90	* 150.29	* 0.28
* main	* 3	* 50-YR	* 2530.00	* 217.50	* 230.46	* 228.63	* 230.84	* 0.001203	* 5.81	* 597.56	* 175.93	* 0.34
* main	* 3	* 100-YR	* 3396.00	* 217.50	* 231.18	* 229.41	* 231.63	* 0.001345	* 6.46	* 726.99	* 186.23	* 0.36
* main	* 3	* 6HR OBS	* 1441.00	* 217.50	* 229.31	* 225.44	* 229.58	* 0.000923	* 4.65	* 404.93	* 153.53	* 0.29
* main	* 3	* 24HR OBS	* 1923.00	* 217.50	* 229.80	* 226.46	* 230.14	* 0.001131	* 5.36	* 483.27	* 166.25	* 0.32
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 2.5	* Culvert	*	*	*	*	*	*	*	*	*	*
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 2	* 2-YR	* 506.00	* 214.76	* 218.27	* 218.18	* 219.78	* 0.018568	* 9.88	* 51.23	* 15.58	* 0.96
* main	* 2	* 10-YR	* 1297.00	* 214.76	* 220.98	* 220.98	* 223.90	* 0.018778	* 13.71	* 94.88	* 16.57	* 1.00
* main	* 2	* 50-YR	* 2530.00	* 214.76	* 225.07	* 225.07	* 228.12	* 0.010405	* 14.53	* 200.90	* 76.66	* 0.81
* main	* 2	* 100-YR	* 3396.00	* 214.76	* 227.45	* 227.45	* 229.15	* 0.005260	* 11.91	* 382.27	* 151.38	* 0.60
* main	* 2	* 6HR OBS	* 1441.00	* 214.76	* 221.40	* 221.40	* 224.53	* 0.018405	* 14.22	* 101.85	* 16.69	* 1.00
* main	* 2	* 24HR OBS	* 1923.00	* 214.76	* 223.40	* 223.40	* 226.50	* 0.012745	* 14.22	* 143.45	* 35.84	* 0.87
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 1	* 2-YR	* 506.00	* 214.13	* 217.55	* 217.41	* 218.86	* 0.015405	* 9.18	* 55.12	* 18.43	* 0.94
* main	* 1	* 10-YR	* 1297.00	* 214.13	* 219.24	* 219.93	* 222.67	* 0.026222	* 14.86	* 87.34	* 19.78	* 1.24
* main	* 1	* 50-YR	* 2530.00	* 214.13	* 221.23	* 222.83	* 226.64	* 0.026707	* 19.08	* 146.03	* 66.56	* 1.32
* main	* 1	* 100-YR	* 3396.00	* 214.13	* 221.93	* 223.51	* 227.50	* 0.025722	* 20.05	* 191.80	* 79.52	* 1.32
* main	* 1	* 6HR OBS	* 1441.00	* 214.13	* 219.51	* 220.32	* 223.27	* 0.026911	* 15.57	* 92.73	* 20.01	* 1.26
* main	* 1	* 24HR OBS	* 1923.00	* 214.13	* 220.39	* 222.29	* 225.14	* 0.027084	* 17.50	* 110.69	* 21.33	* 1.30

Profile Output Table - Standard Table 2

* Reach	* River Sta	* Profile	* E.G. Elev (ft)	* W.S. Elev (ft)	* Vel Head (ft)	* Frctn Loss (ft)	* C & E Loss (ft)	* Q Left (cfs)	* Q Channel (cfs)	* Q Right (cfs)	* Top Width (ft)
* main	* 40	* 2-YR	* 261.15	* 260.12	* 1.03	* 1.28	* 0.01	*	* 436.00	*	* 19.66
* main	* 40	* 10-YR	* 263.96	* 263.13	* 0.83	* 0.76	* 0.10	* 153.58	* 967.37	* 0.05	* 106.32
* main	* 40	* 50-YR	* 265.18	* 264.12	* 1.06	* 0.53	* 0.06	* 755.53	* 1420.01	* 0.46	* 120.56
* main	* 40	* 100-YR	* 265.87	* 264.63	* 1.24	* 0.57	* 0.07	* 1246.92	* 1688.15	* 0.93	* 147.75
* main	* 40	* 6HR OBS	* 264.03	* 263.20	* 0.83	* 0.46	* 0.04	* 178.83	* 990.11	* 0.06	* 107.25
* main	* 40	* 24HR OBS	* 264.57	* 263.66	* 0.92	* 0.49	* 0.05	* 414.50	* 1183.31	* 0.20	* 113.89
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 39	* 2-YR	* 259.86	* 258.75	* 1.11	* 1.36	* 0.08	*	* 436.00	*	* 20.65
* main	* 39	* 10-YR	* 262.97	* 261.12	* 1.85	* 0.92	* 0.24	* 3.93	* 1117.07	*	* 35.55
* main	* 39	* 50-YR	* 264.30	* 262.37	* 1.93	* 0.80	* 0.09	* 564.72	* 1606.14	* 5.14	* 140.68
* main	* 39	* 100-YR	* 264.91	* 262.73	* 2.18	* 0.86	* 0.09	* 1058.15	* 1865.07	* 12.78	* 154.04
* main	* 39	* 6HR OBS	* 263.13	* 261.14	* 1.99	* 0.78	* 0.12	* 5.05	* 1163.95	*	* 36.72
* main	* 39	* 24HR OBS	* 263.75	* 261.96	* 1.79	* 0.74	* 0.09	* 222.24	* 1375.03	* 0.73	* 117.75
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 38	* 2-YR	* 258.43	* 257.59	* 0.84	* 0.40	* 0.03	*	* 436.00	*	* 20.95
* main	* 38	* 10-YR	* 261.81	* 260.78	* 1.04	* 0.34	* 0.05	* 35.34	* 1071.03	* 14.63	* 77.21
* main	* 38	* 50-YR	* 263.19	* 262.21	* 0.98	* 0.26	* 0.01	* 557.41	* 1450.39	* 168.20	* 146.89
* main	* 38	* 100-YR	* 263.79	* 262.72	* 1.07	* 0.28	* 0.02	* 899.50	* 1666.85	* 369.65	* 162.53
* main	* 38	* 6HR OBS	* 261.99	* 261.28	* 0.71	* 0.25	* 0.06	* 126.52	* 1003.46	* 39.02	* 99.12
* main	* 38	* 24HR OBS	* 262.61	* 261.25	* 1.36	* 1.00	* 0.13	* 166.37	* 1380.03	* 51.60	* 98.46
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 37	* 2-YR	* 258.00	* 257.26	* 0.74	* 0.63	* 0.06	*	* 491.00	*	* 19.04
* main	* 37	* 10-YR	* 261.42	* 259.87	* 1.55	* 0.73	* 0.08	* 3.10	* 1229.63	* 4.27	* 54.59
* main	* 37	* 50-YR	* 262.83	* 261.32	* 1.51	* 0.31	* 0.05	* 408.44	* 1703.04	* 330.52	* 137.07
* main	* 37	* 100-YR	* 263.42	* 261.86	* 1.56	* 0.32	* 0.05	* 731.63	* 1901.09	* 637.28	* 140.99
* main	* 37	* 6HR OBS	* 261.67	* 260.34	* 1.33	* 0.64	* 0.11	* 39.92	* 1252.40	* 25.68	* 110.26
* main	* 37	* 24HR OBS	* 262.26	* 260.90	* 1.36	* 0.36	* 0.00	* 202.65	* 1464.79	* 147.56	* 134.09
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 36	* 2-YR	* 257.30	* 256.00	* 1.31	* 0.61	* 0.06	*	* 491.00	*	* 20.42
* main	* 36	* 10-YR	* 260.61	* 258.24	* 2.37	* 0.56	* 0.19	*	* 1237.00	*	* 21.17
* main	* 36	* 50-YR	* 262.20	* 260.25	* 1.95	* 0.59	* 0.04	* 462.11	* 1794.97	* 184.92	* 138.16
* main	* 36	* 100-YR	* 262.78	* 260.68	* 2.10	* 0.60	* 0.05	* 840.20	* 2051.07	* 378.73	* 152.99
* main	* 36	* 6HR OBS	* 260.92	* 258.45	* 2.47	* 0.56	* 0.21	*	* 1318.00	*	* 21.24
* main	* 36	* 24HR OBS	* 261.66	* 259.78	* 1.88	* 0.54	* 0.05	* 179.29	* 1559.24	* 76.47	* 121.23
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 35	* 2-YR	* 256.43	* 254.70	* 1.73	* 0.82	* 0.04	*	* 491.00	*	* 24.95
* main	* 35	* 10-YR	* 259.58	* 255.96	* 3.62	* 0.91	* 0.13	*	* 1237.00	*	* 29.93
* main	* 35	* 50-YR	* 261.60	* 258.61	* 3.00	* 0.49	* 0.10	* 27.01	* 2414.11	* 0.88	* 94.80
* main	* 35	* 100-YR	* 262.23	* 259.37	* 2.86	* 0.47	* 0.08	* 383.14	* 2882.51	* 4.35	* 120.85
* main	* 35	* 6HR OBS	* 259.86	* 256.06	* 3.80	* 0.92	* 0.13	*	* 1318.00	*	* 30.34
* main	* 35	* 24HR OBS	* 260.84	* 257.06	* 3.78	* 0.62	* 0.19	*	* 1815.00	*	* 34.19
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 34	* 2-YR	* 253.40	* 251.78	* 1.63	* 3.00	* 0.03	*	* 491.00	*	* 24.80
* main	* 34	* 10-YR	* 256.17	* 253.61	* 2.56	* 3.08	* 0.32	*	* 1237.00	*	* 27.94
* main	* 34	* 50-YR	* 259.57	* 255.41	* 4.15	* 1.92	* 0.12	* 0.21	* 2441.67	* 0.13	* 31.13
* main	* 34	* 100-YR	* 260.85	* 257.49	* 3.36	* 1.33	* 0.05	* 86.39	* 3168.93	* 14.68	* 100.67
* main	* 34	* 6HR OBS	* 256.80	* 255.73	* 1.07	* 0.40	* 0.12	* 0.39	* 1317.28	* 0.33	* 31.76
* main	* 34	* 24HR OBS	* 257.90	* 256.21	* 1.69	* 0.60	* 0.18	* 1.61	* 1811.77	* 1.62	* 32.70
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 33	* 2-YR	* 251.75	* 251.17	* 0.58	* 0.22	* 0.01	*	* 491.00	*	* 23.48

* main	* 33	* 10-YR	* 255.08	* 254.12	* 0.96	* 0.18	* 0.06	* 1.85	* 1235.15	*	* 30.56
* main	* 33	* 50-YR	* 258.27	* 257.29	* 0.98	* 0.09	* 0.22	* 386.53	* 2050.65	* 4.82	* 98.66
* main	* 33	* 100-YR	* 259.52	* 258.58	* 0.94	* 0.06	* 0.19	* 1054.76	* 2201.91	* 13.33	* 102.35
* main	* 33	* 6HR OBS	* 256.28	* 255.61	* 0.67	* 0.09	* 0.08	* 5.48	* 1312.38	* 0.14	* 40.38
* main	* 33	* 24HR OBS	* 257.13	* 256.03	* 1.10	* 0.12	* 0.22	* 21.79	* 1792.55	* 0.66	* 65.35
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 32	* 2-YR	* 251.52	* 250.96	* 0.57	* 0.02	* 0.00	*	* 491.00	*	* 24.87
* main	* 32	* 10-YR	* 254.84	* 254.00	* 0.85	* 0.02	* 0.01	* 0.83	* 1236.17	*	* 32.90
* main	* 32	* 50-YR	* 257.97	* 257.43	* 0.54	*	*	* 738.27	* 1692.40	* 11.33	* 110.33
* main	* 32	* 100-YR	* 259.28	* 258.70	* 0.57	*	*	* 1380.49	* 1861.41	* 28.10	* 113.16
* main	* 32	* 6HR OBS	* 256.11	* 255.60	* 0.51	*	*	* 42.53	* 1275.27	* 0.20	* 96.08
* main	* 32	* 24HR OBS	* 256.78	* 256.12	* 0.67	*	*	* 201.96	* 1611.52	* 1.53	* 105.78
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 31.5	*	* Bridge	*	*	*	*	*	*	*	*
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 31	* 2-YR	* 251.05	* 249.75	* 1.30	* 1.16	* 0.10	*	* 491.00	*	* 20.52
* main	* 31	* 10-YR	* 254.21	* 252.03	* 2.18	* 0.85	* 0.39	*	* 1237.00	*	* 23.92
* main	* 31	* 50-YR	* 257.17	* 255.70	* 1.47	* 0.65	* 0.02	* 390.23	* 2050.98	* 0.79	* 104.54
* main	* 31	* 100-YR	* 258.09	* 256.37	* 1.73	* 0.68	* 0.00	* 825.88	* 2438.38	* 5.74	* 110.49
* main	* 31	* 6HR OBS	* 254.49	* 252.23	* 2.26	* 0.86	* 0.41	*	* 1318.00	*	* 24.22
* main	* 31	* 24HR OBS	* 256.07	* 253.40	* 2.66	* 0.93	* 0.46	*	* 1815.00	*	* 25.97
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 30	* 2-YR	* 249.56	* 248.59	* 0.97	* 0.62	* 0.13	*	* 491.00	*	* 18.44
* main	* 30	* 10-YR	* 252.81	* 250.74	* 2.07	* 1.37	* 0.03	* 15.00	* 1222.00	*	* 52.27
* main	* 30	* 50-YR	* 255.77	* 251.36	* 4.41	* 1.10	* 0.29	* 323.56	* 2118.44	*	* 90.49
* main	* 30	* 100-YR	* 256.61	* 251.80	* 4.81	* 1.17	* 0.31	* 821.74	* 2448.26	*	* 96.45
* main	* 30	* 6HR OBS	* 253.06	* 250.78	* 2.28	* 1.44	* 0.00	* 21.22	* 1296.78	*	* 56.43
* main	* 30	* 24HR OBS	* 254.34	* 251.13	* 3.21	* 1.67	* 0.05	* 125.96	* 1689.04	*	* 85.93
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 29	* 2-YR	* 248.81	* 248.27	* 0.54	* 0.24	* 0.07	*	* 491.00	*	* 20.06
* main	* 29	* 10-YR	* 251.34	* 248.92	* 2.42	* 1.43	* 0.04	* 24.68	* 1212.32	*	* 39.04
* main	* 29	* 50-YR	* 253.03	* 249.91	* 3.11	* 2.36	* 0.39	* 715.17	* 1726.83	*	* 107.47
* main	* 29	* 100-YR	* 253.91	* 250.44	* 3.47	* 2.30	* 0.40	* 1417.93	* 1852.07	*	* 111.86
* main	* 29	* 6HR OBS	* 251.53	* 249.08	* 2.45	* 1.51	* 0.02	* 47.49	* 1270.51	*	* 54.64
* main	* 29	* 24HR OBS	* 252.27	* 249.53	* 2.74	* 1.93	* 0.14	* 292.15	* 1522.85	*	* 104.41
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 28	* 2-YR	* 248.50	* 248.19	* 0.31	* 0.08	* 0.04	* 44.09	* 446.91	*	* 66.92
* main	* 28	* 10-YR	* 250.54	* 250.26	* 0.28	* 0.05	* 0.03	* 609.11	* 627.89	*	* 130.35
* main	* 28	* 50-YR	* 252.32	* 251.82	* 0.50	* 0.06	* 0.04	* 1445.27	* 995.74	* 0.99	* 134.05
* main	* 28	* 100-YR	* 253.30	* 252.65	* 0.65	* 0.07	* 0.06	* 2028.63	* 1237.82	* 3.56	* 138.70
* main	* 28	* 6HR OBS	* 250.68	* 250.39	* 0.29	* 0.05	* 0.03	* 666.33	* 651.67	*	* 130.65
* main	* 28	* 24HR OBS	* 251.46	* 251.08	* 0.38	* 0.06	* 0.03	* 1008.18	* 806.69	* 0.13	* 132.29
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 27	* 2-YR	* 248.38	* 248.20	* 0.18	* 0.07	* 0.02	* 100.04	* 390.96	*	* 118.39
* main	* 27	* 10-YR	* 250.46	* 250.26	* 0.20	* 0.04	* 0.02	* 646.37	* 589.89	* 0.74	* 132.19
* main	* 27	* 50-YR	* 252.22	* 251.86	* 0.35	* 0.06	* 0.03	* 1503.20	* 934.59	* 4.21	* 134.06
* main	* 27	* 100-YR	* 253.18	* 252.71	* 0.47	* 0.06	* 0.04	* 2107.66	* 1154.45	* 7.90	* 135.05
* main	* 27	* 6HR OBS	* 250.60	* 250.39	* 0.21	* 0.05	* 0.02	* 702.77	* 614.34	* 0.89	* 132.34
* main	* 27	* 24HR OBS	* 251.37	* 251.10	* 0.27	* 0.05	* 0.02	* 1052.39	* 760.52	* 2.09	* 133.17
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 26	* 2-YR	* 248.29	* 248.19	* 0.10	* 0.05	* 0.01	* 181.11	* 309.88	* 0.01	* 103.60
* main	* 26	* 10-YR	* 250.39	* 250.26	* 0.14	* 0.05	* 0.00	* 774.95	* 460.78	* 1.27	* 112.95
* main	* 26	* 50-YR	* 252.13	* 251.87	* 0.26	* 0.06	* 0.00	* 1706.37	* 727.23	* 8.41	* 123.54
* main	* 26	* 100-YR	* 253.08	* 252.74	* 0.34	* 0.06	* 0.00	* 2360.33	* 892.96	* 16.70	* 124.77
* main	* 26	* 6HR OBS	* 250.54	* 250.39	* 0.14	* 0.05	* 0.00	* 836.71	* 479.93	* 1.37	* 113.99

* main	* 26	* 24HR OBS	* 251.30	* 251.11	* 0.19	* 0.05	* 0.00	* 1217.06	* 594.50	* 3.44	* 121.90
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 25	* 2-YR	* 248.24	* 248.16	* 0.08	* 0.00	* 0.02	* 55.47	* 435.15	* 0.38	* 86.17
* main	* 25	* 10-YR	* 250.35	* 250.21	* 0.14	* 0.01	* 0.01	* 441.33	* 787.87	* 7.81	* 110.28
* main	* 25	* 50-YR	* 252.07	* 251.79	* 0.28	* 0.02	* 0.01	* 1206.41	* 1208.35	* 27.24	* 149.25
* main	* 25	* 100-YR	* 253.01	* 252.62	* 0.39	* 0.03	* 0.02	* 1762.38	* 1460.00	* 47.62	* 160.03
* main	* 25	* 6HR OBS	* 250.49	* 250.34	* 0.15	* 0.01	* 0.01	* 489.20	* 819.95	* 8.84	* 113.37
* main	* 25	* 24HR OBS	* 251.25	* 251.04	* 0.21	* 0.02	* 0.00	* 797.54	* 1001.46	* 16.00	* 138.86
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 24	* 2-YR	* 248.21	* 248.21	* 0.00	* 0.00	* 0.01	* 1.76	* 19.24	*	* 61.91
* main	* 24	* 10-YR	* 250.32	* 250.23	* 0.10	* 0.05	* 0.06	* 384.28	* 381.20	* 1.53	* 111.81
* main	* 24	* 50-YR	* 252.04	* 251.70	* 0.34	* 0.08	* 0.08	* 1269.89	* 684.40	* 17.71	* 141.75
* main	* 24	* 100-YR	* 252.97	* 252.42	* 0.54	* 0.09	* 0.09	* 1914.81	* 846.01	* 39.18	* 150.97
* main	* 24	* 6HR OBS	* 250.46	* 250.35	* 0.11	* 0.05	* 0.06	* 439.29	* 406.64	* 2.07	* 114.38
* main	* 24	* 24HR OBS	* 251.23	* 251.02	* 0.21	* 0.07	* 0.07	* 795.29	* 542.49	* 7.22	* 128.00
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 23	* 2-YR	* 248.20	* 248.11	* 0.09	* 0.00	* 0.03	*	* 17.32	* 3.68	* 51.34
* main	* 23	* 10-YR	* 250.22	* 249.56	* 0.65	* 0.06	* 0.17	* 47.02	* 436.23	* 283.75	* 98.29
* main	* 23	* 50-YR	* 251.88	* 250.72	* 1.16	* 0.13	* 0.28	* 208.09	* 1034.34	* 729.57	* 129.34
* main	* 23	* 100-YR	* 252.78	* 251.37	* 1.42	* 0.16	* 0.32	* 327.58	* 1428.69	* 1043.73	* 177.83
* main	* 23	* 6HR OBS	* 250.35	* 249.66	* 0.70	* 0.07	* 0.18	* 56.74	* 477.87	* 313.39	* 100.87
* main	* 23	* 24HR OBS	* 251.09	* 250.17	* 0.92	* 0.10	* 0.23	* 121.13	* 727.81	* 496.05	* 114.98
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 22	* 2-YR	* 245.45	* 245.45	* 0.00	* 0.00	* 0.00	* 0.08	* 20.50	* 0.42	* 126.75
* main	* 22	* 10-YR	* 247.29	* 247.21	* 0.07	* 0.01	* 0.00	* 33.38	* 674.08	* 59.54	* 207.94
* main	* 22	* 50-YR	* 248.40	* 248.17	* 0.23	* 0.02	* 0.00	* 142.55	* 1520.59	* 308.87	* 213.21
* main	* 22	* 100-YR	* 249.01	* 248.67	* 0.34	* 0.03	* 0.01	* 233.47	* 2040.88	* 525.65	* 215.16
* main	* 22	* 6HR OBS	* 247.38	* 247.30	* 0.09	* 0.01	* 0.00	* 38.99	* 736.63	* 72.38	* 208.73
* main	* 22	* 24HR OBS	* 247.88	* 247.72	* 0.15	* 0.02	* 0.00	* 80.27	* 1099.13	* 165.60	* 211.47
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 21	* 2-YR	* 245.45	* 245.45	* 0.00	* 0.00	* 0.01	* 0.39	* 19.47	* 1.14	* 152.74
* main	* 21	* 10-YR	* 247.28	* 247.20	* 0.08	* 0.04	* 0.04	* 84.11	* 587.12	* 95.77	* 244.83
* main	* 21	* 50-YR	* 248.38	* 248.16	* 0.22	* 0.07	* 0.05	* 277.78	* 1292.14	* 402.08	* 268.48
* main	* 21	* 100-YR	* 248.97	* 248.66	* 0.31	* 0.08	* 0.06	* 435.54	* 1718.00	* 646.46	* 272.56
* main	* 21	* 6HR OBS	* 247.37	* 247.28	* 0.09	* 0.04	* 0.04	* 96.89	* 638.16	* 112.95	* 246.79
* main	* 21	* 24HR OBS	* 247.86	* 247.71	* 0.15	* 0.05	* 0.04	* 176.42	* 937.73	* 230.85	* 258.85
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 20	* 2-YR	* 245.44	* 245.32	* 0.12	* 0.54	* 0.00	*	* 21.00	*	* 29.34
* main	* 20	* 10-YR	* 247.21	* 246.78	* 0.43	* 0.30	* 0.00	* 3.58	* 576.49	* 186.93	* 203.82
* main	* 20	* 50-YR	* 248.26	* 247.53	* 0.73	* 0.29	* 0.00	* 159.03	* 1268.93	* 544.04	* 211.35
* main	* 20	* 100-YR	* 248.83	* 247.92	* 0.91	* 0.29	* 0.01	* 304.60	* 1709.69	* 785.71	* 215.32
* main	* 20	* 6HR OBS	* 247.29	* 246.85	* 0.45	* 0.29	* 0.00	* 9.72	* 626.22	* 212.06	* 204.54
* main	* 20	* 24HR OBS	* 247.76	* 247.19	* 0.57	* 0.29	* 0.01	* 66.12	* 918.65	* 360.24	* 207.97
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 19	* 2-YR	* 244.76	* 244.58	* 0.18	* 0.68	* 0.01	*	* 8.58	* 12.42	* 41.38
* main	* 19	* 10-YR	* 246.63	* 245.57	* 1.06	* 0.51	* 0.06	* 55.69	* 280.91	* 430.40	* 154.95
* main	* 19	* 50-YR	* 247.72	* 246.23	* 1.48	* 0.46	* 0.08	* 439.93	* 620.80	* 911.27	* 213.05
* main	* 19	* 100-YR	* 248.29	* 246.54	* 1.76	* 0.44	* 0.09	* 800.97	* 814.41	* 1184.62	* 219.76
* main	* 19	* 6HR OBS	* 246.73	* 245.63	* 1.10	* 0.50	* 0.07	* 71.92	* 307.68	* 468.41	* 158.16
* main	* 19	* 24HR OBS	* 247.23	* 245.96	* 1.27	* 0.46	* 0.07	* 196.11	* 462.16	* 686.73	* 206.74
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 18	* 2-YR	* 241.52	* 240.38	* 1.13	* 3.15	* 0.10	*	* 21.00	*	* 8.06
* main	* 18	* 10-YR	* 244.11	* 241.84	* 2.27	* 2.41	* 0.12	* 1.02	* 749.22	* 16.76	* 63.32
* main	* 18	* 50-YR	* 246.00	* 243.09	* 2.91	* 1.57	* 0.14	* 19.72	* 1827.40	* 124.88	* 66.53
* main	* 18	* 100-YR	* 246.88	* 243.99	* 2.89	* 1.30	* 0.11	* 46.16	* 2547.39	* 206.45	* 114.18

* main	* 18	* 6HR OBS	* 244.29	* 241.92	* 2.37	* 2.31	* 0.13	* 1.50	* 824.86	* 21.63	* 64.15
* main	* 18	* 24HR OBS	* 245.20	* 242.42	* 2.78	* 1.87	* 0.15	* 6.65	* 1274.05	* 64.30	* 65.16
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 17	* 2-YR	* 236.43	* 236.30	* 0.13	* 4.78	* 0.30	*	* 21.00	*	* 34.18
* main	* 17	* 10-YR	* 239.79	* 237.58	* 2.21	* 4.30	* 0.02	*	* 767.00	*	* 52.63
* main	* 17	* 50-YR	* 242.80	* 238.51	* 4.29	* 3.06	* 0.14	*	* 1972.00	*	* 64.11
* main	* 17	* 100-YR	* 244.27	* 239.01	* 5.26	* 2.38	* 0.24	*	* 2800.00	* 0.00	* 69.83
* main	* 17	* 6HR OBS	* 240.05	* 237.66	* 2.39	* 4.25	* 0.00	*	* 848.00	*	* 53.56
* main	* 17	* 24HR OBS	* 241.39	* 238.08	* 3.32	* 3.76	* 0.05	*	* 1345.00	*	* 58.77
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 16	* 2-YR	* 233.98	* 233.79	* 0.19	* 2.45	* 0.01	*	* 21.00	*	* 27.29
* main	* 16	* 10-YR	* 237.25	* 235.50	* 1.75	* 2.40	* 0.14	*	* 767.00	*	* 64.50
* main	* 16	* 50-YR	* 240.11	* 236.96	* 3.15	* 2.36	* 0.34	*	* 1972.00	*	* 77.76
* main	* 16	* 100-YR	* 241.61	* 237.76	* 3.85	* 2.24	* 0.42	* 0.18	* 2799.82	*	* 83.70
* main	* 16	* 6HR OBS	* 237.48	* 235.62	* 1.86	* 2.40	* 0.16	*	* 848.00	*	* 65.92
* main	* 16	* 24HR OBS	* 238.76	* 236.27	* 2.49	* 2.39	* 0.25	*	* 1345.00	*	* 71.65
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 15	* 2-YR	* 231.72	* 231.59	* 0.13	* 0.09	* 0.00	*	* 21.00	*	* 27.20
* main	* 15	* 10-YR	* 234.49	* 233.29	* 1.21	* 2.60	* 0.16	*	* 761.27	*	* 70.83
* main	* 15	* 50-YR	* 237.21	* 234.29	* 2.92	* 2.83	* 0.07	* 52.79	* 1919.21	*	* 87.44
* main	* 15	* 100-YR	* 238.78	* 234.82	* 3.96	* 2.82	* 0.01	* 106.95	* 2693.05	*	* 94.95
* main	* 15	* 6HR OBS	* 234.70	* 233.37	* 1.33	* 2.63	* 0.16	* 7.53	* 840.47	*	* 72.47
* main	* 15	* 24HR OBS	* 235.88	* 233.82	* 2.05	* 2.75	* 0.13	* 23.09	* 1321.91	*	* 80.78
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 14	* 2-YR	* 229.77	* 229.62	* 0.15	* 0.14	* 0.08	* 0.05	* 488.31	* 2.64	* 44.82
* main	* 14	* 10-YR	* 232.04	* 231.78	* 0.25	* 0.15	* 0.11	* 2.78	* 992.53	* 241.69	* 116.96
* main	* 14	* 50-YR	* 233.61	* 233.21	* 0.40	* 0.15	* 0.08	* 9.68	* 1568.05	* 864.27	* 142.43
* main	* 14	* 100-YR	* 234.37	* 233.86	* 0.51	* 0.17	* 0.08	* 15.34	* 1918.88	* 1335.78	* 146.84
* main	* 14	* 6HR OBS	* 232.18	* 231.92	* 0.26	* 0.14	* 0.09	* 3.19	* 1037.48	* 277.33	* 119.60
* main	* 14	* 24HR OBS	* 232.91	* 232.59	* 0.32	* 0.15	* 0.08	* 5.92	* 1285.18	* 523.91	* 133.13
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 13	* 2-YR	* 229.55	* 228.59	* 0.96	* 0.24	* 0.19	*	* 491.00	*	* 31.79
* main	* 13	* 10-YR	* 231.78	* 230.45	* 1.33	* 0.19	* 0.25	*	* 1235.11	* 1.89	* 72.98
* main	* 13	* 50-YR	* 233.37	* 232.15	* 1.22	* 0.20	* 0.09	* 0.74	* 2040.15	* 401.11	* 141.27
* main	* 13	* 100-YR	* 234.12	* 232.76	* 1.35	* 0.19	* 0.12	* 2.22	* 2510.78	* 757.00	* 150.11
* main	* 13	* 6HR OBS	* 231.94	* 230.74	* 1.21	* 0.19	* 0.20	*	* 1298.10	* 19.90	* 92.50
* main	* 13	* 24HR OBS	* 232.69	* 231.52	* 1.17	* 0.21	* 0.11	* 0.10	* 1654.69	* 160.20	* 129.06
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 12	* 2-YR	* 229.12	* 228.79	* 0.33	* 0.28	* 0.08	*	* 491.00	*	* 43.28
* main	* 12	* 10-YR	* 231.34	* 230.83	* 0.51	* 0.18	* 0.04	* 0.28	* 1182.67	* 54.06	* 122.85
* main	* 12	* 50-YR	* 232.79	* 231.88	* 0.91	* 0.17	* 0.06	* 2.45	* 2080.58	* 358.96	* 159.81
* main	* 12	* 100-YR	* 233.59	* 232.65	* 0.94	* 0.16	* 0.08	* 5.69	* 2522.97	* 741.34	* 178.07
* main	* 12	* 6HR OBS	* 231.46	* 230.91	* 0.54	* 0.18	* 0.04	* 0.36	* 1250.26	* 67.38	* 125.90
* main	* 12	* 24HR OBS	* 232.05	* 231.26	* 0.80	* 0.20	* 0.01	* 0.89	* 1661.75	* 152.35	* 138.63
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 11	* 2-YR	* 228.76	* 227.64	* 1.12	* 0.46	* 0.10	*	* 491.00	*	* 25.98
* main	* 11	* 10-YR	* 231.12	* 230.16	* 0.96	* 0.20	* 0.09	* 29.42	* 1107.19	* 100.39	* 150.29
* main	* 11	* 50-YR	* 232.55	* 231.84	* 0.72	* 0.11	* 0.09	* 106.38	* 1542.63	* 792.99	* 191.74
* main	* 11	* 100-YR	* 233.36	* 232.67	* 0.68	* 0.10	* 0.07	* 155.16	* 1797.37	* 1317.46	* 206.04
* main	* 11	* 6HR OBS	* 231.24	* 230.30	* 0.94	* 0.17	* 0.12	* 34.15	* 1147.56	* 136.29	* 155.60
* main	* 11	* 24HR OBS	* 231.84	* 230.93	* 0.91	* 0.14	* 0.15	* 64.76	* 1374.97	* 375.28	* 174.44
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 10	* 2-YR	* 228.19	* 227.41	* 0.78	* 0.40	* 0.03	*	* 491.00	*	* 27.80
* main	* 10	* 10-YR	* 230.55	* 229.91	* 0.65	* 0.16	* 0.07	* 26.35	* 1039.59	* 171.06	* 166.94
* main	* 10	* 50-YR	* 232.35	* 231.93	* 0.42	* 0.10	* 0.02	* 154.74	* 1396.30	* 890.96	* 203.60

* main	* 10	* 100-YR	* 233.18	* 232.73	* 0.45	* 0.10	* 0.01	* 232.56	* 1676.62	* 1360.82	* 215.47
* main	* 10	* 6HR OBS	* 230.74	* 230.20	* 0.54	* 0.14	* 0.05	* 39.63	* 1038.77	* 239.61	* 173.19
* main	* 10	* 24HR OBS	* 231.56	* 231.13	* 0.43	* 0.10	* 0.03	* 93.91	* 1186.37	* 534.72	* 191.74
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 9	* 2-YR	* 227.76	* 227.08	* 0.68	* 0.27	* 0.04	* 0.04	* 490.96	*	* 26.45
* main	* 9	* 10-YR	* 230.32	* 229.89	* 0.43	* 0.09	* 0.05	* 82.80	* 891.69	* 262.51	* 168.62
* main	* 9	* 50-YR	* 232.23	* 231.88	* 0.35	* 0.07	* 0.03	* 246.26	* 1232.04	* 963.70	* 174.74
* main	* 9	* 100-YR	* 233.07	* 232.65	* 0.42	* 0.07	* 0.04	* 354.96	* 1506.80	* 1408.24	* 177.00
* main	* 9	* 6HR OBS	* 230.55	* 230.18	* 0.36	* 0.08	* 0.04	* 97.30	* 889.34	* 331.37	* 169.79
* main	* 9	* 24HR OBS	* 231.43	* 231.10	* 0.32	* 0.07	* 0.03	* 164.70	* 1027.07	* 623.24	* 172.47
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 8	* 2-YR	* 227.44	* 226.91	* 0.53	* 0.26	* 0.09	* 0.12	* 490.88	*	* 34.05
* main	* 8	* 10-YR	* 230.18	* 229.91	* 0.27	* 0.08	* 0.03	* 62.33	* 817.75	* 356.92	* 191.68
* main	* 8	* 50-YR	* 232.13	* 231.89	* 0.24	* 0.06	* 0.02	* 183.26	* 1140.28	* 1118.47	* 215.65
* main	* 8	* 100-YR	* 232.96	* 232.67	* 0.29	* 0.07	* 0.02	* 277.21	* 1389.45	* 1603.34	* 221.13
* main	* 8	* 6HR OBS	* 230.43	* 230.19	* 0.23	* 0.08	* 0.02	* 70.73	* 819.20	* 428.07	* 195.66
* main	* 8	* 24HR OBS	* 231.33	* 231.11	* 0.22	* 0.06	* 0.02	* 116.09	* 952.49	* 746.42	* 208.99
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 7	* 2-YR	* 227.09	* 226.85	* 0.23	* 0.06	* 0.00	*	* 506.00	*	* 32.94
* main	* 7	* 10-YR	* 230.06	* 229.91	* 0.15	* 0.05	* 0.02	* 20.61	* 853.78	* 422.60	* 177.02
* main	* 7	* 50-YR	* 232.05	* 231.87	* 0.18	* 0.06	* 0.05	* 117.79	* 1232.08	* 1180.13	* 185.42
* main	* 7	* 100-YR	* 232.87	* 232.64	* 0.23	* 0.07	* 0.08	* 188.91	* 1521.72	* 1685.37	* 187.50
* main	* 7	* 6HR OBS	* 230.33	* 230.17	* 0.16	* 0.05	* 0.03	* 28.97	* 902.97	* 509.06	* 179.57
* main	* 7	* 24HR OBS	* 231.24	* 231.09	* 0.16	* 0.05	* 0.04	* 68.20	* 1037.55	* 817.25	* 183.30
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 6	* 2-YR	* 227.02	* 226.79	* 0.23	* 0.06	* 0.03	*	* 506.00	*	* 29.31
* main	* 6	* 10-YR	* 229.99	* 229.62	* 0.37	* 0.08	* 0.06	* 11.43	* 1144.68	* 140.88	* 122.37
* main	* 6	* 50-YR	* 231.94	* 231.26	* 0.68	* 0.09	* 0.02	* 83.71	* 2012.61	* 433.68	* 154.82
* main	* 6	* 100-YR	* 232.72	* 231.70	* 1.02	* 0.13	* 0.03	* 148.67	* 2626.90	* 620.43	* 155.99
* main	* 6	* 6HR OBS	* 230.25	* 229.84	* 0.41	* 0.08	* 0.07	* 16.02	* 1253.63	* 171.35	* 125.07
* main	* 6	* 24HR OBS	* 231.16	* 230.64	* 0.51	* 0.08	* 0.02	* 39.16	* 1591.97	* 291.87	* 145.86
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 5	* 2-YR	* 226.94	* 226.46	* 0.48	* 0.09	* 0.04	* 0.00	* 505.97	* 0.03	* 17.83
* main	* 5	* 10-YR	* 229.85	* 228.83	* 1.02	* 0.15	* 0.03	* 10.47	* 1137.66	* 148.87	* 124.54
* main	* 5	* 50-YR	* 231.83	* 230.98	* 0.85	* 0.13	* 0.03	* 46.60	* 1515.68	* 967.72	* 164.84
* main	* 5	* 100-YR	* 232.56	* 231.28	* 1.28	* 0.17	* 0.01	* 57.04	* 1942.23	* 1396.73	* 204.39
* main	* 5	* 6HR OBS	* 230.10	* 228.95	* 1.14	* 0.17	* 0.01	* 12.69	* 1234.95	* 193.37	* 126.99
* main	* 5	* 24HR OBS	* 231.06	* 230.31	* 0.75	* 0.17	* 0.13	* 31.88	* 1284.96	* 606.16	* 143.31
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 4	* 2-YR	* 226.80	* 226.47	* 0.34	* 0.06	* 0.05	*	* 506.00	*	* 23.76
* main	* 4	* 10-YR	* 229.67	* 228.76	* 0.91	* 0.08	* 0.20	* 0.88	* 1292.79	* 3.34	* 55.70
* main	* 4	* 50-YR	* 231.67	* 230.49	* 1.18	* 0.10	* 0.24	* 10.56	* 2062.00	* 457.45	* 165.93
* main	* 4	* 100-YR	* 232.38	* 231.12	* 1.26	* 0.12	* 0.24	* 18.47	* 2416.15	* 961.38	* 180.41
* main	* 4	* 6HR OBS	* 229.91	* 228.82	* 1.10	* 0.09	* 0.25	* 1.07	* 1435.01	* 4.92	* 59.26
* main	* 4	* 24HR OBS	* 230.76	* 228.76	* 2.00	* 0.12	* 0.50	* 1.28	* 1916.96	* 4.76	* 55.24
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 3	* 2-YR	* 226.69	* 226.52	* 0.17	*	*	* 0.00	* 505.37	* 0.62	* 32.35
* main	* 3	* 10-YR	* 229.40	* 229.15	* 0.25	*	*	* 5.46	* 1015.06	* 276.48	* 150.29
* main	* 3	* 50-YR	* 230.84	* 230.46	* 0.38	*	*	* 17.67	* 1565.11	* 947.23	* 175.93
* main	* 3	* 100-YR	* 231.63	* 231.18	* 0.45	*	*	* 28.82	* 1876.38	* 1490.80	* 186.23
* main	* 3	* 6HR OBS	* 229.58	* 229.31	* 0.27	*	*	* 6.58	* 1093.64	* 340.78	* 153.53
* main	* 3	* 24HR OBS	* 230.14	* 229.80	* 0.34	*	*	* 10.90	* 1337.63	* 574.47	* 166.25
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 2.5	*	* Culvert	*	*	*	*	*	*	*	*
*	*	*	*	*	*	*	*	*	*	*	*

* main	* 2	* 2-YR	* 219.78 *	* 218.27 *	* 1.52 *	* 0.82 *	* 0.10 *	* *	* 506.00 *	* *	* 15.58 *
* main	* 2	* 10-YR	* 223.90 *	* 220.98 *	* 2.92 *	* 0.83 *	* 0.22 *	* 0.13 *	* 1296.60 *	* 0.27 *	* 16.57 *
* main	* 2	* 50-YR	* 228.12 *	* 225.07 *	* 3.05 *	* 0.39 *	* 0.71 *	* 78.95 *	* 2332.15 *	* 118.90 *	* 76.66 *
* main	* 2	* 100-YR	* 229.15 *	* 227.45 *	* 1.70 *	* 0.29 *	* 0.10 *	* 207.66 *	* 2369.40 *	* 818.94 *	* 151.38 *
* main	* 2	* 6HR OBS	* 224.53 *	* 221.40 *	* 3.14 *	* 0.82 *	* 0.22 *	* 0.26 *	* 1440.22 *	* 0.52 *	* 16.69 *
* main	* 2	* 24HR OBS	* 226.50 *	* 223.40 *	* 3.11 *	* 0.41 *	* 0.87 *	* 9.83 *	* 1900.07 *	* 13.10 *	* 35.84 *
*	*	*	*	*	*	*	*	*	*	*	*
* main	* 1	* 2-YR	* 218.86 *	* 217.55 *	* 1.31 *	* *	* *	* *	* 506.00 *	* *	* 18.43 *
* main	* 1	* 10-YR	* 222.67 *	* 219.24 *	* 3.43 *	* 1.07 *	* 0.15 *	* 0.12 *	* 1296.88 *	* *	* 19.78 *
* main	* 1	* 50-YR	* 226.64 *	* 221.23 *	* 5.41 *	* 0.77 *	* 0.71 *	* 11.75 *	* 2409.46 *	* 108.79 *	* 66.56 *
* main	* 1	* 100-YR	* 227.50 *	* 221.93 *	* 5.57 *	* 0.49 *	* 1.16 *	* 27.17 *	* 2806.85 *	* 561.98 *	* 79.52 *
* main	* 1	* 6HR OBS	* 223.27 *	* 219.51 *	* 3.76 *	* 1.07 *	* 0.19 *	* 0.31 *	* 1440.69 *	* 0.00 *	* 20.01 *
* main	* 1	* 24HR OBS	* 225.14 *	* 220.39 *	* 4.75 *	* 0.87 *	* 0.49 *	* 1.92 *	* 1920.76 *	* 0.32 *	* 21.33 *

```

X    X  XXXXXX   XXXX       XXXX       XX       XXXX
X    X X         X  X       X  X       X  X       X
X    X X         X         X  X       X  X       X
XXXXXXXX XXXX   X         XXX XXXX   XXXXXX   XXXX
X    X X         X         X  X       X  X       X
X    X X         X  X       X  X       X  X       X
X    X XXXXXX   XXXX       X  X       X  X       XXXXX
  
```

PROJECT DATA

Project Title: Ecity
 Project File : Ecity.prj
 Run Date and Time: 7/12/2013 3:45:12 PM

Project in English units

PLAN DATA

Plan Title: LOFLOW_7_12_FLOW-SWM-SD
 Plan File : i:\5493 - Howard County\01 - Ellicott City Flood Study\H&H\HEC-RAS\Ecity.p20

Geometry Title: 7-12-13LOFLOW
 Geometry File : i:\5493 - Howard County\01 - Ellicott City Flood Study\H&H\HEC-RAS\Ecity.g05

Flow Title : 7-12-13LowFlows-SW-SD
 Flow File : i:\5493 - Howard County\01 - Ellicott City Flood Study\H&H\HEC-RAS\Ecity.f14

Plan Summary Information:

Number of:	Cross Sections =	31	Multiple Openings =	0
	Culverts =	2	Inline Structures =	0
	Bridges =	1	Lateral Structures =	0

Computational Information

Water surface calculation tolerance =	0.01
Critical depth calculation tolerance =	0.01
Maximum number of iterations =	20
Maximum difference tolerance =	0.3
Flow tolerance factor =	0.001

Computation Options

Critical depth computed only where necessary
 Conveyance Calculation Method: At breaks in n values only
 Friction Slope Method: Average Conveyance
 Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: 7-12-13LowFlows-SW-SD
 Flow File : i:\5493 - Howard County\01 - Ellicott City Flood Study\H&H\HEC-RAS\Ecity.f14

Flow Data (cfs)

```

*****
**
* River      Reach      RS      *      2-YR      10-YR      50-YR      100-YR
*
* hudson     main      40      *      364      864      1659      2110
*
* hudson     main      37      *      364      930      1865      2353
*
* hudson     main      14      *      415      990      1925      2413
*
* hudson     main      7       *      431      1038     2017      2562
*
  
```

**

Boundary Conditions

```
*****
* River      Reach      Profile      *      Upstream      Downstream      *
*****
* hudson     main      2-YR      *      Critical      Normal S = 0.0154 *
*****
```

GEOMETRY DATA

Geometry Title: 7-12-13LOFLOW
 Geometry File : i:\5493 - Howard County\01 - Ellicott City Flood Study\H&H\HEC-RAS\Ecity.g05

CROSS SECTION

RIVER: hudson
 REACH: main RS: 40

INPUT

Description:

Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	264.96	15.41	264.78	42.02	264.43	82.53	265.79	100.98	266.38
124.25	264.3	153.94	262.2	160.39	262.32	176.03	262.94	188	262.45
192.31	261.98	195.33	261.51	205.84	262.58	220.94	262.3	226.78	260.3
229.45	256.44	234.7	256.38	239.49	256.83	246.53	259.85	246.86	262.35
250	273.22	254.98	274.03	284.82	277.7				

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.085	124.25	.045	153.94	.02	192.31	.045	220.94	.035
246.86	.045								

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

Left	Right	Left	Channel	Right	Coeff	Contr.	Expan.
220.94	246.86	93.6	97.1	92.95	.1	.3	

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	101	267	F

CROSS SECTION OUTPUT Profile #2-YR

```
*****
* E.G. Elev (ft)      * 260.71 * Element      * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.97  * Wt. n-Val.   *      *      * 0.035 *      *
* W.S. Elev (ft)     * 259.74 * Reach Len. (ft) * 93.60 * 97.10 * 92.95 *
* Crit W.S. (ft)     * 259.54 * Flow Area (sq ft) *      * 46.04 *      *
* E.G. Slope (ft/ft) * 0.012514 * Area (sq ft) *      * 46.04 *      *
* Q Total (cfs)      * 364.00 * Flow (cfs) *      * 364.00 *      *
* Top Width (ft)     * 19.09 * Top Width (ft) *      * 19.09 *      *
* Vel Total (ft/s)   * 7.91  * Avg. Vel. (ft/s) *      * 7.91 *      *
* Max Chl Dpth (ft)  * 3.36  * Hydr. Depth (ft) *      * 2.41 *      *
* Conv. Total (cfs)  * 3253.9 * Conv. (cfs) *      * 3253.9 *      *
* Length Wtd. (ft)   * 97.10 * Wetted Per. (ft) *      * 21.44 *      *
* Min Ch El (ft)     * 256.38 * Shear (lb/sq ft) *      * 1.68 *      *
* Alpha              * 1.00  * Stream Power (lb/ft s) * 284.82 * 0.00 * 0.00 *
* Frctn Loss (ft)    * 1.15  * Cum Volume (acre-ft) * 0.00 * 2.49 * 0.00 *
* C & E Loss (ft)    * 0.05  * Cum SA (acres) * 0.00 * 1.12 * 0.07 *
*****
```

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```
*****
* E.G. Elev (ft)      * 263.20 * Element      * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.53  * Wt. n-Val.   * 0.045 * 0.035 *      *
* W.S. Elev (ft)     * 261.67 * Reach Len. (ft) * 93.60 * 97.10 * 92.95 *
* Crit W.S. (ft)     * 261.43 * Flow Area (sq ft) * 0.21 * 87.11 *      *
```

```

* E.G. Slope (ft/ft)      *0.012293 * Area (sq ft)          * 0.21 * 87.11 *
* Q Total (cfs)          * 864.00 * Flow (cfs)           * 0.14 * 863.86 *
* Top Width (ft)        * 26.60 * Top Width (ft)       * 2.61 * 23.99 *
* Vel Total (ft/s)      * 9.90 * Avg. Vel. (ft/s)    * 0.68 * 9.92 *
* Max Chl Dpth (ft)     * 5.29 * Hydr. Depth (ft)    * 0.08 * 3.63 *
* Conv. Total (cfs)     * 7792.7 * Conv. (cfs)         * 1.3 * 7791.4 *
* Length Wtd. (ft)     * 97.10 * Wetted Per. (ft)    * 2.63 * 28.48 *
* Min Ch El (ft)       * 256.38 * Shear (lb/sq ft)    * 0.06 * 2.35 *
* Alpha                 * 1.00 * Stream Power (lb/ft s) * 284.82 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 1.25 * Cum Volume (acre-ft) * 1.13 * 6.83 * 0.60 *
* C & E Loss (ft)      * 0.01 * Cum SA (acres)      * 1.36 * 1.28 * 1.36 *
*****

```

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)        * 264.64 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)        * 0.93 * Wt. n-Val.          * 0.030 * 0.035 * 0.045 *
* W.S. Elev (ft)       * 263.71 * Reach Len. (ft)     * 93.60 * 97.10 * 92.95 *
* Crit W.S. (ft)       * 263.71 * Flow Area (sq ft)   * 103.70 * 139.39 * 0.27 *
* E.G. Slope (ft/ft)   *0.005654 * Area (sq ft)       * 103.70 * 139.39 * 0.27 *
* Q Total (cfs)        * 1659.00 * Flow (cfs)         * 449.31 * 1209.47 * 0.22 *
* Top Width (ft)       * 114.68 * Top Width (ft)     * 88.37 * 25.92 * 0.39 *
* Vel Total (ft/s)     * 6.82 * Avg. Vel. (ft/s)   * 4.33 * 8.68 * 0.82 *
* Max Chl Dpth (ft)    * 7.33 * Hydr. Depth (ft)   * 1.17 * 5.38 * 0.68 *
* Conv. Total (cfs)    * 22062.6 * Conv. (cfs)        * 5975.3 * 16084.4 * 2.9 *
* Length Wtd. (ft)     * 96.35 * Wetted Per. (ft)   * 88.57 * 31.11 * 1.42 *
* Min Ch El (ft)       * 256.38 * Shear (lb/sq ft)   * 0.41 * 1.58 * 0.07 *
* Alpha                * 1.29 * Stream Power (lb/ft s) * 284.82 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 0.49 * Cum Volume (acre-ft) * 3.14 * 11.25 * 2.41 *
* C & E Loss (ft)      * 0.05 * Cum SA (acres)     * 2.54 * 1.30 * 2.20 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)        * 265.12 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)        * 1.05 * Wt. n-Val.          * 0.029 * 0.035 * 0.045 *
* W.S. Elev (ft)       * 264.07 * Reach Len. (ft)     * 93.60 * 97.10 * 92.95 *
* Crit W.S. (ft)       * 264.07 * Flow Area (sq ft)   * 136.20 * 148.66 * 0.43 *
* E.G. Slope (ft/ft)   *0.006069 * Area (sq ft)       * 136.20 * 148.66 * 0.43 *
* Q Total (cfs)        * 2110.00 * Flow (cfs)         * 714.62 * 1394.96 * 0.42 *
* Top Width (ft)       * 119.84 * Top Width (ft)     * 93.43 * 25.92 * 0.50 *
* Vel Total (ft/s)     * 7.40 * Avg. Vel. (ft/s)   * 5.25 * 9.38 * 0.99 *
* Max Chl Dpth (ft)    * 7.69 * Hydr. Depth (ft)   * 1.46 * 5.74 * 0.86 *
* Conv. Total (cfs)    * 27084.6 * Conv. (cfs)        * 9173.1 * 17906.1 * 5.4 *
* Length Wtd. (ft)     * 96.07 * Wetted Per. (ft)   * 93.63 * 31.11 * 1.79 *
* Min Ch El (ft)       * 256.38 * Shear (lb/sq ft)   * 0.55 * 1.81 * 0.09 *
* Alpha                * 1.23 * Stream Power (lb/ft s) * 284.82 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 0.53 * Cum Volume (acre-ft) * 4.23 * 13.14 * 3.32 *
* C & E Loss (ft)      * 0.06 * Cum SA (acres)     * 2.86 * 1.31 * 2.66 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
 REACH: main RS: 39

INPUT

Description:

Station Elevation Data		num= 26									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	266.26	5.63	266.12	23.64	263.71	63.98	262.23	91.83	261.37		
92.63	260.85	100.64	261.02	115.95	261.34	143.09	261.55	155.5	262.02		
167.36	261.79	168.09	262.42	174.27	262.29	176.57	260.93	177.24	258.17		
177.64	255.56	186.83	254.87	187.72	255.8	187.9	255.97	191.83	257.42		
197.4	257.79	198.77	261.58	202.55	262.02	220.58	268.88	237.64	273.36		
264.28	276.53										

Manning's n Values		num= 4							
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	91.83	.02	176.57	.035	198.77	.045		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	176.57	198.77		113.96	114.57	114.59	.1	.3
Ineffective Flow			num=	1				
Sta L	Sta R	Elev	Permanent					
236.2	264.28	290	F					

CROSS SECTION OUTPUT Profile #2-YR

* E.G. Elev (ft)	* 259.51	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 0.82	* Wt. n-Val.	*	* 0.035	*	*
* W.S. Elev (ft)	* 258.69	* Reach Len. (ft)	* 113.96	* 114.57	* 114.59	*
* Crit W.S. (ft)	* 258.38	* Flow Area (sq ft)	*	* 50.22	*	*
* E.G. Slope (ft/ft)	* 0.011291	* Area (sq ft)	*	* 50.22	*	*
* Q Total (cfs)	* 364.00	* Flow (cfs)	*	* 364.00	*	*
* Top Width (ft)	* 20.61	* Top Width (ft)	*	* 20.61	*	*
* Vel Total (ft/s)	* 7.25	* Avg. Vel. (ft/s)	*	* 7.25	*	*
* Max Chl Dpth (ft)	* 3.82	* Hydr. Depth (ft)	*	* 2.44	*	*
* Conv. Total (cfs)	* 3425.5	* Conv. (cfs)	*	* 3425.5	*	*
* Length Wtd. (ft)	* 114.57	* Wetted Per. (ft)	*	* 24.65	*	*
* Min Ch El (ft)	* 254.87	* Shear (lb/sq ft)	*	* 1.44	*	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 264.28	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 1.57	* Cum Volume (acre-ft)	* 0.00	* 2.38	* 0.00	*
* C & E Loss (ft)	* 0.03	* Cum SA (acres)	* 0.00	* 1.08	* 0.07	*

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 261.94	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 1.64	* Wt. n-Val.	*	* 0.035	*	*
* W.S. Elev (ft)	* 260.30	* Reach Len. (ft)	* 113.96	* 114.57	* 114.59	*
* Crit W.S. (ft)	* 260.06	* Flow Area (sq ft)	*	* 84.13	*	*
* E.G. Slope (ft/ft)	* 0.013510	* Area (sq ft)	*	* 84.13	*	*
* Q Total (cfs)	* 864.00	* Flow (cfs)	*	* 864.00	*	*
* Top Width (ft)	* 21.58	* Top Width (ft)	*	* 21.58	*	*
* Vel Total (ft/s)	* 10.27	* Avg. Vel. (ft/s)	*	* 10.27	*	*
* Max Chl Dpth (ft)	* 5.43	* Hydr. Depth (ft)	*	* 3.90	*	*
* Conv. Total (cfs)	* 7433.5	* Conv. (cfs)	*	* 7433.5	*	*
* Length Wtd. (ft)	* 114.57	* Wetted Per. (ft)	*	* 28.02	*	*
* Min Ch El (ft)	* 254.87	* Shear (lb/sq ft)	*	* 2.53	*	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 264.28	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 1.22	* Cum Volume (acre-ft)	* 1.13	* 6.64	* 0.60	*
* C & E Loss (ft)	* 0.13	* Cum SA (acres)	* 1.35	* 1.22	* 1.36	*

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

Table with 6 columns: Parameter, Value, Element, Left OB, Channel, Right OB. Rows include E.G. Elev, Vel Head, W.S. Elev, Crit W.S., E.G. Slope, Q Total, Top Width, Vel Total, Max Chl Dpth, Conv. Total, Length Wtd, Min Ch El, Alpha, Frctn Loss, C & E Loss.

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

Table with 6 columns: Parameter, Value, Element, Left OB, Channel, Right OB. Rows include E.G. Elev, Vel Head, W.S. Elev, Crit W.S., E.G. Slope, Q Total, Top Width, Vel Total, Max Chl Dpth, Conv. Total, Length Wtd, Min Ch El, Alpha, Frctn Loss, C & E Loss.

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
REACH: main RS: 38

INPUT

Description:

Station Elevation Data table with columns: num=, Sta, Elev. Rows show station numbers and elevations for 25 stations.

169.33 261.87 181.94 262.16 192.36 261.55 206.48 265.12 222.68 272.01

Manning's n Values num= 6
Sta n Val Sta n Val Sta n Val Sta n Val Sta n Val
0 .045 88.5 .02 123.88 .035 145.95 .02 181.94 .045
206.48 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
123.88 145.95 50.64 50.85 51.22 .1 .3

CROSS SECTION OUTPUT Profile #2-YR

E.G. Elev (ft) * 257.91 * Element * Left OB * Channel * Right OB *
Vel Head (ft) * 1.08 * Wt. n-Val. * * 0.035 * *
W.S. Elev (ft) * 256.84 * Reach Len. (ft) * 50.64 * 50.85 * 51.22 *
Crit W.S. (ft) * 256.84 * Flow Area (sq ft) * * 43.74 * *
E.G. Slope (ft/ft) * 0.016871 * Area (sq ft) * * 43.74 * *
Q Total (cfs) * 364.00 * Flow (cfs) * * 364.00 * *
Top Width (ft) * 20.59 * Top Width (ft) * * 20.59 * *
Vel Total (ft/s) * 8.32 * Avg. Vel. (ft/s) * * 8.32 * *
Max Chl Dpth (ft) * 2.53 * Hydr. Depth (ft) * * 2.12 * *
Conv. Total (cfs) * 2802.4 * Conv. (cfs) * * 2802.4 * *
Length Wtd. (ft) * 50.85 * Wetted Per. (ft) * * 23.59 * *
Min Ch El (ft) * 254.31 * Shear (lb/sq ft) * * 1.95 * *
Alpha * 1.00 * Stream Power (lb/ft s) * 222.68 * 0.00 * 0.00 *
Frctn Loss (ft) * 0.47 * Cum Volume (acre-ft) * 0.00 * 2.26 * 0.00 *
C & E Loss (ft) * 0.15 * Cum SA (acres) * 0.00 * 1.02 * 0.07 *

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10-YR

E.G. Elev (ft) * 260.59 * Element * Left OB * Channel * Right OB *
Vel Head (ft) * 1.22 * Wt. n-Val. * * 0.035 * *
W.S. Elev (ft) * 259.37 * Reach Len. (ft) * 50.64 * 50.85 * 51.22 *
Crit W.S. (ft) * * * Flow Area (sq ft) * * 97.47 * *
E.G. Slope (ft/ft) * 0.008585 * Area (sq ft) * * 97.47 * *
Q Total (cfs) * 864.00 * Flow (cfs) * * 864.00 * *
Top Width (ft) * 21.85 * Top Width (ft) * * 21.85 * *
Vel Total (ft/s) * 8.86 * Avg. Vel. (ft/s) * * 8.86 * *
Max Chl Dpth (ft) * 5.06 * Hydr. Depth (ft) * * 4.46 * *
Conv. Total (cfs) * 9325.1 * Conv. (cfs) * * 9325.1 * *
Length Wtd. (ft) * 50.85 * Wetted Per. (ft) * * 28.81 * *
Min Ch El (ft) * 254.31 * Shear (lb/sq ft) * * 1.81 * *
Alpha * 1.00 * Stream Power (lb/ft s) * 222.68 * 0.00 * 0.00 *
Frctn Loss (ft) * 0.42 * Cum Volume (acre-ft) * 1.13 * 6.40 * 0.60 *
C & E Loss (ft) * 0.00 * Cum SA (acres) * 1.35 * 1.17 * 1.36 *

CROSS SECTION OUTPUT Profile #50-YR

E.G. Elev (ft) * 262.68 * Element * Left OB * Channel * Right OB *
Vel Head (ft) * 1.34 * Wt. n-Val. * * 0.025 * 0.035 * 0.020 *
W.S. Elev (ft) * 261.34 * Reach Len. (ft) * 50.64 * 50.85 * 51.22 *
Crit W.S. (ft) * 261.63 * Flow Area (sq ft) * * 47.58 * 140.93 * 12.29 *
E.G. Slope (ft/ft) * 0.006862 * Area (sq ft) * * 47.58 * 140.93 * 12.29 *
Q Total (cfs) * 1659.00 * Flow (cfs) * * 199.23 * 1399.10 * 60.67 *
Top Width (ft) * 101.01 * Top Width (ft) * * 61.91 * 22.07 * 17.03 *
Vel Total (ft/s) * 8.26 * Avg. Vel. (ft/s) * * 4.19 * 9.93 * 4.94 *
Max Chl Dpth (ft) * 7.03 * Hydr. Depth (ft) * * 0.77 * 6.39 * 0.72 *
Conv. Total (cfs) * 20027.0 * Conv. (cfs) * * 2405.0 * 16889.5 * 732.4 *
Length Wtd. (ft) * 50.85 * Wetted Per. (ft) * * 63.06 * 29.71 * 17.10 *
Min Ch El (ft) * 254.31 * Shear (lb/sq ft) * * 0.32 * 2.03 * 0.31 *
Alpha * 1.26 * Stream Power (lb/ft s) * 222.68 * 0.00 * 0.00 *
Frctn Loss (ft) * 0.99 * Cum Volume (acre-ft) * 2.84 * 10.61 * 2.39 *

* C & E Loss (ft) * 0.14 * Cum SA (acres) * 2.13 * 1.19 * 2.17 *

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
 This may indicate the
 need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-YR

 * E.G. Elev (ft) * 263.13 * Element * Left OB * Channel * Right OB *
 * Vel Head (ft) * 1.05 * Wt. n-Val. * 0.025 * 0.035 * 0.020 *
 * W.S. Elev (ft) * 262.08 * Reach Len. (ft) * 50.64 * 50.85 * 51.22 *
 * Crit W.S. (ft) * 262.09 * Flow Area (sq ft) * 97.20 * 157.09 * 31.54 *
 * E.G. Slope (ft/ft) * 0.005221 * Area (sq ft) * 97.20 * 157.09 * 31.54 *
 * Q Total (cfs) * 2110.00 * Flow (cfs) * 503.21 * 1462.29 * 144.50 *
 * Top Width (ft) * 139.06 * Top Width (ft) * 73.65 * 22.07 * 43.34 *
 * Vel Total (ft/s) * 7.38 * Avg. Vel. (ft/s) * 5.18 * 9.31 * 4.58 *
 * Max Chl Dpth (ft) * 7.77 * Hydr. Depth (ft) * 1.32 * 7.12 * 0.73 *
 * Conv. Total (cfs) * 29202.6 * Conv. (cfs) * 6964.4 * 20238.3 * 1999.9 *
 * Length Wtd. (ft) * 50.85 * Wetted Per. (ft) * 74.83 * 29.71 * 43.51 *
 * Min Ch El (ft) * 254.31 * Shear (lb/sq ft) * 0.42 * 1.72 * 0.24 *
 * Alpha * 1.25 * Stream Power (lb/ft s) * 222.68 * 0.00 * 0.00 *
 * Frctn Loss (ft) * 0.86 * Cum Volume (acre-ft) * 3.76 * 12.46 * 3.27 *
 * C & E Loss (ft) * 0.26 * Cum SA (acres) * 2.40 * 1.19 * 2.59 *

Warning: The energy equation could not be balanced within the specified number of iterations. The program
 selected the water

surface that had the least amount of error between computed and assumed values.

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
 additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or
 greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
 This may indicate the
 need for additional cross sections.

CROSS SECTION

RIVER: hudson

REACH: main RS: 37

INPUT

Description:

Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	264	20	260.01	36.61	259.64	40.55	259.78	51.16	260.22
63.4	260.02	64.06	260.27	69.53	260.38	75.38	259.43	76.33	256.54
76.82	253.52	80.8	253.37	85.55	253.19	94.42	253.51	94.78	255.27
94.97	256.342	95.51	259.39	114.56	260	126.13	260.27	138.62	260.6
153.18	260.1	168.22	262.2						

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	40.55	.02	75.38	.035	95.51	.045	126.13	.02
153.18	.1								

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 75.38 95.51 63.51 64.27 60.78 .1 .3

Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 24.82 27.7 265 F

Blocked Obstructions num= 1
 Sta L Sta R Elev
 0 24.82 265

CROSS SECTION OUTPUT Profile #2-YR

 * E.G. Elev (ft) * 257.24 * Element * Left OB * Channel * Right OB *
 * Vel Head (ft) * 0.56 * Wt. n-Val. * * 0.035 * *
 * W.S. Elev (ft) * 256.68 * Reach Len. (ft) * 63.51 * 64.27 * 60.78 *
 * Crit W.S. (ft) * 255.71 * Flow Area (sq ft) * * 60.35 * *
 * E.G. Slope (ft/ft) * 0.005917 * Area (sq ft) * * 60.35 * *

```

* Q Total (cfs)          * 364.00 * Flow (cfs)           *          * 364.00 *          *
* Top Width (ft)        * 18.75 * Top Width (ft)       *          * 18.75 *          *
* Vel Total (ft/s)      * 6.03  * Avg. Vel. (ft/s)     *          * 6.03  *          *
* Max Chl Dpth (ft)    * 3.49  * Hydr. Depth (ft)     *          * 3.22  *          *
* Conv. Total (cfs)     * 4732.3 * Conv. (cfs)          *          * 4732.3 *          *
* Length Wtd. (ft)     * 64.27 * Wetted Per. (ft)     *          * 24.04 *          *
* Min Ch El (ft)       * 253.19 * Shear (lb/sq ft)     *          * 0.93  *          *
* Alpha                 * 1.00  * Stream Power (lb/ft s) * 168.22 * 0.00  * 0.00  *
* Frctn Loss (ft)      * 0.60  * Cum Volume (acre-ft) * 0.00  * 2.20  * 0.00  *
* C & E Loss (ft)      * 0.05  * Cum SA (acres)       * 0.00  * 1.00  * 0.07  *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)        * 260.16 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)         * 1.26  * Wt. n-Val.           *          * 0.035 *          *
* W.S. Elev (ft)        * 258.90 * Reach Len. (ft)      * 63.51  * 64.27 * 60.78  *
* Crit W.S. (ft)        * 257.73 * Flow Area (sq ft)    *          * 103.33 *          *
* E.G. Slope (ft/ft)    * 0.008125 * Area (sq ft)         *          * 103.33 *          *
* Q Total (cfs)         * 930.00 * Flow (cfs)           *          * 930.00 *          *
* Top Width (ft)        * 19.87 * Top Width (ft)       *          * 19.87 *          *
* Vel Total (ft/s)      * 9.00  * Avg. Vel. (ft/s)     *          * 9.00  *          *
* Max Chl Dpth (ft)    * 5.71  * Hydr. Depth (ft)     *          * 5.20  *          *
* Conv. Total (cfs)     * 10317.3 * Conv. (cfs)          *          * 10317.3 *          *
* Length Wtd. (ft)     * 64.27 * Wetted Per. (ft)     *          * 28.65 *          *
* Min Ch El (ft)       * 253.19 * Shear (lb/sq ft)     *          * 1.83  *          *
* Alpha                 * 1.00  * Stream Power (lb/ft s) * 168.22 * 0.00  * 0.00  *
* Frctn Loss (ft)      * 0.72  * Cum Volume (acre-ft) * 1.13  * 6.28  * 0.60  *
* C & E Loss (ft)      * 0.07  * Cum SA (acres)       * 1.35  * 1.14  * 1.36  *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)        * 262.32 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)         * 1.39  * Wt. n-Val.           * 0.026  * 0.035 * 0.036  *
* W.S. Elev (ft)        * 260.92 * Reach Len. (ft)      * 63.51  * 64.27 * 60.78  *
* Crit W.S. (ft)        * 261.30 * Flow Area (sq ft)    * 44.74  * 143.91 * 49.44  *
* E.G. Slope (ft/ft)    * 0.007279 * Area (sq ft)         * 47.77  * 143.91 * 49.44  *
* Q Total (cfs)         * 1865.00 * Flow (cfs)           * 214.63 * 1492.83 * 157.55 *
* Top Width (ft)        * 134.26 * Top Width (ft)       * 50.56  * 20.13 * 63.57  *
* Vel Total (ft/s)      * 7.83  * Avg. Vel. (ft/s)     * 4.80  * 10.37 * 3.19  *
* Max Chl Dpth (ft)    * 7.73  * Hydr. Depth (ft)     * 0.94  * 7.15  * 0.78  *
* Conv. Total (cfs)     * 21860.3 * Conv. (cfs)          * 2515.7 * 17497.9 * 1846.7 *
* Length Wtd. (ft)     * 63.96 * Wetted Per. (ft)     * 47.82  * 29.69 * 63.65  *
* Min Ch El (ft)       * 253.19 * Shear (lb/sq ft)     * 0.43  * 2.20  * 0.35  *
* Alpha                 * 1.46  * Stream Power (lb/ft s) * 168.22 * 0.00  * 0.00  *
* Frctn Loss (ft)      * 0.36  * Cum Volume (acre-ft) * 2.79  * 10.45 * 2.36  *
* C & E Loss (ft)      * 0.01  * Cum SA (acres)       * 2.06  * 1.16  * 2.12  *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)        * 262.76 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)         * 1.51  * Wt. n-Val.           * 0.025  * 0.035 * 0.034  *
* W.S. Elev (ft)        * 261.25 * Reach Len. (ft)      * 63.51  * 64.27 * 60.78  *
* Crit W.S. (ft)        * 261.63 * Flow Area (sq ft)    * 60.37  * 150.51 * 70.67  *
* E.G. Slope (ft/ft)    * 0.007918 * Area (sq ft)         * 64.35  * 150.51 * 70.67  *
* Q Total (cfs)         * 2353.00 * Flow (cfs)           * 375.20 * 1677.87 * 299.94 *
* Top Width (ft)        * 136.61 * Top Width (ft)       * 50.56  * 20.13 * 65.92  *
* Vel Total (ft/s)      * 8.36  * Avg. Vel. (ft/s)     * 6.21  * 11.15 * 4.24  *

```

```

* Max Chl Dpth (ft)      * 8.06 * Hydr. Depth (ft)      * 1.27 * 7.48 * 1.07 *
* Conv. Total (cfs)     * 26442.8 * Conv. (cfs)         * 4216.4 * 18855.7 * 3370.7 *
* Length Wtd. (ft)     * 63.79 * Wetted Per. (ft)   * 47.82 * 29.69 * 66.03 *
* Min Ch El (ft)       * 253.19 * Shear (lb/sq ft)   * 0.62 * 2.51 * 0.53 *
* Alpha                 * 1.39 * Stream Power (lb/ft s) * 168.22 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 0.33 * Cum Volume (acre-ft) * 3.67 * 12.28 * 3.21 *
* C & E Loss (ft)      * 0.05 * Cum SA (acres)     * 2.33 * 1.17 * 2.53 *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
REACH: main RS: 36

INPUT

Description:

Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	261.81	18.27	260.05	31.92	258.51	38.67	258.86	48.77	259.26
63.07	259.14	63.8	259.62	68.79	259.63	78.21	259.56	85.38	259.39
95.85	258.62	96.33	255.18	96.88	253.12	104.68	252.84	105.34	252.93
111.53	253.8	116.04	253.82	116.53	255.43	117.13	258.54	134.15	259.47
148.83	260.07	164.32	260.56	184.71	266.62				

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	31.92	.02	68.79	.045	95.85	.035	117.13	.02
164.32	.1								

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	95.85	117.13		34	38.78	43.34		.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	10.17	270	F

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft)      * 256.59 * Element             * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.08 * Wt. n-Val.         *         * 0.035 *         *
* W.S. Elev (ft)     * 255.51 * Reach Len. (ft)   * 34.00 * 38.78 * 43.34 *
* Crit W.S. (ft)     * 255.51 * Flow Area (sq ft) *         * 43.65 *         *
* E.G. Slope (ft/ft) * 0.016866 * Area (sq ft)     *         * 43.65 *         *
* Q Total (cfs)      * 364.00 * Flow (cfs)        *         * 364.00 *         *
* Top Width (ft)     * 20.26 * Top Width (ft)    *         * 20.26 *         *
* Vel Total (ft/s)   * 8.34 * Avg. Vel. (ft/s)  *         * 8.34 *         *
* Max Chl Dpth (ft) * 2.67 * Hydr. Depth (ft)  *         * 2.15 *         *
* Conv. Total (cfs) * 2802.9 * Conv. (cfs)       *         * 2802.9 *         *
* Length Wtd. (ft)  * 38.78 * Wetted Per. (ft)  *         * 23.47 *         *
* Min Ch El (ft)    * 252.84 * Shear (lb/sq ft)  *         * 1.96 *         *
* Alpha             * 1.00 * Stream Power (lb/ft s) * 184.71 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 0.63 * Cum Volume (acre-ft) * 0.00 * 2.12 * 0.00 *
* C & E Loss (ft)   * 0.04 * Cum SA (acres)    * 0.00 * 0.97 * 0.07 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)      * 259.37 * Element             * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.98 * Wt. n-Val.         *         * 0.035 *         *
* W.S. Elev (ft)     * 257.39 * Reach Len. (ft)   * 34.00 * 38.78 * 43.34 *
* Crit W.S. (ft)     * 257.39 * Flow Area (sq ft) *         * 82.30 *         *
* E.G. Slope (ft/ft) * 0.016248 * Area (sq ft)     *         * 82.30 *         *
* Q Total (cfs)      * 930.00 * Flow (cfs)        *         * 930.00 *         *

```

```

* Top Width (ft)          * 20.89 * Top Width (ft)          *          * 20.89 *          *
* Vel Total (ft/s)       * 11.30 * Avg. Vel. (ft/s)       *          * 11.30 *          *
* Max Chl Dpth (ft)     * 4.55 * Hydr. Depth (ft)      *          * 3.94 *          *
* Conv. Total (cfs)      * 7296.0 * Conv. (cfs)           *          * 7296.0 *          *
* Length Wtd. (ft)      * 38.78 * Wetted Per. (ft)      *          * 27.28 *          *
* Min Ch El (ft)        * 252.84 * Shear (lb/sq ft)     *          * 3.06 *          *
* Alpha                  * 1.00 * Stream Power (lb/ft s) * 184.71 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.57 * Cum Volume (acre-ft)  * 1.13 * 6.15 * 0.60 *
* C & E Loss (ft)       * 0.15 * Cum SA (acres)        * 1.35 * 1.11 * 1.36 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid

subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)         * 261.71 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)         * 1.89  * Wt. n-Val.            * 0.026  * 0.035  * 0.020  *
* W.S. Elev (ft)        * 259.83 * Reach Len. (ft)       * 34.00  * 38.78  * 43.34  *
* Crit W.S. (ft)        * 260.48 * Flow Area (sq ft)     * 46.64  * 133.87 * 15.51  *
* E.G. Slope (ft/ft)    * 0.010392 * Area (sq ft)         * 46.64  * 133.87 * 15.51  *
* Q Total (cfs)         * 1865.00 * Flow (cfs)           * 199.77 * 1581.45 * 83.78  *
* Top Width (ft)        * 122.59 * Top Width (ft)       * 75.59  * 21.28  * 25.72  *
* Vel Total (ft/s)      * 9.51  * Avg. Vel. (ft/s)     * 4.28   * 11.81  * 5.40   *
* Max Chl Dpth (ft)     * 6.99  * Hydr. Depth (ft)     * 0.62   * 6.29   * 0.60   *
* Conv. Total (cfs)     * 18294.5 * Conv. (cfs)          * 1959.6 * 15513.1 * 821.8  *
* Length Wtd. (ft)     * 38.63 * Wetted Per. (ft)     * 75.86  * 29.69  * 25.75  *
* Min Ch El (ft)       * 252.84 * Shear (lb/sq ft)     * 0.40   * 2.93   * 0.39   *
* Alpha                 * 1.34  * Stream Power (lb/ft s) * 184.71 * 0.00   * 0.00   *
* Frctn Loss (ft)      * 0.55  * Cum Volume (acre-ft) * 2.72   * 10.24  * 2.31   *
* C & E Loss (ft)      * 0.05  * Cum SA (acres)       * 1.97   * 1.13   * 2.06   *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)         * 262.13 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)         * 1.94  * Wt. n-Val.            * 0.026  * 0.035  * 0.020  *
* W.S. Elev (ft)        * 260.19 * Reach Len. (ft)       * 34.00  * 38.78  * 43.34  *
* Crit W.S. (ft)        * 260.83 * Flow Area (sq ft)     * 74.56  * 141.57 * 26.45  *
* E.G. Slope (ft/ft)    * 0.010752 * Area (sq ft)         * 74.56  * 141.57 * 26.45  *
* Q Total (cfs)         * 2353.00 * Flow (cfs)           * 419.75 * 1765.55 * 167.70 *
* Top Width (ft)        * 135.68 * Top Width (ft)       * 79.00  * 21.28  * 35.40  *
* Vel Total (ft/s)      * 9.70  * Avg. Vel. (ft/s)     * 5.63   * 12.47  * 6.34   *
* Max Chl Dpth (ft)     * 7.35  * Hydr. Depth (ft)     * 0.94   * 6.65   * 0.75   *
* Conv. Total (cfs)     * 22692.3 * Conv. (cfs)          * 4048.1 * 17027.0 * 1617.3 *
* Length Wtd. (ft)     * 38.51 * Wetted Per. (ft)     * 79.29  * 29.69  * 35.44  *
* Min Ch El (ft)       * 252.84 * Shear (lb/sq ft)     * 0.63   * 3.20   * 0.50   *
* Alpha                 * 1.33  * Stream Power (lb/ft s) * 184.71 * 0.00   * 0.00   *
* Frctn Loss (ft)      * 0.59  * Cum Volume (acre-ft) * 3.57   * 12.06  * 3.14   *
* C & E Loss (ft)      * 0.04  * Cum SA (acres)       * 2.24   * 1.14   * 2.46   *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main RS: 35

INPUT

Description:

Station Elevation Data num= 25
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev

```

*****
0 272.29 12.72 268.66 14.93 263.32 22.97 258.48 24.24 258.47
28.13 258.35 28.26 258.02 35.22 258.31 46.72 258.76 58.21 258.6
62.8 258.53 65.06 258.27 65.77 258.45 66.39 258.71 97.96 258.28
101.22 258.07 106.12 255.1 111.68 252.21 119.94 252.29 120.05 252.29
126.93 252.72 131.27 254.45 138.58 257.73 150.13 262.76 157.42 263.01

```

```

Manning's n Values      num=      5
Sta  n Val      Sta  n Val      Sta  n Val      Sta  n Val
*****
0      .045  28.13      .02  65.77      .045  101.22      .035  138.58      .1

```

```

Bank Sta: Left  Right      Lengths: Left Channel  Right      Coeff Contr.  Expan.
          101.22 138.58          69.27  79.77  85.15          .1          .3

```

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft)      * 255.75 * Element      * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.37 * Wt. n-Val.   *      *      *      *
* W.S. Elev (ft)      * 254.38 * Reach Len. (ft) * 69.27 * 79.77 * 85.15 *
* Crit W.S. (ft)      * 254.71 * Flow Area (sq ft) *      * 38.80 *      *
* E.G. Slope (ft/ft) * 0.026415 * Area (sq ft) *      * 38.80 *      *
* Q Total (cfs)      * 364.00 * Flow (cfs) *      * 364.00 *      *
* Top Width (ft)      * 23.61 * Top Width (ft) *      * 23.61 *      *
* Vel Total (ft/s)    * 9.38 * Avg. Vel. (ft/s) *      * 9.38 *      *
* Max Chl Dpth (ft)  * 2.17 * Hydr. Depth (ft) *      * 1.64 *      *
* Conv. Total (cfs)   * 2239.6 * Conv. (cfs) *      * 2239.6 *      *
* Length Wtd. (ft)   * 79.77 * Wetted Per. (ft) *      * 24.47 *      *
* Min Ch El (ft)     * 252.21 * Shear (lb/sq ft) *      * 2.61 *      *
* Alpha              * 1.00 * Stream Power (lb/ft s) * 157.42 * 0.00 * 0.00 *
* Frctn Loss (ft)    * 0.81 * Cum Volume (acre-ft) * 0.00 * 2.08 * 0.00 *
* C & E Loss (ft)    * 0.03 * Cum SA (acres) * 0.00 * 0.95 * 0.07 *
*****

```

Note: Program found supercritical flow starting at this cross section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)      * 258.40 * Element      * Left OB * Channel * Right OB *
* Vel Head (ft)      * 2.88 * Wt. n-Val.   *      * 0.035 *      *
* W.S. Elev (ft)      * 255.52 * Reach Len. (ft) * 69.27 * 79.77 * 85.15 *
* Crit W.S. (ft)      * 256.40 * Flow Area (sq ft) *      * 68.26 *      *
* E.G. Slope (ft/ft) * 0.033829 * Area (sq ft) *      * 68.26 *      *
* Q Total (cfs)      * 930.00 * Flow (cfs) *      * 930.00 *      *
* Top Width (ft)      * 28.22 * Top Width (ft) *      * 28.22 *      *
* Vel Total (ft/s)    * 13.62 * Avg. Vel. (ft/s) *      * 13.62 *      *
* Max Chl Dpth (ft)  * 3.31 * Hydr. Depth (ft) *      * 2.42 *      *
* Conv. Total (cfs)   * 5056.4 * Conv. (cfs) *      * 5056.4 *      *
* Length Wtd. (ft)   * 79.77 * Wetted Per. (ft) *      * 29.62 *      *
* Min Ch El (ft)     * 252.21 * Shear (lb/sq ft) *      * 4.87 *      *
* Alpha              * 1.00 * Stream Power (lb/ft s) * 157.42 * 0.00 * 0.00 *
* Frctn Loss (ft)    * 0.88 * Cum Volume (acre-ft) * 1.13 * 6.08 * 0.60 *
* C & E Loss (ft)    * 0.09 * Cum SA (acres) * 1.35 * 1.09 * 1.36 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Program found supercritical flow starting at this cross section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)      * 260.91 * Element      * Left OB * Channel * Right OB *
* Vel Head (ft)      * 3.74 * Wt. n-Val.   *      * 0.035 *      *
* W.S. Elev (ft)      * 257.17 * Reach Len. (ft) * 69.27 * 79.77 * 85.15 *
* Crit W.S. (ft)      * 259.15 * Flow Area (sq ft) *      * 120.17 *      *
* E.G. Slope (ft/ft) * 0.027628 * Area (sq ft) *      * 120.17 *      *
* Q Total (cfs)      * 1865.00 * Flow (cfs) *      * 1865.00 *      *
* Top Width (ft)      * 34.63 * Top Width (ft) *      * 34.63 *      *
* Vel Total (ft/s)    * 15.52 * Avg. Vel. (ft/s) *      * 15.52 *      *
* Max Chl Dpth (ft)  * 4.96 * Hydr. Depth (ft) *      * 3.47 *      *
* Conv. Total (cfs)   * 11220.2 * Conv. (cfs) *      * 11220.2 *      *
* Length Wtd. (ft)   * 79.77 * Wetted Per. (ft) *      * 36.84 *      *

```



```

* Min Ch El (ft)          * 252.21 * Shear (lb/sq ft)      *          * 5.63 *
* Alpha                   * 1.00 * Stream Power (lb/ft s) * 157.42 * 0.00 * 0.00 *
* Frctn Loss (ft)        * 0.62 * Cum Volume (acre-ft)  * 2.70 * 10.13 * 2.31 *
* C & E Loss (ft)        * 0.19 * Cum SA (acres)        * 1.94 * 1.11 * 2.05 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)          * 261.51 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)           * 3.09  * Wt. n-Val.             * 0.025 * 0.035 * 0.100 *
* W.S. Elev (ft)          * 258.42 * Reach Len. (ft)        * 69.27 * 79.77 * 85.15 *
* Crit W.S. (ft)          * 259.61 * Flow Area (sq ft)      * 3.77 * 165.93 * 0.55 *
* E.G. Slope (ft/ft)      * 0.016582 * Area (sq ft)          * 3.77 * 165.93 * 0.55 *
* Q Total (cfs)           * 2353.00 * Flow (cfs)             * 8.22 * 2344.29 * 0.49 *
* Top Width (ft)          * 66.94 * Top Width (ft)         * 27.99 * 37.36 * 1.59 *
* Vel Total (ft/s)        * 13.82 * Avg. Vel. (ft/s)       * 2.18 * 14.13 * 0.89 *
* Max Chl Dpth (ft)       * 6.21  * Hydr. Depth (ft)       * 0.13 * 4.44 * 0.35 *
* Conv. Total (cfs)       * 18272.5 * Conv. (cfs)            * 63.8 * 18204.8 * 3.8 *
* Length Wtd. (ft)        * 79.75 * Wetted Per. (ft)       * 28.26 * 39.94 * 1.73 *
* Min Ch El (ft)         * 252.21 * Shear (lb/sq ft)      * 0.14 * 4.30 * 0.33 *
* Alpha                   * 1.04 * Stream Power (lb/ft s) * 157.42 * 0.00 * 0.00 *
* Frctn Loss (ft)        * 0.51 * Cum Volume (acre-ft)  * 3.53 * 11.93 * 3.13 *
* C & E Loss (ft)        * 0.11 * Cum SA (acres)        * 2.20 * 1.11 * 2.44 *
*****

```

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: hudson
REACH: main RS: 34

INPUT

Description:

Station Elevation Data num= 26

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	270.86	5.82	269.22	16.88	263.73	17.79	259.61	22.7	257.28
26.7	257.19	26.85	256.92	33.08	257.17	44.84	257.6	55.58	257.27
59.49	257.15	61.23	256.88	62.36	256.99	63.12	257.26	82.27	256.72
95.14	256.54	96.56	254.93	98.86	251.53	103.36	249.74	105.37	248.88
113.05	249	116.46	249.69	123.31	251.6	126.88	255.05	132.96	260.69
151.23	267.31								

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	22.7	.02	63.12	.045	96.56	.05	126.88	.045
132.96	.1								

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	96.56	126.88		59.8	61.46	61.27	.1 .3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
83.83	95	265	F

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft)          * 252.79 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)           * 1.42  * Wt. n-Val.             *          * 0.050 *          *
* W.S. Elev (ft)          * 251.37 * Reach Len. (ft)        * 59.80 * 61.46 * 61.27 *
* Crit W.S. (ft)          * 251.72 * Flow Area (sq ft)      *          * 38.10 *          *
* E.G. Slope (ft/ft)      * 0.055821 * Area (sq ft)          *          * 38.10 *          *
* Q Total (cfs)           * 364.00 * Flow (cfs)             *          * 364.00 *          *
* Top Width (ft)          * 23.22 * Top Width (ft)         *          * 23.22 *          *
* Vel Total (ft/s)        * 9.55  * Avg. Vel. (ft/s)       *          * 9.55 *          *
* Max Chl Dpth (ft)       * 2.49  * Hydr. Depth (ft)       *          * 1.64 *          *
* Conv. Total (cfs)       * 1540.6 * Conv. (cfs)            *          * 1540.6 *          *
* Length Wtd. (ft)        * 61.46 * Wetted Per. (ft)       *          * 24.01 *          *
* Min Ch El (ft)         * 248.88 * Shear (lb/sq ft)      *          * 5.53 *          *
*****

```

```

* Alpha * 1.00 * Stream Power (lb/ft s) * 151.23 * 0.00 * 0.00 *
* Frctn Loss (ft) * 2.96 * Cum Volume (acre-ft) * 0.00 * 2.01 * 0.00 *
* C & E Loss (ft) * 0.01 * Cum SA (acres) * 0.00 * 0.91 * 0.07 *
*****

```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft) * 255.16 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 2.23 * Wt. n-Val. * * 0.050 * *
* W.S. Elev (ft) * 252.93 * Reach Len. (ft) * 59.80 * 61.46 * 61.27 *
* Crit W.S. (ft) * 253.40 * Flow Area (sq ft) * * 77.61 * *
* E.G. Slope (ft/ft) * 0.043553 * Area (sq ft) * * 77.61 * *
* Q Total (cfs) * 930.00 * Flow (cfs) * * 930.00 * *
* Top Width (ft) * 26.77 * Top Width (ft) * * 26.77 * *
* Vel Total (ft/s) * 11.98 * Avg. Vel. (ft/s) * * 11.98 * *
* Max Chl Dpth (ft) * 4.05 * Hydr. Depth (ft) * * 2.90 * *
* Conv. Total (cfs) * 4456.3 * Conv. (cfs) * * 4456.3 * *
* Length Wtd. (ft) * 61.46 * Wetted Per. (ft) * * 28.90 * *
* Min Ch El (ft) * 248.88 * Shear (lb/sq ft) * * 7.30 * *
* Alpha * 1.00 * Stream Power (lb/ft s) * 151.23 * 0.00 * 0.00 *
* Frctn Loss (ft) * 3.05 * Cum Volume (acre-ft) * 1.13 * 5.94 * 0.60 *
* C & E Loss (ft) * 0.20 * Cum SA (acres) * 1.35 * 1.04 * 1.36 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft) * 258.09 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 3.51 * Wt. n-Val. * * 0.050 * *
* W.S. Elev (ft) * 254.57 * Reach Len. (ft) * 59.80 * 61.46 * 61.27 *
* Crit W.S. (ft) * 255.40 * Flow Area (sq ft) * * 123.99 * *
* E.G. Slope (ft/ft) * 0.044305 * Area (sq ft) * * 123.99 * *
* Q Total (cfs) * 1865.00 * Flow (cfs) * * 1865.00 * *
* Top Width (ft) * 29.58 * Top Width (ft) * * 29.58 * *
* Vel Total (ft/s) * 15.04 * Avg. Vel. (ft/s) * * 15.04 * *
* Max Chl Dpth (ft) * 5.69 * Hydr. Depth (ft) * * 4.19 * *
* Conv. Total (cfs) * 8860.4 * Conv. (cfs) * * 8860.4 * *
* Length Wtd. (ft) * 61.45 * Wetted Per. (ft) * * 33.25 * *
* Min Ch El (ft) * 248.88 * Shear (lb/sq ft) * * 10.31 * *
* Alpha * 1.00 * Stream Power (lb/ft s) * 151.23 * 0.00 * 0.00 *
* Frctn Loss (ft) * 2.75 * Cum Volume (acre-ft) * 2.70 * 9.91 * 2.31 *
* C & E Loss (ft) * 0.07 * Cum SA (acres) * 1.94 * 1.05 * 2.05 *
*****

```

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft) * 259.37 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 4.12 * Wt. n-Val. * * 0.050 * * 0.045 *
* W.S. Elev (ft) * 255.25 * Reach Len. (ft) * 59.80 * 61.46 * 61.27 *
* Crit W.S. (ft) * 256.25 * Flow Area (sq ft) * * 0.05 * 144.48 * 0.02 *
* E.G. Slope (ft/ft) * 0.044261 * Area (sq ft) * * 0.05 * 144.48 * 0.02 *
* Q Total (cfs) * 2353.00 * Flow (cfs) * * 0.07 * 2352.90 * 0.03 *
* Top Width (ft) * 30.83 * Top Width (ft) * * 0.29 * 30.32 * 0.22 *
* Vel Total (ft/s) * 16.28 * Avg. Vel. (ft/s) * * 1.57 * 16.29 * 1.23 *
* Max Chl Dpth (ft) * 6.37 * Hydr. Depth (ft) * * 0.16 * 4.77 * 0.10 *
* Conv. Total (cfs) * 11184.3 * Conv. (cfs) * * 0.3 * 11183.9 * 0.1 *
* Length Wtd. (ft) * 61.36 * Wetted Per. (ft) * * 0.43 * 34.37 * 0.30 *

```

```

* Min Ch El (ft)      * 248.88 * Shear (lb/sq ft)   * 0.30 * 11.62 * 0.21 *
* Alpha              * 1.00 * Stream Power (lb/ft s) * 151.23 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 2.04 * Cum Volume (acre-ft) * 3.53 * 11.64 * 3.13 *
* C & E Loss (ft)   * 0.10 * Cum SA (acres)      * 2.17 * 1.05 * 2.44 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main

RS: 33

INPUT

Description:

```

Station Elevation Data      num=      31
Sta      Elev      Sta      Elev      Sta      Elev      Sta      Elev      Sta      Elev
*****
0      267.97    11.3    262.18    12.79    256.32    14.18    255.91    17.8    255.8
17.92    255.46    24.87    255.71    35.98    256.23    47.24    256.09    51.14    255.99
52.99    255.73    54.13    255.85    54.77    256.14    56.99    256.29    59.17    257.32
63.7     257.22    68.17    255.85    74.07    255.58    75.41    254.94    79.49    252.81
81.03    250.1     81.57    248.66    82.17    247.45    88.62    246.6     89.54    246.48
93.53    247.41    98.75    247.71    100.67   248.38    102.43   249.97    108.59   254.98
126.55   265.81

```

```

Manning's n Values      num=      6
Sta      n Val      Sta      n Val      Sta      n Val      Sta      n Val      Sta      n Val
*****
0      .045    14.18    .02    63.7     .045    79.49    .05    102.43   .045
108.59    .1

```

```

Bank Sta: Left  Right  Lengths: Left Channel  Right  Coeff Contr.  Expan.
          79.49 108.59          21.85 21.89          21.7          .1          .3
Ineffective Flow      num=      1
Sta L  Sta R  Elev Permanent
  65    79    265          F

```

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft)      * 250.99 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.49 * Wt. n-Val.      *          * 0.050 *          *
* W.S. Elev (ft)     * 250.51 * Reach Len. (ft) * 21.85 * 21.89 * 21.70 *
* Crit W.S. (ft)     * 249.52 * Flow Area (sq ft) *          * 65.12 *          *
* E.G. Slope (ft/ft) * 0.010003 * Area (sq ft)    *          * 65.12 *          *
* Q Total (cfs)      * 364.00 * Flow (cfs)      *          * 364.00 *          *
* Top Width (ft)     * 22.29 * Top Width (ft)  *          * 22.29 *          *
* Vel Total (ft/s)   * 5.59 * Avg. Vel. (ft/s) *          * 5.59 *          *
* Max Chl Dpth (ft)  * 4.03 * Hydr. Depth (ft) *          * 2.92 *          *
* Conv. Total (cfs)  * 3639.4 * Conv. (cfs)     *          * 3639.4 *          *
* Length Wtd. (ft)   * 21.89 * Wetted Per. (ft) *          * 25.38 *          *
* Min Ch El (ft)     * 246.48 * Shear (lb/sq ft) *          * 1.60 *          *
* Alpha              * 1.00 * Stream Power (lb/ft s) * 126.55 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 0.22 * Cum Volume (acre-ft) * 0.00 * 1.94 * 0.00 *
* C & E Loss (ft)   * 0.00 * Cum SA (acres)  * 0.00 * 0.88 * 0.07 *
*****

```

Note: Manning's n values were composited to a single value in the main channel.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)      * 253.81 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.86 * Wt. n-Val.      * 0.045 * 0.049 *          *
* W.S. Elev (ft)     * 252.95 * Reach Len. (ft) * 21.85 * 21.89 * 21.70 *
* Crit W.S. (ft)     * 251.42 * Flow Area (sq ft) * 0.02 * 125.00 *          *
* E.G. Slope (ft/ft) * 0.009852 * Area (sq ft)    * 0.02 * 125.00 *          *

```

```

* Q Total (cfs)          * 930.00 * Flow (cfs)           * 0.01 * 929.99 *
* Top Width (ft)        * 26.88 * Top Width (ft)       * 0.28 * 26.61 *
* Vel Total (ft/s)      * 7.44 * Avg. Vel. (ft/s)    * 0.52 * 7.44 *
* Max Chl Dpth (ft)    * 6.47 * Hydr. Depth (ft)    * 0.07 * 4.70 *
* Conv. Total (cfs)     * 9369.5 * Conv. (cfs)         * 0.1 * 9369.4 *
* Length Wtd. (ft)     * 21.89 * Wetted Per. (ft)    * 0.31 * 31.90 *
* Min Ch El (ft)       * 246.48 * Shear (lb/sq ft)   * 0.04 * 2.41 *
* Alpha                 * 1.00 * Stream Power (lb/ft s) * 126.55 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 0.21 * Cum Volume (acre-ft) * 1.13 * 5.80 * 0.60 *
* C & E Loss (ft)      * 0.02 * Cum SA (acres)     * 1.35 * 1.00 * 1.36 *
*****

```

Note: Manning's n values were composited to a single value in the main channel.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)        * 257.14 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)        * 1.20 * Wt. n-Val.           * 0.032 * 0.049 * 0.100 *
* W.S. Elev (ft)       * 255.94 * Reach Len. (ft)     * 21.85 * 21.89 * 21.70 *
* Crit W.S. (ft)       * 253.66 * Flow Area (sq ft)   * 5.20 * 209.40 * 0.77 *
* E.G. Slope (ft/ft)   * 0.007794 * Area (sq ft)        * 14.42 * 209.40 * 0.77 *
* Q Total (cfs)        * 1865.00 * Flow (cfs)          * 16.72 * 1847.72 * 0.56 *
* Top Width (ft)       * 60.88 * Top Width (ft)      * 30.19 * 29.10 * 1.59 *
* Vel Total (ft/s)     * 8.66 * Avg. Vel. (ft/s)    * 3.21 * 8.82 * 0.73 *
* Max Chl Dpth (ft)    * 9.46 * Hydr. Depth (ft)    * 0.27 * 7.20 * 0.48 *
* Conv. Total (cfs)    * 21125.3 * Conv. (cfs)         * 189.4 * 20929.6 * 6.3 *
* Length Wtd. (ft)    * 21.89 * Wetted Per. (ft)    * 19.42 * 35.11 * 1.86 *
* Min Ch El (ft)      * 246.48 * Shear (lb/sq ft)   * 0.13 * 2.90 * 0.20 *
* Alpha                * 1.03 * Stream Power (lb/ft s) * 126.55 * 0.00 * 0.00 *
* Frctn Loss (ft)     * 0.13 * Cum Volume (acre-ft) * 2.69 * 9.67 * 2.30 *
* C & E Loss (ft)     * 0.16 * Cum SA (acres)     * 1.92 * 1.01 * 2.05 *
*****

```

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)        * 258.07 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)        * 1.10 * Wt. n-Val.           * 0.021 * 0.049 * 0.100 *
* W.S. Elev (ft)       * 256.97 * Reach Len. (ft)     * 21.85 * 21.89 * 21.70 *
* Crit W.S. (ft)       * 254.59 * Flow Area (sq ft)   * 46.99 * 239.26 * 3.27 *
* E.G. Slope (ft/ft)   * 0.006356 * Area (sq ft)        * 69.31 * 239.26 * 3.27 *
* Q Total (cfs)        * 2353.00 * Flow (cfs)          * 265.64 * 2083.88 * 3.48 *
* Top Width (ft)       * 93.16 * Top Width (ft)      * 60.76 * 29.10 * 3.30 *
* Vel Total (ft/s)     * 8.13 * Avg. Vel. (ft/s)    * 5.65 * 8.71 * 1.06 *
* Max Chl Dpth (ft)    * 10.49 * Hydr. Depth (ft)    * 1.00 * 8.22 * 0.99 *
* Conv. Total (cfs)    * 29513.0 * Conv. (cfs)         * 3331.9 * 26137.5 * 43.7 *
* Length Wtd. (ft)    * 21.88 * Wetted Per. (ft)    * 47.91 * 35.11 * 3.85 *
* Min Ch El (ft)      * 246.48 * Shear (lb/sq ft)   * 0.39 * 2.70 * 0.34 *
* Alpha                * 1.07 * Stream Power (lb/ft s) * 126.55 * 0.00 * 0.00 *
* Frctn Loss (ft)     * 0.10 * Cum Volume (acre-ft) * 3.48 * 11.37 * 3.13 *
* C & E Loss (ft)     * 0.16 * Cum SA (acres)     * 2.13 * 1.01 * 2.44 *
*****

```

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
REACH: main RS: 32

INPUT
Description:

Station Elevation Data		num= 26		Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	266.84	9.53	261.29	11.26	255.77	14.67	255.03	17.66	254.94				
17.8	254.66	26.41	255.03	37.4	255.52	48.5	255.51	52.57	255.4				
54.31	255.14	55.62	255.34	56.23	255.61	65.26	255.59	74.5	255.3				
79.26	253.29	81.14	250.5	82.86	247.64	85.73	246.65	88.71	246.53				
92.02	246.39	101.96	248.55	106	251.15	112.23	255.1	119.71	256.72				
133.84	264.12												

Manning's n Values		num= 5		Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	14.67	.02	56.23	.045	79.26	.05	112.23	.1		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	79.26	112.23		24.44	27.61	26.31	.3 .5
Ineffective Flow	num= 1						
Sta L	Sta R	Elev	Permanent				
65	74.5	265	F				

CROSS SECTION OUTPUT Profile #2-YR

* E.G. Elev (ft)	* 250.77	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.49	* Wt. n-Val.	* 0.050	*	*
* W.S. Elev (ft)	* 250.29	* Reach Len. (ft)	* 2.00	* 2.00	* 2.00
* Crit W.S. (ft)	* 249.36	* Flow Area (sq ft)	*	* 65.11	*
* E.G. Slope (ft/ft)	* 0.010298	* Area (sq ft)	*	* 65.11	*
* Q Total (cfs)	* 364.00	* Flow (cfs)	*	* 364.00	*
* Top Width (ft)	* 23.39	* Top Width (ft)	*	* 23.39	*
* Vel Total (ft/s)	* 5.59	* Avg. Vel. (ft/s)	*	* 5.59	*
* Max Chl Dpth (ft)	* 3.90	* Hydr. Depth (ft)	*	* 2.78	*
* Conv. Total (cfs)	* 3587.0	* Conv. (cfs)	*	* 3587.0	*
* Length Wtd. (ft)	* 2.00	* Wetted Per. (ft)	*	* 25.80	*
* Min Ch El (ft)	* 246.39	* Shear (lb/sq ft)	*	* 1.62	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 133.84	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.02	* Cum Volume (acre-ft)	* 0.00	* 1.91	* 0.00
* C & E Loss (ft)	* 0.00	* Cum SA (acres)	* 0.00	* 0.87	* 0.07

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 253.58	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.78	* Wt. n-Val.	* 0.050	*	*
* W.S. Elev (ft)	* 252.80	* Reach Len. (ft)	* 2.00	* 2.00	* 2.00
* Crit W.S. (ft)	* 251.23	* Flow Area (sq ft)	*	* 130.89	*
* E.G. Slope (ft/ft)	* 0.009285	* Area (sq ft)	*	* 130.89	*
* Q Total (cfs)	* 930.00	* Flow (cfs)	*	* 930.00	*
* Top Width (ft)	* 29.01	* Top Width (ft)	*	* 29.01	*
* Vel Total (ft/s)	* 7.11	* Avg. Vel. (ft/s)	*	* 7.11	*
* Max Chl Dpth (ft)	* 6.41	* Hydr. Depth (ft)	*	* 4.51	*
* Conv. Total (cfs)	* 9651.3	* Conv. (cfs)	*	* 9651.3	*
* Length Wtd. (ft)	* 2.00	* Wetted Per. (ft)	*	* 33.49	*
* Min Ch El (ft)	* 246.39	* Shear (lb/sq ft)	*	* 2.27	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 133.84	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.02	* Cum Volume (acre-ft)	* 1.13	* 5.74	* 0.60
* C & E Loss (ft)	* 0.00	* Cum SA (acres)	* 1.35	* 0.99	* 1.36

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 256.85	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.68	* Wt. n-Val.	* 0.024	* 0.050	* 0.100
* W.S. Elev (ft)	* 256.18	* Reach Len. (ft)	* 2.00	* 2.00	* 2.00
* Crit W.S. (ft)	* 253.39	* Flow Area (sq ft)	* 55.27	* 238.01	* 2.67
* E.G. Slope (ft/ft)	* 0.004719	* Area (sq ft)	* 62.18	* 238.01	* 2.67
* Q Total (cfs)	* 1865.00	* Flow (cfs)	* 223.25	* 1639.97	* 1.78
* Top Width (ft)	* 106.06	* Top Width (ft)	* 68.13	* 32.97	* 4.97
* Vel Total (ft/s)	* 6.30	* Avg. Vel. (ft/s)	* 4.04	* 6.89	* 0.66
* Max Chl Dpth (ft)	* 9.79	* Hydr. Depth (ft)	* 0.94	* 7.22	* 0.54
* Conv. Total (cfs)	* 27147.9	* Conv. (cfs)	* 3249.8	* 23872.2	* 25.9
* Length Wtd. (ft)	* 2.00	* Wetted Per. (ft)	* 59.70	* 38.39	* 5.08
* Min Ch El (ft)	* 246.39	* Shear (lb/sq ft)	* 0.27	* 1.83	* 0.15

```

* Alpha * 1.10 * Stream Power (lb/ft s) * 133.84 * 0.00 * 0.00 *
* Frctn Loss (ft) * * Cum Volume (acre-ft) * 2.67 * 9.56 * 2.30 *
* C & E Loss (ft) * * Cum SA (acres) * 1.90 * 0.99 * 2.04 *
*****

```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft) * 257.81 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.56 * Wt. n-Val. * 0.024 * 0.050 * 0.100 *
* W.S. Elev (ft) * 257.25 * Reach Len. (ft) * 2.00 * 2.00 * 2.00 *
* Crit W.S. (ft) * 254.34 * Flow Area (sq ft) * 118.48 * 273.45 * 10.30 *
* E.G. Slope (ft/ft) * 0.003164 * Area (sq ft) * 135.60 * 273.45 * 10.30 *
* Q Total (cfs) * 2353.00 * Flow (cfs) * 651.06 * 1692.38 * 9.56 *
* Top Width (ft) * 109.93 * Top Width (ft) * 68.46 * 32.97 * 8.49 *
* Vel Total (ft/s) * 5.85 * Avg. Vel. (ft/s) * 5.50 * 6.19 * 0.93 *
* Max Chl Dpth (ft) * 10.86 * Hydr. Depth (ft) * 2.01 * 8.29 * 1.21 *
* Conv. Total (cfs) * 41831.1 * Conv. (cfs) * 11574.3 * 30086.8 * 169.9 *
* Length Wtd. (ft) * 2.00 * Wetted Per. (ft) * 60.82 * 38.39 * 8.80 *
* Min Ch El (ft) * 246.39 * Shear (lb/sq ft) * 0.38 * 1.41 * 0.23 *
* Alpha * 1.05 * Stream Power (lb/ft s) * 133.84 * 0.00 * 0.00 *
* Frctn Loss (ft) * * Cum Volume (acre-ft) * 3.43 * 11.24 * 3.12 *
* C & E Loss (ft) * * Cum SA (acres) * 2.10 * 0.99 * 2.43 *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

BRIDGE

RIVER: hudson
REACH: main RS: 31.5

INPUT

Description:
Distance from Upstream XS = 2
Deck/Roadway Width = 18
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 4

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
65	265	255	109	265	255	109.1	265	250						
110	265	250												

Upstream Bridge Cross Section Data

Station	Elevation	Data	num=	26					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	266.84	9.53	261.29	11.26	255.77	14.67	255.03	17.66	254.94
17.8	254.66	26.41	255.03	37.4	255.52	48.5	255.51	52.57	255.4
54.31	255.14	55.62	255.34	56.23	255.61	65.26	255.59	74.5	255.3
79.26	253.29	81.14	250.5	82.86	247.64	85.73	246.65	88.71	246.53
92.02	246.39	101.96	248.55	106	251.15	112.23	255.1	119.71	256.72
133.84	264.12								

Manning's n Values

Sta	n	Val	Sta	n	Val	Sta	n	Val	Sta	n	Val	Sta	n	Val
0	.045	14.67	.02	56.23	.045	79.26	.05	112.23	.1					

Bank Sta: Left Right Coeff Contr. Expan.
79.26 112.23 .3 .5

Ineffective Flow num= 1
Sta L Sta R Elev Permanent
65 74.5 265 F

Downstream Deck/Roadway Coordinates

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
68	265	255	112	265	255	112.1	265	250						
113	265	250												

Downstream Bridge Cross Section Data

Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	265.97	10.7	260.17	11.79	255.21	15.21	254.22	19.1	254.07
19.19	253.84	28.59	254.27	39.3	254.7	50.59	254.7	54.49	254.58
56.09	254.29	57.57	254.47	58.16	254.71	82.38	255.45	86.44	255.21
87.14	251.02	87.29	249.71	87.53	246.88	95.77	246.81	99.73	246.85
103.43	246.88	104.83	247.39	107.58	249.58	108.86	250.5	112.96	253.59
114.18	255.6	121.03	255.92	134	261.71				

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	15.21	.02	58.16	.045	86.44	.035	112.96	.1

Bank Sta: Left Right Coeff Contr. Expan.
 86.44 112.96 .3 .5

Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 65.65 86.44 265 F

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
 Downstream Embankment side slope = 0 horiz. to 1.0 vertical
 Maximum allowable submergence for weir flow = .98
 Elevation at which weir flow begins =
 Energy head used in spillway design =
 Spillway height used in design =
 Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
 Energy
 Selected Low Flow Methods = Energy

High Flow Method
 Pressure and Weir flow
 Submerged Inlet Cd =
 Submerged Inlet + Outlet Cd = .8
 Max Low Cord =

Additional Bridge Parameters
 Add Friction component to Momentum
 Do not add Weight component to Momentum
 Class B flow critical depth computations use critical depth
 inside the bridge at the upstream end
 Criteria to check for pressure flow = Upstream energy grade line

BRIDGE OUTPUT Profile #2-YR

* E.G. US. (ft)	*	250.77	* Element	* Inside BR US	* Inside BR DS	*
* W.S. US. (ft)	*	250.29	* E.G. Elev (ft)	*	250.55	*
* Q Total (cfs)	*	364.00	* W.S. Elev (ft)	*	250.25	*
* Q Bridge (cfs)	*	364.00	* Crit W.S. (ft)	*	249.37	*
* Q Weir (cfs)	*		* Max Chl Dpth (ft)	*	3.86	*
* Weir Sta Lft (ft)	*		* Vel Total (ft/s)	*	5.66	*
* Weir Sta Rgt (ft)	*		* Flow Area (sq ft)	*	64.34	*
* Weir Submerg	*		* Froude # Chl	*	0.60	*
* Weir Max Depth (ft)	*		* Specif Force (cu ft)	*	165.18	*
* Min El Weir Flow (ft)	*	253.70	* Hydr Depth (ft)	*	2.76	*
* Min El Prs (ft)	*	255.00	* W.P. Total (ft)	*	25.70	*
* Delta EG (ft)	*	0.44	* Conv. Total (cfs)	*	3525.8	*
* Delta WS (ft)	*	1.05	* Top Width (ft)	*	23.32	*
* BR Open Area (sq ft)	*	179.01	* Frctn Loss (ft)	*	0.16	*
* BR Open Vel (ft/s)	*	6.35	* C & E Loss (ft)	*	0.04	*
* Coef of Q	*		* Shear Total (lb/sq ft)	*	1.67	*
* Br Sel Method	*	*Energy only	* Power Total (lb/ft s)	*	0.00	*

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
 This may indicate the need for additional cross sections.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

BRIDGE OUTPUT Profile #10-YR

```

*****
* E.G. US. (ft) * 253.58 * Element *Inside BR US *Inside BR DS *
* W.S. US. (ft) * 252.80 * E.G. Elev (ft) * 253.56 * 253.28 *
* Q Total (cfs) * 930.00 * W.S. Elev (ft) * 252.77 * 252.07 *
* Q Bridge (cfs) * 930.00 * Crit W.S. (ft) * 251.23 * 251.19 *
* Q Weir (cfs) * * * Max Chl Dpth (ft) * 6.38 * 5.26 *
* Weir Sta Lft (ft) * * * Vel Total (ft/s) * 7.15 * 8.82 *
* Weir Sta Rgt (ft) * * * Flow Area (sq ft) * 130.12 * 105.40 *
* Weir Submerg * * * Froude # Chl * 0.59 * 0.74 *
* Weir Max Depth (ft) * * * Specif Force (cu ft) * 549.55 * 513.04 *
* Min El Weir Flow (ft) * 253.70 * Hydr Depth (ft) * 4.50 * 4.39 *
* Min El Prs (ft) * 255.00 * W.P. Total (ft) * 33.41 * 30.32 *
* Delta EG (ft) * 0.50 * Conv. Total (cfs) * 9571.8 * 10267.4 *
* Delta WS (ft) * 1.33 * Top Width (ft) * 28.95 * 23.98 *
* BR Open Area (sq ft) * 179.01 * Frctn Loss (ft) * 0.16 * 0.08 *
* BR Open Vel (ft/s) * 8.82 * C & E Loss (ft) * 0.12 * 0.12 *
* Coef of Q * * * Shear Total (lb/sq ft) * 2.30 * 1.78 *
* Br Sel Method *Energy only * Power Total (lb/ft s) * 0.00 * 0.00 *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

BRIDGE OUTPUT Profile #50-YR

```

*****
* E.G. US. (ft) * 256.85 * Element *Inside BR US *Inside BR DS *
* W.S. US. (ft) * 256.18 * E.G. Elev (ft) * 256.85 * 256.22 *
* Q Total (cfs) * 1865.00 * W.S. Elev (ft) * 256.18 * 255.51 *
* Q Bridge (cfs) * 1554.23 * Crit W.S. (ft) * 253.37 * 253.44 *
* Q Weir (cfs) * 310.77 * Max Chl Dpth (ft) * 9.79 * 8.70 *
* Weir Sta Lft (ft) * 10.92 * Vel Total (ft/s) * 6.32 * 5.88 *
* Weir Sta Rgt (ft) * 119.97 * Flow Area (sq ft) * 295.28 * 317.24 *
* Weir Submerg * 0.00 * Froude # Chl * 0.42 * 0.48 *
* Weir Max Depth (ft) * 3.17 * Specif Force (cu ft) * 1400.90 * 1260.70 *
* Min El Weir Flow (ft) * 253.70 * Hydr Depth (ft) * 4.84 * 5.76 *
* Min El Prs (ft) * 255.00 * W.P. Total (ft) * 140.04 * 120.89 *
* Delta EG (ft) * 0.64 * Conv. Total (cfs) * * *
* Delta WS (ft) * 2.66 * Top Width (ft) * 61.06 * 57.40 *
* BR Open Area (sq ft) * 179.01 * Frctn Loss (ft) * * *
* BR Open Vel (ft/s) * 8.68 * C & E Loss (ft) * * *
* Coef of Q * * * Shear Total (lb/sq ft) * * *
* Br Sel Method * Press/Weir * Power Total (lb/ft s) * 0.00 * 0.00 *
*****

```

Note: The downstream water surface is below the minimum elevation for pressure flow. The sluice gate equations were used for pressure flow.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
 Note: For the cross section inside the bridge at the upstream end, the water surface and energy have been projected from the upstream cross section. The selected bridge modeling method does not compute answers inside the bridge.
 Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
 Note: For the cross section inside the bridge at the downstream end, the water surface and energy are based on critical depth over the weir.

BRIDGE OUTPUT Profile #100-YR

```

*****
* E.G. US. (ft) * 257.81 * Element *Inside BR US *Inside BR DS *
* W.S. US. (ft) * 257.25 * E.G. Elev (ft) * 257.81 * 257.11 *
* Q Total (cfs) * 2353.00 * W.S. Elev (ft) * 257.25 * 256.13 *
* Q Bridge (cfs) * 1707.86 * Crit W.S. (ft) * 254.30 * 255.37 *
* Q Weir (cfs) * 645.14 * Max Chl Dpth (ft) * 10.86 * 9.32 *
* Weir Sta Lft (ft) * 10.62 * Vel Total (ft/s) * 6.58 * 6.20 *
* Weir Sta Rgt (ft) * 121.79 * Flow Area (sq ft) * 357.39 * 379.75 *
* Weir Submerg * 0.13 * Froude # Chl * 0.44 * 0.51 *
* Weir Max Depth (ft) * 4.12 * Specif Force (cu ft) * 1862.36 * 1595.86 *
* Min El Weir Flow (ft) * 253.70 * Hydr Depth (ft) * 5.50 * 6.07 *
* Min El Prs (ft) * 255.00 * W.P. Total (ft) * 147.04 * 129.63 *
* Delta EG (ft) * 0.75 * Conv. Total (cfs) * * *
* Delta WS (ft) * 1.64 * Top Width (ft) * 64.93 * 64.92 *

```



```

* BR Open Area (sq ft) * 179.01 * Frctn Loss (ft) * * *
* BR Open Vel (ft/s) * 9.54 * C & E Loss (ft) * * *
* Coef of Q * * Shear Total (lb/sq ft) * * *
* Br Sel Method * Press/Weir * Power Total (lb/ft s) * 0.00 * 0.00 *
*****

```

Note: The downstream water surface is above the minimum elevation required for orifice flow. The orifice flow equation was used for pressure flow.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: For the cross section inside the bridge at the upstream end, the water surface and energy have been projected from the upstream cross section. The selected bridge modeling method does not compute answers inside the bridge.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: For the cross section inside the bridge at the downstream end, the water surface and energy are based on critical depth over the weir.

CROSS SECTION

RIVER: hudson
 REACH: main RS: 31

INPUT

Description:

Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	265.97	10.7	260.17	11.79	255.21	15.21	254.22	19.1	254.07
19.19	253.84	28.59	254.27	39.3	254.7	50.59	254.7	54.49	254.58
56.09	254.29	57.57	254.47	58.16	254.71	82.38	255.45	86.44	255.21
87.14	251.02	87.29	249.71	87.53	246.88	95.77	246.81	99.73	246.85
103.43	246.88	104.83	247.39	107.58	249.58	108.86	250.5	112.96	253.59
114.18	255.6	121.03	255.92	134	261.71				

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	15.21	.02	58.16	.045	86.44	.035
						112.96	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 86.44 112.96 95.55 97.06 99 .3 .5

Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 65.65 86.44 265 F

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft) * 250.33 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 1.09 * Wt. n-Val. * * 0.035 * *
* W.S. Elev (ft) * 249.24 * Reach Len. (ft) * 95.55 * 97.06 * 99.00 *
* Crit W.S. (ft) * 249.24 * Flow Area (sq ft) * * 43.36 * *
* E.G. Slope (ft/ft) * 0.016519 * Area (sq ft) * * 43.36 * *
* Q Total (cfs) * 364.00 * Flow (cfs) * * 364.00 * *
* Top Width (ft) * 19.82 * Top Width (ft) * * 19.82 * *
* Vel Total (ft/s) * 8.39 * Avg. Vel. (ft/s) * * 8.39 * *
* Max Chl Dpth (ft) * 2.43 * Hydr. Depth (ft) * * 2.19 * *
* Conv. Total (cfs) * 2832.1 * Conv. (cfs) * * 2832.1 * *
* Length Wtd. (ft) * 97.06 * Wetted Per. (ft) * * 22.72 * *
* Min Ch El (ft) * 246.81 * Shear (lb/sq ft) * * 1.97 * *
* Alpha * 1.00 * Stream Power (lb/ft s) * 134.00 * 0.00 * 0.00 *
* Frctn Loss (ft) * 1.45 * Cum Volume (acre-ft) * 0.00 * 1.87 * 0.00 *
* C & E Loss (ft) * 0.00 * Cum SA (acres) * 0.00 * 0.85 * 0.07 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)      * 253.08 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.62  * Wt. n-Val.      *         * 0.035  *         *
* W.S. Elev (ft)     * 251.46 * Reach Len. (ft) * 95.55  * 97.06  * 99.00  *
* Crit W.S. (ft)     * 251.19 * Flow Area (sq ft) *         * 91.07  *         *
* E.G. Slope (ft/ft) * 0.012406 * Area (sq ft)    *         * 91.07  *         *
* Q Total (cfs)      * 930.00 * Flow (cfs)      *         * 930.00 *         *
* Top Width (ft)     * 23.07  * Top Width (ft)  *         * 23.07  *         *
* Vel Total (ft/s)   * 10.21  * Avg. Vel. (ft/s) *         * 10.21  *         *
* Max Chl Dpth (ft) * 4.65   * Hydr. Depth (ft) *         * 3.95   *         *
* Conv. Total (cfs)  * 8349.5 * Conv. (cfs)     *         * 8349.5 *         *
* Length Wtd. (ft)  * 97.06  * Wetted Per. (ft) *         * 28.69  *         *
* Min Ch El (ft)    * 246.81 * Shear (lb/sq ft) *         * 2.46   *         *
* Alpha             * 1.00   * Stream Power (lb/ft s) * 134.00 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 1.34   * Cum Volume (acre-ft) * 1.13  * 5.67  * 0.60  *
* C & E Loss (ft)   * 0.12   * Cum SA (acres)   * 1.35  * 0.97  * 1.36  *
*****

```

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)      * 256.21 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 2.70   * Wt. n-Val.      *         * 0.035  *         *
* W.S. Elev (ft)     * 253.52 * Reach Len. (ft) * 95.55  * 97.06  * 99.00  *
* Crit W.S. (ft)     * 253.52 * Flow Area (sq ft) *         * 141.56 *         *
* E.G. Slope (ft/ft) * 0.014482 * Area (sq ft)    *         * 141.56 *         *
* Q Total (cfs)      * 1865.00 * Flow (cfs)      *         * 1865.00 *         *
* Top Width (ft)     * 26.14  * Top Width (ft)  *         * 26.14  *         *
* Vel Total (ft/s)   * 13.17  * Avg. Vel. (ft/s) *         * 13.17  *         *
* Max Chl Dpth (ft) * 6.71   * Hydr. Depth (ft) *         * 5.42   *         *
* Conv. Total (cfs)  * 15497.9 * Conv. (cfs)     *         * 15497.9 *         *
* Length Wtd. (ft)  * 97.00  * Wetted Per. (ft) *         * 34.18  *         *
* Min Ch El (ft)    * 246.81 * Shear (lb/sq ft) *         * 3.74   *         *
* Alpha             * 1.00   * Stream Power (lb/ft s) * 134.00 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 0.94   * Cum Volume (acre-ft) * 2.64  * 9.44  * 2.30  *
* C & E Loss (ft)   * 0.78   * Cum SA (acres)   * 1.87  * 0.99  * 2.04  *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)      * 257.06 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.45   * Wt. n-Val.      * 0.021  * 0.035  * 0.100  *
* W.S. Elev (ft)     * 255.61 * Reach Len. (ft) * 95.55  * 97.06  * 99.00  *
* Crit W.S. (ft)     * 255.61 * Flow Area (sq ft) * 59.77  * 196.81 * 1.24  *
* E.G. Slope (ft/ft) * 0.005996 * Area (sq ft)    * 67.84  * 196.81 * 1.24  *
* Q Total (cfs)      * 2353.00 * Flow (cfs)      * 345.16 * 2006.96 * 0.88  *
* Top Width (ft)     * 102.67 * Top Width (ft)  * 74.74  * 26.52  * 1.41  *
* Vel Total (ft/s)   * 9.13   * Avg. Vel. (ft/s) * 5.77   * 10.20  * 0.71  *
* Max Chl Dpth (ft) * 8.80   * Hydr. Depth (ft) * 1.11   * 7.42   * 0.88  *
* Conv. Total (cfs)  * 30388.4 * Conv. (cfs)     * 4457.7 * 25919.4 * 11.4  *
*****

```

```

* Length Wtd. (ft)      * 96.84 * Wetted Per. (ft)      * 54.68 * 36.02 * 2.54 *
* Min Ch El (ft)      * 246.81 * Shear (lb/sq ft)      * 0.41 * 2.04 * 0.18 *
* Alpha                * 1.12 * Stream Power (lb/ft s) * 134.00 * 0.00 * 0.00 *
* Frctn Loss (ft)     * 0.65 * Cum Volume (acre-ft)  * 3.37 * 11.12 * 3.12 *
* C & E Loss (ft)     * 0.04 * Cum SA (acres)        * 2.06 * 0.99 * 2.43 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: hudson
REACH: main RS: 30

INPUT

Description:

```

Station Elevation Data num= 26
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
*****
0 261.9 8.71 261.46 10.94 261.11 20.78 255.45 29.7 250.65
33.4 250.57 33.51 250.33 42.38 250.72 53.4 251.15 64.42 250.86
68.5 250.72 70.19 250.5 71.48 250.68 72.13 250.92 85.33 250.3
118.15 253.54 118.2 248.77 118.26 245.77 127.23 243.69 127.46 243.63
130.64 244.4 132.33 245.89 137.14 248.9 142.04 252.09 145.58 254.31
152.9 256.12

```

```

Manning's n Values num= 5
Sta n Val Sta n Val Sta n Val Sta n Val Sta n Val
*****
0 .045 29.7 .02 85.33 .045 118.15 .035 142.04 .1

```

```

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
118.15 142.04 69.42 70.58 71.76 .1 .3

```

```

Ineffective Flow num= 1
Sta L Sta R Elev Permanent
88.6 115.6 260 F

```

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft) * 248.62 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 1.09 * Wt. n-Val. * * 0.035 * *
* W.S. Elev (ft) * 247.54 * Reach Len. (ft) * 69.42 * 70.58 * 71.76 *
* Crit W.S. (ft) * 247.37 * Flow Area (sq ft) * * 43.52 * *
* E.G. Slope (ft/ft) * 0.013620 * Area (sq ft) * * 43.52 * *
* Q Total (cfs) * 364.00 * Flow (cfs) * * 364.00 * *
* Top Width (ft) * 16.74 * Top Width (ft) * * 16.74 * *
* Vel Total (ft/s) * 8.36 * Avg. Vel. (ft/s) * * 8.36 * *
* Max Chl Dpth (ft) * 3.91 * Hydr. Depth (ft) * * 2.60 * *
* Conv. Total (cfs) * 3119.0 * Conv. (cfs) * * 3119.0 * *
* Length Wtd. (ft) * 70.58 * Wetted Per. (ft) * * 19.84 * *
* Min Ch El (ft) * 243.63 * Shear (lb/sq ft) * * 1.86 * *
* Alpha * 1.00 * Stream Power (lb/ft s) * 152.90 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.94 * Cum Volume (acre-ft) * 0.00 * 1.77 * 0.00 *
* C & E Loss (ft) * 0.14 * Cum SA (acres) * 0.00 * 0.81 * 0.07 *
*****

```

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft) * 251.62 * Element * Left OB * Channel * Right OB *

```

```

* Vel Head (ft)          * 2.01 * Wt. n-Val.          * 0.035 *
* W.S. Elev (ft)        * 249.61 * Reach Len. (ft)    * 69.42 * 70.58 * 71.76 *
* Crit W.S. (ft)        * 249.59 * Flow Area (sq ft)  * 81.66 *
* E.G. Slope (ft/ft)    * 0.015475 * Area (sq ft)      * 81.66 *
* Q Total (cfs)         * 930.00 * Flow (cfs)        * 930.00 *
* Top Width (ft)        * 20.04 * Top Width (ft)     * 20.04 *
* Vel Total (ft/s)      * 11.39 * Avg. Vel. (ft/s)   * 11.39 *
* Max Chl Dpth (ft)     * 5.98 * Hydr. Depth (ft)   * 4.07 *
* Conv. Total (cfs)     * 7476.0 * Conv. (cfs)        * 7476.0 *
* Length Wtd. (ft)      * 70.54 * Wetted Per. (ft)   * 25.79 *
* Min Ch El (ft)        * 243.63 * Shear (lb/sq ft)   * 3.06 *
* Alpha                 * 1.00 * Stream Power (lb/ft s) * 152.90 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 1.05 * Cum Volume (acre-ft) * 1.13 * 5.47 * 0.60 *
* C & E Loss (ft)      * 0.30 * Cum SA (acres)     * 1.35 * 0.93 * 1.36 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)        * 254.39 * Element            * Left OB * Channel * Right OB *
* Vel Head (ft)        * 3.21 * Wt. n-Val.         * 0.022 * 0.035 *
* W.S. Elev (ft)       * 251.18 * Reach Len. (ft)    * 69.42 * 70.58 * 71.76 *
* Crit W.S. (ft)       * 252.13 * Flow Area (sq ft)  * 26.20 * 114.99 *
* E.G. Slope (ft/ft)   * 0.020749 * Area (sq ft)      * 27.76 * 114.99 *
* Q Total (cfs)        * 1865.00 * Flow (cfs)        * 151.47 * 1713.53 *
* Top Width (ft)       * 87.97 * Top Width (ft)     * 65.50 * 22.46 *
* Vel Total (ft/s)     * 13.21 * Avg. Vel. (ft/s)   * 5.78 * 14.90 *
* Max Chl Dpth (ft)    * 7.55 * Hydr. Depth (ft)   * 0.44 * 5.12 *
* Conv. Total (cfs)    * 12947.2 * Conv. (cfs)        * 1051.5 * 11895.7 *
* Length Wtd. (ft)    * 70.43 * Wetted Per. (ft)   * 60.29 * 30.23 *
* Min Ch El (ft)       * 243.63 * Shear (lb/sq ft)   * 0.56 * 4.93 *
* Alpha                * 1.18 * Stream Power (lb/ft s) * 152.90 * 0.00 * 0.00 *
* Frctn Loss (ft)     * 1.67 * Cum Volume (acre-ft) * 2.61 * 9.16 * 2.30 *
* C & E Loss (ft)     * 0.15 * Cum SA (acres)     * 1.79 * 0.93 * 2.04 *
*****

```

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)        * 255.29 * Element            * Left OB * Channel * Right OB *
* Vel Head (ft)        * 3.88 * Wt. n-Val.         * 0.021 * 0.035 *
* W.S. Elev (ft)       * 251.41 * Reach Len. (ft)    * 69.42 * 70.58 * 71.76 *
* Crit W.S. (ft)       * 252.48 * Flow Area (sq ft)  * 40.12 * 120.23 *
* E.G. Slope (ft/ft)   * 0.025353 * Area (sq ft)      * 43.25 * 120.23 *
* Q Total (cfs)        * 2353.00 * Flow (cfs)        * 341.75 * 2011.25 *
* Top Width (ft)       * 91.10 * Top Width (ft)     * 68.28 * 22.82 *
* Vel Total (ft/s)     * 14.67 * Avg. Vel. (ft/s)   * 8.52 * 16.73 *
* Max Chl Dpth (ft)    * 7.78 * Hydr. Depth (ft)   * 0.67 * 5.27 *
* Conv. Total (cfs)    * 14777.7 * Conv. (cfs)        * 2146.3 * 12631.4 *
* Length Wtd. (ft)    * 70.33 * Wetted Per. (ft)   * 60.78 * 30.88 *
* Min Ch El (ft)       * 243.63 * Shear (lb/sq ft)   * 1.04 * 6.16 *
* Alpha                * 1.16 * Stream Power (lb/ft s) * 152.90 * 0.00 * 0.00 *
* Frctn Loss (ft)     * 1.05 * Cum Volume (acre-ft) * 3.25 * 10.77 * 3.12 *
* C & E Loss (ft)     * 0.73 * Cum SA (acres)     * 1.90 * 0.94 * 2.43 *
*****

```

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main RS: 29

INPUT

Description:

Station Elevation Data num= 25
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
0 261 17.86 252.38 26.6 250.54 34.72 249.13 38.62 248.41
46.69 248.68 57.55 249.04 68.41 249.12 72.61 249.1 75.04 249.07
76.3 249.08 83.12 249.4 114.42 249.03 115.16 250.46 124.07 250.44
124.13 251 125.22 246.94 126.17 242.79 129.62 242.7 131.16 242.71
133.3 242.72 141.03 245.06 144.33 247.85 148.3 250.68 159.15 258.51

Manning's n Values num= 5
Sta n Val Sta n Val Sta n Val Sta n Val Sta n Val
0 .045 34.72 .02 83.12 .045 124.13 .05 148.3 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
124.13 148.3 57 58.22 61.16 .1 .3
Ineffective Flow num= 1
Sta L Sta R Elev Permanent
93.91 122.11 260 F

CROSS SECTION OUTPUT Profile #2-YR

E.G. Elev (ft) * 247.55 * Element * Left OB * Channel * Right OB *
Vel Head (ft) * 0.63 * Wt. n-Val. * 0.050 *
W.S. Elev (ft) * 246.92 * Reach Len. (ft) * 57.00 * 58.22 * 61.16 *
Crit W.S. (ft) * 245.98 * Flow Area (sq ft) * 57.34 *
E.G. Slope (ft/ft) *0.012974 * Area (sq ft) * 57.34 *
Q Total (cfs) * 364.00 * Flow (cfs) * 364.00 *
Top Width (ft) * 18.01 * Top Width (ft) * 18.01 *
Vel Total (ft/s) * 6.35 * Avg. Vel. (ft/s) * 6.35 *
Max Chl Dpth (ft) * 4.22 * Hydr. Depth (ft) * 3.18 *
Conv. Total (cfs) * 3195.7 * Conv. (cfs) * 3195.7 *
Length Wtd. (ft) * 58.22 * Wetted Per. (ft) * 22.33 *
Min Ch El (ft) * 242.70 * Shear (lb/sq ft) * 2.08 *
Alpha * 1.00 * Stream Power (lb/ft s) * 159.15 * 0.00 * 0.00 *
Frctn Loss (ft) * 0.56 * Cum Volume (acre-ft) * 0.00 * 1.69 * 0.00 *
C & E Loss (ft) * 0.00 * Cum SA (acres) * 0.00 * 0.78 * 0.07 *

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

E.G. Elev (ft) * 250.28 * Element * Left OB * Channel * Right OB *
Vel Head (ft) * 1.03 * Wt. n-Val. * 0.020 * 0.050 *
W.S. Elev (ft) * 249.25 * Reach Len. (ft) * 57.00 * 58.22 * 61.16 *
Crit W.S. (ft) * 248.18 * Flow Area (sq ft) * 15.19 * 103.42 *
E.G. Slope (ft/ft) *0.014271 * Area (sq ft) * 17.25 * 103.42 *
Q Total (cfs) * 930.00 * Flow (cfs) * 64.85 * 865.15 *
Top Width (ft) * 86.29 * Top Width (ft) * 64.60 * 21.69 *
Vel Total (ft/s) * 7.84 * Avg. Vel. (ft/s) * 4.27 * 8.37 *
Max Chl Dpth (ft) * 6.55 * Hydr. Depth (ft) * 0.33 * 4.77 *
Conv. Total (cfs) * 7785.0 * Conv. (cfs) * 542.9 * 7242.1 *
Length Wtd. (ft) * 57.93 * Wetted Per. (ft) * 45.98 * 28.59 *
Min Ch El (ft) * 242.70 * Shear (lb/sq ft) * 0.29 * 3.22 *
Alpha * 1.08 * Stream Power (lb/ft s) * 159.15 * 0.00 * 0.00 *
Frctn Loss (ft) * 0.22 * Cum Volume (acre-ft) * 1.12 * 5.32 * 0.60 *
C & E Loss (ft) * 0.23 * Cum SA (acres) * 1.30 * 0.89 * 1.36 *

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
 This may indicate the need for additional cross sections.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```
*****
* E.G. Elev (ft)      * 252.32 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 2.75  * Wt. n-Val.      * 0.021  * 0.050  *         *
* W.S. Elev (ft)     * 249.57 * Reach Len. (ft) * 57.00  * 58.22  * 61.16  *
* Crit W.S. (ft)     * 250.33 * Flow Area (sq ft) * 33.24  * 110.36 *         *
* E.G. Slope (ft/ft) * 0.037860 * Area (sq ft)    * 41.82  * 110.36 *         *
* Q Total (cfs)      * 1865.00 * Flow (cfs)      * 325.86 * 1539.14 *         *
* Top Width (ft)     * 104.71 * Top Width (ft)  * 82.49  * 22.22  *         *
* Vel Total (ft/s)   * 12.99  * Avg. Vel. (ft/s) * 9.80   * 13.95  *         *
* Max Chl Dpth (ft) * 6.87   * Hydr. Depth (ft) * 0.54   * 4.97   *         *
* Conv. Total (cfs) * 9584.9 * Conv. (cfs)     * 1674.7 * 7910.2 *         *
* Length Wtd. (ft)  * 57.54  * Wetted Per. (ft) * 61.82  * 29.46  *         *
* Min Ch El (ft)    * 242.70 * Shear (lb/sq ft) * 1.27   * 8.85   *         *
* Alpha             * 1.05   * Stream Power (lb/ft s) * 159.15 * 0.00   * 0.00   *
* Frctn Loss (ft)  * 1.93   * Cum Volume (acre-ft) * 2.56   * 8.97   * 2.30   *
* C & E Loss (ft)  * 0.14   * Cum SA (acres)    * 1.68   * 0.90   * 2.04   *
*****
```

Warning: Divided flow computed for this cross-section.
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
 This may indicate the need for additional cross sections.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```
*****
* E.G. Elev (ft)      * 252.85 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 2.96  * Wt. n-Val.      * 0.021  * 0.050  *         *
* W.S. Elev (ft)     * 249.89 * Reach Len. (ft) * 57.00  * 58.22  * 61.16  *
* Crit W.S. (ft)     * 250.74 * Flow Area (sq ft) * 53.57  * 117.66 *         *
* E.G. Slope (ft/ft) * 0.037940 * Area (sq ft)    * 68.93  * 117.66 *         *
* Q Total (cfs)      * 2353.00 * Flow (cfs)      * 672.49 * 1680.51 *         *
* Top Width (ft)     * 107.29 * Top Width (ft)  * 84.53  * 22.76  *         *
* Vel Total (ft/s)   * 13.74  * Avg. Vel. (ft/s) * 12.55  * 14.28  *         *
* Max Chl Dpth (ft) * 7.19   * Hydr. Depth (ft) * 0.84   * 5.17   *         *
* Conv. Total (cfs) * 12080.2 * Conv. (cfs)     * 3452.5 * 8627.7 *         *
* Length Wtd. (ft)  * 57.48  * Wetted Per. (ft) * 63.72  * 30.36  *         *
* Min Ch El (ft)    * 242.70 * Shear (lb/sq ft) * 1.99   * 9.18   *         *
* Alpha             * 1.01   * Stream Power (lb/ft s) * 159.15 * 0.00   * 0.00   *
* Frctn Loss (ft)  * 2.16   * Cum Volume (acre-ft) * 3.16   * 10.57  * 3.12   *
* C & E Loss (ft)  * 0.27   * Cum SA (acres)    * 1.78   * 0.90   * 2.43   *
*****
```

Warning: Divided flow computed for this cross-section.
 Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
 This may indicate the need for additional cross sections.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
 REACH: main RS: 28

INPUT

Description:

Station Elevation Data		num=		23					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	264.37	23.62	258.39	50.23	252	71.83	247.8	75.82	247.43
75.84	247.3	94.09	247.92	107.87	247.74	110.08	247.7	111.03	248.12
136.72	248.93	162.62	248.9	162.9	250.11	163.74	249.99	163.88	246.41
164.27	242.97	171.24	242.92	171.44	242.91	178.26	243.18	186.65	247.92
192.33	250.44	199.04	253.27	209.04	257.59				

Manning's n Values num= 5
 Sta n Val Sta n Val Sta n Val Sta n Val Sta n Val

 0 .045 71.83 .02 111.03 .045 163.74 .035 192.33 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 163.74 192.33 46 46.77 46.35 .1 .3

Ineffective Flow num= 2
 Sta L Sta R Elev Permanent
 25.38 50.22 260 F
 124.9 163.74 260 F

Blocked Obstructions num= 1
 Sta L Sta R Elev

 50.22 61.56 260

CROSS SECTION OUTPUT Profile #2-YR

 * E.G. Elev (ft) * 246.99 * Element * Left OB * Channel * Right OB *
 * Vel Head (ft) * 0.65 * Wt. n-Val. * * 0.035 * * *
 * W.S. Elev (ft) * 246.34 * Reach Len. (ft) * 46.00 * 46.77 * 46.35 *
 * Crit W.S. (ft) * 245.63 * Flow Area (sq ft) * * 56.28 * * *
 * E.G. Slope (ft/ft) * 0.007372 * Area (sq ft) * * 56.28 * * *
 * Q Total (cfs) * 364.00 * Flow (cfs) * * 364.00 * * *
 * Top Width (ft) * 19.96 * Top Width (ft) * * 19.96 * * *
 * Vel Total (ft/s) * 6.47 * Avg. Vel. (ft/s) * * 6.47 * * *
 * Max Chl Dpth (ft) * 3.43 * Hydr. Depth (ft) * * 2.82 * * *
 * Conv. Total (cfs) * 4239.5 * Conv. (cfs) * * 4239.5 * * *
 * Length Wtd. (ft) * 46.77 * Wetted Per. (ft) * * 23.81 * * *
 * Min Ch El (ft) * 242.91 * Shear (lb/sq ft) * * 1.09 * * *
 * Alpha * 1.00 * Stream Power (lb/ft s) * 209.04 * 0.00 * 0.00 *
 * Frctn Loss (ft) * 0.31 * Cum Volume (acre-ft) * 0.00 * 1.62 * 0.00 *
 * C & E Loss (ft) * 0.02 * Cum SA (acres) * 0.00 * 0.76 * 0.07 *

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

 * E.G. Elev (ft) * 249.83 * Element * Left OB * Channel * Right OB *
 * Vel Head (ft) * 0.26 * Wt. n-Val. * 0.022 * 0.035 * * *
 * W.S. Elev (ft) * 249.57 * Reach Len. (ft) * 46.00 * 46.77 * 46.35 *
 * Crit W.S. (ft) * 248.44 * Flow Area (sq ft) * 98.28 * 130.85 * * *
 * E.G. Slope (ft/ft) * 0.001685 * Area (sq ft) * 124.99 * 130.85 * * *
 * Q Total (cfs) * 930.00 * Flow (cfs) * 373.49 * 556.51 * * *
 * Top Width (ft) * 126.65 * Top Width (ft) * 100.04 * 26.61 * * *
 * Vel Total (ft/s) * 4.06 * Avg. Vel. (ft/s) * 3.80 * 4.25 * * *
 * Max Chl Dpth (ft) * 6.66 * Hydr. Depth (ft) * 1.58 * 4.92 * * *
 * Conv. Total (cfs) * 22658.1 * Conv. (cfs) * 9099.6 * 13558.5 * * *
 * Length Wtd. (ft) * 46.44 * Wetted Per. (ft) * 62.57 * 34.32 * * *
 * Min Ch El (ft) * 242.91 * Shear (lb/sq ft) * 0.17 * 0.40 * * *
 * Alpha * 1.01 * Stream Power (lb/ft s) * 209.04 * 0.00 * 0.00 *
 * Frctn Loss (ft) * 0.06 * Cum Volume (acre-ft) * 1.02 * 5.17 * 0.60 *
 * C & E Loss (ft) * 0.02 * Cum SA (acres) * 1.19 * 0.86 * 1.36 *

Warning: Divided flow computed for this cross-section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

 * E.G. Elev (ft) * 251.60 * Element * Left OB * Channel * Right OB *
 * Vel Head (ft) * 0.38 * Wt. n-Val. * 0.024 * 0.035 * 0.100 *
 * W.S. Elev (ft) * 251.22 * Reach Len. (ft) * 46.00 * 46.77 * 46.35 *
 * Crit W.S. (ft) * 249.43 * Flow Area (sq ft) * 202.79 * 177.23 * 0.72 *
 * E.G. Slope (ft/ft) * 0.001445 * Area (sq ft) * 293.24 * 177.23 * 0.72 *
 * Q Total (cfs) * 1865.00 * Flow (cfs) * 1050.49 * 814.31 * 0.21 *
 * Top Width (ft) * 132.62 * Top Width (ft) * 102.18 * 28.59 * 1.85 *
 * Vel Total (ft/s) * 4.90 * Avg. Vel. (ft/s) * 5.18 * 4.59 * 0.29 *
 * Max Chl Dpth (ft) * 8.31 * Hydr. Depth (ft) * 3.20 * 6.20 * 0.39 *
 * Conv. Total (cfs) * 49064.0 * Conv. (cfs) * 27636.0 * 21422.6 * 5.4 *
 * Length Wtd. (ft) * 46.33 * Wetted Per. (ft) * 65.19 * 36.89 * 2.01 *
 * Min Ch El (ft) * 242.91 * Shear (lb/sq ft) * 0.28 * 0.43 * 0.03 *
 * Alpha * 1.01 * Stream Power (lb/ft s) * 209.04 * 0.00 * 0.00 *
 * Frctn Loss (ft) * 0.05 * Cum Volume (acre-ft) * 2.34 * 8.78 * 2.30 *
 * C & E Loss (ft) * 0.03 * Cum SA (acres) * 1.55 * 0.86 * 2.04 *

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```
*****
* E.G. Elev (ft)      * 252.32 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.45  * Wt. n-Val.      * 0.024  * 0.035  * 0.100  *
* W.S. Elev (ft)     * 251.86 * Reach Len. (ft) * 46.00  * 46.77  * 46.35  *
* Crit W.S. (ft)     * 249.82 * Flow Area (sq ft) * 243.42 * 195.57 * 2.40  *
* E.G. Slope (ft/ft) * 0.001433 * Area (sq ft)    * 358.79 * 195.57 * 2.40  *
* Q Total (cfs)      * 2353.00 * Flow (cfs)      * 1396.25 * 955.73 * 1.02  *
* Top Width (ft)     * 134.14 * Top Width (ft)  * 102.18 * 28.59  * 3.37  *
* Vel Total (ft/s)   * 5.33  * Avg. Vel. (ft/s) * 5.74  * 4.89  * 0.42  *
* Max Chl Dpth (ft) * 8.95  * Hydr. Depth (ft) * 3.84  * 6.84  * 0.71  *
* Conv. Total (cfs) * 62149.0 * Conv. (cfs)     * 36878.7 * 25243.5 * 26.9  *
* Length Wtd. (ft)  * 46.30 * Wetted Per. (ft) * 65.83 * 36.89  * 3.66  *
* Min Ch El (ft)    * 242.91 * Shear (lb/sq ft) * 0.33  * 0.47  * 0.06  *
* Alpha             * 1.03  * Stream Power (lb/ft s) * 209.04 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 0.06  * Cum Volume (acre-ft) * 2.88  * 10.36  * 3.12  *
* C & E Loss (ft)   * 0.04  * Cum SA (acres)   * 1.66  * 0.86  * 2.42  *
*****
```

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main RS: 27

INPUT

Description:

Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	255.09	20	249.09	33.99	247.99	38.71	247.58	38.75	247.85
39.31	247.8	39.44	247.14	43.43	246.84	60.68	247.42	71.39	247.31
72.7	247.26	73.42	247.77	126.3	247.56	126.61	247.89	126.74	247.92
127.57	244.53	128.15	242.33	131.06	242.08	133	241.75	133.14	241.73
135.18	242.19	140.09	243.34	145.42	244.45	149.99	248.38	161	257.81

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	38.71	.02	73.42	.045	126.74	.035	149.99	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 126.74 149.99 60.75 61.7 65.02 .1 .3

Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 95.87 126.74 255 F

Blocked Obstructions num= 1
 Sta L Sta R Elev
 0 20 255

CROSS SECTION OUTPUT Profile #2-YR

```
*****
* E.G. Elev (ft)      * 246.65 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.58  * Wt. n-Val.      * 0.035  * 0.035  * 0.035  *
* W.S. Elev (ft)     * 246.07 * Reach Len. (ft) * 60.75  * 61.70  * 65.02  *
* Crit W.S. (ft)     * 245.21 * Flow Area (sq ft) * 59.51  * 59.51  * 59.51  *
* E.G. Slope (ft/ft) * 0.006171 * Area (sq ft)    * 59.51  * 59.51  * 59.51  *
* Q Total (cfs)      * 364.00 * Flow (cfs)      * 364.00 * 364.00 * 364.00  *
* Top Width (ft)     * 20.11 * Top Width (ft)  * 20.11  * 20.11  * 20.11  *
* Vel Total (ft/s)   * 6.12  * Avg. Vel. (ft/s) * 6.12  * 6.12  * 6.12  *
* Max Chl Dpth (ft) * 4.34  * Hydr. Depth (ft) * 2.96  * 2.96  * 2.96  *
* Conv. Total (cfs) * 4633.5 * Conv. (cfs)     * 4633.5 * 4633.5 * 4633.5  *
* Length Wtd. (ft)  * 61.70 * Wetted Per. (ft) * 23.96  * 23.96  * 23.96  *
* Min Ch El (ft)    * 241.73 * Shear (lb/sq ft) * 0.96  * 0.96  * 0.96  *
* Alpha             * 1.00  * Stream Power (lb/ft s) * 161.00 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 0.41  * Cum Volume (acre-ft) * 0.00  * 1.55  * 0.00  *
* C & E Loss (ft)   * 0.00  * Cum SA (acres)   * 0.00  * 0.74  * 0.07  *
*****
```


Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```
*****
* E.G. Elev (ft)          * 249.74 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.18  * Wt. n-Val.      * 0.025  * 0.035  * 0.100  *
* W.S. Elev (ft)         * 249.57 * Reach Len. (ft) * 60.75  * 61.70  * 65.02  *
* Crit W.S. (ft)         * 248.03 * Flow Area (sq ft) * 145.78 * 137.24 * 0.82  *
* E.G. Slope (ft/ft)     * 0.000980 * Area (sq ft)    * 205.79 * 137.24 * 0.82  *
* Q Total (cfs)          * 930.00 * Flow (cfs)      * 420.44 * 509.34 * 0.22  *
* Top Width (ft)         * 131.38 * Top Width (ft)  * 106.74 * 23.25  * 1.39  *
* Vel Total (ft/s)       * 3.28  * Avg. Vel. (ft/s) * 2.88  * 3.71  * 0.27  *
* Max Chl Dpth (ft)      * 7.84  * Hydr. Depth (ft) * 1.92  * 5.90  * 0.59  *
* Conv. Total (cfs)      * 29714.3 * Conv. (cfs)     * 13433.4 * 16273.7 * 7.2  *
* Length Wtd. (ft)       * 61.22 * Wetted Per. (ft) * 77.37 * 29.40  * 1.82  *
* Min Ch El (ft)         * 241.73 * Shear (lb/sq ft) * 0.12  * 0.29  * 0.03  *
* Alpha                  * 1.05  * Stream Power (lb/ft s) * 161.00 * 0.00  * 0.00  *
* Frctn Loss (ft)        * 0.05  * Cum Volume (acre-ft) * 0.85  * 5.02  * 0.60  *
* C & E Loss (ft)        * 0.02  * Cum SA (acres)   * 1.08  * 0.83  * 1.36  *
*****
```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```
*****
* E.G. Elev (ft)          * 251.51 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.27  * Wt. n-Val.      * 0.027  * 0.035  * 0.100  *
* W.S. Elev (ft)         * 251.24 * Reach Len. (ft) * 60.75  * 61.70  * 65.02  *
* Crit W.S. (ft)         * 249.04 * Flow Area (sq ft) * 272.94 * 176.21 * 4.78  *
* E.G. Slope (ft/ft)     * 0.000967 * Area (sq ft)    * 384.68 * 176.21 * 4.78  *
* Q Total (cfs)          * 1865.00 * Flow (cfs)      * 1095.32 * 767.35 * 2.34  *
* Top Width (ft)         * 133.33 * Top Width (ft)  * 106.74 * 23.25  * 3.34  *
* Vel Total (ft/s)       * 4.11  * Avg. Vel. (ft/s) * 4.01  * 4.35  * 0.49  *
* Max Chl Dpth (ft)      * 9.51  * Hydr. Depth (ft) * 3.60  * 7.58  * 1.43  *
* Conv. Total (cfs)      * 59989.0 * Conv. (cfs)     * 35231.6 * 24682.3 * 75.1  *
* Length Wtd. (ft)       * 61.11 * Wetted Per. (ft) * 79.05 * 29.40  * 4.40  *
* Min Ch El (ft)         * 241.73 * Shear (lb/sq ft) * 0.21  * 0.36  * 0.07  *
* Alpha                  * 1.02  * Stream Power (lb/ft s) * 161.00 * 0.00  * 0.00  *
* Frctn Loss (ft)        * 0.05  * Cum Volume (acre-ft) * 1.98  * 8.59  * 2.30  *
* C & E Loss (ft)        * 0.02  * Cum SA (acres)   * 1.44  * 0.84  * 2.04  *
*****
```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```
*****
* E.G. Elev (ft)          * 252.22 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.32  * Wt. n-Val.      * 0.027  * 0.035  * 0.100  *
* W.S. Elev (ft)         * 251.90 * Reach Len. (ft) * 60.75  * 61.70  * 65.02  *
* Crit W.S. (ft)         * 249.42 * Flow Area (sq ft) * 322.59 * 191.42 * 7.22  *
* E.G. Slope (ft/ft)     * 0.001003 * Area (sq ft)    * 454.54 * 191.42 * 7.22  *
* Q Total (cfs)          * 2353.00 * Flow (cfs)      * 1451.68 * 897.20 * 4.12  *
* Top Width (ft)         * 134.10 * Top Width (ft)  * 106.74 * 23.25  * 4.11  *
* Vel Total (ft/s)       * 4.51  * Avg. Vel. (ft/s) * 4.50  * 4.69  * 0.57  *
* Max Chl Dpth (ft)      * 10.17 * Hydr. Depth (ft) * 4.25  * 8.23  * 1.76  *
* Conv. Total (cfs)      * 74313.7 * Conv. (cfs)     * 45847.8 * 28335.8 * 130.1  *
* Length Wtd. (ft)       * 61.08 * Wetted Per. (ft) * 79.70 * 29.40  * 5.41  *
* Min Ch El (ft)         * 241.73 * Shear (lb/sq ft) * 0.25  * 0.41  * 0.08  *
* Alpha                  * 1.02  * Stream Power (lb/ft s) * 161.00 * 0.00  * 0.00  *
* Frctn Loss (ft)        * 0.05  * Cum Volume (acre-ft) * 2.45  * 10.16 * 3.11  *
* C & E Loss (ft)        * 0.03  * Cum SA (acres)   * 1.55  * 0.84  * 2.42  *
*****
```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main RS: 26

INPUT

Description:

Station Elevation Data num= 36
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev

```

*****
0 251.78 20 251.78 20.48 251.76 20.58 250.83 24.3 250.68
24.56 249.63 29.3 248.97 33.54 247.03 37.14 246.75 37.25 246.32
40 246.47 53.02 246.87 67.72 246.7 69.59 246.62 71.15 246.17
71.18 247.08 74.6 247.24 97.24 247.51 107.98 247.72 111.72 247.58
112.26 248.1 112.8 247.58 114 243.79 115.64 239.33 116.82 240.91
117.57 241.91 118.99 240.94 125.05 242.14 126.06 243.1 129.39 244.4
134.13 247.88 136.05 249.09 136.62 250.19 137.14 250.23 142.14 250.89
152.72 258.34

```

```

Manning's n Values num= 5
Sta n Val Sta n Val Sta n Val Sta n Val Sta n Val
*****
0 .045 33.54 .02 74.6 .045 112.8 .035 134.13 .1

```

```

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
112.8 134.13 83.06 84.96 87.67 .1 .3
Blocked Obstructions num= 1
Sta L Sta R Elev
*****
0 20 260

```

```

CROSS SECTION OUTPUT Profile #2-YR
*****
* E.G. Elev (ft) * 246.24 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.61 * Wt. n-Val. * * 0.035 * *
* W.S. Elev (ft) * 245.63 * Reach Len. (ft) * 83.06 * 84.96 * 87.67 *
* Crit W.S. (ft) * * * Flow Area (sq ft) * * 57.95 * *
* E.G. Slope (ft/ft) * 0.007077 * Area (sq ft) * * 57.95 * *
* Q Total (cfs) * 364.00 * Flow (cfs) * * 364.00 * *
* Top Width (ft) * 17.65 * Top Width (ft) * * 17.65 * *
* Vel Total (ft/s) * 6.28 * Avg. Vel. (ft/s) * * 6.28 * *
* Max Chl Dpth (ft) * 6.30 * Hydr. Depth (ft) * * 3.28 * *
* Conv. Total (cfs) * 4327.0 * Conv. (cfs) * * 4327.0 * *
* Length Wtd. (ft) * 84.96 * Wetted Per. (ft) * * 24.85 * *
* Min Ch El (ft) * 239.33 * Shear (lb/sq ft) * * 1.03 * *
* Alpha * 1.00 * Stream Power (lb/ft s) * 152.72 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.17 * Cum Volume (acre-ft) * 0.00 * 1.47 * 0.00 *
* C & E Loss (ft) * 0.14 * Cum SA (acres) * 0.00 * 0.71 * 0.07 *
*****

```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

```

CROSS SECTION OUTPUT Profile #10-YR
*****
* E.G. Elev (ft) * 249.68 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.12 * Wt. n-Val. * 0.025 * 0.035 * 0.100 *
* W.S. Elev (ft) * 249.56 * Reach Len. (ft) * 83.06 * 84.96 * 87.67 *
* Crit W.S. (ft) * * * Flow Area (sq ft) * 203.02 * 137.76 * 2.12 *
* E.G. Slope (ft/ft) * 0.000624 * Area (sq ft) * 203.02 * 137.76 * 2.12 *
* Q Total (cfs) * 930.00 * Flow (cfs) * 531.79 * 397.56 * 0.66 *
* Top Width (ft) * 111.24 * Top Width (ft) * 87.74 * 21.33 * 2.16 *
* Vel Total (ft/s) * 2.71 * Avg. Vel. (ft/s) * 2.62 * 2.89 * 0.31 *
* Max Chl Dpth (ft) * 10.23 * Hydr. Depth (ft) * 2.31 * 6.46 * 0.98 *
* Conv. Total (cfs) * 37224.6 * Conv. (cfs) * 21285.5 * 15912.8 * 26.2 *
* Length Wtd. (ft) * 84.13 * Wetted Per. (ft) * 89.94 * 30.70 * 2.80 *
* Min Ch El (ft) * 239.33 * Shear (lb/sq ft) * 0.09 * 0.17 * 0.03 *
* Alpha * 1.02 * Stream Power (lb/ft s) * 152.72 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.04 * Cum Volume (acre-ft) * 0.56 * 4.83 * 0.60 *
* C & E Loss (ft) * 0.00 * Cum SA (acres) * 0.95 * 0.80 * 1.36 *
*****

```

```

CROSS SECTION OUTPUT Profile #50-YR
*****
* E.G. Elev (ft) * 251.44 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.19 * Wt. n-Val. * 0.026 * 0.035 * 0.100 *
* W.S. Elev (ft) * 251.25 * Reach Len. (ft) * 83.06 * 84.96 * 87.67 *
* Crit W.S. (ft) * * * Flow Area (sq ft) * 353.87 * 173.72 * 10.28 *
* E.G. Slope (ft/ft) * 0.000655 * Area (sq ft) * 353.87 * 173.72 * 10.28 *
* Q Total (cfs) * 1865.00 * Flow (cfs) * 1261.61 * 599.33 * 4.07 *
* Top Width (ft) * 122.11 * Top Width (ft) * 92.26 * 21.33 * 8.52 *
* Vel Total (ft/s) * 3.47 * Avg. Vel. (ft/s) * 3.57 * 3.45 * 0.40 *
* Max Chl Dpth (ft) * 11.92 * Hydr. Depth (ft) * 3.84 * 8.14 * 1.21 *
* Conv. Total (cfs) * 72883.2 * Conv. (cfs) * 49302.9 * 23421.4 * 158.9 *
* Length Wtd. (ft) * 83.90 * Wetted Per. (ft) * 95.66 * 30.70 * 9.69 *
* Min Ch El (ft) * 239.33 * Shear (lb/sq ft) * 0.15 * 0.23 * 0.04 *
* Alpha * 1.03 * Stream Power (lb/ft s) * 152.72 * 0.00 * 0.00 *

```

```

* Frctn Loss (ft)          * 0.05 * Cum Volume (acre-ft) * 1.47 * 8.34 * 2.29 *
* C & E Loss (ft)        * 0.00 * Cum SA (acres) * 1.31 * 0.80 * 2.03 *
*****

```

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)          * 252.14 * Element * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.23 * Wt. n-Val. * 0.027 * 0.035 * 0.100 *
* W.S. Elev (ft)         * 251.91 * Reach Len. (ft) * 83.06 * 84.96 * 87.67 *
* Crit W.S. (ft)         * * Flow Area (sq ft) * 415.09 * 187.85 * 16.23 *
* E.G. Slope (ft/ft)     * 0.000684 * Area (sq ft) * 415.09 * 187.85 * 16.23 *
* Q Total (cfs)          * 2353.00 * Flow (cfs) * 1646.68 * 698.06 * 8.26 *
* Top Width (ft)         * 123.59 * Top Width (ft) * 92.80 * 21.33 * 9.46 *
* Vel Total (ft/s)       * 3.80 * Avg. Vel. (ft/s) * 3.97 * 3.72 * 0.51 *
* Max Chl Dpth (ft)      * 12.58 * Hydr. Depth (ft) * 4.47 * 8.81 * 1.72 *
* Conv. Total (cfs)      * 89939.1 * Conv. (cfs) * 62941.3 * 26682.1 * 315.7 *
* Length Wtd. (ft)      * 83.84 * Wetted Per. (ft) * 96.79 * 30.70 * 10.84 *
* Min Ch El (ft)        * 239.33 * Shear (lb/sq ft) * 0.18 * 0.26 * 0.06 *
* Alpha                  * 1.05 * Stream Power (lb/ft s) * 152.72 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.05 * Cum Volume (acre-ft) * 1.85 * 9.89 * 3.09 *
* C & E Loss (ft)       * 0.00 * Cum SA (acres) * 1.41 * 0.80 * 2.41 *
*****

```

CROSS SECTION

RIVER: hudson
REACH: main RS: 25

INPUT

Description:

Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	255.25	50	250.34	65.47	250.35	81.44	249.54	86.03	247.3
89.33	247.2	89.41	246.92	102.47	247.31	117.22	247.27	131.96	247.57
134.13	247.31	136.41	247.39	137.44	248.18	137.82	248.22	138.14	244.16
138.35	239.92	139.66	239.76	146.05	239.32	146.16	239.32	151.12	239.56
153.23	240.93	160.29	244.16	166.89	247.11	173.09	248.75	184.32	251.72
186.91	252.67	194.32	256.17						

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.02	131.96	.045	137.82	.035	166.89	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
137.82 166.89 29.59 30.248 33.09 .1 .3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
18	68	260	F
184.35	189.68	265	F

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft)          * 245.93 * Element * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.15 * Wt. n-Val. * * 0.035 * * *
* W.S. Elev (ft)         * 245.78 * Reach Len. (ft) * 29.59 * 30.25 * 33.09 *
* Crit W.S. (ft)         * 242.30 * Flow Area (sq ft) * * 118.16 * * *
* E.G. Slope (ft/ft)     * 0.000958 * Area (sq ft) * * 118.16 * * *
* Q Total (cfs)          * 364.00 * Flow (cfs) * * 364.00 * * *
* Top Width (ft)         * 25.90 * Top Width (ft) * * 25.90 * * *
* Vel Total (ft/s)       * 3.08 * Avg. Vel. (ft/s) * * 3.08 * * *
* Max Chl Dpth (ft)      * 6.46 * Hydr. Depth (ft) * * 4.56 * * *
* Conv. Total (cfs)      * 11760.1 * Conv. (cfs) * * 11760.1 * * *
* Length Wtd. (ft)      * 30.25 * Wetted Per. (ft) * * 32.92 * * *
* Min Ch El (ft)        * 239.32 * Shear (lb/sq ft) * * 0.21 * * *
* Alpha                  * 1.00 * Stream Power (lb/ft s) * 194.32 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.03 * Cum Volume (acre-ft) * 0.00 * 1.30 * 0.00 *
* C & E Loss (ft)       * 0.01 * Cum SA (acres) * 0.00 * 0.67 * 0.07 *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)          * 249.63 * Element * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.11 * Wt. n-Val. * 0.021 * 0.035 * 0.100 *

```

```

* W.S. Elev (ft)          * 249.52 * Reach Len. (ft)        * 29.59 * 30.25 * 33.09 *
* Crit W.S. (ft)         * 244.41 * Flow Area (sq ft)     * 119.68 * 224.63 * 10.97 *
* E.G. Slope (ft/ft)     * 0.000431 * Area (sq ft)         * 119.68 * 224.63 * 10.97 *
* Q Total (cfs)          * 930.00 * Flow (cfs)            * 286.05 * 640.21 * 3.74 *
* Top Width (ft)         * 94.51 * Top Width (ft)        * 56.34 * 29.07 * 9.11 *
* Vel Total (ft/s)       * 2.62 * Avg. Vel. (ft/s)      * 2.39 * 2.85 * 0.34 *
* Max Chl Dpth (ft)      * 10.20 * Hydr. Depth (ft)      * 2.12 * 7.73 * 1.20 *
* Conv. Total (cfs)      * 44798.8 * Conv. (cfs)           * 13779.0 * 30839.4 * 180.4 *
* Length Wtd. (ft)       * 30.04 * Wetted Per. (ft)      * 57.36 * 38.63 * 9.42 *
* Min Ch El (ft)        * 239.32 * Shear (lb/sq ft)      * 0.06 * 0.16 * 0.03 *
* Alpha                  * 1.07 * Stream Power (lb/ft s) * 194.32 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.02 * Cum Volume (acre-ft)  * 0.26 * 4.47 * 0.59 *
* C & E Loss (ft)       * 0.01 * Cum SA (acres)        * 0.81 * 0.75 * 1.35 *
*****

```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)          * 251.39 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.21 * Wt. n-Val.             * 0.021 * 0.035 * 0.100 *
* W.S. Elev (ft)         * 251.18 * Reach Len. (ft)        * 29.59 * 30.25 * 33.09 *
* Crit W.S. (ft)         * 246.77 * Flow Area (sq ft)     * 230.81 * 272.93 * 31.32 *
* E.G. Slope (ft/ft)     * 0.000557 * Area (sq ft)         * 249.59 * 272.93 * 31.32 *
* Q Total (cfs)          * 1865.00 * Flow (cfs)            * 841.11 * 1006.65 * 17.24 *
* Top Width (ft)         * 140.84 * Top Width (ft)        * 96.38 * 29.07 * 15.39 *
* Vel Total (ft/s)       * 3.49 * Avg. Vel. (ft/s)      * 3.64 * 3.69 * 0.55 *
* Max Chl Dpth (ft)      * 11.86 * Hydr. Depth (ft)      * 3.31 * 9.39 * 2.04 *
* Conv. Total (cfs)      * 79044.6 * Conv. (cfs)           * 35648.9 * 42665.1 * 730.6 *
* Length Wtd. (ft)       * 29.92 * Wetted Per. (ft)      * 70.86 * 38.63 * 15.92 *
* Min Ch El (ft)        * 239.32 * Shear (lb/sq ft)      * 0.11 * 0.25 * 0.07 *
* Alpha                  * 1.10 * Stream Power (lb/ft s) * 194.32 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.02 * Cum Volume (acre-ft)  * 0.89 * 7.91 * 2.25 *
* C & E Loss (ft)       * 0.02 * Cum SA (acres)        * 1.13 * 0.76 * 2.01 *
*****

```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)          * 252.09 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.26 * Wt. n-Val.             * 0.021 * 0.035 * 0.100 *
* W.S. Elev (ft)         * 251.83 * Reach Len. (ft)        * 29.59 * 30.25 * 33.09 *
* Crit W.S. (ft)         * 248.52 * Flow Area (sq ft)     * 276.20 * 291.83 * 42.10 *
* E.G. Slope (ft/ft)     * 0.000589 * Area (sq ft)         * 314.40 * 291.83 * 42.12 *
* Q Total (cfs)          * 2353.00 * Flow (cfs)            * 1168.61 * 1157.69 * 26.69 *
* Top Width (ft)         * 149.80 * Top Width (ft)        * 103.00 * 29.07 * 17.73 *
* Vel Total (ft/s)       * 3.86 * Avg. Vel. (ft/s)      * 4.23 * 3.97 * 0.63 *
* Max Chl Dpth (ft)      * 12.51 * Hydr. Depth (ft)      * 3.96 * 10.04 * 2.41 *
* Conv. Total (cfs)      * 96953.9 * Conv. (cfs)           * 48152.0 * 47702.0 * 1099.8 *
* Length Wtd. (ft)       * 29.90 * Wetted Per. (ft)      * 70.86 * 38.63 * 18.06 *
* Min Ch El (ft)        * 239.32 * Shear (lb/sq ft)      * 0.14 * 0.28 * 0.09 *
* Alpha                  * 1.12 * Stream Power (lb/ft s) * 194.32 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.03 * Cum Volume (acre-ft)  * 1.15 * 9.42 * 3.04 *
* C & E Loss (ft)       * 0.02 * Cum SA (acres)        * 1.22 * 0.76 * 2.38 *
*****

```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
REACH: main

RS: 24

INPUT
Description:

Station Elevation Data		num= 26		Sta Elev		Sta Elev		Sta Elev		Sta Elev	
0	254.15	60	249.15	72.46	248.78	93.03	247.76	97.13	247.24		
109.77	247.72	125.05	247.56	126.78	247.48	128.29	247.42	129	247.97		
134.47	248.34	134.6	249.05	135.81	248.92	136.29	242.7	136.51	238.47		
137.41	237.99	142.41	237.72	142.42	237.71	147.58	238.1	148.73	238.76		
148.9	242.62	149.32	249.18	149.64	249.21	149.95	249.15	171.17	251.7		
181.17	253.7										

Manning's n Values		num= 4		Sta n Val		Sta n Val	
0	.02	129	.045	135.81	.035	149.95	.1

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	135.81	149.32		615.41	591.97	573.52	.3 .5

Ineffective Flow		num= 1		Sta L Sta R Elev Permanent	
0	65	260	F		

Blocked Obstructions		num= 1		Sta L Sta R Elev	
171.7	181.17	260			

CROSS SECTION OUTPUT Profile #2-YR

* E.G. Elev (ft)	* 245.89	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.22	* Wt. n-Val.	* 0.021	* 0.035	* 0.055
* W.S. Elev (ft)	* 245.67	* Reach Len. (ft)	* 615.41	* 591.97	* 573.52
* Crit W.S. (ft)	* 240.97	* Flow Area (sq ft)	* 98.40	* 145.98	* 0.31
* E.G. Slope (ft/ft)	* 0.001407	* Area (sq ft)	* 100.13	* 145.98	* 0.31
* Q Total (cfs)	* 364.00	* Flow (cfs)	* 322.65	* 607.27	* 0.08
* Top Width (ft)	* 13.03	* Top Width (ft)	* 78.40	* 13.51	* 2.43
* Vel Total (ft/s)	* 3.76	* Avg. Vel. (ft/s)	* 3.28	* 4.16	* 0.26
* Max Chl Dpth (ft)	* 7.96	* Hydr. Depth (ft)	* 1.39	* 10.81	* 0.13
* Conv. Total (cfs)	* 9704.7	* Conv. (cfs)	* 8793.1	* 16549.5	* 2.2
* Length Wtd. (ft)	* 591.97	* Wetted Per. (ft)	* 71.68	* 33.45	* 2.45
* Min Ch El (ft)	* 237.71	* Shear (lb/sq ft)	* 0.12	* 0.37	* 0.01
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 181.17	* 0.00	* 0.00
* Frctn Loss (ft)	*	* Cum Volume (acre-ft)	* 0.00	* 1.22	* 0.00
* C & E Loss (ft)	*	* Cum SA (acres)	* 0.00	* 0.65	* 0.07

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 249.60	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.23	* Wt. n-Val.	* 0.021	* 0.035	* 0.055
* W.S. Elev (ft)	* 249.37	* Reach Len. (ft)	* 615.41	* 591.97	* 573.52
* Crit W.S. (ft)	* 243.58	* Flow Area (sq ft)	* 98.40	* 145.98	* 0.31
* E.G. Slope (ft/ft)	* 0.001346	* Area (sq ft)	* 100.13	* 145.98	* 0.31
* Q Total (cfs)	* 930.00	* Flow (cfs)	* 322.65	* 607.27	* 0.08
* Top Width (ft)	* 94.34	* Top Width (ft)	* 78.40	* 13.51	* 2.43
* Vel Total (ft/s)	* 3.80	* Avg. Vel. (ft/s)	* 3.28	* 4.16	* 0.26
* Max Chl Dpth (ft)	* 11.66	* Hydr. Depth (ft)	* 1.39	* 10.81	* 0.13
* Conv. Total (cfs)	* 25344.8	* Conv. (cfs)	* 8793.1	* 16549.5	* 2.2
* Length Wtd. (ft)	* 591.97	* Wetted Per. (ft)	* 71.68	* 33.45	* 2.45
* Min Ch El (ft)	* 237.71	* Shear (lb/sq ft)	* 0.12	* 0.37	* 0.01
* Alpha	* 1.04	* Stream Power (lb/ft s)	* 181.17	* 0.00	* 0.00
* Frctn Loss (ft)	*	* Cum Volume (acre-ft)	* 0.18	* 4.35	* 0.58
* C & E Loss (ft)	*	* Cum SA (acres)	* 0.77	* 0.74	* 1.34

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 251.35	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.38	* Wt. n-Val.	* 0.021	* 0.035	* 0.083
* W.S. Elev (ft)	* 250.97	* Reach Len. (ft)	* 615.41	* 591.97	* 573.52
* Crit W.S. (ft)	* 249.16	* Flow Area (sq ft)	* 211.94	* 167.64	* 14.90
* E.G. Slope (ft/ft)	* 0.001274	* Area (sq ft)	* 241.27	* 167.64	* 14.90
* Q Total (cfs)	* 1865.00	* Flow (cfs)	* 1111.80	* 743.90	* 9.31
* Top Width (ft)	* 126.92	* Top Width (ft)	* 97.64	* 13.51	* 15.77
* Vel Total (ft/s)	* 4.73	* Avg. Vel. (ft/s)	* 5.25	* 4.44	* 0.62

```

* Max Chl Dpth (ft)      * 13.26 * Hydr. Depth (ft)      * 2.99 * 12.41 * 0.94 *
* Conv. Total (cfs)     * 52251.4 * Conv. (cfs)          * 31149.0 * 20841.7 * 260.8 *
* Length Wtd. (ft)     * 591.97 * Wetted Per. (ft)    * 71.68 * 33.45 * 15.89 *
* Min Ch El (ft)       * 237.71 * Shear (lb/sq ft)    * 0.24 * 0.40 * 0.07 *
* Alpha                 * 1.09 * Stream Power (lb/ft s) * 181.17 * 0.00 * 0.00 *
* Frctn Loss (ft)      * * Cum Volume (acre-ft) * 0.72 * 7.75 * 2.23 *
* C & E Loss (ft)      * * Cum SA (acres)      * 1.06 * 0.74 * 1.99 *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)        * 252.04 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)        * 0.47 * Wt. n-Val.           * 0.021 * 0.035 * 0.086 *
* W.S. Elev (ft)       * 251.57 * Reach Len. (ft)     * 615.41 * 591.97 * 573.52 *
* Crit W.S. (ft)       * 249.51 * Flow Area (sq ft)   * 254.33 * 175.73 * 25.83 *
* E.G. Slope (ft/ft)   * 0.001303 * Area (sq ft)        * 301.88 * 175.73 * 25.83 *
* Q Total (cfs)        * 2353.00 * Flow (cfs)          * 1520.53 * 813.66 * 18.80 *
* Top Width (ft)       * 139.09 * Top Width (ft)      * 104.83 * 13.51 * 20.75 *
* Vel Total (ft/s)     * 5.16 * Avg. Vel. (ft/s)    * 5.98 * 4.63 * 0.73 *
* Max Chl Dpth (ft)    * 13.86 * Hydr. Depth (ft)    * 3.59 * 13.01 * 1.24 *
* Conv. Total (cfs)    * 65195.8 * Conv. (cfs)         * 42130.2 * 22544.6 * 521.0 *
* Length Wtd. (ft)    * 591.97 * Wetted Per. (ft)    * 71.68 * 33.45 * 20.90 *
* Min Ch El (ft)      * 237.71 * Shear (lb/sq ft)    * 0.29 * 0.43 * 0.10 *
* Alpha                * 1.15 * Stream Power (lb/ft s) * 181.17 * 0.00 * 0.00 *
* Frctn Loss (ft)     * * Cum Volume (acre-ft) * 0.94 * 9.26 * 3.01 *
* C & E Loss (ft)     * * Cum SA (acres)     * 1.15 * 0.74 * 2.37 *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CULVERT

RIVER: hudson
REACH: main RS: 20

INPUT

Description:

Distance from Upstream XS = 2
Deck/Roadway Width = 566
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates

```

num= 3
Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord
*****
135.81 249.15 137 249.15 152 249.15

```

Upstream Bridge Cross Section Data

```

Station Elevation Data num= 26
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
*****
0 254.15 60 249.15 72.46 248.78 93.03 247.76 97.13 247.24
109.77 247.72 125.05 247.56 126.78 247.48 128.29 247.42 129 247.97
134.47 248.34 134.6 249.05 135.81 248.92 136.29 242.7 136.51 238.47
137.41 237.99 142.41 237.72 142.42 237.71 147.58 238.1 148.73 238.76
148.9 242.62 149.32 249.18 149.64 249.21 149.95 249.15 171.17 251.7
181.17 253.7

```

Manning's n Values

```

num= 4
Sta n Val Sta n Val Sta n Val Sta n Val
*****
0 .02 129 .045 135.81 .035 149.95 .1

```

Bank Sta: Left Right Coeff Contr. Expan.
135.81 149.32 .3 .5

Ineffective Flow num= 1
Sta L Sta R Elev Permanent
0 65 260 F

Blocked Obstructions num= 1
Sta L Sta R Elev

171.7 181.17 260

Downstream Deck/Roadway Coordinates
num= 9

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
0		245.5			46		242.55			49		242.28		
69		236.72			88		232.44			113		231.06		
131		231.6			162		233.79			183		235.96		

Downstream Bridge Cross Section Data

Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	248.1	14.71	237.72	23.72	231	25.86	230	28.49	229
38.71	227	42.25	227	50.16	227	55.6	228.96	71.32	229.8
113.72	230.51	160.05	232.96	160.35	232.96	186.93	237.56	188.11	241.98
189.39	242.3	193.37	242.37	197.27	242.28	197.37	242.11	217.75	242.56
234.11	241.83	235.6	241.71	236.27	242.26	242.78	242.92	249.14	247.54
255.21	248.57	259.08	250.56						

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.08	28.49	.035	55.6	.03	186.93	.04	193.37	.02
236.27	.06								

Bank Sta: Left Right Coeff Contr. Expan.

23.72 55.6 .3 .5

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
147.8	188	255	F

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = 8
Elevation at which weir flow begins = 244.7
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name Shape Rise Span

Culvert #1 Circular 7
FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 1 - Square edge entrance with headwall
Solution Criteria = Highest U.S. EG

Culvert	Upstrm	Dist	Length	Top n	Bottom n	Depth Blocked	Entrance	Loss Coef	Exit	Loss Coef
2	566	.024	.024	0	.2	1				

Upstream Elevation = 237.7
Centerline Station = 142.42
Downstream Elevation = 227.1
Centerline Station = 44.43

CULVERT OUTPUT Profile #2-YR Culv Group: Culvert #1

* Q Culv Group (cfs)	* 364.00	* Culv Full Len (ft)	* *
* # Barrels	* 1	* Culv Vel US (ft/s)	* 12.30 *
* Q Barrel (cfs)	* 364.00	* Culv Vel DS (ft/s)	* 13.57 *
* E.G. US. (ft)	* 245.89	* Culv Inv El Up (ft)	* 237.70 *
* W.S. US. (ft)	* 245.67	* Culv Inv El Dn (ft)	* 227.10 *
* E.G. DS (ft)	* 229.59	* Culv Frctn Ls (ft)	* 10.52 *
* W.S. DS (ft)	* 229.47	* Culv Exit Loss (ft)	* 4.97 *
* Delta EG (ft)	* 16.30	* Culv Entr Loss (ft)	* 0.81 *
* Delta WS (ft)	* 16.19	* Q Weir (cfs)	* *
* E.G. IC (ft)	* 245.89	* Weir Sta Lft (ft)	* *
* E.G. OC (ft)	* 245.55	* Weir Sta Rgt (ft)	* *
* Culvert Control	* Inlet	* Weir Submerg	* *
* Culv WS Inlet (ft)	* 242.73	* Weir Max Depth (ft)	* *
* Culv WS Outlet (ft)	* 231.70	* Weir Avg Depth (ft)	* *
* Culv Nml Depth (ft)	* 4.60	* Weir Flow Area (sq ft)	* *
* Culv Crt Depth (ft)	* 5.03	* Min El Weir Flow (ft)	* 247.25 *

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
Note: During the supercritical calculations a hydraulic jump occurred at the outlet of (leaving) the culvert.
Warning: During the supercritical analysis, the program could not converge on a supercritical answer in the downstream cross section. The program used the solution with the least error.

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.

Note: The flow in the culvert is entirely supercritical.

```
CULVERT OUTPUT Profile #10-YR Culv Group: Culvert #1
*****
* Q Culv Group (cfs)      * 526.07 * Culv Full Len (ft)    * 323.16 *
* # Barrels              *      1 * Culv Vel US (ft/s)   * 13.67 *
* Q Barrel (cfs)        * 526.07 * Culv Vel DS (ft/s)   * 15.05 *
* E.G. US. (ft)         * 249.60 * Culv Inv El Up (ft)  * 237.70 *
* W.S. US. (ft)         * 249.37 * Culv Inv El Dn (ft)  * 227.10 *
* E.G. DS (ft)          * 231.59 * Culv Frctn Ls (ft)   * 12.43 *
* W.S. DS (ft)          * 231.37 * Culv Exit Loss (ft)  * 5.00 *
* Delta EG (ft)         * 18.01 * Culv Entr Loss (ft)  * 0.58 *
* Delta WS (ft)         * 17.99 * Q Weir (cfs)         * 403.93 *
* E.G. IC (ft)          * 249.59 * Weir Sta Lft (ft)    * 65.00 *
* E.G. OC (ft)          * 249.60 * Weir Sta Rgt (ft)    * 153.65 *
* Culvert Control       * Outlet * Weir Submerg        * 0.00 *
* Culv WS Inlet (ft)    * 244.70 * Weir Max Depth (ft)  * 2.36 *
* Culv WS Outlet (ft)   * 233.07 * Weir Avg Depth (ft)  * 1.37 *
* Culv Nml Depth (ft)   * 7.00 * Weir Flow Area (sq ft) * 121.72 *
* Culv Crt Depth (ft)   * 5.97 * Min El Weir Flow (ft) * 247.25 *
*****
```

Note: The normal depth exceeds the height of the culvert. The program assumes that the normal depth is equal to the height of the culvert.

Note: During supercritical analysis, the culvert direct step method went to critical depth. The program then assumed critical depth at the outlet.

Note: During the supercritical calculations a hydraulic jump occurred inside of the culvert.

Note: The culvert inlet is submerged and the culvert flows full over part or all of its length.

Therefore, the culvert inlet

equations are not valid and the supercritical result has been discarded. The outlet answer will be used.

```
CULVERT OUTPUT Profile #50-YR Culv Group: Culvert #1
*****
* Q Culv Group (cfs)      * 546.99 * Culv Full Len (ft)    * 460.19 *
* # Barrels              *      1 * Culv Vel US (ft/s)   * 14.21 *
* Q Barrel (cfs)        * 546.99 * Culv Vel DS (ft/s)   * 15.45 *
* E.G. US. (ft)         * 251.35 * Culv Inv El Up (ft)  * 237.70 *
* W.S. US. (ft)         * 250.97 * Culv Inv El Dn (ft)  * 227.10 *
* E.G. DS (ft)          * 233.19 * Culv Frctn Ls (ft)   * 13.85 *
* W.S. DS (ft)          * 232.89 * Culv Exit Loss (ft)  * 3.67 *
* Delta EG (ft)         * 18.15 * Culv Entr Loss (ft)  * 0.63 *
* Delta WS (ft)         * 18.08 * Q Weir (cfs)         * 1318.01 *
* E.G. IC (ft)          * 251.30 * Weir Sta Lft (ft)    * 65.00 *
* E.G. OC (ft)          * 251.35 * Weir Sta Rgt (ft)    * 168.18 *
* Culvert Control       * Outlet * Weir Submerg        * 0.00 *
* Culv WS Inlet (ft)    * 244.70 * Weir Max Depth (ft)  * 4.10 *
* Culv WS Outlet (ft)   * 233.16 * Weir Avg Depth (ft)  * 2.80 *
* Culv Nml Depth (ft)   * 7.00 * Weir Flow Area (sq ft) * 289.12 *
* Culv Crt Depth (ft)   * 6.06 * Min El Weir Flow (ft) * 247.25 *
*****
```

Note: The normal depth exceeds the height of the culvert. The program assumes that the normal depth is equal to the height of the culvert.

```
CULVERT OUTPUT Profile #100-YR Culv Group: Culvert #1
*****
* Q Culv Group (cfs)      * 556.02 * Culv Full Len (ft)    * 486.65 *
* # Barrels              *      1 * Culv Vel US (ft/s)   * 14.45 *
* Q Barrel (cfs)        * 556.02 * Culv Vel DS (ft/s)   * 15.27 *
* E.G. US. (ft)         * 252.04 * Culv Inv El Up (ft)  * 237.70 *
* W.S. US. (ft)         * 251.57 * Culv Inv El Dn (ft)  * 227.10 *
* E.G. DS (ft)          * 233.74 * Culv Frctn Ls (ft)   * 14.39 *
* W.S. DS (ft)          * 233.39 * Culv Exit Loss (ft)  * 3.26 *
* Delta EG (ft)         * 18.30 * Culv Entr Loss (ft)  * 0.65 *
* Delta WS (ft)         * 18.18 * Q Weir (cfs)         * 1796.98 *
* E.G. IC (ft)          * 251.99 * Weir Sta Lft (ft)    * 65.00 *
* E.G. OC (ft)          * 252.04 * Weir Sta Rgt (ft)    * 171.70 *
* Culvert Control       * Outlet * Weir Submerg        * 0.00 *
* Culv WS Inlet (ft)    * 244.70 * Weir Max Depth (ft)  * 4.78 *
* Culv WS Outlet (ft)   * 233.39 * Weir Avg Depth (ft)  * 3.38 *
* Culv Nml Depth (ft)   * 7.00 * Weir Flow Area (sq ft) * 361.18 *
* Culv Crt Depth (ft)   * 6.10 * Min El Weir Flow (ft) * 247.25 *
```

Note: The normal depth exceeds the height of the culvert. The program assumes that the normal depth is equal to the height of the culvert.

CROSS SECTION

RIVER: hudson
REACH: main RS: 14

INPUT

Description:

Table with 10 columns: Station, Elevation, Data, num=, Sta, Elev, Sta, Elev, Sta, Elev. Contains 10 rows of data points.

Table with 10 columns: Manning's n Values, num=, Sta, n Val, Sta, n Val, Sta, n Val, Sta, n Val, Sta, n Val. Contains 2 rows of data points.

Table with 7 columns: Bank Sta: Left, Right, Lengths: Left Channel, Right, Coeff Contr., Expan. Contains 2 rows of data points.

CROSS SECTION OUTPUT Profile #2-YR

Table with 7 columns: E.G. Elev (ft), Vel Head (ft), W.S. Elev (ft), Crit W.S. (ft), E.G. Slope (ft/ft), Q Total (cfs), Top Width (ft), Vel Total (ft/s), Max Chl Dpth (ft), Conv. Total (cfs), Length Wtd. (ft), Min Ch El (ft), Alpha, Frctn Loss (ft), C & E Loss (ft). Contains 15 rows of data points.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #10-YR

Table with 7 columns: E.G. Elev (ft), Vel Head (ft), W.S. Elev (ft), Crit W.S. (ft), E.G. Slope (ft/ft), Q Total (cfs), Top Width (ft), Vel Total (ft/s), Max Chl Dpth (ft), Conv. Total (cfs), Length Wtd. (ft), Min Ch El (ft), Alpha. Contains 13 rows of data points.

```

* Frctn Loss (ft)          * 0.13 * Cum Volume (acre-ft) * 0.18 * 2.25 * 0.58 *
* C & E Loss (ft)         * 0.23 * Cum SA (acres) * 0.19 * 0.43 * 0.84 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)          * 233.19 * Element * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.30 * Wt. n-Val. * 0.100 * 0.052 * 0.045 *
* W.S. Elev (ft)         * 232.89 * Reach Len. (ft) * 32.61 * 35.44 * 36.08 *
* Crit W.S. (ft)         * 229.79 * Flow Area (sq ft) * 7.90 * 260.39 * 221.93 *
* E.G. Slope (ft/ft)     * 0.002226 * Area (sq ft) * 7.90 * 260.39 * 225.13 *
* Q Total (cfs)          * 1925.00 * Flow (cfs) * 6.94 * 1297.45 * 620.61 *
* Top Width (ft)         * 139.12 * Top Width (ft) * 4.04 * 31.88 * 103.21 *
* Vel Total (ft/s)       * 3.93 * Avg. Vel. (ft/s) * 0.88 * 4.98 * 2.80 *
* Max Chl Dpth (ft)      * 9.99 * Hydr. Depth (ft) * 1.96 * 8.17 * 2.41 *
* Conv. Total (cfs)      * 40803.7 * Conv. (cfs) * 147.2 * 27501.7 * 13154.8 *
* Length Wtd. (ft)       * 35.57 * Wetted Per. (ft) * 5.62 * 36.63 * 92.28 *
* Min Ch El (ft)         * 222.90 * Shear (lb/sq ft) * 0.20 * 0.99 * 0.33 *
* Alpha                  * 1.25 * Stream Power (lb/ft s) * 259.08 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.13 * Cum Volume (acre-ft) * 0.72 * 3.47 * 2.23 *
* C & E Loss (ft)       * 0.24 * Cum SA (acres) * 0.34 * 0.43 * 1.21 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)          * 233.74 * Element * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.35 * Wt. n-Val. * 0.100 * 0.052 * 0.045 *
* W.S. Elev (ft)         * 233.39 * Reach Len. (ft) * 32.61 * 35.44 * 36.08 *
* Crit W.S. (ft)         * 231.19 * Flow Area (sq ft) * 10.01 * 276.07 * 267.29 *
* E.G. Slope (ft/ft)     * 0.002480 * Area (sq ft) * 10.01 * 276.07 * 277.13 *
* Q Total (cfs)          * 2413.00 * Flow (cfs) * 10.05 * 1509.81 * 893.14 *
* Top Width (ft)         * 143.63 * Top Width (ft) * 4.54 * 31.88 * 107.21 *
* Vel Total (ft/s)       * 4.36 * Avg. Vel. (ft/s) * 1.00 * 5.47 * 3.34 *
* Max Chl Dpth (ft)      * 10.49 * Hydr. Depth (ft) * 2.20 * 8.66 * 2.90 *
* Conv. Total (cfs)      * 48453.7 * Conv. (cfs) * 201.8 * 30317.5 * 17934.4 *
* Length Wtd. (ft)       * 35.60 * Wetted Per. (ft) * 6.33 * 36.63 * 92.28 *
* Min Ch El (ft)         * 222.90 * Shear (lb/sq ft) * 0.24 * 1.17 * 0.45 *
* Alpha                  * 1.20 * Stream Power (lb/ft s) * 259.08 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.14 * Cum Volume (acre-ft) * 0.94 * 4.02 * 3.01 *
* C & E Loss (ft)       * 0.26 * Cum SA (acres) * 0.38 * 0.43 * 1.53 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: hudson
REACH: main RS: 13

INPUT

Description:

Station Elevation Data num= 24
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev

```
*****
0 241.96 14.55 230.95 32.96 227.31 36.62 225.36 41.86 224.74
42.53 224.66 46.66 225.42 50.53 227.84 56.2 227.42 61.55 230.48
83.14 230.27 114.16 230.85 147.33 231.62 165.36 233 196.3 242.62
199.29 241.9 203.15 241.91 203.26 241.69 211.59 241.93 222.67 242.05
233.56 241.54 240.52 241.08 241.1 241.66 251.87 250.04
```

```
Manning's n Values num= 5
Sta n Val Sta n Val Sta n Val Sta n Val Sta n Val
*****
0 .1 14.55 .035 61.55 .045 199.29 .02 241.1 .1
```

```
Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
14.55 61.55 36.53 35.61 35.05 .1 .3
Ineffective Flow num= 1
Sta L Sta R Elev Permanent
157.7 165.4 255 F
Blocked Obstructions num= 1
Sta L Sta R Elev
*****
165.4 196.3 255
```

CROSS SECTION OUTPUT Profile #2-YR

```
*****
* E.G. Elev (ft) * 229.23 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.91 * Wt. n-Val. * * 0.035 * *
* W.S. Elev (ft) * 228.32 * Reach Len. (ft) * 36.53 * 35.61 * 35.05 *
* Crit W.S. (ft) * 228.32 * Flow Area (sq ft) * * 54.19 * *
* E.G. Slope (ft/ft) *0.015845 * Area (sq ft) * * 54.19 * *
* Q Total (cfs) * 415.00 * Flow (cfs) * * 415.00 * *
* Top Width (ft) * 29.94 * Top Width (ft) * * 29.94 * *
* Vel Total (ft/s) * 7.66 * Avg. Vel. (ft/s) * * 7.66 * *
* Max Chl Dpth (ft) * 3.66 * Hydr. Depth (ft) * * 1.81 * *
* Conv. Total (cfs) * 3296.9 * Conv. (cfs) * * 3296.9 * *
* Length Wtd. (ft) * 35.61 * Wetted Per. (ft) * * 31.59 * *
* Min Ch El (ft) * 224.66 * Shear (lb/sq ft) * * 1.70 * *
* Alpha * 1.00 * Stream Power (lb/ft s) * 251.87 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.26 * Cum Volume (acre-ft) * * 0.79 * *
* C & E Loss (ft) * 0.18 * Cum SA (acres) * * 0.32 * *
*****
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```
*****
* E.G. Elev (ft) * 231.24 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.97 * Wt. n-Val. * * 0.035 * *
* W.S. Elev (ft) * 230.27 * Reach Len. (ft) * 36.53 * 35.61 * 35.05 *
* Crit W.S. (ft) * 229.83 * Flow Area (sq ft) * * 125.24 * *
* E.G. Slope (ft/ft) *0.008992 * Area (sq ft) * * 125.24 * *
* Q Total (cfs) * 990.00 * Flow (cfs) * * 990.00 * *
* Top Width (ft) * 43.17 * Top Width (ft) * * 43.17 * *
* Vel Total (ft/s) * 7.90 * Avg. Vel. (ft/s) * * 7.90 * *
* Max Chl Dpth (ft) * 5.61 * Hydr. Depth (ft) * * 2.90 * *
* Conv. Total (cfs) * 10439.9 * Conv. (cfs) * * 10439.9 * *
* Length Wtd. (ft) * 35.61 * Wetted Per. (ft) * * 45.52 * *
* Min Ch El (ft) * 224.66 * Shear (lb/sq ft) * * 1.54 * *
* Alpha * 1.00 * Stream Power (lb/ft s) * 251.87 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.16 * Cum Volume (acre-ft) * 0.18 * 2.11 * 0.55 *
* C & E Loss (ft) * 0.16 * Cum SA (acres) * 0.19 * 0.40 * 0.80 *
*****
```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```
*****
* E.G. Elev (ft)      * 232.82 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.11  * Wt. n-Val.      * 0.100  * 0.035  * 0.045  *
* W.S. Elev (ft)     * 231.71 * Reach Len. (ft) * 36.53  * 35.61  * 35.05  *
* Crit W.S. (ft)     * 231.71 * Flow Area (sq ft) * 0.38  * 191.83 * 80.23  *
* E.G. Slope (ft/ft) * 0.007247 * Area (sq ft)    * 0.38  * 191.83 * 80.23  *
* Q Total (cfs)      * 1925.00 * Flow (cfs)      * 0.22  * 1711.06 * 213.73 *
* Top Width (ft)     * 134.95 * Top Width (ft)  * 1.00  * 47.00  * 86.94  *
* Vel Total (ft/s)   * 7.07  * Avg. Vel. (ft/s) * 0.57  * 8.92  * 2.66  *
* Max Chl Dpth (ft)  * 7.05  * Hydr. Depth (ft) * 0.38  * 4.08  * 0.92  *
* Conv. Total (cfs)  * 22613.0 * Conv. (cfs)     * 2.6   * 20099.8 * 2510.7 *
* Length Wtd. (ft)   * 35.55 * Wetted Per. (ft) * 1.26  * 49.48 * 86.96  *
* Min Ch El (ft)     * 224.66 * Shear (lb/sq ft) * 0.14  * 1.75  * 0.42  *
* Alpha              * 1.43  * Stream Power (lb/ft s) * 251.87 * 0.00  * 0.00  *
* Frctn Loss (ft)    * 0.20  * Cum Volume (acre-ft) * 0.72  * 3.28  * 2.10  *
* C & E Loss (ft)    * 0.08  * Cum SA (acres)   * 0.34  * 0.40  * 1.13  *
*****
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```
*****
* E.G. Elev (ft)      * 233.34 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.21  * Wt. n-Val.      * 0.100  * 0.035  * 0.045  *
* W.S. Elev (ft)     * 232.13 * Reach Len. (ft) * 36.53  * 35.61  * 35.05  *
* Crit W.S. (ft)     * 232.13 * Flow Area (sq ft) * 0.92  * 211.61 * 117.97 *
* E.G. Slope (ft/ft) * 0.007290 * Area (sq ft)    * 0.92  * 211.61 * 117.97 *
* Q Total (cfs)      * 2413.00 * Flow (cfs)      * 0.71  * 2021.08 * 391.22 *
* Top Width (ft)     * 141.00 * Top Width (ft)  * 1.56  * 47.00  * 92.44  *
* Vel Total (ft/s)   * 7.30  * Avg. Vel. (ft/s) * 0.77  * 9.55  * 3.32  *
* Max Chl Dpth (ft)  * 7.47  * Hydr. Depth (ft) * 0.59  * 4.50  * 1.28  *
* Conv. Total (cfs)  * 28260.8 * Conv. (cfs)     * 8.3   * 23670.6 * 4581.9 *
* Length Wtd. (ft)   * 35.52 * Wetted Per. (ft) * 1.96  * 49.48 * 92.48  *
* Min Ch El (ft)     * 224.66 * Shear (lb/sq ft) * 0.21  * 1.95  * 0.58  *
* Alpha              * 1.47  * Stream Power (lb/ft s) * 251.87 * 0.00  * 0.00  *
* Frctn Loss (ft)    * 0.19  * Cum Volume (acre-ft) * 0.94  * 3.83  * 2.85  *
* C & E Loss (ft)    * 0.10  * Cum SA (acres)   * 0.38  * 0.40  * 1.44  *
*****
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main

RS: 12

INPUT

Description:

Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	235.97	4.29	233.19	9.01	229.89	17.76	227.7	28.61	225.14
36.48	224.53	37.83	224.73	40.71	225.18	43.81	227.25	55.11	226.71

56.34	228.17	57.5	230.17	63.19	230.16	87.64	229.97	122.51	230.61
158.38	231.61	163.21	231.75	184.45	232.71	185.11	234.3	200.8	234.38
201.16	240.02	206.05	240.52	209.96	240.56	228.22	240.92	246.17	240.16
246.99	240.76	255.05	247.12						

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	9.01	.035	57.5	.045	206.05	.02	246.99	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 9.01 57.5 43.41 42.27 41.38 .1 .3

Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 179.23 201.87 250 F

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft) * 228.77 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.32 * Wt. n-Val. * * * 0.035 * *
* W.S. Elev (ft) * 228.46 * Reach Len. (ft) * 43.41 * 42.27 * 41.38 *
* Crit W.S. (ft) * 227.62 * Flow Area (sq ft) * * * 91.94 * *
* E.G. Slope (ft/ft) * 0.004197 * Area (sq ft) * * * 91.94 * *
* Q Total (cfs) * 415.00 * Flow (cfs) * * * 415.00 * *
* Top Width (ft) * 41.77 * Top Width (ft) * * * 41.77 * *
* Vel Total (ft/s) * 4.51 * Avg. Vel. (ft/s) * * * 4.51 * *
* Max Chl Dpth (ft) * 3.93 * Hydr. Depth (ft) * * * 2.20 * *
* Conv. Total (cfs) * 6406.1 * Conv. (cfs) * * * 6406.1 * *
* Length Wtd. (ft) * 42.27 * Wetted Per. (ft) * * * 43.72 * *
* Min Ch El (ft) * 224.53 * Shear (lb/sq ft) * * * 0.55 * *
* Alpha * 1.00 * Stream Power (lb/ft s) * 255.05 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.30 * Cum Volume (acre-ft) * * * 0.73 * *
* C & E Loss (ft) * 0.07 * Cum SA (acres) * * * 0.29 * *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft) * 230.91 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.42 * Wt. n-Val. * 0.100 * 0.035 * 0.045 *
* W.S. Elev (ft) * 230.48 * Reach Len. (ft) * 43.41 * 42.27 * 41.38 *
* Crit W.S. (ft) * 228.88 * Flow Area (sq ft) * 0.25 * 185.26 * 19.26 *
* E.G. Slope (ft/ft) * 0.002789 * Area (sq ft) * 0.25 * 185.26 * 19.26 *
* Q Total (cfs) * 990.00 * Flow (cfs) * 0.08 * 973.85 * 16.08 *
* Top Width (ft) * 107.49 * Top Width (ft) * 0.85 * 48.49 * 58.15 *
* Vel Total (ft/s) * 4.83 * Avg. Vel. (ft/s) * 0.31 * 5.26 * 0.83 *
* Max Chl Dpth (ft) * 5.95 * Hydr. Depth (ft) * 0.30 * 3.82 * 0.33 *
* Conv. Total (cfs) * 18746.3 * Conv. (cfs) * 1.5 * 18440.4 * 304.4 *
* Length Wtd. (ft) * 42.27 * Wetted Per. (ft) * 1.04 * 51.60 * 58.15 *
* Min Ch El (ft) * 224.53 * Shear (lb/sq ft) * 0.04 * 0.63 * 0.06 *
* Alpha * 1.16 * Stream Power (lb/ft s) * 255.05 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.21 * Cum Volume (acre-ft) * 0.18 * 1.99 * 0.54 *
* C & E Loss (ft) * 0.10 * Cum SA (acres) * 0.19 * 0.36 * 0.78 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft) * 232.19 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.83 * Wt. n-Val. * 0.100 * 0.035 * 0.045 *
* W.S. Elev (ft) * 231.35 * Reach Len. (ft) * 43.41 * 42.27 * 41.38 *
* Crit W.S. (ft) * 230.73 * Flow Area (sq ft) * 1.53 * 227.37 * 85.17 *
* E.G. Slope (ft/ft) * 0.004519 * Area (sq ft) * 1.53 * 227.37 * 85.17 *
* Q Total (cfs) * 1925.00 * Flow (cfs) * 1.09 * 1743.90 * 180.01 *
*****

```

```

* Top Width (ft)          * 142.22 * Top Width (ft)          * 2.09 * 48.49 * 91.64 *
* Vel Total (ft/s)       * 6.13  * Avg. Vel. (ft/s)       * 0.71 * 7.67 * 2.11 *
* Max Chl Dpth (ft)     * 6.82  * Hydr. Depth (ft)      * 0.73 * 4.69 * 0.93 *
* Conv. Total (cfs)      * 28637.1 * Conv. (cfs)           * 16.2 * 25943.0 * 2677.9 *
* Length Wtd. (ft)      * 42.14 * Wetted Per. (ft)      * 2.55 * 51.60 * 91.66 *
* Min Ch El (ft)        * 224.53 * Shear (lb/sq ft)      * 0.17 * 1.24 * 0.26 *
* Alpha                  * 1.43  * Stream Power (lb/ft s) * 255.05 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.19  * Cum Volume (acre-ft)  * 0.72 * 3.11 * 2.04 *
* C & E Loss (ft)       * 0.01  * Cum SA (acres)        * 0.34 * 0.36 * 1.06 *
*****

```

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)        * 232.78 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)        * 0.87  * Wt. n-Val.             * 0.100 * 0.035 * 0.045 *
* W.S. Elev (ft)       * 231.91 * Reach Len. (ft)       * 43.41 * 42.27 * 41.38 *
* Crit W.S. (ft)       * 231.33 * Flow Area (sq ft)     * 2.93 * 254.55 * 141.96 *
* E.G. Slope (ft/ft)   * 0.004269 * Area (sq ft)         * 2.93 * 254.55 * 141.96 *
* Q Total (cfs)        * 2413.00 * Flow (cfs)           * 2.51 * 2046.03 * 364.46 *
* Top Width (ft)       * 160.70 * Top Width (ft)       * 2.89 * 48.49 * 109.32 *
* Vel Total (ft/s)     * 6.04  * Avg. Vel. (ft/s)     * 0.86 * 8.04 * 2.57 *
* Max Chl Dpth (ft)   * 7.38  * Hydr. Depth (ft)     * 1.01 * 5.25 * 1.30 *
* Conv. Total (cfs)    * 36933.1 * Conv. (cfs)         * 38.4 * 31316.3 * 5578.4 *
* Length Wtd. (ft)    * 42.08 * Wetted Per. (ft)     * 3.53 * 51.60 * 109.34 *
* Min Ch El (ft)      * 224.53 * Shear (lb/sq ft)     * 0.22 * 1.31 * 0.35 *
* Alpha                * 1.53  * Stream Power (lb/ft s) * 255.05 * 0.00 * 0.00 *
* Frctn Loss (ft)     * 0.16  * Cum Volume (acre-ft) * 0.93 * 3.63 * 2.74 *
* C & E Loss (ft)     * 0.06  * Cum SA (acres)       * 0.38 * 0.36 * 1.36 *
*****

```

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
REACH: main RS: 11

INPUT

Description:

Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	245.96	10.1	239.95	27.61	230.25	50	227.94	56.91	224.69
62.67	224.26	62.68	224.25	63.08	224.22	69.01	224.83	75.79	227.38
81.94	229.34	113.15	229.54	159.41	229.57	197.32	230.73	229.05	232.56
241.65	238.86	245.59	238.88	245.71	238.5	252.11	238.68	263.49	238.91
274.3	238.47	281.62	238.2	282.41	238.74	288.52	243.68	297.15	245.07

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	50	.035	81.94	.045	229.05	.05	241.65	.02
282.41	.1								

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
50 81.94 42.45 41.39 40 .1 .3

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft)        * 228.40 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)        * 1.05  * Wt. n-Val.             * 0.100 * 0.035 * 0.045 *
* W.S. Elev (ft)       * 227.35 * Reach Len. (ft)       * 42.45 * 41.39 * 40.00 *
* Crit W.S. (ft)       * 227.35 * Flow Area (sq ft)     * 2.93 * 254.55 * 141.96 *
* E.G. Slope (ft/ft)   * 0.015094 * Area (sq ft)         * 2.93 * 254.55 * 141.96 *
* Q Total (cfs)        * 415.00 * Flow (cfs)           * 2.51 * 2046.03 * 364.46 *
* Top Width (ft)       * 24.45 * Top Width (ft)       * 2.89 * 48.49 * 109.32 *
* Vel Total (ft/s)     * 8.22  * Avg. Vel. (ft/s)     * 0.86 * 8.04 * 2.57 *
* Max Chl Dpth (ft)   * 3.13  * Hydr. Depth (ft)     * 1.01 * 5.25 * 1.30 *
* Conv. Total (cfs)    * 3377.9 * Conv. (cfs)         * 38.4 * 31316.3 * 5578.4 *
* Length Wtd. (ft)    * 41.39 * Wetted Per. (ft)     * 3.53 * 51.60 * 109.34 *
* Min Ch El (ft)      * 224.22 * Shear (lb/sq ft)     * 0.22 * 1.31 * 0.35 *
* Alpha                * 1.00  * Stream Power (lb/ft s) * 297.15 * 0.00 * 0.00 *
*****

```

```

* Frctn Loss (ft)      * 0.55 * Cum Volume (acre-ft) * 0.66 *
* C & E Loss (ft)     * 0.05 * Cum SA (acres) * 0.26 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)      * 230.59 * Element * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.45 * Wt. n-Val. * 0.100 * 0.035 *
* W.S. Elev (ft)     * 229.14 * Reach Len. (ft) * 42.45 * 41.39 * 40.00 *
* Crit W.S. (ft)     * 229.08 * Flow Area (sq ft) * 6.93 * 101.06 *
* E.G. Slope (ft/ft) * 0.011692 * Area (sq ft) * 6.93 * 101.06 *
* Q Total (cfs)      * 990.00 * Flow (cfs) * 7.87 * 982.13 *
* Top Width (ft)     * 42.89 * Top Width (ft) * 11.59 * 31.30 *
* Vel Total (ft/s)   * 9.17 * Avg. Vel. (ft/s) * 1.14 * 9.72 *
* Max Chl Dpth (ft) * 4.92 * Hydr. Depth (ft) * 0.60 * 3.23 *
* Conv. Total (cfs) * 9155.6 * Conv. (cfs) * 72.8 * 9082.8 *
* Length Wtd. (ft)  * 41.37 * Wetted Per. (ft) * 11.65 * 32.81 *
* Min Ch El (ft)    * 224.22 * Shear (lb/sq ft) * 0.43 * 2.25 *
* Alpha              * 1.11 * Stream Power (lb/ft s) * 297.15 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 0.32 * Cum Volume (acre-ft) * 0.18 * 1.85 * 0.53 *
* C & E Loss (ft)   * 0.19 * Cum SA (acres) * 0.19 * 0.32 * 0.75 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)      * 231.98 * Element * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.79 * Wt. n-Val. * 0.100 * 0.035 * 0.045 *
* W.S. Elev (ft)     * 231.20 * Reach Len. (ft) * 42.45 * 41.39 * 40.00 *
* Crit W.S. (ft)     * 230.98 * Flow Area (sq ft) * 47.83 * 166.79 * 172.17 *
* E.G. Slope (ft/ft) * 0.004449 * Area (sq ft) * 47.83 * 166.79 * 172.17 *
* Q Total (cfs)      * 1925.00 * Flow (cfs) * 74.14 * 1377.56 * 473.30 *
* Top Width (ft)     * 179.48 * Top Width (ft) * 24.10 * 31.94 * 123.45 *
* Vel Total (ft/s)   * 4.98 * Avg. Vel. (ft/s) * 1.55 * 8.26 * 2.75 *
* Max Chl Dpth (ft) * 6.98 * Hydr. Depth (ft) * 1.99 * 5.22 * 1.39 *
* Conv. Total (cfs) * 28858.9 * Conv. (cfs) * 1111.5 * 20651.9 * 7095.5 *
* Length Wtd. (ft)  * 41.05 * Wetted Per. (ft) * 24.46 * 33.49 * 123.48 *
* Min Ch El (ft)    * 224.22 * Shear (lb/sq ft) * 0.54 * 1.38 * 0.39 *
* Alpha              * 2.05 * Stream Power (lb/ft s) * 297.15 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 0.12 * Cum Volume (acre-ft) * 0.70 * 2.92 * 1.91 *
* C & E Loss (ft)   * 0.11 * Cum SA (acres) * 0.33 * 0.32 * 0.96 *
*****

```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)      * 232.56 * Element * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.67 * Wt. n-Val. * 0.100 * 0.035 * 0.045 *
* W.S. Elev (ft)     * 231.88 * Reach Len. (ft) * 42.45 * 41.39 * 40.00 *
* Crit W.S. (ft)     * * Flow Area (sq ft) * 64.81 * 188.73 * 261.04 *
* E.G. Slope (ft/ft) * 0.003549 * Area (sq ft) * 64.81 * 188.73 * 261.04 *
* Q Total (cfs)      * 2413.00 * Flow (cfs) * 105.81 * 1511.73 * 795.46 *
* Top Width (ft)     * 192.63 * Top Width (ft) * 25.34 * 31.94 * 135.36 *
* Vel Total (ft/s)   * 4.69 * Avg. Vel. (ft/s) * 1.63 * 8.01 * 3.05 *
* Max Chl Dpth (ft) * 7.66 * Hydr. Depth (ft) * 2.56 * 5.91 * 1.93 *
* Conv. Total (cfs) * 40502.4 * Conv. (cfs) * 1776.0 * 25374.5 * 13351.9 *
* Length Wtd. (ft)  * 40.96 * Wetted Per. (ft) * 25.88 * 33.49 * 135.41 *
* Min Ch El (ft)    * 224.22 * Shear (lb/sq ft) * 0.55 * 1.25 * 0.43 *
* Alpha              * 1.97 * Stream Power (lb/ft s) * 297.15 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 0.11 * Cum Volume (acre-ft) * 0.90 * 3.42 * 2.55 *
* C & E Loss (ft)   * 0.08 * Cum SA (acres) * 0.36 * 0.32 * 1.25 *
*****

```

CROSS SECTION

RIVER: hudson
 REACH: main RS: 10

INPUT

Description:

Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	254.32	27.86	234.84	35.17	229.78	70.22	228.43	73.71	226.78
79.05	224.24	84.97	223.61	84.98	223.61	85.18	223.59	91.53	224.07
98.22	226.6	103.1	228.6	141.3	228.97	185.05	229.06	221.96	230.91
249.71	232.98	255.38	233.62	263.5	236.98	267.35	237.07	267.53	236.24
273.96	236.72	285.11	236.99	295.42	236.53	296.92	236.06	297.07	236.98
300.37	237.15	316.57	238.76						

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	27.86	.085	70.22	.035	103.1	.045	263.5	.02
300.37	.05								

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	70.22	103.1		57.02	54.55	53	.1 .3

CROSS SECTION OUTPUT Profile #2-YR

* E.G. Elev (ft)	* 227.75	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 0.87	* Wt. n-Val.	*	* 0.035	*	*
* W.S. Elev (ft)	* 226.88	* Reach Len. (ft)	* 57.02	* 54.55	* 53.00	*
* Crit W.S. (ft)	* 226.69	* Flow Area (sq ft)	*	* 55.30	*	*
* E.G. Slope (ft/ft)	* 0.011760	* Area (sq ft)	*	* 55.30	*	*
* Q Total (cfs)	* 415.00	* Flow (cfs)	*	* 415.00	*	*
* Top Width (ft)	* 25.40	* Top Width (ft)	*	* 25.40	*	*
* Vel Total (ft/s)	* 7.51	* Avg. Vel. (ft/s)	*	* 7.51	*	*
* Max Chl Dpth (ft)	* 3.29	* Hydr. Depth (ft)	*	* 2.18	*	*
* Conv. Total (cfs)	* 3826.8	* Conv. (cfs)	*	* 3826.8	*	*
* Length Wtd. (ft)	* 54.55	* Wetted Per. (ft)	*	* 26.57	*	*
* Min Ch El (ft)	* 223.59	* Shear (lb/sq ft)	*	* 1.53	*	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 316.57	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.58	* Cum Volume (acre-ft)	*	* 0.61	*	*
* C & E Loss (ft)	* 0.01	* Cum SA (acres)	*	* 0.24	*	*

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 230.09	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 0.83	* Wt. n-Val.	* 0.085	* 0.035	* 0.045	*
* W.S. Elev (ft)	* 229.26	* Reach Len. (ft)	* 57.02	* 54.55	* 53.00	*
* Crit W.S. (ft)	* 228.38	* Flow Area (sq ft)	* 8.84	* 127.26	* 28.86	*
* E.G. Slope (ft/ft)	* 0.005469	* Area (sq ft)	* 8.84	* 127.26	* 28.86	*
* Q Total (cfs)	* 990.00	* Flow (cfs)	* 6.33	* 949.59	* 34.08	*
* Top Width (ft)	* 140.16	* Top Width (ft)	* 21.43	* 32.88	* 85.85	*
* Vel Total (ft/s)	* 6.00	* Avg. Vel. (ft/s)	* 0.72	* 7.46	* 1.18	*
* Max Chl Dpth (ft)	* 5.67	* Hydr. Depth (ft)	* 0.41	* 3.87	* 0.34	*
* Conv. Total (cfs)	* 13387.0	* Conv. (cfs)	* 85.6	* 12840.5	* 460.8	*
* Length Wtd. (ft)	* 54.52	* Wetted Per. (ft)	* 21.44	* 34.73	* 85.85	*
* Min Ch El (ft)	* 223.59	* Shear (lb/sq ft)	* 0.14	* 1.25	* 0.11	*
* Alpha	* 1.48	* Stream Power (lb/ft s)	* 316.57	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.23	* Cum Volume (acre-ft)	* 0.17	* 1.74	* 0.52	*
* C & E Loss (ft)	* 0.08	* Cum SA (acres)	* 0.17	* 0.29	* 0.71	*

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 231.74	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 0.41	* Wt. n-Val.	* 0.085	* 0.035	* 0.045	*
* W.S. Elev (ft)	* 231.34	* Reach Len. (ft)	* 57.02	* 54.55	* 53.00	*
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 80.04	* 195.76	* 250.39	*
* E.G. Slope (ft/ft)	* 0.002122	* Area (sq ft)	* 80.04	* 195.76	* 250.39	*
* Q Total (cfs)	* 1925.00	* Flow (cfs)	* 106.26	* 1212.45	* 606.29	*
* Top Width (ft)	* 194.79	* Top Width (ft)	* 37.30	* 32.88	* 124.61	*
* Vel Total (ft/s)	* 3.66	* Avg. Vel. (ft/s)	* 1.33	* 6.19	* 2.42	*
* Max Chl Dpth (ft)	* 7.75	* Hydr. Depth (ft)	* 2.15	* 5.95	* 2.01	*


```

* Conv. Total (cfs)      * 41788.8 * Conv. (cfs)           * 2306.7 * 26320.3 * 13161.7 *
* Length Wtd. (ft)     * 54.21  * Wetted Per. (ft)     * 37.81  * 34.73  * 124.67  *
* Min Ch El (ft)       * 223.59 * Shear (lb/sq ft)     * 0.28   * 0.75   * 0.27   *
* Alpha                 * 1.95   * Stream Power (lb/ft s) * 316.57 * 0.00   * 0.00   *
* Frctn Loss (ft)      * 0.10   * Cum Volume (acre-ft)  * 0.63   * 2.75   * 1.72   *
* C & E Loss (ft)       * 0.03   * Cum SA (acres)        * 0.30   * 0.29   * 0.84   *
*****

```

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)       * 232.37 * Element               * Left OB * Channel * Right OB *
* Vel Head (ft)        * 0.40  * Wt. n-Val.            * 0.085  * 0.035  * 0.045  *
* W.S. Elev (ft)       * 231.97 * Reach Len. (ft)       * 57.02  * 54.55  * 53.00  *
* Crit W.S. (ft)       *        * Flow Area (sq ft)     * 103.86 * 216.50 * 331.68 *
* E.G. Slope (ft/ft)   * 0.001942 * Area (sq ft)         * 103.86 * 216.50 * 331.68 *
* Q Total (cfs)        * 2413.00 * Flow (cfs)           * 153.95 * 1372.06 * 886.99 *
* Top Width (ft)       * 204.16 * Top Width (ft)        * 38.21  * 32.88  * 133.06 *
* Vel Total (ft/s)     * 3.70   * Avg. Vel. (ft/s)      * 1.48   * 6.34   * 2.67   *
* Max Chl Dpth (ft)    * 8.38   * Hydr. Depth (ft)      * 2.72   * 6.58   * 2.49   *
* Conv. Total (cfs)    * 54750.2 * Conv. (cfs)           * 3493.1 * 31131.5 * 20125.6 *
* Length Wtd. (ft)     * 54.16  * Wetted Per. (ft)      * 38.92  * 34.73  * 133.15 *
* Min Ch El (ft)       * 223.59 * Shear (lb/sq ft)     * 0.32   * 0.76   * 0.30   *
* Alpha                 * 1.87   * Stream Power (lb/ft s) * 316.57 * 0.00   * 0.00   *
* Frctn Loss (ft)      * 0.09   * Cum Volume (acre-ft)  * 0.82   * 3.23   * 2.28   *
* C & E Loss (ft)       * 0.02   * Cum SA (acres)        * 0.33   * 0.29   * 1.12   *
*****

```

CROSS SECTION

RIVER: hudson
REACH: main RS: 9

INPUT

Description:

Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	238.33	24.58	229.92	45.06	228.52	69.24	226.93	73.73	223.36
80	223.1	80.81	223.12	88.24	223.37	92.16	226.13	95.78	228.73
133.97	228.37	138.72	228.37	155.61	228.1	193.63	229.24	249.29	234.89
254.41	235.12	258.27	235.18	258.47	234.69	265.15	234.88	276.18	235.08
287.68	234.68	288.3	235.23	303.88	237.07				

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	45.06	.085	69.24	.035	95.78	.045	254.41	.02
288.3	.05								

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
69.24 95.78 55.45 51.85 50.87 .1 .3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
193.6	249.3	250

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft)       * 227.16 * Element               * Left OB * Channel * Right OB *
* Vel Head (ft)        * 0.83  * Wt. n-Val.            *        * 0.035  *        *
* W.S. Elev (ft)       * 226.33 * Reach Len. (ft)       * 55.45  * 51.85  * 50.87  *
* Crit W.S. (ft)       *        * Flow Area (sq ft)     *        * 56.79  *        *
* E.G. Slope (ft/ft)   * 0.009627 * Area (sq ft)         *        * 56.79  *        *
* Q Total (cfs)        * 415.00 * Flow (cfs)           *        * 415.00 *        *
* Top Width (ft)       * 22.45  * Top Width (ft)        *        * 22.45  *        *
* Vel Total (ft/s)     * 7.31   * Avg. Vel. (ft/s)      *        * 7.31   *        *
* Max Chl Dpth (ft)    * 3.23   * Hydr. Depth (ft)      *        * 2.53   *        *
* Conv. Total (cfs)    * 4229.7 * Conv. (cfs)           *        * 4229.7 *        *
* Length Wtd. (ft)     * 51.85  * Wetted Per. (ft)      *        * 24.44  *        *
* Min Ch El (ft)       * 223.10 * Shear (lb/sq ft)     *        * 1.40   *        *
* Alpha                 * 1.00   * Stream Power (lb/ft s) * 303.88 * 0.00   * 0.00   *
* Frctn Loss (ft)      * 0.58   * Cum Volume (acre-ft)  *        * 0.54   *        *
* C & E Loss (ft)       * 0.02   * Cum SA (acres)        *        * 0.21   *        *
*****

```

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)       * 229.78 * Element               * Left OB * Channel * Right OB *

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```

* Vel Head (ft) * 0.57 * Wt. n-Val. * 0.085 * 0.035 * 0.045 *
* W.S. Elev (ft) * 229.21 * Reach Len. (ft) * 55.45 * 51.85 * 50.87 *
* Crit W.S. (ft) * 227.85 * Flow Area (sq ft) * 39.44 * 128.98 * 66.36 *
* E.G. Slope (ft/ft) * 0.003319 * Area (sq ft) * 39.44 * 128.98 * 66.36 *
* Q Total (cfs) * 990.00 * Flow (cfs) * 48.56 * 843.37 * 98.07 *
* Top Width (ft) * 157.74 * Top Width (ft) * 34.30 * 26.54 * 96.90 *
* Vel Total (ft/s) * 4.22 * Avg. Vel. (ft/s) * 1.23 * 6.54 * 1.48 *
* Max Chl Dpth (ft) * 6.11 * Hydr. Depth (ft) * 1.15 * 4.86 * 0.68 *
* Conv. Total (cfs) * 17183.2 * Conv. (cfs) * 842.9 * 14638.1 * 1702.2 *
* Length Wtd. (ft) * 51.87 * Wetted Per. (ft) * 34.37 * 29.51 * 96.92 *
* Min Ch El (ft) * 223.10 * Shear (lb/sq ft) * 0.24 * 0.91 * 0.14 *
* Alpha * 2.06 * Stream Power (lb/ft s) * 303.88 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.12 * Cum Volume (acre-ft) * 0.14 * 1.58 * 0.46 *
* C & E Loss (ft) * 0.07 * Cum SA (acres) * 0.13 * 0.25 * 0.60 *
*****

```

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft) * 231.62 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.32 * Wt. n-Val. * 0.088 * 0.035 * 0.045 *
* W.S. Elev (ft) * 231.30 * Reach Len. (ft) * 55.45 * 51.85 * 50.87 *
* Crit W.S. (ft) * * Flow Area (sq ft) * 131.93 * 184.46 * 270.85 *
* E.G. Slope (ft/ft) * 0.001575 * Area (sq ft) * 131.93 * 184.46 * 270.85 *
* Q Total (cfs) * 1925.00 * Flow (cfs) * 180.27 * 1054.65 * 690.08 *
* Top Width (ft) * 173.06 * Top Width (ft) * 48.70 * 26.54 * 97.82 *
* Vel Total (ft/s) * 3.28 * Avg. Vel. (ft/s) * 1.37 * 5.72 * 2.55 *
* Max Chl Dpth (ft) * 8.20 * Hydr. Depth (ft) * 2.71 * 6.95 * 2.77 *
* Conv. Total (cfs) * 48506.5 * Conv. (cfs) * 4542.4 * 26575.2 * 17388.8 *
* Length Wtd. (ft) * 51.75 * Wetted Per. (ft) * 49.03 * 29.51 * 99.90 *
* Min Ch El (ft) * 223.10 * Shear (lb/sq ft) * 0.26 * 0.61 * 0.27 *
* Alpha * 1.90 * Stream Power (lb/ft s) * 303.88 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.06 * Cum Volume (acre-ft) * 0.49 * 2.51 * 1.40 *
* C & E Loss (ft) * 0.03 * Cum SA (acres) * 0.24 * 0.25 * 0.71 *
*****

```

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft) * 232.26 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.34 * Wt. n-Val. * 0.089 * 0.035 * 0.045 *
* W.S. Elev (ft) * 231.92 * Reach Len. (ft) * 55.45 * 51.85 * 50.87 *
* Crit W.S. (ft) * * Flow Area (sq ft) * 162.46 * 200.79 * 331.05 *
* E.G. Slope (ft/ft) * 0.001565 * Area (sq ft) * 162.46 * 200.79 * 331.05 *
* Q Total (cfs) * 2413.00 * Flow (cfs) * 244.40 * 1211.19 * 957.41 *
* Top Width (ft) * 174.86 * Top Width (ft) * 50.50 * 26.54 * 97.82 *
* Vel Total (ft/s) * 3.48 * Avg. Vel. (ft/s) * 1.50 * 6.03 * 2.89 *
* Max Chl Dpth (ft) * 8.82 * Hydr. Depth (ft) * 3.22 * 7.57 * 3.38 *
* Conv. Total (cfs) * 60987.3 * Conv. (cfs) * 6177.1 * 30612.2 * 24198.1 *
* Length Wtd. (ft) * 51.75 * Wetted Per. (ft) * 50.93 * 29.51 * 100.52 *
* Min Ch El (ft) * 223.10 * Shear (lb/sq ft) * 0.31 * 0.67 * 0.32 *
* Alpha * 1.81 * Stream Power (lb/ft s) * 303.88 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.06 * Cum Volume (acre-ft) * 0.64 * 2.97 * 1.87 *
* C & E Loss (ft) * 0.03 * Cum SA (acres) * 0.27 * 0.25 * 0.98 *
*****

```

CROSS SECTION

RIVER: hudson
REACH: main RS: 8

INPUT

Description:

Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	232.66	10	231.25	20	230.58	45.39	228.78	62.29	226.96
73.22	226.75	78.86	222.87	84.37	222.42	85.34	222.48	91.4	222.85
93.16	222.95	100.51	227.98	129.11	227.53	173.64	228.25	221.13	229.38
256.1	234.43	261.75	233.86	265.78	233.85	265.89	233.49	272.62	233.6
283.68	233.78	295	233.52	295.71	234.03	308.74	235.94		

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	73.22	.035	100.51	.045	261.75	.02	295	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
73.22 100.51 84.59 69.8 31.19 .1 .3
Blocked Obstructions num= 1

```

Sta L   Sta R   Elev
*****
221.13 256.1   250

```

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft)      * 226.56 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.02  * Wt. n-Val.      *         * 0.035  *         *
* W.S. Elev (ft)     * 225.54 * Reach Len. (ft) * 84.59  * 69.80  * 31.19  *
* Crit W.S. (ft)     * 225.43 * Flow Area (sq ft) *         * 51.20  *         *
* E.G. Slope (ft/ft) * 0.013012 * Area (sq ft)    *         * 51.20  *         *
* Q Total (cfs)      * 415.00 * Flow (cfs)      *         * 415.00 *         *
* Top Width (ft)     * 21.98  * Top Width (ft)  *         * 21.98  *         *
* Vel Total (ft/s)   * 8.11  * Avg. Vel. (ft/s) *         * 8.11   *         *
* Max Chl Dpth (ft)  * 3.12  * Hydr. Depth (ft) *         * 2.33   *         *
* Conv. Total (cfs)  * 3638.1 * Conv. (cfs)     *         * 3638.1 *         *
* Length Wtd. (ft)   * 69.80  * Wetted Per. (ft) *         * 23.65  *         *
* Min Ch El (ft)     * 222.42 * Shear (lb/sq ft) *         * 1.76   *         *
* Alpha              * 1.00  * Stream Power (lb/ft s) * 308.74 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 0.77  * Cum Volume (acre-ft) *         * 0.47   *         *
* C & E Loss (ft)    * 0.17  * Cum SA (acres)   *         * 0.18   *         *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)      * 229.59 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.33  * Wt. n-Val.      * 0.100  * 0.035  * 0.045  *
* W.S. Elev (ft)     * 229.26 * Reach Len. (ft) * 84.59  * 69.80  * 31.19  *
* Crit W.S. (ft)     *         * Flow Area (sq ft) * 51.26  * 147.09 * 125.00 *
* E.G. Slope (ft/ft) * 0.001801 * Area (sq ft)    * 51.26  * 147.09 * 125.00 *
* Q Total (cfs)      * 990.00 * Flow (cfs)      * 41.95  * 763.33 * 184.71 *
* Top Width (ft)     * 177.23 * Top Width (ft)  * 34.54  * 27.29  * 115.40 *
* Vel Total (ft/s)   * 3.06  * Avg. Vel. (ft/s) * 0.82   * 5.19   * 1.48   *
* Max Chl Dpth (ft)  * 6.84  * Hydr. Depth (ft) * 1.48   * 5.39   * 1.08   *
* Conv. Total (cfs)  * 23329.5 * Conv. (cfs)     * 988.7  * 17988.1 * 4352.8 *
* Length Wtd. (ft)   * 61.83  * Wetted Per. (ft) * 34.66  * 30.09  * 115.42 *
* Min Ch El (ft)     * 222.42 * Shear (lb/sq ft) * 0.17   * 0.55   * 0.12   *
* Alpha              * 2.26  * Stream Power (lb/ft s) * 308.74 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 0.11  * Cum Volume (acre-ft) * 0.08   * 1.41   * 0.35   *
* C & E Loss (ft)    * 0.05  * Cum SA (acres)   * 0.09   * 0.22   * 0.48   *
*****

```

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)      * 231.52 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.22  * Wt. n-Val.      * 0.100  * 0.035  * 0.045  *
* W.S. Elev (ft)     * 231.31 * Reach Len. (ft) * 84.59  * 69.80  * 31.19  *
* Crit W.S. (ft)     *         * Flow Area (sq ft) * 152.03 * 203.09 * 372.18 *
* E.G. Slope (ft/ft) * 0.001009 * Area (sq ft)    * 152.03 * 203.09 * 372.18 *
* Q Total (cfs)      * 1925.00 * Flow (cfs)      * 128.01 * 978.32 * 818.67 *
* Top Width (ft)     * 211.54 * Top Width (ft)  * 63.63  * 27.29  * 120.62 *
* Vel Total (ft/s)   * 2.65  * Avg. Vel. (ft/s) * 0.84   * 4.82   * 2.20   *
* Max Chl Dpth (ft)  * 8.89  * Hydr. Depth (ft) * 2.39   * 7.44   * 3.09   *
* Conv. Total (cfs)  * 60595.4 * Conv. (cfs)     * 4029.6 * 30795.5 * 25770.2 *
* Length Wtd. (ft)   * 53.92  * Wetted Per. (ft) * 63.82  * 30.09  * 122.57 *
* Min Ch El (ft)     * 222.42 * Shear (lb/sq ft) * 0.15   * 0.43   * 0.19   *
* Alpha              * 1.98  * Stream Power (lb/ft s) * 308.74 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 0.06  * Cum Volume (acre-ft) * 0.31   * 2.28   * 1.03   *
* C & E Loss (ft)    * 0.02  * Cum SA (acres)   * 0.17   * 0.22   * 0.58   *
*****

```

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)      * 232.16 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.23  * Wt. n-Val.      * 0.100  * 0.035  * 0.045  *
* W.S. Elev (ft)     * 231.93 * Reach Len. (ft) * 84.59  * 69.80  * 31.19  *
* Crit W.S. (ft)     *         * Flow Area (sq ft) * 192.78 * 219.98 * 446.85 *
* E.G. Slope (ft/ft) * 0.001015 * Area (sq ft)    * 192.78 * 219.98 * 446.85 *
* Q Total (cfs)      * 2413.00 * Flow (cfs)      * 182.36 * 1120.87 * 1109.78 *
* Top Width (ft)     * 215.93 * Top Width (ft)  * 68.02  * 27.29  * 120.62 *
* Vel Total (ft/s)   * 2.81  * Avg. Vel. (ft/s) * 0.95   * 5.10   * 2.48   *
* Max Chl Dpth (ft)  * 9.51  * Hydr. Depth (ft) * 2.83   * 8.06   * 3.70   *
* Conv. Total (cfs)  * 75741.0 * Conv. (cfs)     * 5724.0 * 35182.5 * 34834.5 *
* Length Wtd. (ft)   * 52.78  * Wetted Per. (ft) * 68.25  * 30.09  * 123.19 *
* Min Ch El (ft)     * 222.42 * Shear (lb/sq ft) * 0.18   * 0.46   * 0.23   *
* Alpha              * 1.90  * Stream Power (lb/ft s) * 308.74 * 0.00  * 0.00  *
*****

```

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* Frctn Loss (ft) * 0.06 * Cum Volume (acre-ft) * 0.42 * 2.72 * 1.42 *
* C & E Loss (ft) * 0.01 * Cum SA (acres) * 0.20 * 0.22 * 0.85 *
*****

```

CROSS SECTION

RIVER: hudson

REACH: main RS: 7

INPUT

Description:

```

Station Elevation Data num= 33
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
*****
0 234.04 10 230.35 20.49 229.26 49.25 228.19 49.94 225.03
50.48 222.23 52 221.26 53.15 220.87 57.91 221.25 57.92 221.25
58.62 221.31 70.98 222.8 77.17 225.03 82.97 227.02 87.29 227.48
102.57 228.06 126.88 227.25 155.03 227.58 176.4 228.42 200.94 228.99
209.92 229.21 212.72 229.36 218.32 230.36 244.3 234 249.97 233.49
253.93 233.54 254.06 233.18 260.63 233.3 271.65 233.45 283.01 233.19
283.75 233.74 295.85 234.97 305.8 242.14

```

```

Manning's n Values num= 7
Sta n Val Sta n Val Sta n Val Sta n Val Sta n Val
*****
0 .1 49.25 .05 82.97 .1 102.57 .045 176.4 .05
249.97 .02 283.75 .05

```

```

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
49.25 82.97 20.21 31 42.19 .1 .3

```

```

Blocked Obstructions num= 1
Sta L Sta R Elev
*****
191.3 244.3 250

```

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft) * 225.62 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.46 * Wt. n-Val. * * 0.050 * *
* W.S. Elev (ft) * 225.16 * Reach Len. (ft) * 20.21 * 31.00 * 42.19 *
* Crit W.S. (ft) * * * Flow Area (sq ft) * * 79.24 * *
* E.G. Slope (ft/ft) * 0.009558 * Area (sq ft) * * 79.24 * *
* Q Total (cfs) * 431.00 * Flow (cfs) * * 431.00 * *
* Top Width (ft) * 27.65 * Top Width (ft) * * 27.65 * *
* Vel Total (ft/s) * 5.44 * Avg. Vel. (ft/s) * * 5.44 * *
* Max Chl Dpth (ft) * 4.29 * Hydr. Depth (ft) * * 2.87 * *
* Conv. Total (cfs) * 4408.5 * Conv. (cfs) * * 4408.5 * *
* Length Wtd. (ft) * 31.00 * Wetted Per. (ft) * * 30.94 * *
* Min Ch El (ft) * 220.87 * Shear (lb/sq ft) * * 1.53 * *
* Alpha * 1.00 * Stream Power (lb/ft s) * 305.80 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.17 * Cum Volume (acre-ft) * * 0.37 * *
* C & E Loss (ft) * 0.01 * Cum SA (acres) * * 0.14 * *
*****

```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft) * 229.43 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.17 * Wt. n-Val. * 0.100 * 0.050 * 0.051 *
* W.S. Elev (ft) * 229.26 * Reach Len. (ft) * 20.21 * 31.00 * 42.19 *
* Crit W.S. (ft) * * * Flow Area (sq ft) * 15.43 * 211.37 * 159.44 *
* E.G. Slope (ft/ft) * 0.001660 * Area (sq ft) * 15.43 * 211.37 * 159.44 *
* Q Total (cfs) * 1038.00 * Flow (cfs) * 6.16 * 779.75 * 252.09 *
* Top Width (ft) * 170.83 * Top Width (ft) * 28.77 * 33.72 * 108.33 *
* Vel Total (ft/s) * 2.69 * Avg. Vel. (ft/s) * 0.40 * 3.69 * 1.58 *
* Max Chl Dpth (ft) * 8.39 * Hydr. Depth (ft) * 0.54 * 6.27 * 1.47 *
* Conv. Total (cfs) * 25474.0 * Conv. (cfs) * 151.3 * 19136.1 * 6186.6 *
* Length Wtd. (ft) * 32.75 * Wetted Per. (ft) * 28.79 * 39.75 * 108.90 *
* Min Ch El (ft) * 220.87 * Shear (lb/sq ft) * 0.06 * 0.55 * 0.15 *
* Alpha * 1.50 * Stream Power (lb/ft s) * 305.80 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.05 * Cum Volume (acre-ft) * 0.02 * 1.13 * 0.25 *
* C & E Loss (ft) * 0.01 * Cum SA (acres) * 0.03 * 0.17 * 0.40 *
*****

```

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)      * 231.45 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.15  * Wt. n-Val.      * 0.100  * 0.050  * 0.051  *
* W.S. Elev (ft)     * 231.29 * Reach Len. (ft) * 20.21  * 31.00  * 42.19  *
* Crit W.S. (ft)     *        * Flow Area (sq ft) * 90.63  * 279.83 * 379.39 *
* E.G. Slope (ft/ft) * 0.001198 * Area (sq ft)    * 90.63  * 279.83 * 379.39 *
* Q Total (cfs)      * 2017.00 * Flow (cfs)      * 77.79  * 1057.45 * 881.77 *
* Top Width (ft)     * 183.85 * Top Width (ft)  * 41.80  * 33.72  * 108.33 *
* Vel Total (ft/s)   * 2.69  * Avg. Vel. (ft/s) * 0.86   * 3.78   * 2.32   *
* Max Chl Dpth (ft) * 10.42  * Hydr. Depth (ft) * 2.17   * 8.30   * 3.50   *
* Conv. Total (cfs)  * 58263.7 * Conv. (cfs)     * 2246.9 * 30545.8 * 25471.0 *
* Length Wtd. (ft)  * 34.00  * Wetted Per. (ft) * 42.05  * 39.75  * 110.93 *
* Min Ch El (ft)    * 220.87 * Shear (lb/sq ft) * 0.16   * 0.53   * 0.26   *
* Alpha             * 1.36   * Stream Power (lb/ft s) * 305.80 * 0.00   * 0.00   *
* Frctn Loss (ft)   * 0.05   * Cum Volume (acre-ft) * 0.08   * 1.89   * 0.76   *
* C & E Loss (ft)   * 0.04   * Cum SA (acres)   * 0.07   * 0.17   * 0.50   *
*****

```

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)      * 232.08 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.18  * Wt. n-Val.      * 0.100  * 0.050  * 0.051  *
* W.S. Elev (ft)     * 231.90 * Reach Len. (ft) * 20.21  * 31.00  * 42.19  *
* Crit W.S. (ft)     *        * Flow Area (sq ft) * 116.58 * 300.37 * 445.35 *
* E.G. Slope (ft/ft) * 0.001308 * Area (sq ft)    * 116.58 * 300.37 * 445.35 *
* Q Total (cfs)      * 2562.00 * Flow (cfs)      * 120.31 * 1243.04 * 1198.65 *
* Top Width (ft)     * 185.50 * Top Width (ft)  * 43.45  * 33.72  * 108.33 *
* Vel Total (ft/s)   * 2.97  * Avg. Vel. (ft/s) * 1.03   * 4.14   * 2.69   *
* Max Chl Dpth (ft) * 11.03  * Hydr. Depth (ft) * 2.68   * 8.91   * 4.11   *
* Conv. Total (cfs)  * 70842.9 * Conv. (cfs)     * 3326.7 * 34371.7 * 33144.5 *
* Length Wtd. (ft)  * 34.15  * Wetted Per. (ft) * 43.81  * 39.75  * 111.54 *
* Min Ch El (ft)    * 220.87 * Shear (lb/sq ft) * 0.22   * 0.62   * 0.33   *
* Alpha             * 1.33   * Stream Power (lb/ft s) * 305.80 * 0.00   * 0.00   *
* Frctn Loss (ft)   * 0.06   * Cum Volume (acre-ft) * 0.12   * 2.30   * 1.10   *
* C & E Loss (ft)   * 0.05   * Cum SA (acres)   * 0.09   * 0.17   * 0.77   *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: hudson

REACH: main RS: 6

INPUT

Description:

Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	232.81	5	230.96	33.91	229.84	59.4	227.76	60.24	222.1
63.1	220.81	66.12	220.29	66.23	220.27	69.39	220.61	76.64	221.39
91.29	227.87	96.51	227.85	109.84	226.87	129.26	226.95	146.31	227.92
180.09	228.74	190.82	229.33	212.5	233.18	218.13	232.45	222.02	232.45
222.21	232.15	228.69	232.32	239.79	232.57	251.13	232.34	251.79	232.87
264	234.33	274.08	241.19						

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	59.4	.035	91.29	.1	218.13	.02	251.79	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 59.4 91.29 19.21 30.14 38.14 .1 .3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
159	208.5	250

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft)      * 225.44 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.41  * Wt. n-Val.      *        * 0.035  *        *
* W.S. Elev (ft)     * 225.03 * Reach Len. (ft) * 19.21  * 30.14  * 38.14  *
* Crit W.S. (ft)     *        * Flow Area (sq ft) *        * 83.58  *        *
* E.G. Slope (ft/ft) * 0.003555 * Area (sq ft)    *        * 83.58  *        *
* Q Total (cfs)      * 431.00 * Flow (cfs)      *        * 431.00 *        *
* Top Width (ft)     * 25.06  * Top Width (ft)  *        * 25.06  *        *
*****

```

* Vel Total (ft/s)	* 5.16	* Avg. Vel. (ft/s)	* 5.16	*	*
* Max Chl Dpth (ft)	* 4.76	* Hydr. Depth (ft)	* 3.33	*	*
* Conv. Total (cfs)	* 7229.2	* Conv. (cfs)	* 7229.2	*	*
* Length Wtd. (ft)	* 30.14	* Wetted Per. (ft)	* 28.74	*	*
* Min Ch El (ft)	* 220.27	* Shear (lb/sq ft)	* 0.65	*	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 274.08	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.18	* Cum Volume (acre-ft)	* 0.31	*	*
* C & E Loss (ft)	* 0.07	* Cum SA (acres)	* 0.12	*	*

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 229.37	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.32	* Wt. n-Val.	* 0.100	* 0.035	* 0.100
* W.S. Elev (ft)	* 229.05	* Reach Len. (ft)	* 19.21	* 30.14	* 38.14
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 10.19	* 202.12	* 110.19
* E.G. Slope (ft/ft)	* 0.001348	* Area (sq ft)	* 10.19	* 202.12	* 110.19
* Q Total (cfs)	* 1038.00	* Flow (cfs)	* 4.14	* 951.40	* 82.46
* Top Width (ft)	* 115.40	* Top Width (ft)	* 15.80	* 31.89	* 67.71
* Vel Total (ft/s)	* 3.22	* Avg. Vel. (ft/s)	* 0.41	* 4.71	* 0.75
* Max Chl Dpth (ft)	* 8.78	* Hydr. Depth (ft)	* 0.64	* 6.34	* 1.63
* Conv. Total (cfs)	* 28268.1	* Conv. (cfs)	* 112.7	* 25909.8	* 2245.6
* Length Wtd. (ft)	* 30.52	* Wetted Per. (ft)	* 15.86	* 38.52	* 68.60
* Min Ch El (ft)	* 220.27	* Shear (lb/sq ft)	* 0.05	* 0.44	* 0.14
* Alpha	* 1.96	* Stream Power (lb/ft s)	* 274.08	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.07	* Cum Volume (acre-ft)	* 0.01	* 0.98	* 0.12
* C & E Loss (ft)	* 0.07	* Cum SA (acres)	* 0.02	* 0.15	* 0.31

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 231.36	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.52	* Wt. n-Val.	* 0.100	* 0.035	* 0.100
* W.S. Elev (ft)	* 230.84	* Reach Len. (ft)	* 19.21	* 30.14	* 38.14
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 64.92	* 259.24	* 231.44
* E.G. Slope (ft/ft)	* 0.001769	* Area (sq ft)	* 64.92	* 259.24	* 231.44
* Q Total (cfs)	* 2017.00	* Flow (cfs)	* 47.40	* 1649.78	* 319.82
* Top Width (ft)	* 150.91	* Top Width (ft)	* 51.31	* 31.89	* 67.71
* Vel Total (ft/s)	* 3.63	* Avg. Vel. (ft/s)	* 0.73	* 6.36	* 1.38
* Max Chl Dpth (ft)	* 10.57	* Hydr. Depth (ft)	* 1.27	* 8.13	* 3.42
* Conv. Total (cfs)	* 47958.8	* Conv. (cfs)	* 1127.1	* 39227.3	* 7604.4
* Length Wtd. (ft)	* 31.92	* Wetted Per. (ft)	* 51.42	* 38.52	* 70.39
* Min Ch El (ft)	* 220.27	* Shear (lb/sq ft)	* 0.14	* 0.74	* 0.36
* Alpha	* 2.54	* Stream Power (lb/ft s)	* 274.08	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.07	* Cum Volume (acre-ft)	* 0.04	* 1.70	* 0.46
* C & E Loss (ft)	* 0.02	* Cum SA (acres)	* 0.04	* 0.15	* 0.41

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 231.98	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.69	* Wt. n-Val.	* 0.100	* 0.035	* 0.100
* W.S. Elev (ft)	* 231.28	* Reach Len. (ft)	* 19.21	* 30.14	* 38.14
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 88.98	* 273.36	* 261.44
* E.G. Slope (ft/ft)	* 0.002256	* Area (sq ft)	* 88.98	* 273.36	* 261.44
* Q Total (cfs)	* 2562.00	* Flow (cfs)	* 86.08	* 2035.29	* 440.64
* Top Width (ft)	* 154.87	* Top Width (ft)	* 55.27	* 31.89	* 67.71
* Vel Total (ft/s)	* 4.11	* Avg. Vel. (ft/s)	* 0.97	* 7.45	* 1.69
* Max Chl Dpth (ft)	* 11.01	* Hydr. Depth (ft)	* 1.61	* 8.57	* 3.86
* Conv. Total (cfs)	* 53944.2	* Conv. (cfs)	* 1812.4	* 42854.0	* 9277.8
* Length Wtd. (ft)	* 32.08	* Wetted Per. (ft)	* 55.44	* 38.52	* 70.83
* Min Ch El (ft)	* 220.27	* Shear (lb/sq ft)	* 0.23	* 1.00	* 0.52
* Alpha	* 2.64	* Stream Power (lb/ft s)	* 274.08	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.09	* Cum Volume (acre-ft)	* 0.07	* 2.09	* 0.76
* C & E Loss (ft)	* 0.02	* Cum SA (acres)	* 0.07	* 0.15	* 0.69

CROSS SECTION

RIVER: hudson
 REACH: main

RS: 5

INPUT

Description:

Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	237.05	19.33	231.35	34.54	230.9	49.16	226.44	49.71	221.74
54.79	221.59	60	219.53	61.57	219.8	61.58	219.8	62.02	219.88
63.98	219.98	66.43	226.23	69.34	227.52	113.51	228.23	150.48	227.88
173.2	229.28	184.22	231	187	231.13	190.89	231.01	190.99	230.72
197.15	230.94	207.98	231.26	218.02	231.1	225.62	230.81	226.28	231.35
242.65	238.23	244.51	238.31						

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	49.16	.035	69.34	.045	150.48	.05	187	.02
226.28	.05								

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

49.16	66.43	33.07	34.23	33.12	.1	.3
-------	-------	-------	-------	-------	----	----

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
138.5	173.2	240	F

CROSS SECTION OUTPUT Profile #2-YR

* E.G. Elev (ft)	* 225.20	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 1.06	* Wt. n-Val.	*	* 0.035	*	*
* W.S. Elev (ft)	* 224.13	* Reach Len. (ft)	* 33.07	* 34.23	* 33.12	*
* Crit W.S. (ft)	* 223.70	* Flow Area (sq ft)	*	* 52.07	*	*
* E.G. Slope (ft/ft)	*0.011736	* Area (sq ft)	*	* 52.07	*	*
* Q Total (cfs)	* 431.00	* Flow (cfs)	*	* 431.00	*	*
* Top Width (ft)	* 16.18	* Top Width (ft)	*	* 16.18	*	*
* Vel Total (ft/s)	* 8.28	* Avg. Vel. (ft/s)	*	* 8.28	*	*
* Max Chl Dpth (ft)	* 4.60	* Hydr. Depth (ft)	*	* 3.22	*	*
* Conv. Total (cfs)	* 3978.5	* Conv. (cfs)	*	* 3978.5	*	*
* Length Wtd. (ft)	* 34.23	* Wetted Per. (ft)	*	* 21.57	*	*
* Min Ch El (ft)	* 219.53	* Shear (lb/sq ft)	*	* 1.77	*	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 244.51	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.37	* Cum Volume (acre-ft)	*	* 0.26	*	*
* C & E Loss (ft)	* 0.02	* Cum SA (acres)	*	* 0.11	*	*

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 229.22	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 1.04	* Wt. n-Val.	* 0.100	* 0.035	* 0.041	*
* W.S. Elev (ft)	* 228.18	* Reach Len. (ft)	* 33.07	* 34.23	* 33.12	*
* Crit W.S. (ft)	* 225.98	* Flow Area (sq ft)	* 4.98	* 120.81	* 19.33	*
* E.G. Slope (ft/ft)	*0.004982	* Area (sq ft)	* 4.98	* 120.81	* 23.01	*
* Q Total (cfs)	* 1038.00	* Flow (cfs)	* 4.62	* 1004.41	* 28.97	*
* Top Width (ft)	* 103.93	* Top Width (ft)	* 5.71	* 17.27	* 80.94	*
* Vel Total (ft/s)	* 7.15	* Avg. Vel. (ft/s)	* 0.93	* 8.31	* 1.50	*
* Max Chl Dpth (ft)	* 8.65	* Hydr. Depth (ft)	* 0.87	* 7.00	* 0.30	*
* Conv. Total (cfs)	* 14705.8	* Conv. (cfs)	* 65.5	* 14230.0	* 410.4	*
* Length Wtd. (ft)	* 34.21	* Wetted Per. (ft)	* 5.97	* 26.14	* 64.34	*
* Min Ch El (ft)	* 219.53	* Shear (lb/sq ft)	* 0.26	* 1.44	* 0.09	*
* Alpha	* 1.31	* Stream Power (lb/ft s)	* 244.51	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.14	* Cum Volume (acre-ft)	* 0.01	* 0.87	* 0.06	*
* C & E Loss (ft)	* 0.11	* Cum SA (acres)	* 0.01	* 0.13	* 0.25	*

Warning: Divided flow computed for this cross-section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 231.27	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 0.69	* Wt. n-Val.	* 0.100	* 0.035	* 0.044	*

```

* W.S. Elev (ft)          * 230.58 * Reach Len. (ft)        * 33.07 * 34.23 * 33.12 *
* Crit W.S. (ft)         * 229.62 * Flow Area (sq ft)     * 28.04 * 162.15 * 197.03 *
* E.G. Slope (ft/ft)     * 0.003074 * Area (sq ft)         * 28.04 * 162.15 * 274.00 *
* Q Total (cfs)          * 2017.00 * Flow (cfs)           * 36.39 * 1288.37 * 692.24 *
* Top Width (ft)         * 145.90 * Top Width (ft)       * 13.56 * 17.27 * 115.07 *
* Vel Total (ft/s)       * 5.21 * Avg. Vel. (ft/s)     * 1.30 * 7.95 * 3.51 *
* Max Chl Dpth (ft)     * 11.05 * Hydr. Depth (ft)     * 2.07 * 9.39 * 2.45 *
* Conv. Total (cfs)      * 36382.0 * Conv. (cfs)          * 656.5 * 23239.1 * 12486.4 *
* Length Wtd. (ft)      * 34.03 * Wetted Per. (ft)     * 14.17 * 26.14 * 80.75 *
* Min Ch El (ft)        * 219.53 * Shear (lb/sq ft)     * 0.38 * 1.19 * 0.47 *
* Alpha                  * 1.64 * Stream Power (lb/ft s) * 244.51 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.18 * Cum Volume (acre-ft) * 0.02 * 1.55 * 0.24 *
* C & E Loss (ft)       * 0.18 * Cum SA (acres)       * 0.03 * 0.13 * 0.33 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

```

CROSS SECTION OUTPUT Profile #100-YR
*****
* E.G. Elev (ft)          * 231.86 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.86 * Wt. n-Val.             * 0.100 * 0.035 * 0.044 *
* W.S. Elev (ft)         * 231.00 * Reach Len. (ft)        * 33.07 * 34.23 * 33.12 *
* Crit W.S. (ft)         * 230.16 * Flow Area (sq ft)     * 34.23 * 169.47 * 233.30 *
* E.G. Slope (ft/ft)     * 0.003747 * Area (sq ft)         * 34.23 * 169.47 * 324.98 *
* Q Total (cfs)          * 2562.00 * Flow (cfs)           * 46.65 * 1531.13 * 984.22 *
* Top Width (ft)         * 166.55 * Top Width (ft)       * 18.00 * 17.27 * 131.28 *
* Vel Total (ft/s)       * 5.86 * Avg. Vel. (ft/s)     * 1.36 * 9.03 * 4.22 *
* Max Chl Dpth (ft)     * 11.47 * Hydr. Depth (ft)     * 1.90 * 9.81 * 2.42 *
* Conv. Total (cfs)      * 41855.9 * Conv. (cfs)          * 762.2 * 25014.3 * 16079.4 *
* Length Wtd. (ft)      * 33.90 * Wetted Per. (ft)     * 18.66 * 26.14 * 97.27 *
* Min Ch El (ft)        * 219.53 * Shear (lb/sq ft)     * 0.43 * 1.52 * 0.56 *
* Alpha                  * 1.62 * Stream Power (lb/ft s) * 244.51 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.14 * Cum Volume (acre-ft) * 0.04 * 1.94 * 0.50 *
* C & E Loss (ft)       * 0.03 * Cum SA (acres)       * 0.05 * 0.13 * 0.60 *
*****

```

Warning: Divided flow computed for this cross-section.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
REACH: main RS: 4

INPUT

Description:

Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	236.53	25.81	231.56	34.44	227.61	36.43	225.45	40.94	219.23
43.91	218.9	46.89	219.58	48.04	219.84	56.6	224.71	62	228.28
77.44	229.09	101.22	231.33	123.11	228.43	154.18	229.18	167.64	229.57
171.48	229.63	171.59	229.32	177.83	229.47	188.28	229.72	198.64	229.54
206.83	229.21	207.55	229.77	218.65	234.17	221.38	234.44	232.87	234.82

Manning's n Values num= 7

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	34.44	.035	62	.05	77.44	.045	167.64	.02
207.55	.05	218.65	.02						

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

34.44	62	47.24	49.31	53.94	.1	.3
-------	----	-------	-------	-------	----	----

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
131	139.6	250	F

```

CROSS SECTION OUTPUT Profile #2-YR
*****
* E.G. Elev (ft)          * 224.81 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.99 * Wt. n-Val.             * 0.100 * 0.035 * 0.044 *

```



```

* W.S. Elev (ft)          * 223.81 * Reach Len. (ft)        * 47.24 * 49.31 * 53.94 *
* Crit W.S. (ft)         * 223.30 * Flow Area (sq ft)     *      *      *      *
* E.G. Slope (ft/ft)     * 0.010005 * Area (sq ft)         *      * 53.97 *      *
* Q Total (cfs)          * 431.00 * Flow (cfs)           *      * 431.00 *      *
* Top Width (ft)         * 17.41 * Top Width (ft)        *      * 17.41 *      *
* Vel Total (ft/s)       * 7.99 * Avg. Vel. (ft/s)     *      * 7.99 *      *
* Max Chl Dpth (ft)     * 4.91 * Hydr. Depth (ft)     *      * 3.10 *      *
* Conv. Total (cfs)      * 4308.9 * Conv. (cfs)          *      * 4308.9 *      *
* Length Wtd. (ft)      * 49.31 * Wetted Per. (ft)     *      * 20.93 *      *
* Min Ch El (ft)        * 218.90 * Shear (lb/sq ft)     *      * 1.61 *      *
* Alpha                  * 1.00 * Stream Power (lb/ft s) * 232.87 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.18 * Cum Volume (acre-ft) *      * 0.22 *      *
* C & E Loss (ft)       * 0.23 * Cum SA (acres)       *      * 0.10 *      *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)          * 228.98 * Element               * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.69 * Wt. n-Val.            * 0.100 * 0.035 * 0.000 *
* W.S. Elev (ft)         * 228.29 * Reach Len. (ft)       * 47.24 * 49.31 * 53.94 *
* Crit W.S. (ft)         * 225.64 * Flow Area (sq ft)     * 0.51 * 155.78 * 0.00 *
* E.G. Slope (ft/ft)     * 0.003257 * Area (sq ft)         * 0.51 * 155.78 * 0.00 *
* Q Total (cfs)          * 1038.00 * Flow (cfs)           * 0.20 * 1037.80 * 0.00 *
* Top Width (ft)         * 29.26 * Top Width (ft)        * 1.49 * 27.56 * 0.21 *
* Vel Total (ft/s)       * 6.64 * Avg. Vel. (ft/s)     * 0.39 * 6.66 * 0.05 *
* Max Chl Dpth (ft)     * 9.39 * Hydr. Depth (ft)     * 0.34 * 5.65 * 0.01 *
* Conv. Total (cfs)      * 18188.3 * Conv. (cfs)          * 3.4 * 18184.8 * 0.0 *
* Length Wtd. (ft)      * 49.58 * Wetted Per. (ft)     * 1.64 * 34.17 * 0.21 *
* Min Ch El (ft)        * 218.90 * Shear (lb/sq ft)     * 0.06 * 0.93 *      *
* Alpha                  * 1.01 * Stream Power (lb/ft s) * 232.87 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.07 * Cum Volume (acre-ft) * 0.00 * 0.76 * 0.05 *
* C & E Loss (ft)       * 0.15 * Cum SA (acres)       * 0.01 * 0.11 * 0.22 *
*****

```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)          * 230.91 * Element               * Left OB * Channel * Right OB *
* Vel Head (ft)          * 2.47 * Wt. n-Val.            * 0.100 * 0.035 * 0.050 *
* W.S. Elev (ft)         * 228.44 * Reach Len. (ft)       * 47.24 * 49.31 * 53.94 *
* Crit W.S. (ft)         * 228.13 * Flow Area (sq ft)     * 0.76 * 159.99 * 0.26 *
* E.G. Slope (ft/ft)     * 0.011246 * Area (sq ft)         * 0.76 * 159.99 * 0.26 *
* Q Total (cfs)          * 2017.00 * Flow (cfs)           * 0.63 * 2016.22 * 0.15 *
* Top Width (ft)         * 33.19 * Top Width (ft)        * 1.82 * 27.56 * 3.80 *
* Vel Total (ft/s)       * 12.53 * Avg. Vel. (ft/s)     * 0.83 * 12.60 * 0.59 *
* Max Chl Dpth (ft)     * 9.54 * Hydr. Depth (ft)     * 0.42 * 5.81 * 0.07 *
* Conv. Total (cfs)      * 19019.8 * Conv. (cfs)          * 5.9 * 19012.4 * 1.4 *
* Length Wtd. (ft)      * 49.98 * Wetted Per. (ft)     * 2.00 * 34.17 * 3.81 *
* Min Ch El (ft)        * 218.90 * Shear (lb/sq ft)     * 0.27 * 3.29 * 0.05 *
* Alpha                  * 1.01 * Stream Power (lb/ft s) * 232.87 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.13 * Cum Volume (acre-ft) * 0.01 * 1.43 * 0.14 *
* C & E Loss (ft)       * 0.64 * Cum SA (acres)       * 0.02 * 0.12 * 0.29 *
*****

```

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)          * 231.70 * Element               * Left OB * Channel * Right OB *

```

```

* Vel Head (ft) * 1.18 * Wt. n-Val. * 0.100 * 0.035 * 0.036 *
* W.S. Elev (ft) * 230.51 * Reach Len. (ft) * 47.24 * 49.31 * 53.94 *
* Crit W.S. (ft) * 230.51 * Flow Area (sq ft) * 9.20 * 216.98 * 148.28 *
* E.G. Slope (ft/ft) * 0.004326 * Area (sq ft) * 9.20 * 216.98 * 163.65 *
* Q Total (cfs) * 2562.00 * Flow (cfs) * 10.81 * 2077.84 * 473.35 *
* Top Width (ft) * 166.46 * Top Width (ft) * 6.34 * 27.56 * 132.56 *
* Vel Total (ft/s) * 6.84 * Avg. Vel. (ft/s) * 1.18 * 9.58 * 3.19 *
* Max Chl Dpth (ft) * 11.61 * Hydr. Depth (ft) * 1.45 * 7.87 * 1.20 *
* Conv. Total (cfs) * 38953.1 * Conv. (cfs) * 164.4 * 31591.8 * 7196.9 *
* Length Wtd. (ft) * 50.55 * Wetted Per. (ft) * 6.97 * 34.17 * 124.76 *
* Min Ch El (ft) * 218.90 * Shear (lb/sq ft) * 0.36 * 1.72 * 0.32 *
* Alpha * 1.63 * Stream Power (lb/ft s) * 232.87 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.11 * Cum Volume (acre-ft) * 0.03 * 1.79 * 0.32 *
* C & E Loss (ft) * 0.24 * Cum SA (acres) * 0.04 * 0.12 * 0.50 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid

subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main

RS: 3

INPUT

Description: Channel vegetation heavy

Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	234.33	12.74	233.78	27.06	229.74	36.02	226.32	41.07	223.02
45.32	220.34	49.21	217.7	50.93	217.52	51.14	217.5	54.29	218.25
59.95	222.39	65.56	225.54	72.74	228.64	102.54	228.16	121.2	229.93
135.83	227.74	149.63	227.65	153.57	227.69	153.67	227.23	159.35	227.29
169.96	227.5	180.29	227.5	188.17	227.34	188.91	227.93	191.54	227.85
192.54	229.42	203.14	230.82	206.02	230.85	216.02	232.35		

Manning's n Values

num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	36.02	.035	65.56	.045	149.63	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
36.02	65.56	112.21	120.13	138.27	.3	.5

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
207.91	216.02	245	F

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft) * 224.39 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.22 * Wt. n-Val. * * 0.035 * *
* W.S. Elev (ft) * 224.17 * Reach Len. (ft) * 112.21 * 120.13 * 138.27 *
* Crit W.S. (ft) * 221.54 * Flow Area (sq ft) * * 88.86 * *
* E.G. Slope (ft/ft) * 0.001625 * Area (sq ft) * * 88.86 * *
* Q Total (cfs) * 331.00 * Flow (cfs) * * 331.00 * *
* Top Width (ft) * 23.82 * Top Width (ft) * * 23.82 * *
* Vel Total (ft/s) * 3.73 * Avg. Vel. (ft/s) * * 3.73 * *
* Max Chl Dpth (ft) * 6.67 * Hydr. Depth (ft) * * 3.73 * *
* Conv. Total (cfs) * 8211.0 * Conv. (cfs) * * 8211.0 * *
* Length Wtd. (ft) * 120.13 * Wetted Per. (ft) * * 27.67 * *
* Min Ch El (ft) * 217.50 * Shear (lb/sq ft) * * 0.33 * *
* Alpha * 1.00 * Stream Power (lb/ft s) * 216.02 * 0.00 * 0.00 *
* Frctn Loss (ft) * * Cum Volume (acre-ft) * * 0.14 * *
* C & E Loss (ft) * * Cum SA (acres) * * 0.07 * *

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 228.77	* Element	* Left OB	* Channel	* Right OB	* *
* Vel Head (ft)	* 0.19	* Wt. n-Val.	* 0.100	* 0.035	* 0.025	* *
* W.S. Elev (ft)	* 228.57	* Reach Len. (ft)	* 112.21	* 120.13	* 138.27	* *
* Crit W.S. (ft)	* 224.00	* Flow Area (sq ft)	* 6.65	* 213.59	* 77.67	* *
* E.G. Slope (ft/ft)	* 0.000678	* Area (sq ft)	* 6.65	* 213.59	* 77.67	* *
* Q Total (cfs)	* 918.00	* Flow (cfs)	* 2.66	* 797.90	* 117.44	* *
* Top Width (ft)	* 134.14	* Top Width (ft)	* 5.90	* 29.54	* 98.70	* *
* Vel Total (ft/s)	* 3.08	* Avg. Vel. (ft/s)	* 0.40	* 3.74	* 1.51	* *
* Max Chl Dpth (ft)	* 11.07	* Hydr. Depth (ft)	* 1.13	* 7.23	* 0.79	* *
* Conv. Total (cfs)	* 35254.7	* Conv. (cfs)	* 102.1	* 30642.5	* 4510.1	* *
* Length Wtd. (ft)	* 120.13	* Wetted Per. (ft)	* 6.32	* 34.38	* 100.39	* *
* Min Ch El (ft)	* 217.50	* Shear (lb/sq ft)	* 0.04	* 0.26	* 0.03	* *
* Alpha	* 1.31	* Stream Power (lb/ft s)	* 216.02	* 0.00	* 0.00	* *
* Frctn Loss (ft)	*	* Cum Volume (acre-ft)	* 0.00	* 0.55	* 0.00	* *
* C & E Loss (ft)	*	* Cum SA (acres)	* 0.01	* 0.08	* 0.16	* *

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 230.14	* Element	* Left OB	* Channel	* Right OB	* *
* Vel Head (ft)	* 0.33	* Wt. n-Val.	* 0.100	* 0.035	* 0.027	* *
* W.S. Elev (ft)	* 229.81	* Reach Len. (ft)	* 112.21	* 120.13	* 138.27	* *
* Crit W.S. (ft)	* 226.40	* Flow Area (sq ft)	* 15.98	* 250.21	* 219.55	* *
* E.G. Slope (ft/ft)	* 0.001077	* Area (sq ft)	* 15.98	* 250.21	* 219.55	* *
* Q Total (cfs)	* 1887.00	* Flow (cfs)	* 10.75	* 1309.26	* 566.99	* *
* Top Width (ft)	* 166.67	* Top Width (ft)	* 9.22	* 29.54	* 127.92	* *
* Vel Total (ft/s)	* 3.88	* Avg. Vel. (ft/s)	* 0.67	* 5.23	* 2.58	* *
* Max Chl Dpth (ft)	* 12.31	* Hydr. Depth (ft)	* 1.73	* 8.47	* 1.72	* *
* Conv. Total (cfs)	* 57494.1	* Conv. (cfs)	* 327.6	* 39891.1	* 17275.4	* *
* Length Wtd. (ft)	* 120.13	* Wetted Per. (ft)	* 9.86	* 34.38	* 130.27	* *
* Min Ch El (ft)	* 217.50	* Shear (lb/sq ft)	* 0.11	* 0.49	* 0.11	* *
* Alpha	* 1.39	* Stream Power (lb/ft s)	* 216.02	* 0.00	* 0.00	* *
* Frctn Loss (ft)	*	* Cum Volume (acre-ft)	* 0.00	* 1.20	* 0.00	* *
* C & E Loss (ft)	*	* Cum SA (acres)	* 0.02	* 0.08	* 0.21	* *

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 230.72	* Element	* Left OB	* Channel	* Right OB	* *
* Vel Head (ft)	* 0.37	* Wt. n-Val.	* 0.100	* 0.035	* 0.028	* *
* W.S. Elev (ft)	* 230.35	* Reach Len. (ft)	* 112.21	* 120.13	* 138.27	* *
* Crit W.S. (ft)	* 228.58	* Flow Area (sq ft)	* 21.48	* 266.19	* 290.83	* *
* E.G. Slope (ft/ft)	* 0.001182	* Area (sq ft)	* 21.48	* 266.19	* 290.83	* *
* Q Total (cfs)	* 2412.00	* Flow (cfs)	* 16.32	* 1520.55	* 875.13	* *
* Top Width (ft)	* 174.72	* Top Width (ft)	* 11.13	* 29.54	* 134.04	* *
* Vel Total (ft/s)	* 4.17	* Avg. Vel. (ft/s)	* 0.76	* 5.71	* 3.01	* *
* Max Chl Dpth (ft)	* 12.85	* Hydr. Depth (ft)	* 1.93	* 9.01	* 2.17	* *
* Conv. Total (cfs)	* 70155.3	* Conv. (cfs)	* 474.6	* 44226.7	* 25454.1	* *
* Length Wtd. (ft)	* 120.13	* Wetted Per. (ft)	* 11.85	* 34.38	* 136.44	* *
* Min Ch El (ft)	* 217.50	* Shear (lb/sq ft)	* 0.13	* 0.57	* 0.16	* *
* Alpha	* 1.37	* Stream Power (lb/ft s)	* 216.02	* 0.00	* 0.00	* *
* Frctn Loss (ft)	*	* Cum Volume (acre-ft)	* 0.01	* 1.52	* 0.03	* *
* C & E Loss (ft)	*	* Cum SA (acres)	* 0.03	* 0.08	* 0.34	* *

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CULVERT

RIVER: hudson

REACH: main

RS: 2.5

INPUT

Description:

Distance from Upstream XS = 13
Deck/Roadway Width = 95
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates

Table with 12 columns: num=, Sta, Hi, Cord, Lo, Cord, Sta, Hi, Cord, Lo, Cord, Sta, Hi, Cord, Lo, Cord. Contains coordinate data for 6 points.

Upstream Bridge Cross Section Data

Table with 10 columns: Station, Elev, Sta, Elev, Sta, Elev, Sta, Elev, Sta, Elev. Contains elevation data for 29 stations.

Manning's n Values

Table with 6 columns: Sta, n Val, Sta, n Val, Sta, n Val, Sta, n Val. Contains Manning's n values for 4 stations.

Bank Sta: Left Right Coeff Contr. Expan.
36.02 65.56 .3 .5

Ineffective Flow num= 1
Sta L Sta R Elev Permanent
207.91 216.02 245 F

Downstream Deck/Roadway Coordinates

Table with 12 columns: num=, Sta, Hi, Cord, Lo, Cord, Sta, Hi, Cord, Lo, Cord, Sta, Hi, Cord, Lo, Cord. Contains coordinate data for 7 points.

Downstream Bridge Cross Section Data

Table with 10 columns: Station, Elev, Sta, Elev, Sta, Elev, Sta, Elev, Sta, Elev. Contains elevation data for 25 stations.

Manning's n Values

Table with 6 columns: Sta, n Val, Sta, n Val, Sta, n Val, Sta, n Val. Contains Manning's n values for 4 stations.

Bank Sta: Left Right Coeff Contr. Expan.
30.41 46.53 .3 .5

Ineffective Flow num= 2
Sta L Sta R Elev Permanent
56.4 111.4 240 F
171.08 177.81 240 F

Blocked Obstructions num= 1

Table with 3 columns: Sta L, Sta R, Elev. Contains obstruction data for 1 point.

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins = 224.95
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Culverts = 1

Table with 4 columns: Culvert Name, Shape, Rise, Span. Contains data for Culvert #1.

FHWA Chart # 1 - Concrete Pipe Culvert
 FHWA Scale # 1 - Square edge entrance with headwall
 Solution Criteria = Highest U.S. EG

Culvert	Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
	13.5	94.77	.024	.024	0	.5	1

Upstream Elevation = 216.95
 Centerline Station = 51.14
 Downstream Elevation = 215.35
 Centerline Station = 39.16

```
CULVERT OUTPUT Profile #2-YR Culv Group: Culvert #1
*****
* Q Culv Group (cfs)      * 331.00 * Culv Full Len (ft)    *      *
* # Barrels              *      1 * Culv Vel US (ft/s)   * 11.05 *
* Q Barrel (cfs)        * 331.00 * Culv Vel DS (ft/s)   * 12.77 *
* E.G. US. (ft)         * 224.40 * Culv Inv El Up (ft)  * 216.95 *
* W.S. US. (ft)         * 224.17 * Culv Inv El Dn (ft)  * 215.35 *
* E.G. DS (ft)          * 218.60 * Culv Frctn Ls (ft)   * 1.47 *
* W.S. DS (ft)          * 217.52 * Culv Exit Loss (ft)  * 3.38 *
* Delta EG (ft)         * 5.80  * Culv Entr Loss (ft)  * 0.95 *
* Delta WS (ft)         * 6.65  * Q Weir (cfs)         *      *
* E.G. IC (ft)          * 223.81 * Weir Sta Lft (ft)   *      *
* E.G. OC (ft)          * 224.40 * Weir Sta Rgt (ft)   *      *
* Culvert Control       * Outlet * Weir Submerg        *      *
* Culv WS Inlet (ft)    * 221.56 * Weir Max Depth (ft) *      *
* Culv WS Outlet (ft)   * 219.45 * Weir Avg Depth (ft) *      *
* Culv Nml Depth (ft)   * 4.07  * Weir Flow Area (sq ft) *      *
* Culv Crt Depth (ft)   * 4.61  * Min El Weir Flow (ft) * 227.24 *
*****
```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
 Note: During the supercritical calculations a hydraulic jump occurred at the outlet of (leaving) the culvert.
 Warning: During the supercritical analysis, the program could not converge on a supercritical answer in the downstream cross section. The program used the solution with the least error.
 Note: The flow in the culvert is entirely supercritical.

```
CULVERT OUTPUT Profile #10-YR Culv Group: Culvert #1
*****
* Q Culv Group (cfs)      * 643.83 * Culv Full Len (ft)    *      *
* # Barrels              *      1 * Culv Vel US (ft/s)   * 14.56 *
* Q Barrel (cfs)        * 643.83 * Culv Vel DS (ft/s)   * 14.84 *
* E.G. US. (ft)         * 228.77 * Culv Inv El Up (ft)  * 216.95 *
* W.S. US. (ft)         * 228.57 * Culv Inv El Dn (ft)  * 215.35 *
* E.G. DS (ft)          * 222.09 * Culv Frctn Ls (ft)   * 1.61 *
* W.S. DS (ft)          * 219.77 * Culv Exit Loss (ft)  * 3.12 *
* Delta EG (ft)         * 6.68  * Culv Entr Loss (ft)  * 1.95 *
* Delta WS (ft)         * 8.81  * Q Weir (cfs)         * 274.17 *
* E.G. IC (ft)          * 228.77 * Weir Sta Lft (ft)   * 37.00 *
* E.G. OC (ft)          * 228.72 * Weir Sta Rgt (ft)   * 192.12 *
* Culvert Control       * Inlet  * Weir Submerg        * 0.00 *
* Culv WS Inlet (ft)    * 223.53 * Weir Max Depth (ft) * 1.53 *
* Culv WS Outlet (ft)   * 221.79 * Weir Avg Depth (ft) * 0.79 *
* Culv Nml Depth (ft)   * 6.58  * Weir Flow Area (sq ft) * 107.32 *
* Culv Crt Depth (ft)   * 6.44  * Min El Weir Flow (ft) * 227.24 *
*****
```

```
CULVERT OUTPUT Profile #50-YR Culv Group: Culvert #1
*****
* Q Culv Group (cfs)      * 708.01 * Culv Full Len (ft)    *      *
* # Barrels              *      1 * Culv Vel US (ft/s)   * 14.09 *
* Q Barrel (cfs)        * 708.01 * Culv Vel DS (ft/s)   * 14.10 *
* E.G. US. (ft)         * 230.14 * Culv Inv El Up (ft)  * 216.95 *
* W.S. US. (ft)         * 229.81 * Culv Inv El Dn (ft)  * 215.35 *
* E.G. DS (ft)          * 226.37 * Culv Frctn Ls (ft)   * 2.23 *
* W.S. DS (ft)          * 222.74 * Culv Exit Loss (ft)  * 0.00 *
* Delta EG (ft)         * 3.77  * Culv Entr Loss (ft)  * 1.54 *
* Delta WS (ft)         * 7.07  * Q Weir (cfs)         * 1178.99 *
* E.G. IC (ft)          * 230.14 * Weir Sta Lft (ft)   * 25.74 *
* E.G. OC (ft)          * 230.06 * Weir Sta Rgt (ft)   * 197.78 *
* Culvert Control       * Inlet  * Weir Submerg        * 0.00 *
* Culv WS Inlet (ft)    * 224.95 * Weir Max Depth (ft) * 2.88 *
* Culv WS Outlet (ft)   * 223.28 * Weir Avg Depth (ft) * 1.85 *
* Culv Nml Depth (ft)   * 8.00  * Weir Flow Area (sq ft) * 318.14 *
* Culv Crt Depth (ft)   * 6.72  * Min El Weir Flow (ft) * 227.24 *
*****
```

Note: The normal depth exceeds the height of the culvert. The program assumes that the normal depth is equal to the height of the culvert.

Note: During the supercritical calculations a hydraulic jump occurred inside of the culvert.

```
CULVERT OUTPUT Profile #100-YR Culv Group: Culvert #1
*****
* Q Culv Group (cfs)      * 644.61 * Culv Full Len (ft)    * 94.77 *
* # Barrels              * 1     * Culv Vel US (ft/s)   * 12.82 *
* Q Barrel (cfs)        * 644.61 * Culv Vel DS (ft/s)   * 12.82 *
* E.G. US. (ft)         * 230.72 * Culv Inv El Up (ft)  * 216.95 *
* W.S. US. (ft)         * 230.35 * Culv Inv El Dn (ft)  * 215.35 *
* E.G. DS (ft)          * 227.83 * Culv Frctn Ls (ft)   * 1.61 *
* W.S. DS (ft)          * 224.85 * Culv Exit Loss (ft)  * 0.00 *
* Delta EG (ft)         * 2.89  * Culv Entr Loss (ft) * 1.28 *
* Delta WS (ft)         * 5.50  * Q Weir (cfs)        * 1767.39 *
* E.G. IC (ft)          * 230.65 * Weir Sta Lft (ft)   * 23.60 *
* E.G. OC (ft)          * 230.72 * Weir Sta Rgt (ft)   * 202.36 *
* Culvert Control       * Outlet * Weir Submerg        * 0.00 *
* Culv WS Inlet (ft)    * 224.95 * Weir Max Depth (ft) * 3.49 *
* Culv WS Outlet (ft)   * 223.35 * Weir Avg Depth (ft) * 2.37 *
* Culv Nml Depth (ft)   *        * Weir Flow Area (sq ft) * 424.27 *
* Culv Crt Depth (ft)   * 6.44  * Min El Weir Flow (ft) * 227.24 *
*****
```

CROSS SECTION

RIVER: hudson
REACH: main RS: 2

INPUT

Description:

```
Station Elevation Data num= 25
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
*****
0 227.98 20.1 224.25 30.05 222.24 30.41 219.53 30.82 217.54
31.07 215.18 39.03 214.76 40.17 214.78 46.05 214.86 46.12 217.7
46.53 219.53 47.08 222.67 75.26 224.24 87.23 224.69 122.58 225.91
127.5 225.75 127.65 225.43 133.54 225.65 143.95 225.88 153.46 225.71
159.5 225.41 160.11 225.99 160.7 226 161.7 228.68 177.81 229.82
```

```
Manning's n Values num= 4
Sta n Val Sta n Val Sta n Val Sta n Val
*****
0 .045 31.07 .035 47.08 .045 122.58 .02
```

```
Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
30.41 46.53 46.04 48.67 51.13 .3 .5
Ineffective Flow num= 2
Sta L Sta R Elev Permanent
56.4 111.4 240 F
171.08 177.81 240 F
Blocked Obstructions num= 1
Sta L Sta R Elev
*****
14.6 21.6 230
```

```
CROSS SECTION OUTPUT Profile #2-YR
*****
* E.G. Elev (ft)      * 218.60 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.08  * Wt. n-Val.          * * 0.036 * *
* W.S. Elev (ft)     * 217.52 * Reach Len. (ft)     * 46.04 * 48.67 * 51.13 *
* Crit W.S. (ft)     * 217.37 * Flow Area (sq ft)   * * 39.71 * *
* E.G. Slope (ft/ft) * 0.016582 * Area (sq ft)        * * 39.71 * *
* Q Total (cfs)      * 331.00 * Flow (cfs)          * * 331.00 * *
* Top Width (ft)     * 15.29 * Top Width (ft)      * * 15.29 * *
* Vel Total (ft/s)   * 8.34  * Avg. Vel. (ft/s)   * * 8.34 * *
* Max Chl Dpth (ft)  * 2.76  * Hydr. Depth (ft)   * * 2.60 * *
* Conv. Total (cfs)  * 2570.5 * Conv. (cfs)         * * 2570.5 * *
* Length Wtd. (ft)   * 48.67 * Wetted Per. (ft)    * * 20.01 * *
* Min Ch El (ft)     * 214.76 * Shear (lb/sq ft)    * * 2.05 * *
* Alpha              * 1.00  * Stream Power (lb/ft s) * 177.81 * 0.00 * 0.00 *
* Frctn Loss (ft)    * 0.78  * Cum Volume (acre-ft) * * 0.05 * *
* C & E Loss (ft)    * 0.04  * Cum SA (acres)      * * 0.02 * *
*****
```

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #10-YR

```
*****
* E.G. Elev (ft)      * 222.09 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 2.32  * Wt. n-Val.      * 0.000  * 0.037  * 0.035  *
* W.S. Elev (ft)     * 219.77 * Reach Len. (ft) * 46.04  * 48.67  * 51.13  *
* Crit W.S. (ft)     * 219.77 * Flow Area (sq ft) * 0.00  * 75.02  * 0.00  *
* E.G. Slope (ft/ft) * 0.020355 * Area (sq ft)    * 0.00  * 75.02  * 0.00  *
* Q Total (cfs)      * 918.00 * Flow (cfs)      * 0.00  * 918.00 * 0.00  *
* Top Width (ft)     * 16.19 * Top Width (ft)  * 0.03  * 16.12  * 0.04  *
* Vel Total (ft/s)   * 12.23 * Avg. Vel. (ft/s) * 0.29  * 12.24  * 0.45  *
* Max Chl Dpth (ft)  * 5.01  * Hydr. Depth (ft) * 0.12  * 4.65  * 0.12  *
* Conv. Total (cfs)  * 6434.3 * Conv. (cfs)     * 0.0  * 6434.3 * 0.0  *
* Length Wtd. (ft)   * 48.67 * Wetted Per. (ft) * 0.24  * 24.11  * 0.24  *
* Min Ch El (ft)     * 214.76 * Shear (lb/sq ft) *  *  * 3.95  * 0.03  *
* Alpha              * 1.00  * Stream Power (lb/ft s) * 177.81 * 0.00  * 0.00  *
* Frctn Loss (ft)    * 0.86  * Cum Volume (acre-ft) * 0.00  * 0.08  * 0.00  *
* C & E Loss (ft)    * 0.21  * Cum SA (acres)   * 0.00  * 0.02  * 0.00  *
*****
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

subcritical answer. The program defaulted to critical depth.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50-YR

```
*****
* E.G. Elev (ft)      * 226.37 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 3.63  * Wt. n-Val.      * 0.045  * 0.037  * 0.035  *
* W.S. Elev (ft)     * 222.74 * Reach Len. (ft) * 46.04  * 48.67  * 51.13  *
* Crit W.S. (ft)     * 222.74 * Flow Area (sq ft) * 1.29  * 122.99 * 0.95  *
* E.G. Slope (ft/ft) * 0.016483 * Area (sq ft)    * 1.29  * 122.99 * 0.95  *
* Q Total (cfs)      * 1887.00 * Flow (cfs)      * 2.14  * 1882.72 * 2.14  *
* Top Width (ft)     * 20.79 * Top Width (ft)  * 2.84  * 16.12  * 1.83  *
* Vel Total (ft/s)   * 15.07 * Avg. Vel. (ft/s) * 1.66  * 15.31  * 2.26  *
* Max Chl Dpth (ft)  * 7.98  * Hydr. Depth (ft) * 0.45  * 7.63  * 0.52  *
* Conv. Total (cfs)  * 14697.8 * Conv. (cfs)     * 16.7  * 14664.4 * 16.7  *
* Length Wtd. (ft)   * 48.67 * Wetted Per. (ft) * 5.27  * 24.11  * 4.47  *
* Min Ch El (ft)     * 214.76 * Shear (lb/sq ft) * 0.25  * 5.25  * 0.22  *
* Alpha              * 1.03  * Stream Power (lb/ft s) * 177.81 * 0.00  * 0.00  *
* Frctn Loss (ft)    * 0.45  * Cum Volume (acre-ft) * 0.00  * 0.13  * 0.00  *
* C & E Loss (ft)    * 1.14  * Cum SA (acres)   * 0.00  * 0.02  * 0.00  *
*****
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

subcritical answer. The program defaulted to critical depth.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100-YR

```
*****
* E.G. Elev (ft)      * 227.83 * Element          * Left OB * Channel * Right OB *
*****
```

```

* Vel Head (ft)          * 2.98 * Wt. n-Val.          * 0.045 * 0.037 * 0.044 *
* W.S. Elev (ft)        * 224.85 * Reach Len. (ft)    * 46.04 * 48.67 * 51.13 *
* Crit W.S. (ft)        * 224.85 * Flow Area (sq ft)  * 16.26 * 156.96 * 19.95 *
* E.G. Slope (ft/ft)    * 0.010407 * Area (sq ft)      * 16.26 * 156.96 * 46.29 *
* Q Total (cfs)         * 2412.00 * Flow (cfs)         * 66.11 * 2246.28 * 99.61 *
* Top Width (ft)        * 70.22 * Top Width (ft)     * 8.81 * 16.12 * 45.29 *
* Vel Total (ft/s)      * 12.49 * Avg. Vel. (ft/s)   * 4.07 * 14.31 * 4.99 *
* Max Chl Dpth (ft)    * 10.09 * Hydr. Depth (ft)   * 1.85 * 9.74 * 2.02 *
* Conv. Total (cfs)     * 23643.7 * Conv. (cfs)        * 648.1 * 22019.2 * 976.4 *
* Length Wtd. (ft)     * 48.72 * Wetted Per. (ft)   * 12.26 * 24.11 * 12.52 *
* Min Ch El (ft)       * 214.76 * Shear (lb/sq ft)   * 0.86 * 4.23 * 1.03 *
* Alpha                 * 1.23 * Stream Power (lb/ft s) * 177.81 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 0.39 * Cum Volume (acre-ft) * 0.01 * 0.16 * 0.03 *
* C & E Loss (ft)      * 0.70 * Cum SA (acres)     * 0.01 * 0.02 * 0.05 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: hudson

REACH: main RS: 1

INPUT

Description:

Station Elevation Data		num= 25							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	230.14	25.94	222.15	37.57	221.8	42.97	220.18	43.67	218.62
44.08	217.3	45.37	214.42	51.45	214.18	52.87	214.13	61	214.53
62.45	217.58	63.27	219.47	63.72	220.69	65.96	220.54	105.43	221.17
130.89	223.8	152.14	226.21	154.82	225.97	160.48	226.02	170.65	226.19
180.49	226	187.04	225.77	187.73	226.32	190.41	226.66	200	229.64

Manning's n Values		num= 4					
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	45.37	.035	63.72	.02	190.41	.045

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	43.67	63.27		0	0	.1	.3

Ineffective Flow		num= 1	
Sta L	Sta R	Elev	Permanent
103.5	146.6	240	F

CROSS SECTION OUTPUT Profile #2-YR

```

*****
* E.G. Elev (ft)        * 217.78 * Element            * Left OB * Channel * Right OB *
* Vel Head (ft)         * 1.00  * Wt. n-Val.         *          * 0.036   *          *
* W.S. Elev (ft)        * 216.78 * Reach Len. (ft)    *          *          *          *
* Crit W.S. (ft)        * 216.67 * Flow Area (sq ft)  *          * 41.22   *          *
* E.G. Slope (ft/ft)    * 0.015412 * Area (sq ft)      *          * 41.22   *          *
* Q Total (cfs)         * 331.00 * Flow (cfs)         *          * 331.00  *          *
* Top Width (ft)        * 17.76 * Top Width (ft)     *          * 17.76   *          *
* Vel Total (ft/s)      * 8.03  * Avg. Vel. (ft/s)   *          * 8.03    *          *
* Max Chl Dpth (ft)    * 2.65  * Hydr. Depth (ft)   *          * 2.32    *          *
* Conv. Total (cfs)     * 2666.2 * Conv. (cfs)        *          * 2666.2  *          *
* Length Wtd. (ft)     *          * Wetted Per. (ft)   *          * 20.73   *          *
* Min Ch El (ft)       * 214.13 * Shear (lb/sq ft)   *          * 1.91    *          *
* Alpha                 * 1.00  * Stream Power (lb/ft s) * 200.00 * 0.00   * 0.00 *
* Frctn Loss (ft)      *          * Cum Volume (acre-ft) *          *          *          *
* C & E Loss (ft)      *          * Cum SA (acres)     *          *          *          *
*****

```


Note: Manning's n values were composited to a single value in the main channel.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10-YR

```
*****
* E.G. Elev (ft)      * 220.97 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 2.52  * Wt. n-Val.      *         * 0.037  *         *
* W.S. Elev (ft)     * 218.46 * Reach Len. (ft) *         *         *         *
* Crit W.S. (ft)     * 218.85 * Flow Area (sq ft) *         * 72.11  *         *
* E.G. Slope (ft/ft) * 0.023477 * Area (sq ft) *         * 72.11  *         *
* Q Total (cfs)      * 918.00 * Flow (cfs)      *         * 918.00 *         *
* Top Width (ft)     * 19.11 * Top Width (ft)  *         * 19.11  *         *
* Vel Total (ft/s)   * 12.73 * Avg. Vel. (ft/s) *         * 12.73  *         *
* Max Chl Dpth (ft) * 4.33  * Hydr. Depth (ft) *         * 3.77   *         *
* Conv. Total (cfs)  * 5991.2 * Conv. (cfs)     *         * 5991.2 *         *
* Length Wtd. (ft)  *         * Wetted Per. (ft) *         * 24.34  *         *
* Min Ch El (ft)    * 214.13 * Shear (lb/sq ft) *         * 4.34   *         *
* Alpha             * 1.00  * Stream Power (lb/ft s) * 200.00 * 0.00  * 0.00 *
* Frctn Loss (ft)   * 1.06  * Cum Volume (acre-ft) *         *         *         *
* C & E Loss (ft)   * 0.06  * Cum SA (acres)  *         *         *         *
*****
```

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Manning's n values were composited to a single value in the main channel.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```
*****
* E.G. Elev (ft)      * 225.02 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 4.72  * Wt. n-Val.      * 0.045  * 0.037  * 0.035  *
* W.S. Elev (ft)     * 220.30 * Reach Len. (ft) *         *         *         *
* Crit W.S. (ft)     * 222.25 * Flow Area (sq ft) * 0.65  * 108.03 * 0.13  *
* E.G. Slope (ft/ft) * 0.027521 * Area (sq ft) * 0.65  * 108.03 * 0.13  *
* Q Total (cfs)      * 1887.00 * Flow (cfs)      * 1.63  * 1885.13 * 0.24  *
* Top Width (ft)     * 21.00 * Top Width (ft)  * 1.10  * 19.60  * 0.31  *
* Vel Total (ft/s)   * 17.34 * Avg. Vel. (ft/s) * 2.50  * 17.45  * 1.93  *
* Max Chl Dpth (ft) * 6.17  * Hydr. Depth (ft) * 0.60  * 5.51  * 0.41  *
* Conv. Total (cfs)  * 11374.7 * Conv. (cfs)     * 9.8   * 11363.4 * 1.5   *
* Length Wtd. (ft)  *         * Wetted Per. (ft) * 2.13  * 25.62  * 0.88  *
* Min Ch El (ft)    * 214.13 * Shear (lb/sq ft) * 0.53  * 7.24   * 0.25  *
* Alpha             * 1.01  * Stream Power (lb/ft s) * 200.00 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 1.02  * Cum Volume (acre-ft) *         *         *         *
* C & E Loss (ft)   * 0.33  * Cum SA (acres)  *         *         *         *
*****
```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Manning's n values were composited to a single value in the main channel.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```
*****
* E.G. Elev (ft)      * 226.39 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 5.24  * Wt. n-Val.      * 0.045  * 0.037  * 0.020  *
* W.S. Elev (ft)     * 221.15 * Reach Len. (ft) *         *         *         *
* Crit W.S. (ft)     * 222.74 * Flow Area (sq ft) * 2.79  * 124.70 * 13.34  *
* E.G. Slope (ft/ft) * 0.026006 * Area (sq ft) * 2.79  * 124.70 * 13.34  *
* Q Total (cfs)      * 2412.00 * Flow (cfs)      * 9.98  * 2327.81 * 74.22  *
* Top Width (ft)     * 64.45 * Top Width (ft)  * 3.93  * 19.60  * 40.91  *
* Vel Total (ft/s)   * 17.13 * Avg. Vel. (ft/s) * 3.57  * 18.67  * 5.56  *
* Max Chl Dpth (ft) * 7.02  * Hydr. Depth (ft) * 0.71  * 6.36   * 0.33  *
* Conv. Total (cfs)  * 14956.9 * Conv. (cfs)     * 61.9  * 14434.8 * 460.2  *
* Length Wtd. (ft)  *         * Wetted Per. (ft) * 5.09  * 25.62  * 41.09  *
* Min Ch El (ft)    * 214.13 * Shear (lb/sq ft) * 0.89  * 7.90   * 0.53  *
* Alpha             * 1.15  * Stream Power (lb/ft s) * 200.00 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 0.76  * Cum Volume (acre-ft) *         *         *         *
*****
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* C & E Loss (ft) * 0.68 * Cum SA (acres) * * * *

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
 This may indicate the need for additional cross sections.
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
 Note: Manning's n values were composited to a single value in the main channel.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

SUMMARY OF MANNING'S N VALUES

River: hudson

* Reach	* River Sta.	* n1	* n2	* n3	* n4	* n5	* n6	* n7	*
*main	* 40	* .085*	* .045*	* .02*	* .045*	* .035*	* .045*	* *	* *
*main	* 39	* .045*	* .02*	* .035*	* .045*	* *	* *	* *	* *
*main	* 38	* .045*	* .02*	* .035*	* .02*	* .045*	* .1*	* *	* *
*main	* 37	* .045*	* .02*	* .035*	* .045*	* .02*	* .1*	* *	* *
*main	* 36	* .045*	* .02*	* .045*	* .035*	* .02*	* .1*	* *	* *
*main	* 35	* .045*	* .02*	* .045*	* .035*	* .1*	* *	* *	* *
*main	* 34	* .045*	* .02*	* .045*	* .05*	* .045*	* .1*	* *	* *
*main	* 33	* .045*	* .02*	* .045*	* .05*	* .045*	* .1*	* *	* *
*main	* 32	* .045*	* .02*	* .045*	* .05*	* .1*	* *	* *	* *
*main	* 31.5	* Bridge	* *	* *	* *	* *	* *	* *	* *
*main	* 31	* .045*	* .02*	* .045*	* .035*	* .1*	* *	* *	* *
*main	* 30	* .045*	* .02*	* .045*	* .035*	* .1*	* *	* *	* *
*main	* 29	* .045*	* .02*	* .045*	* .05*	* .1*	* *	* *	* *
*main	* 28	* .045*	* .02*	* .045*	* .035*	* .1*	* *	* *	* *
*main	* 27	* .045*	* .02*	* .045*	* .035*	* .1*	* *	* *	* *
*main	* 26	* .045*	* .02*	* .045*	* .035*	* .1*	* *	* *	* *
*main	* 25	* .02*	* .045*	* .035*	* .1*	* *	* *	* *	* *
*main	* 24	* .02*	* .045*	* .035*	* .1*	* *	* *	* *	* *
*main	* 20	* Culvert	* *	* *	* *	* *	* *	* *	* *
*main	* 14	* .1*	* .035*	* .045*	* .05*	* .02*	* .1*	* *	* *
*main	* 13	* .1*	* .035*	* .045*	* .02*	* .1*	* *	* *	* *
*main	* 12	* .1*	* .035*	* .045*	* .02*	* .1*	* *	* *	* *
*main	* 11	* .1*	* .035*	* .045*	* .05*	* .02*	* .1*	* *	* *
*main	* 10	* .1*	* .085*	* .035*	* .045*	* .02*	* .05*	* *	* *
*main	* 9	* .1*	* .085*	* .035*	* .045*	* .02*	* .05*	* *	* *
*main	* 8	* .1*	* .035*	* .045*	* .02*	* .05*	* *	* *	* *
*main	* 7	* .1*	* .05*	* .1*	* .045*	* .05*	* .02*	* .05*	* *
*main	* 6	* .1*	* .035*	* .1*	* .02*	* .05*	* *	* *	* *
*main	* 5	* .1*	* .035*	* .045*	* .05*	* .02*	* .05*	* *	* *
*main	* 4	* .1*	* .035*	* .05*	* .045*	* .02*	* .05*	* .02*	* *
*main	* 3	* .1*	* .035*	* .045*	* .02*	* *	* *	* *	* *
*main	* 2.5	* Culvert	* *	* *	* *	* *	* *	* *	* *
*main	* 2	* .045*	* .035*	* .045*	* .02*	* *	* *	* *	* *
*main	* 1	* .045*	* .035*	* .02*	* .045*	* *	* *	* *	* *

SUMMARY OF REACH LENGTHS

River: hudson

* Reach	* River Sta.	* Left	* Channel	* Right	*
*main	* 40	* 93.6*	* 97.1*	* 92.95*	*
*main	* 39	* 113.96*	* 114.57*	* 114.59*	*
*main	* 38	* 50.64*	* 50.85*	* 51.22*	*
*main	* 37	* 63.51*	* 64.27*	* 60.78*	*
*main	* 36	* 34*	* 38.78*	* 43.34*	*
*main	* 35	* 69.27*	* 79.77*	* 85.15*	*
*main	* 34	* 59.8*	* 61.46*	* 61.27*	*
*main	* 33	* 21.85*	* 21.89*	* 21.7*	*
*main	* 32	* 24.44*	* 27.61*	* 26.31*	*
*main	* 31.5	* Bridge	* *	* *	*

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*main      * 31      * 95.55* 97.06* 99*
*main      * 30      * 69.42* 70.58* 71.76*
*main      * 29      * 57* 58.22* 61.16*
*main      * 28      * 46* 46.77* 46.35*
*main      * 27      * 60.75* 61.7* 65.02*
*main      * 26      * 83.06* 84.96* 87.67*
*main      * 25      * 29.59* 30.248* 33.09*
*main      * 24      * 615.41* 591.97* 573.52*
*main      * 20      *Culvert * *
*main      * 14      * 32.61* 35.44* 36.08*
*main      * 13      * 36.53* 35.61* 35.05*
*main      * 12      * 43.41* 42.27* 41.38*
*main      * 11      * 42.45* 41.39* 40*
*main      * 10      * 57.02* 54.55* 53*
*main      * 9      * 55.45* 51.85* 50.87*
*main      * 8      * 84.59* 69.8* 31.19*
*main      * 7      * 20.21* 31* 42.19*
*main      * 6      * 19.21* 30.14* 38.14*
*main      * 5      * 33.07* 34.23* 33.12*
*main      * 4      * 47.24* 49.31* 53.94*
*main      * 3      * 112.21* 120.13* 138.27*
*main      * 2.5    *Culvert * *
*main      * 2      * 46.04* 48.67* 51.13*
*main      * 1      * 0* 0* 0*
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SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: hudson

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*****
* Reach      * River Sta. * Contr. * Expan. *
*****
*main      * 40      * .1* .3*
*main      * 39      * .1* .3*
*main      * 38      * .1* .3*
*main      * 37      * .1* .3*
*main      * 36      * .1* .3*
*main      * 35      * .1* .3*
*main      * 34      * .1* .3*
*main      * 33      * .1* .3*
*main      * 32      * .3* .5*
*main      * 31.5    *Bridge *
*main      * 31      * .3* .5*
*main      * 30      * .1* .3*
*main      * 29      * .1* .3*
*main      * 28      * .1* .3*
*main      * 27      * .1* .3*
*main      * 26      * .1* .3*
*main      * 25      * .1* .3*
*main      * 24      * .3* .5*
*main      * 20      *Culvert *
*main      * 14      * .3* .5*
*main      * 13      * .1* .3*
*main      * 12      * .1* .3*
*main      * 11      * .1* .3*
*main      * 10      * .1* .3*
*main      * 9      * .1* .3*
*main      * 8      * .1* .3*
*main      * 7      * .1* .3*
*main      * 6      * .1* .3*
*main      * 5      * .1* .3*
*main      * 4      * .1* .3*
*main      * 3      * .3* .5*
*main      * 2.5    *Culvert *
*main      * 2      * .3* .5*
*main      * 1      * .1* .3*
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Profile Output Table - Standard Table 1

* Reach	* River Sta	* Profile	* Q Total	* Min Ch El	* W.S. Elev	* Crit W.S.	* E.G. Elev	* E.G. Slope	* Vel Chnl	* Flow Area	* Top Width	* Froude #	* Chl
*	*	*	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	*	*
* main	* 40	* 2-YR	* 364.00	* 256.38	* 259.74	* 259.54	* 260.71	* 0.012514	* 7.91	* 46.04	* 19.09	* 0.90	*
* main	* 40	* 10-YR	* 864.00	* 256.38	* 261.67	* 261.43	* 263.20	* 0.012293	* 9.92	* 87.31	* 26.60	* 0.92	*
* main	* 40	* 50-YR	* 1659.00	* 256.38	* 263.71	* 263.71	* 264.64	* 0.005654	* 8.68	* 243.36	* 114.68	* 0.66	*
* main	* 40	* 100-YR	* 2110.00	* 256.38	* 264.07	* 264.07	* 265.12	* 0.006069	* 9.38	* 285.29	* 119.84	* 0.69	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 39	* 2-YR	* 364.00	* 254.87	* 258.69	* 258.38	* 259.51	* 0.011291	* 7.25	* 50.22	* 20.61	* 0.82	*
* main	* 39	* 10-YR	* 864.00	* 254.87	* 260.30	* 260.06	* 261.94	* 0.013510	* 10.27	* 84.13	* 21.58	* 0.92	*
* main	* 39	* 50-YR	* 1659.00	* 254.87	* 262.02	* 262.67	* 263.81	* 0.011301	* 11.49	* 172.64	* 124.42	* 0.86	*
* main	* 39	* 100-YR	* 2110.00	* 254.87	* 262.33	* 262.95	* 264.24	* 0.011964	* 12.27	* 213.48	* 137.79	* 0.90	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 38	* 2-YR	* 364.00	* 254.31	* 256.84	* 256.84	* 257.91	* 0.016871	* 8.32	* 43.74	* 20.59	* 1.01	*
* main	* 38	* 10-YR	* 864.00	* 254.31	* 259.37	*	* 260.59	* 0.008585	* 8.86	* 97.47	* 21.85	* 0.74	*
* main	* 38	* 50-YR	* 1659.00	* 254.31	* 261.34	* 261.63	* 262.68	* 0.006862	* 9.93	* 200.80	* 101.01	* 0.69	*
* main	* 38	* 100-YR	* 2110.00	* 254.31	* 262.08	* 262.09	* 263.13	* 0.005221	* 9.31	* 285.83	* 139.06	* 0.61	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 37	* 2-YR	* 364.00	* 253.19	* 256.68	* 255.71	* 257.24	* 0.005917	* 6.03	* 60.35	* 18.75	* 0.59	*
* main	* 37	* 10-YR	* 930.00	* 253.19	* 258.90	* 257.73	* 260.16	* 0.008125	* 9.00	* 103.33	* 19.87	* 0.70	*
* main	* 37	* 50-YR	* 1865.00	* 253.19	* 260.92	* 261.30	* 262.32	* 0.007279	* 10.37	* 238.10	* 134.26	* 0.68	*
* main	* 37	* 100-YR	* 2353.00	* 253.19	* 261.25	* 261.63	* 262.76	* 0.007918	* 11.15	* 281.56	* 136.61	* 0.72	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 36	* 2-YR	* 364.00	* 252.84	* 255.51	* 255.51	* 256.59	* 0.016866	* 8.34	* 43.65	* 20.26	* 1.00	*
* main	* 36	* 10-YR	* 930.00	* 252.84	* 257.39	* 257.39	* 259.37	* 0.016248	* 11.30	* 82.30	* 20.89	* 1.00	*
* main	* 36	* 50-YR	* 1865.00	* 252.84	* 259.83	* 260.48	* 261.71	* 0.010392	* 11.81	* 196.02	* 122.59	* 0.83	*
* main	* 36	* 100-YR	* 2353.00	* 252.84	* 260.19	* 260.83	* 262.13	* 0.010752	* 12.47	* 242.58	* 135.68	* 0.85	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 35	* 2-YR	* 364.00	* 252.21	* 254.38	* 254.71	* 255.75	* 0.026415	* 9.38	* 38.80	* 23.61	* 1.29	*
* main	* 35	* 10-YR	* 930.00	* 252.21	* 255.52	* 256.40	* 258.40	* 0.033829	* 13.62	* 68.26	* 28.22	* 1.54	*
* main	* 35	* 50-YR	* 1865.00	* 252.21	* 257.17	* 259.15	* 260.91	* 0.027628	* 15.52	* 120.17	* 34.63	* 1.47	*
* main	* 35	* 100-YR	* 2353.00	* 252.21	* 258.42	* 259.61	* 261.51	* 0.016582	* 14.13	* 170.26	* 66.94	* 1.18	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 34	* 2-YR	* 364.00	* 248.88	* 251.37	* 251.72	* 252.79	* 0.055821	* 9.55	* 38.10	* 23.22	* 1.31	*
* main	* 34	* 10-YR	* 930.00	* 248.88	* 252.93	* 253.40	* 255.16	* 0.043553	* 11.98	* 77.61	* 26.77	* 1.24	*
* main	* 34	* 50-YR	* 1865.00	* 248.88	* 254.57	* 255.40	* 258.09	* 0.044305	* 15.04	* 123.99	* 29.58	* 1.29	*
* main	* 34	* 100-YR	* 2353.00	* 248.88	* 255.25	* 256.25	* 259.37	* 0.044261	* 16.29	* 144.55	* 30.83	* 1.31	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 33	* 2-YR	* 364.00	* 246.48	* 250.51	* 249.52	* 250.99	* 0.010003	* 5.59	* 65.12	* 22.29	* 0.58	*
* main	* 33	* 10-YR	* 930.00	* 246.48	* 252.95	* 251.42	* 253.81	* 0.009852	* 7.44	* 125.02	* 26.88	* 0.60	*
* main	* 33	* 50-YR	* 1865.00	* 246.48	* 255.94	* 253.66	* 257.14	* 0.007794	* 8.82	* 215.37	* 60.88	* 0.58	*
* main	* 33	* 100-YR	* 2353.00	* 246.48	* 256.97	* 254.59	* 258.07	* 0.006356	* 8.71	* 289.53	* 93.16	* 0.54	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 32	* 2-YR	* 364.00	* 246.39	* 250.29	* 249.36	* 250.77	* 0.010298	* 5.59	* 65.11	* 23.39	* 0.59	*
* main	* 32	* 10-YR	* 930.00	* 246.39	* 252.80	* 251.23	* 253.58	* 0.009285	* 7.11	* 130.89	* 29.01	* 0.59	*
* main	* 32	* 50-YR	* 1865.00	* 246.39	* 256.18	* 253.39	* 256.85	* 0.004719	* 6.89	* 295.95	* 106.06	* 0.45	*
* main	* 32	* 100-YR	* 2353.00	* 246.39	* 257.25	* 254.34	* 257.81	* 0.003164	* 6.19	* 402.23	* 109.93	* 0.38	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 31.5		* Bridge	*	*	*	*	*	*	*	*	*	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 31	* 2-YR	* 364.00	* 246.81	* 249.24	* 249.24	* 250.33	* 0.016519	* 8.39	* 43.36	* 19.82	* 1.00	*
* main	* 31	* 10-YR	* 930.00	* 246.81	* 251.46	* 251.19	* 253.08	* 0.012406	* 10.21	* 91.07	* 23.07	* 0.91	*
* main	* 31	* 50-YR	* 1865.00	* 246.81	* 253.52	* 253.52	* 256.21	* 0.014482	* 13.17	* 141.56	* 26.14	* 1.00	*
* main	* 31	* 100-YR	* 2353.00	* 246.81	* 255.61	* 255.61	* 257.06	* 0.005996	* 10.20	* 257.82	* 102.67	* 0.66	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 30	* 2-YR	* 364.00	* 243.63	* 247.54	* 247.37	* 248.62	* 0.013620	* 8.36	* 43.52	* 16.74	* 0.91	*

* main	* 30	* 10-YR	* 930.00	* 243.63	* 249.61	* 249.59	* 251.62	* 0.015475	* 11.39	* 81.66	* 20.04	* 0.99
* main	* 30	* 50-YR	* 1865.00	* 243.63	* 251.18	* 252.13	* 254.39	* 0.020749	* 14.90	* 141.18	* 87.97	* 1.16
* main	* 30	* 100-YR	* 2353.00	* 243.63	* 251.41	* 252.48	* 255.29	* 0.025353	* 16.73	* 160.35	* 91.10	* 1.28
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 29	* 2-YR	* 364.00	* 242.70	* 246.92	* 245.98	* 247.55	* 0.012974	* 6.35	* 57.34	* 18.01	* 0.63
* main	* 29	* 10-YR	* 930.00	* 242.70	* 249.25	* 248.18	* 250.28	* 0.014271	* 8.37	* 118.61	* 86.29	* 0.68
* main	* 29	* 50-YR	* 1865.00	* 242.70	* 249.57	* 250.33	* 252.32	* 0.037860	* 13.95	* 143.59	* 104.71	* 1.10
* main	* 29	* 100-YR	* 2353.00	* 242.70	* 249.89	* 250.74	* 252.85	* 0.037940	* 14.28	* 171.23	* 107.29	* 1.11
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 28	* 2-YR	* 364.00	* 242.91	* 246.34	* 245.63	* 246.99	* 0.007372	* 6.47	* 56.28	* 19.96	* 0.68
* main	* 28	* 10-YR	* 930.00	* 242.91	* 249.57	* 248.44	* 249.83	* 0.001685	* 4.25	* 229.13	* 126.65	* 0.34
* main	* 28	* 50-YR	* 1865.00	* 242.91	* 251.22	* 249.43	* 251.60	* 0.001445	* 4.59	* 380.74	* 132.62	* 0.33
* main	* 28	* 100-YR	* 2353.00	* 242.91	* 251.86	* 249.82	* 252.32	* 0.001433	* 4.89	* 441.39	* 134.14	* 0.33
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 27	* 2-YR	* 364.00	* 241.73	* 246.07	* 245.21	* 246.65	* 0.006171	* 6.12	* 59.51	* 20.11	* 0.63
* main	* 27	* 10-YR	* 930.00	* 241.73	* 249.57	* 248.03	* 249.74	* 0.000980	* 3.71	* 283.85	* 131.38	* 0.27
* main	* 27	* 50-YR	* 1865.00	* 241.73	* 251.24	* 249.04	* 251.51	* 0.000967	* 4.35	* 453.93	* 133.33	* 0.28
* main	* 27	* 100-YR	* 2353.00	* 241.73	* 251.90	* 249.42	* 252.22	* 0.001003	* 4.69	* 521.23	* 134.10	* 0.29
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 26	* 2-YR	* 364.00	* 239.33	* 245.63	*	* 246.24	* 0.007077	* 6.28	* 57.95	* 17.65	* 0.61
* main	* 26	* 10-YR	* 930.00	* 239.33	* 249.56	*	* 249.68	* 0.000624	* 2.89	* 342.90	* 111.24	* 0.20
* main	* 26	* 50-YR	* 1865.00	* 239.33	* 251.25	*	* 251.44	* 0.000655	* 3.45	* 537.87	* 122.11	* 0.21
* main	* 26	* 100-YR	* 2353.00	* 239.33	* 251.91	*	* 252.14	* 0.000684	* 3.72	* 619.17	* 123.59	* 0.22
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 25	* 2-YR	* 364.00	* 239.32	* 245.78	* 242.30	* 245.93	* 0.000958	* 3.08	* 118.16	* 25.90	* 0.25
* main	* 25	* 10-YR	* 930.00	* 239.32	* 249.52	* 244.41	* 249.63	* 0.000431	* 2.85	* 355.27	* 94.51	* 0.18
* main	* 25	* 50-YR	* 1865.00	* 239.32	* 251.18	* 246.77	* 251.39	* 0.000557	* 3.69	* 535.05	* 140.84	* 0.21
* main	* 25	* 100-YR	* 2353.00	* 239.32	* 251.83	* 248.52	* 252.09	* 0.000589	* 3.97	* 610.13	* 149.80	* 0.22
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 24	* 2-YR	* 364.00	* 237.71	* 245.67	* 240.97	* 245.89	* 0.001407	* 3.76	* 96.79	* 13.03	* 0.24
* main	* 24	* 10-YR	* 930.00	* 237.71	* 249.37	* 243.58	* 249.60	* 0.001346	* 4.16	* 244.69	* 94.34	* 0.22
* main	* 24	* 50-YR	* 1865.00	* 237.71	* 250.97	* 249.16	* 251.35	* 0.001274	* 4.44	* 394.47	* 126.92	* 0.22
* main	* 24	* 100-YR	* 2353.00	* 237.71	* 251.57	* 249.51	* 252.04	* 0.001303	* 4.63	* 455.89	* 139.09	* 0.23
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 20	*	Culvert	*	*	*	*	*	*	*	*	*
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 14	* 2-YR	* 415.00	* 222.90	* 229.47	* 226.06	* 229.59	* 0.001382	* 2.73	* 153.90	* 41.99	* 0.22
* main	* 14	* 10-YR	* 990.00	* 222.90	* 231.37	* 227.68	* 231.59	* 0.001866	* 3.98	* 304.87	* 108.79	* 0.27
* main	* 14	* 50-YR	* 1925.00	* 222.90	* 232.89	* 229.79	* 233.19	* 0.002226	* 4.98	* 490.21	* 139.12	* 0.31
* main	* 14	* 100-YR	* 2413.00	* 222.90	* 233.39	* 231.19	* 233.74	* 0.002480	* 5.47	* 553.36	* 143.63	* 0.33
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 13	* 2-YR	* 415.00	* 224.66	* 228.32	* 228.32	* 229.23	* 0.015845	* 7.66	* 54.19	* 29.94	* 1.00
* main	* 13	* 10-YR	* 990.00	* 224.66	* 230.27	* 229.83	* 231.24	* 0.008992	* 7.90	* 125.24	* 43.17	* 0.82
* main	* 13	* 50-YR	* 1925.00	* 224.66	* 231.71	* 231.71	* 232.82	* 0.007247	* 8.92	* 272.44	* 134.95	* 0.78
* main	* 13	* 100-YR	* 2413.00	* 224.66	* 232.13	* 232.13	* 233.34	* 0.007290	* 9.55	* 330.50	* 141.00	* 0.79
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 12	* 2-YR	* 415.00	* 224.53	* 228.46	* 227.62	* 228.77	* 0.004197	* 4.51	* 91.94	* 41.77	* 0.54
* main	* 12	* 10-YR	* 990.00	* 224.53	* 230.48	* 228.88	* 230.91	* 0.002789	* 5.26	* 204.77	* 107.49	* 0.47
* main	* 12	* 50-YR	* 1925.00	* 224.53	* 231.35	* 230.73	* 232.19	* 0.004519	* 7.67	* 314.06	* 142.22	* 0.62
* main	* 12	* 100-YR	* 2413.00	* 224.53	* 231.91	* 231.33	* 232.78	* 0.004269	* 8.04	* 399.43	* 160.70	* 0.62
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 11	* 2-YR	* 415.00	* 224.22	* 227.35	* 227.35	* 228.40	* 0.015094	* 8.22	* 50.51	* 24.45	* 1.01
* main	* 11	* 10-YR	* 990.00	* 224.22	* 229.14	* 229.08	* 230.59	* 0.011692	* 9.72	* 107.99	* 42.89	* 0.95
* main	* 11	* 50-YR	* 1925.00	* 224.22	* 231.20	* 230.98	* 231.98	* 0.004449	* 8.26	* 386.79	* 179.48	* 0.64
* main	* 11	* 100-YR	* 2413.00	* 224.22	* 231.88	*	* 232.56	* 0.003549	* 8.01	* 514.58	* 192.63	* 0.58
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 10	* 2-YR	* 415.00	* 223.59	* 226.88	* 226.69	* 227.75	* 0.011760	* 7.51	* 55.30	* 25.40	* 0.90
* main	* 10	* 10-YR	* 990.00	* 223.59	* 229.26	* 228.38	* 230.09	* 0.005469	* 7.46	* 164.96	* 140.16	* 0.67
* main	* 10	* 50-YR	* 1925.00	* 223.59	* 231.34	*	* 231.74	* 0.002122	* 6.19	* 526.19	* 194.79	* 0.45

* main	* 10	* 100-YR	* 2413.00	* 223.59	* 231.97	*	* 232.37	* 0.001942	* 6.34	* 652.04	* 204.16	* 0.44
* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
* main	* 9	* 2-YR	* 415.00	* 223.10	* 226.33	*	* 227.16	* 0.009627	* 7.31	* 56.79	* 22.45	* 0.81
* main	* 9	* 10-YR	* 990.00	* 223.10	* 229.21	* 227.85	* 229.78	* 0.003319	* 6.54	* 234.78	* 157.74	* 0.52
* main	* 9	* 50-YR	* 1925.00	* 223.10	* 231.30	*	* 231.62	* 0.001575	* 5.72	* 587.24	* 173.06	* 0.38
* main	* 9	* 100-YR	* 2413.00	* 223.10	* 231.92	*	* 232.26	* 0.001565	* 6.03	* 694.30	* 174.86	* 0.39
* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
* main	* 8	* 2-YR	* 415.00	* 222.42	* 225.54	* 225.43	* 226.56	* 0.013012	* 8.11	* 51.20	* 21.98	* 0.94
* main	* 8	* 10-YR	* 990.00	* 222.42	* 229.26	*	* 229.59	* 0.001801	* 5.19	* 323.34	* 177.23	* 0.39
* main	* 8	* 50-YR	* 1925.00	* 222.42	* 231.31	*	* 231.52	* 0.001009	* 4.82	* 727.31	* 211.54	* 0.31
* main	* 8	* 100-YR	* 2413.00	* 222.42	* 231.93	*	* 232.16	* 0.001015	* 5.10	* 859.62	* 215.93	* 0.32
* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
* main	* 7	* 2-YR	* 431.00	* 220.87	* 225.16	*	* 225.62	* 0.009558	* 5.44	* 79.24	* 27.65	* 0.57
* main	* 7	* 10-YR	* 1038.00	* 220.87	* 229.26	*	* 229.43	* 0.001660	* 3.69	* 386.24	* 170.83	* 0.26
* main	* 7	* 50-YR	* 2017.00	* 220.87	* 231.29	*	* 231.45	* 0.001198	* 3.78	* 749.85	* 183.85	* 0.23
* main	* 7	* 100-YR	* 2562.00	* 220.87	* 231.90	*	* 232.08	* 0.001308	* 4.14	* 862.30	* 185.50	* 0.24
* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
* main	* 6	* 2-YR	* 431.00	* 220.27	* 225.03	*	* 225.44	* 0.003555	* 5.16	* 83.58	* 25.06	* 0.50
* main	* 6	* 10-YR	* 1038.00	* 220.27	* 229.05	*	* 229.37	* 0.001348	* 4.71	* 322.50	* 115.40	* 0.33
* main	* 6	* 50-YR	* 2017.00	* 220.27	* 230.84	*	* 231.36	* 0.001769	* 6.36	* 555.60	* 150.91	* 0.39
* main	* 6	* 100-YR	* 2562.00	* 220.27	* 231.28	*	* 231.98	* 0.002256	* 7.45	* 623.77	* 154.87	* 0.45
* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
* main	* 5	* 2-YR	* 431.00	* 219.53	* 224.13	* 223.70	* 225.20	* 0.011736	* 8.28	* 52.07	* 16.18	* 0.81
* main	* 5	* 10-YR	* 1038.00	* 219.53	* 228.18	* 225.98	* 229.22	* 0.004982	* 8.31	* 145.12	* 103.93	* 0.55
* main	* 5	* 50-YR	* 2017.00	* 219.53	* 230.58	* 229.62	* 231.27	* 0.003074	* 7.95	* 387.22	* 145.90	* 0.46
* main	* 5	* 100-YR	* 2562.00	* 219.53	* 231.00	* 230.16	* 231.86	* 0.003747	* 9.03	* 437.00	* 166.55	* 0.51
* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
* main	* 4	* 2-YR	* 431.00	* 218.90	* 223.81	* 223.30	* 224.81	* 0.010005	* 7.99	* 53.97	* 17.41	* 0.80
* main	* 4	* 10-YR	* 1038.00	* 218.90	* 228.29	* 225.64	* 228.98	* 0.003257	* 6.66	* 156.29	* 29.26	* 0.49
* main	* 4	* 50-YR	* 2017.00	* 218.90	* 228.44	* 228.13	* 230.91	* 0.011246	* 12.60	* 161.01	* 33.19	* 0.92
* main	* 4	* 100-YR	* 2562.00	* 218.90	* 230.51	* 230.51	* 231.70	* 0.004326	* 9.58	* 374.46	* 166.46	* 0.60
* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
* main	* 3	* 2-YR	* 331.00	* 217.50	* 224.17	* 221.54	* 224.39	* 0.001625	* 3.73	* 88.86	* 23.82	* 0.34
* main	* 3	* 10-YR	* 918.00	* 217.50	* 228.57	* 224.00	* 228.77	* 0.000678	* 3.74	* 297.90	* 134.14	* 0.24
* main	* 3	* 50-YR	* 1887.00	* 217.50	* 229.81	* 226.40	* 230.14	* 0.001077	* 5.23	* 485.74	* 166.67	* 0.32
* main	* 3	* 100-YR	* 2412.00	* 217.50	* 230.35	* 228.58	* 230.72	* 0.001182	* 5.71	* 578.50	* 174.72	* 0.34
* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
* main	* 2.5		* Culvert	*	*	*	*	*	*	*	*	*
* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
* main	* 2	* 2-YR	* 331.00	* 214.76	* 217.52	* 217.37	* 218.60	* 0.016582	* 8.34	* 39.71	* 15.29	* 0.91
* main	* 2	* 10-YR	* 918.00	* 214.76	* 219.77	* 219.77	* 222.09	* 0.020355	* 12.24	* 75.03	* 16.19	* 1.00
* main	* 2	* 50-YR	* 1887.00	* 214.76	* 222.74	* 222.74	* 226.37	* 0.016483	* 15.31	* 125.22	* 20.79	* 0.98
* main	* 2	* 100-YR	* 2412.00	* 214.76	* 224.85	* 224.85	* 227.83	* 0.010407	* 14.31	* 193.16	* 70.22	* 0.81
* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
* main	* 1	* 2-YR	* 331.00	* 214.13	* 216.78	* 216.67	* 217.78	* 0.015412	* 8.03	* 41.22	* 17.76	* 0.93
* main	* 1	* 10-YR	* 918.00	* 214.13	* 218.46	* 218.85	* 220.97	* 0.023477	* 12.73	* 72.11	* 19.11	* 1.15
* main	* 1	* 50-YR	* 1887.00	* 214.13	* 220.30	* 222.25	* 225.02	* 0.027521	* 17.45	* 108.81	* 21.00	* 1.31
* main	* 1	* 100-YR	* 2412.00	* 214.13	* 221.15	* 222.74	* 226.39	* 0.026006	* 18.67	* 140.83	* 64.45	* 1.30

Profile Output Table - Standard Table 2

* Reach	* River Sta	* Profile	* E.G. Elev (ft)	* W.S. Elev (ft)	* Vel Head (ft)	* Frctn Loss (ft)	* C & E Loss (ft)	* Q Left (cfs)	* Q Channel (cfs)	* Q Right (cfs)	* Top Width (ft)
* main	* 40	* 2-YR	* 260.71	* 259.74	* 0.97	* 1.15	* 0.05	*	* 364.00	*	* 19.09
* main	* 40	* 10-YR	* 263.20	* 261.67	* 1.53	* 1.25	* 0.01	* 0.14	* 863.86	*	* 26.60
* main	* 40	* 50-YR	* 264.64	* 263.71	* 0.93	* 0.49	* 0.05	* 449.31	* 1209.47	* 0.22	* 114.68
* main	* 40	* 100-YR	* 265.12	* 264.07	* 1.05	* 0.53	* 0.06	* 714.62	* 1394.96	* 0.42	* 119.84
* main	* 39	* 2-YR	* 259.51	* 258.69	* 0.82	* 1.57	* 0.03	*	* 364.00	*	* 20.61
* main	* 39	* 10-YR	* 261.94	* 260.30	* 1.64	* 1.22	* 0.13	*	* 864.00	*	* 21.58
* main	* 39	* 50-YR	* 263.81	* 262.02	* 1.80	* 0.75	* 0.09	* 256.51	* 1401.44	* 1.05	* 124.42
* main	* 39	* 100-YR	* 264.24	* 262.33	* 1.91	* 0.80	* 0.09	* 524.04	* 1581.40	* 4.56	* 137.79
* main	* 38	* 2-YR	* 257.91	* 256.84	* 1.08	* 0.47	* 0.15	*	* 364.00	*	* 20.59
* main	* 38	* 10-YR	* 260.59	* 259.37	* 1.22	* 0.42	* 0.00	*	* 864.00	*	* 21.85
* main	* 38	* 50-YR	* 262.68	* 261.34	* 1.34	* 0.99	* 0.14	* 199.23	* 1399.10	* 60.67	* 101.01
* main	* 38	* 100-YR	* 263.13	* 262.08	* 1.05	* 0.86	* 0.26	* 503.21	* 1462.29	* 144.50	* 139.06
* main	* 37	* 2-YR	* 257.24	* 256.68	* 0.56	* 0.60	* 0.05	*	* 364.00	*	* 18.75
* main	* 37	* 10-YR	* 260.16	* 258.90	* 1.26	* 0.72	* 0.07	*	* 930.00	*	* 19.87
* main	* 37	* 50-YR	* 262.32	* 260.92	* 1.39	* 0.36	* 0.01	* 214.63	* 1492.83	* 157.55	* 134.26
* main	* 37	* 100-YR	* 262.76	* 261.25	* 1.51	* 0.33	* 0.05	* 375.20	* 1677.87	* 299.94	* 136.61
* main	* 36	* 2-YR	* 256.59	* 255.51	* 1.08	* 0.63	* 0.04	*	* 364.00	*	* 20.26
* main	* 36	* 10-YR	* 259.37	* 257.39	* 1.98	* 0.57	* 0.15	*	* 930.00	*	* 20.89
* main	* 36	* 50-YR	* 261.71	* 259.83	* 1.89	* 0.55	* 0.05	* 199.77	* 1581.45	* 83.78	* 122.59
* main	* 36	* 100-YR	* 262.13	* 260.19	* 1.94	* 0.59	* 0.04	* 419.75	* 1765.55	* 167.70	* 135.68
* main	* 35	* 2-YR	* 255.75	* 254.38	* 1.37	* 0.81	* 0.03	*	* 364.00	*	* 23.61
* main	* 35	* 10-YR	* 258.40	* 255.52	* 2.88	* 0.88	* 0.09	*	* 930.00	*	* 28.22
* main	* 35	* 50-YR	* 260.91	* 257.17	* 3.74	* 0.62	* 0.19	*	* 1865.00	*	* 34.63
* main	* 35	* 100-YR	* 261.51	* 258.42	* 3.09	* 0.51	* 0.11	* 8.22	* 2344.29	* 0.49	* 66.94
* main	* 34	* 2-YR	* 252.79	* 251.37	* 1.42	* 2.96	* 0.01	*	* 364.00	*	* 23.22
* main	* 34	* 10-YR	* 255.16	* 252.93	* 2.23	* 3.05	* 0.20	*	* 930.00	*	* 26.77
* main	* 34	* 50-YR	* 258.09	* 254.57	* 3.51	* 2.75	* 0.07	*	* 1865.00	*	* 29.58
* main	* 34	* 100-YR	* 259.37	* 255.25	* 4.12	* 2.04	* 0.10	* 0.07	* 2352.90	* 0.03	* 30.83
* main	* 33	* 2-YR	* 250.99	* 250.51	* 0.49	* 0.22	* 0.00	*	* 364.00	*	* 22.29
* main	* 33	* 10-YR	* 253.81	* 252.95	* 0.86	* 0.21	* 0.02	* 0.01	* 929.99	*	* 26.88
* main	* 33	* 50-YR	* 257.14	* 255.94	* 1.20	* 0.13	* 0.16	* 16.72	* 1847.72	* 0.56	* 60.88
* main	* 33	* 100-YR	* 258.07	* 256.97	* 1.10	* 0.10	* 0.16	* 265.64	* 2083.88	* 3.48	* 93.16
* main	* 32	* 2-YR	* 250.77	* 250.29	* 0.49	* 0.02	* 0.00	*	* 364.00	*	* 23.39
* main	* 32	* 10-YR	* 253.58	* 252.80	* 0.78	* 0.02	* 0.00	*	* 930.00	*	* 29.01
* main	* 32	* 50-YR	* 256.85	* 256.18	* 0.68	*	*	* 223.25	* 1639.97	* 1.78	* 106.06
* main	* 32	* 100-YR	* 257.81	* 257.25	* 0.56	*	*	* 651.06	* 1692.38	* 9.56	* 109.93
* main	* 31.5	* Bridge	*	*	*	*	*	*	*	*	*
* main	* 31	* 2-YR	* 250.33	* 249.24	* 1.09	* 1.45	* 0.00	*	* 364.00	*	* 19.82
* main	* 31	* 10-YR	* 253.08	* 251.46	* 1.62	* 1.34	* 0.12	*	* 930.00	*	* 23.07
* main	* 31	* 50-YR	* 256.21	* 253.52	* 2.70	* 0.94	* 0.78	*	* 1865.00	*	* 26.14

* main	* 31	* 100-YR	* 257.06	* 255.61	* 1.45	* 0.65	* 0.04	* 345.16	* 2006.96	* 0.88	* 102.67
* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
* main	* 30	* 2-YR	* 248.62	* 247.54	* 1.09	* 0.94	* 0.14	* 364.00	* 364.00	* *	* 16.74
* main	* 30	* 10-YR	* 251.62	* 249.61	* 2.01	* 1.05	* 0.30	* 930.00	* 930.00	* *	* 20.04
* main	* 30	* 50-YR	* 254.39	* 251.18	* 3.21	* 1.67	* 0.15	* 151.47	* 1713.53	* *	* 87.97
* main	* 30	* 100-YR	* 255.29	* 251.41	* 3.88	* 1.05	* 0.73	* 341.75	* 2011.25	* *	* 91.10
* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
* main	* 29	* 2-YR	* 247.55	* 246.92	* 0.63	* 0.56	* 0.00	* 364.00	* 364.00	* *	* 18.01
* main	* 29	* 10-YR	* 250.28	* 249.25	* 1.03	* 0.22	* 0.23	* 64.85	* 865.15	* *	* 86.29
* main	* 29	* 50-YR	* 252.32	* 249.57	* 2.75	* 1.93	* 0.14	* 325.86	* 1539.14	* *	* 104.71
* main	* 29	* 100-YR	* 252.85	* 249.89	* 2.96	* 2.16	* 0.27	* 672.49	* 1680.51	* *	* 107.29
* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
* main	* 28	* 2-YR	* 246.99	* 246.34	* 0.65	* 0.31	* 0.02	* 364.00	* 364.00	* *	* 19.96
* main	* 28	* 10-YR	* 249.83	* 249.57	* 0.26	* 0.06	* 0.02	* 373.49	* 556.51	* *	* 126.65
* main	* 28	* 50-YR	* 251.60	* 251.22	* 0.38	* 0.05	* 0.03	* 1050.49	* 814.31	* 0.21	* 132.62
* main	* 28	* 100-YR	* 252.32	* 251.86	* 0.45	* 0.06	* 0.04	* 1396.25	* 955.73	* 1.02	* 134.14
* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
* main	* 27	* 2-YR	* 246.65	* 246.07	* 0.58	* 0.41	* 0.00	* 364.00	* 364.00	* *	* 20.11
* main	* 27	* 10-YR	* 249.74	* 249.57	* 0.18	* 0.05	* 0.02	* 420.44	* 509.34	* 0.22	* 131.38
* main	* 27	* 50-YR	* 251.51	* 251.24	* 0.27	* 0.05	* 0.02	* 1095.32	* 767.35	* 2.34	* 133.33
* main	* 27	* 100-YR	* 252.22	* 251.90	* 0.32	* 0.05	* 0.03	* 1451.68	* 897.20	* 4.12	* 134.10
* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
* main	* 26	* 2-YR	* 246.24	* 245.63	* 0.61	* 0.17	* 0.14	* 364.00	* 364.00	* *	* 17.65
* main	* 26	* 10-YR	* 249.68	* 249.56	* 0.12	* 0.04	* 0.00	* 531.79	* 397.56	* 0.66	* 111.24
* main	* 26	* 50-YR	* 251.44	* 251.25	* 0.19	* 0.05	* 0.00	* 1261.61	* 599.33	* 4.07	* 122.11
* main	* 26	* 100-YR	* 252.14	* 251.91	* 0.23	* 0.05	* 0.00	* 1646.68	* 698.06	* 8.26	* 123.59
* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
* main	* 25	* 2-YR	* 245.93	* 245.78	* 0.15	* 0.03	* 0.01	* 364.00	* 364.00	* *	* 25.90
* main	* 25	* 10-YR	* 249.63	* 249.52	* 0.11	* 0.02	* 0.01	* 286.05	* 640.21	* 3.74	* 94.51
* main	* 25	* 50-YR	* 251.39	* 251.18	* 0.21	* 0.02	* 0.02	* 841.11	* 1006.65	* 17.24	* 140.84
* main	* 25	* 100-YR	* 252.09	* 251.83	* 0.26	* 0.03	* 0.02	* 1168.61	* 1157.69	* 26.69	* 149.80
* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
* main	* 24	* 2-YR	* 245.89	* 245.67	* 0.22	* *	* *	* 364.00	* 364.00	* *	* 13.03
* main	* 24	* 10-YR	* 249.60	* 249.37	* 0.23	* *	* *	* 322.65	* 607.27	* 0.08	* 94.34
* main	* 24	* 50-YR	* 251.35	* 250.97	* 0.38	* *	* *	* 1111.80	* 743.90	* 9.31	* 126.92
* main	* 24	* 100-YR	* 252.04	* 251.57	* 0.47	* *	* *	* 1520.53	* 813.66	* 18.80	* 139.09
* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
* main	* 20	* *	* Culvert	* *	* *	* *	* *	* *	* *	* *	* *
* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
* main	* 14	* 2-YR	* 229.59	* 229.47	* 0.12	* 0.12	* 0.24	* 0.02	* 413.76	* 1.22	* 41.99
* main	* 14	* 10-YR	* 231.59	* 231.37	* 0.21	* 0.13	* 0.23	* 1.71	* 842.61	* 145.68	* 108.79
* main	* 14	* 50-YR	* 233.19	* 232.89	* 0.30	* 0.13	* 0.24	* 6.94	* 1297.45	* 620.61	* 139.12
* main	* 14	* 100-YR	* 233.74	* 233.39	* 0.35	* 0.14	* 0.26	* 10.05	* 1509.81	* 893.14	* 143.63
* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
* main	* 13	* 2-YR	* 229.23	* 228.32	* 0.91	* 0.26	* 0.18	* *	* 415.00	* *	* 29.94
* main	* 13	* 10-YR	* 231.24	* 230.27	* 0.97	* 0.16	* 0.16	* *	* 990.00	* *	* 43.17
* main	* 13	* 50-YR	* 232.82	* 231.71	* 1.11	* 0.20	* 0.08	* 0.22	* 1711.06	* 213.73	* 134.95
* main	* 13	* 100-YR	* 233.34	* 232.13	* 1.21	* 0.19	* 0.10	* 0.71	* 2021.08	* 391.22	* 141.00
* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
* main	* 12	* 2-YR	* 228.77	* 228.46	* 0.32	* 0.30	* 0.07	* *	* 415.00	* *	* 41.77
* main	* 12	* 10-YR	* 230.91	* 230.48	* 0.42	* 0.21	* 0.10	* 0.08	* 973.85	* 16.08	* 107.49
* main	* 12	* 50-YR	* 232.19	* 231.35	* 0.83	* 0.19	* 0.01	* 1.09	* 1743.90	* 180.01	* 142.22
* main	* 12	* 100-YR	* 232.78	* 231.91	* 0.87	* 0.16	* 0.06	* 2.51	* 2046.03	* 364.46	* 160.70
* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
* main	* 11	* 2-YR	* 228.40	* 227.35	* 1.05	* 0.55	* 0.05	* *	* 415.00	* *	* 24.45

* main	* 11	* 10-YR	* 230.59	* 229.14	* 1.45	* 0.32	* 0.19	* 7.87	* 982.13	* 42.89
* main	* 11	* 50-YR	* 231.98	* 231.20	* 0.79	* 0.12	* 0.11	* 74.14	* 1377.56	* 473.30
* main	* 11	* 100-YR	* 232.56	* 231.88	* 0.67	* 0.11	* 0.08	* 105.81	* 1511.73	* 795.46
* main	* 10	* 2-YR	* 227.75	* 226.88	* 0.87	* 0.58	* 0.01	* 415.00	* 25.40	
* main	* 10	* 10-YR	* 230.09	* 229.26	* 0.83	* 0.23	* 0.08	* 6.33	* 949.59	* 34.08
* main	* 10	* 50-YR	* 231.74	* 231.34	* 0.41	* 0.10	* 0.03	* 106.26	* 1212.45	* 606.29
* main	* 10	* 100-YR	* 232.37	* 231.97	* 0.40	* 0.09	* 0.02	* 153.95	* 1372.06	* 886.99
* main	* 9	* 2-YR	* 227.16	* 226.33	* 0.83	* 0.58	* 0.02	* 415.00	* 22.45	
* main	* 9	* 10-YR	* 229.78	* 229.21	* 0.57	* 0.12	* 0.07	* 48.56	* 843.37	* 98.07
* main	* 9	* 50-YR	* 231.62	* 231.30	* 0.32	* 0.06	* 0.03	* 180.27	* 1054.65	* 690.08
* main	* 9	* 100-YR	* 232.26	* 231.92	* 0.34	* 0.06	* 0.03	* 244.40	* 1211.19	* 957.41
* main	* 8	* 2-YR	* 226.56	* 225.54	* 1.02	* 0.77	* 0.17	* 415.00	* 21.98	
* main	* 8	* 10-YR	* 229.59	* 229.26	* 0.33	* 0.11	* 0.05	* 41.95	* 763.33	* 184.71
* main	* 8	* 50-YR	* 231.52	* 231.31	* 0.22	* 0.06	* 0.02	* 128.01	* 978.32	* 818.67
* main	* 8	* 100-YR	* 232.16	* 231.93	* 0.23	* 0.06	* 0.01	* 182.36	* 1120.87	* 1109.78
* main	* 7	* 2-YR	* 225.62	* 225.16	* 0.46	* 0.17	* 0.01	* 431.00	* 27.65	
* main	* 7	* 10-YR	* 229.43	* 229.26	* 0.17	* 0.05	* 0.01	* 6.16	* 779.75	* 252.09
* main	* 7	* 50-YR	* 231.45	* 231.29	* 0.15	* 0.05	* 0.04	* 77.79	* 1057.45	* 881.77
* main	* 7	* 100-YR	* 232.08	* 231.90	* 0.18	* 0.06	* 0.05	* 120.31	* 1243.04	* 1198.65
* main	* 6	* 2-YR	* 225.44	* 225.03	* 0.41	* 0.18	* 0.07	* 431.00	* 25.06	
* main	* 6	* 10-YR	* 229.37	* 229.05	* 0.32	* 0.07	* 0.07	* 4.14	* 951.40	* 82.46
* main	* 6	* 50-YR	* 231.36	* 230.84	* 0.52	* 0.07	* 0.02	* 47.40	* 1649.78	* 319.82
* main	* 6	* 100-YR	* 231.98	* 231.28	* 0.69	* 0.09	* 0.02	* 86.08	* 2035.29	* 440.64
* main	* 5	* 2-YR	* 225.20	* 224.13	* 1.06	* 0.37	* 0.02	* 431.00	* 16.18	
* main	* 5	* 10-YR	* 229.22	* 228.18	* 1.04	* 0.14	* 0.11	* 4.62	* 1004.41	* 28.97
* main	* 5	* 50-YR	* 231.27	* 230.58	* 0.69	* 0.18	* 0.18	* 36.39	* 1288.37	* 692.24
* main	* 5	* 100-YR	* 231.86	* 231.00	* 0.86	* 0.14	* 0.03	* 46.65	* 1531.13	* 984.22
* main	* 4	* 2-YR	* 224.81	* 223.81	* 0.99	* 0.18	* 0.23	* 431.00	* 17.41	
* main	* 4	* 10-YR	* 228.98	* 228.29	* 0.69	* 0.07	* 0.15	* 0.20	* 1037.80	* 0.00
* main	* 4	* 50-YR	* 230.91	* 228.44	* 2.47	* 0.13	* 0.64	* 0.63	* 2016.22	* 0.15
* main	* 4	* 100-YR	* 231.70	* 230.51	* 1.18	* 0.11	* 0.24	* 10.81	* 2077.84	* 473.35
* main	* 3	* 2-YR	* 224.39	* 224.17	* 0.22	* 0.22	* 0.22	* 331.00	* 23.82	
* main	* 3	* 10-YR	* 228.77	* 228.57	* 0.19	* 0.19	* 0.19	* 2.66	* 797.90	* 117.44
* main	* 3	* 50-YR	* 230.14	* 229.81	* 0.33	* 0.33	* 0.33	* 10.75	* 1309.26	* 566.99
* main	* 3	* 100-YR	* 230.72	* 230.35	* 0.37	* 0.37	* 0.37	* 16.32	* 1520.55	* 875.13
* main	* 2.5		Culvert							
* main	* 2	* 2-YR	* 218.60	* 217.52	* 1.08	* 0.78	* 0.04	* 331.00	* 15.29	
* main	* 2	* 10-YR	* 222.09	* 219.77	* 2.32	* 0.86	* 0.21	* 0.00	* 918.00	* 0.00
* main	* 2	* 50-YR	* 226.37	* 222.74	* 3.63	* 0.45	* 1.14	* 2.14	* 1882.72	* 2.14
* main	* 2	* 100-YR	* 227.83	* 224.85	* 2.98	* 0.39	* 0.70	* 66.11	* 2246.28	* 99.61
* main	* 1	* 2-YR	* 217.78	* 216.78	* 1.00	* 1.00	* 1.00	* 331.00	* 17.76	
* main	* 1	* 10-YR	* 220.97	* 218.46	* 2.52	* 1.06	* 0.06	* 918.00	* 19.11	
* main	* 1	* 50-YR	* 225.02	* 220.30	* 4.72	* 1.02	* 0.33	* 1.63	* 1885.13	* 0.24
* main	* 1	* 100-YR	* 226.39	* 221.15	* 5.24	* 0.76	* 0.68	* 9.98	* 2327.81	* 74.22

HEC-RAS Version 4.1.0 Jan 2010
 U.S. Army Corps of Engineers
 Hydrologic Engineering Center
 609 Second Street
 Davis, California

```

X   X  XXXXXX   XXXX       XXXX       XX       XXXX
X   X  X        X   X      X   X      X   X      X
X   X  X        X         X   X      X   X      X
XXXXXXXX XXXX   X         XXX XXXX   XXXXXX   XXXX
X   X  X        X         X   X      X   X          X
X   X  X        X   X     X   X      X   X          X
X   X  XXXXXX   XXXX       X   X      X   X   XXXXX
  
```

PROJECT DATA

Project Title: Ecity
 Project File : Ecity.prj
 Run Date and Time: 7/12/2013 6:23:00 PM

Project in English units

PLAN DATA

Plan Title: HIFLOW_7_12_FLOW-SWM-SD
 Plan File : i:\5493 - Howard County\01 - Ellicott City Flood Study\H&H\HEC-RAS\Ecity.p22

Geometry Title: 7-12-13HIFLOW
 Geometry File : i:\5493 - Howard County\01 - Ellicott City Flood Study\H&H\HEC-RAS\Ecity.g06

Flow Title : 7-12-13HighFlows-SW-SD
 Flow File : i:\5493 - Howard County\01 - Ellicott City Flood Study\H&H\HEC-RAS\Ecity.f16

Plan Summary Information:

Number of: Cross Sections = 40 Multiple Openings = 0
 Culverts = 1 Inline Structures = 0
 Bridges = 1 Lateral Structures = 0

Computational Information

Water surface calculation tolerance = 0.01
 Critical depth calculation tolerance = 0.01
 Maximum number of iterations = 20
 Maximum difference tolerance = 0.3
 Flow tolerance factor = 0.001

Computation Options

Critical depth computed only where necessary
 Conveyance Calculation Method: At breaks in n values only
 Friction Slope Method: Average Conveyance
 Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: 7-12-13HighFlows-SW-SD
 Flow File : i:\5493 - Howard County\01 - Ellicott City Flood Study\H&H\HEC-RAS\Ecity.f16

Flow Data (cfs)

```

*****
* River      Reach      RS      *      2-YR      10-YR      50-YR
100-YR *
* hudson     main      40      *      364      864      1659
2110 *
* hudson     main      37      *      364      890      1825
2313 *
* hudson     main      24      *      1      420      1355
1843 *
* hudson     main      14      *      415      990      1925
2413 *
* hudson     main      7      *      431      1038     2017
2562 *
  
```

2412 *

Boundary Conditions

* River Reach Profile * Upstream Downstream *

* hudson main 2-YR * Critical Normal S = 0.0154 *

GEOMETRY DATA

Geometry Title: 7-12-13HIFLOW

Geometry File : i:\5493 - Howard County\01 - Ellicott City Flood Study\H&H\HEC-RAS\Ecity.g06

CROSS SECTION

RIVER: hudson
REACH: main RS: 40

INPUT

Description:

Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	264.96	15.41	264.78	42.02	264.43	82.53	265.79	100.98	266.38
124.25	264.3	153.94	262.2	160.39	262.32	176.03	262.94	188	262.45
192.31	261.98	195.33	261.51	205.84	262.58	220.94	262.3	226.78	260.3
229.45	256.44	234.7	256.38	239.49	256.83	246.53	259.85	246.86	262.35
250	273.22	254.98	274.03	284.82	277.7				

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.085	124.25	.045	153.94	.02	192.31	.045	220.94	.035
246.86	.045								

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

220.94	246.86	93.6	97.1	92.95	.1	.3
--------	--------	------	------	-------	----	----

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	101	267	F

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 263.20	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 1.51	* Wt. n-Val.	* 0.045	* 0.035	* 0.045
* W.S. Elev (ft)	* 261.69	* Reach Len. (ft)	* 93.60	* 97.10	* 92.95
* Crit W.S. (ft)	* 261.43	* Flow Area (sq ft)	* 0.28	* 87.67	* 0.27
* E.G. Slope (ft/ft)	* 0.012083	* Area (sq ft)	* 0.28	* 87.67	* 0.27
* Q Total (cfs)	* 864.00	* Flow (cfs)	* 0.20	* 863.80	* 0.20
* Top Width (ft)	* 27.06	* Top Width (ft)	* 2.99	* 24.06	* 2.99
* Vel Total (ft/s)	* 9.82	* Avg. Vel. (ft/s)	* 0.74	* 9.85	* 0.74
* Max Chl Dpth (ft)	* 5.31	* Hydr. Depth (ft)	* 0.09	* 3.64	* 0.09
* Conv. Total (cfs)	* 7860.2	* Conv. (cfs)	* 1.8	* 7858.4	* 1.8
* Length Wtd. (ft)	* 97.10	* Wetted Per. (ft)	* 3.02	* 28.58	* 3.02
* Min Ch El (ft)	* 256.38	* Shear (lb/sq ft)	* 0.07	* 2.31	* 0.07
* Alpha	* 1.01	* Stream Power (lb/ft s)	* 284.82	* 0.00	* 0.00
* Frctn Loss (ft)	* 1.25	* Cum Volume (acre-ft)	* 1.53	* 6.49	* 0.93
* C & E Loss (ft)	* 0.02	* Cum SA (acres)	* 1.10	* 1.83	* 1.26

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 264.64	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.93	* Wt. n-Val.	* 0.030	* 0.035	* 0.045
* W.S. Elev (ft)	* 263.71	* Reach Len. (ft)	* 93.60	* 97.10	* 92.95
* Crit W.S. (ft)	* 263.71	* Flow Area (sq ft)	* 103.70	* 139.39	* 0.27
* E.G. Slope (ft/ft)	* 0.005654	* Area (sq ft)	* 103.70	* 139.39	* 0.27

```

* Q Total (cfs)          * 1659.00 * Flow (cfs)           * 449.31 * 1209.47 * 0.22 *
* Top Width (ft)        * 114.68 * Top Width (ft)       * 88.37 * 25.92 * 0.39 *
* Vel Total (ft/s)      * 6.82  * Avg. Vel. (ft/s)    * 4.33 * 8.68 * 0.82 *
* Max Chl Dpth (ft)    * 7.33  * Hydr. Depth (ft)    * 1.17 * 5.38 * 0.68 *
* Conv. Total (cfs)    * 22062.6 * Conv. (cfs)         * 5975.3 * 16084.4 * 2.9 *
* Length Wtd. (ft)     * 96.35 * Wetted Per. (ft)    * 88.57 * 31.11 * 1.42 *
* Min Ch El (ft)       * 256.38 * Shear (lb/sq ft)    * 0.41 * 1.58 * 0.07 *
* Alpha                 * 1.29  * Stream Power (lb/ft s) * 284.82 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 0.49  * Cum Volume (acre-ft) * 3.83 * 9.58 * 3.24 *
* C & E Loss (ft)      * 0.05  * Cum SA (acres)      * 2.35 * 1.91 * 2.00 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid

subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)        * 265.12 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)         * 1.05  * Wt. n-Val.           * 0.029 * 0.035 * 0.045 *
* W.S. Elev (ft)        * 264.07 * Reach Len. (ft)      * 93.60 * 97.10 * 92.95 *
* Crit W.S. (ft)        * 264.07 * Flow Area (sq ft)    * 136.20 * 148.66 * 0.43 *
* E.G. Slope (ft/ft)    * 0.006069 * Area (sq ft)         * 136.20 * 148.66 * 0.43 *
* Q Total (cfs)         * 2110.00 * Flow (cfs)           * 714.62 * 1394.96 * 0.42 *
* Top Width (ft)        * 119.84 * Top Width (ft)       * 93.43 * 25.92 * 0.50 *
* Vel Total (ft/s)      * 7.40  * Avg. Vel. (ft/s)    * 5.25 * 9.38 * 0.99 *
* Max Chl Dpth (ft)    * 7.69  * Hydr. Depth (ft)    * 1.46 * 5.74 * 0.86 *
* Conv. Total (cfs)    * 27084.6 * Conv. (cfs)         * 9173.1 * 17906.1 * 5.4 *
* Length Wtd. (ft)     * 96.07 * Wetted Per. (ft)    * 93.63 * 31.11 * 1.79 *
* Min Ch El (ft)       * 256.38 * Shear (lb/sq ft)    * 0.55 * 1.81 * 0.09 *
* Alpha                 * 1.23  * Stream Power (lb/ft s) * 284.82 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 0.53  * Cum Volume (acre-ft) * 5.08 * 10.86 * 4.36 *
* C & E Loss (ft)      * 0.06  * Cum SA (acres)      * 2.64 * 1.93 * 2.43 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid

subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main RS: 39

INPUT

Description:

```

Station Elevation Data      num=      26
  Sta   Elev   Sta   Elev   Sta   Elev   Sta   Elev   Sta   Elev
*****
    0  266.26   5.63  266.12  23.64  263.71  63.98  262.23  91.83  261.37
  92.63  260.85  100.64  261.02  115.95  261.34  143.09  261.55  155.5  262.02
 167.36  261.79  168.09  262.42  174.27  262.29  176.57  260.93  177.24  258.17
 177.64  255.56  186.83  254.87  187.72  255.8   187.9  255.97  191.83  257.42
 197.4  257.79  198.77  261.58  202.55  262.02  220.58  268.88  237.64  273.36
 264.28  276.53

```

Manning's n Values

num= 4

```

  Sta   n Val   Sta   n Val   Sta   n Val   Sta   n Val
*****
    0   .045   91.83   .02  176.57   .035  198.77   .045

```

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
176.57	198.77	113.96	114.57	114.59	.1	.3
Ineffective Flow	num=	1				
Sta L	Sta R	Elev	Permanent			
236.2	264.28	290	F			

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)          * 261.93 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 1.67  * Wt. n-Val.      *         * 0.035  *         *
* W.S. Elev (ft)         * 260.26 * Reach Len. (ft) * 113.96 * 114.57 * 114.59 *
* Crit W.S. (ft)         * 260.06 * Flow Area (sq ft) *         * 83.41  *         *
* E.G. Slope (ft/ft)     * 0.013857 * Area (sq ft)    *         * 83.41  *         *
* Q Total (cfs)          * 864.00 * Flow (cfs)      *         * 864.00 *         *
* Top Width (ft)         * 21.56  * Top Width (ft)  *         * 21.56  *         *
* Vel Total (ft/s)       * 10.36  * Avg. Vel. (ft/s) *         * 10.36  *         *
* Max Chl Dpth (ft)     * 5.39   * Hydr. Depth (ft) *         * 3.87   *         *
* Conv. Total (cfs)     * 7339.8 * Conv. (cfs)     *         * 7339.8 *         *
* Length Wtd. (ft)      * 114.57 * Wetted Per. (ft) *         * 27.95  *         *
* Min Ch El (ft)        * 254.87 * Shear (lb/sq ft) *         * 2.58   *         *
* Alpha                  * 1.00   * Stream Power (lb/ft s) * 264.28 * 0.00  * 0.00 *
* Frctn Loss (ft)       * 1.35   * Cum Volume (acre-ft) * 1.53  * 6.30  * 0.93 *
* C & E Loss (ft)       * 0.09   * Cum SA (acres)    * 1.10  * 1.78  * 1.26 *
*****

```

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)          * 263.81 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 1.80   * Wt. n-Val.      * 0.021  * 0.035  * 0.045  *
* W.S. Elev (ft)         * 262.02 * Reach Len. (ft) * 113.96 * 114.57 * 114.59 *
* Crit W.S. (ft)         * 262.67 * Flow Area (sq ft) * 49.84  * 121.98 * 0.82   *
* E.G. Slope (ft/ft)     * 0.011301 * Area (sq ft)    * 49.84  * 121.98 * 0.82   *
* Q Total (cfs)          * 1659.00 * Flow (cfs)      * 256.51 * 1401.44 * 1.05   *
* Top Width (ft)         * 124.42 * Top Width (ft)  * 98.46  * 22.20  * 3.76   *
* Vel Total (ft/s)       * 9.61   * Avg. Vel. (ft/s) * 5.15   * 11.49  * 1.27   *
* Max Chl Dpth (ft)     * 7.15   * Hydr. Depth (ft) * 0.51   * 5.49   * 0.22   *
* Conv. Total (cfs)     * 15606.0 * Conv. (cfs)     * 2413.0 * 13183.1 * 9.8    *
* Length Wtd. (ft)      * 114.49 * Wetted Per. (ft) * 99.02  * 30.03  * 3.79   *
* Min Ch El (ft)        * 254.87 * Shear (lb/sq ft) * 0.36   * 2.87   * 0.15   *
* Alpha                  * 1.25   * Stream Power (lb/ft s) * 264.28 * 0.00  * 0.00 *
* Frctn Loss (ft)       * 0.75   * Cum Volume (acre-ft) * 3.67  * 9.29  * 3.24 *
* C & E Loss (ft)       * 0.09   * Cum SA (acres)    * 2.15  * 1.86  * 2.00 *
*****

```

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)          * 264.24 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 1.91   * Wt. n-Val.      * 0.022  * 0.035  * 0.045  *
* W.S. Elev (ft)         * 262.33 * Reach Len. (ft) * 113.96 * 114.57 * 114.59 *
* Crit W.S. (ft)         * 262.95 * Flow Area (sq ft) * 82.42  * 128.93 * 2.13   *
* E.G. Slope (ft/ft)     * 0.011964 * Area (sq ft)    * 82.42  * 128.93 * 2.13   *
* Q Total (cfs)          * 2110.00 * Flow (cfs)      * 524.04 * 1581.40 * 4.56   *
* Top Width (ft)         * 137.79 * Top Width (ft)  * 110.99 * 22.20  * 4.60   *
* Vel Total (ft/s)       * 9.88   * Avg. Vel. (ft/s) * 6.36   * 12.27  * 2.14   *
* Max Chl Dpth (ft)     * 7.46   * Hydr. Depth (ft) * 0.74   * 5.81   * 0.46   *
* Conv. Total (cfs)     * 19290.2 * Conv. (cfs)     * 4790.9 * 14457.6 * 41.7   *
* Length Wtd. (ft)      * 114.42 * Wetted Per. (ft) * 111.75 * 30.03  * 4.68   *
* Min Ch El (ft)        * 254.87 * Shear (lb/sq ft) * 0.55   * 3.21   * 0.34   *
* Alpha                  * 1.26   * Stream Power (lb/ft s) * 264.28 * 0.00  * 0.00 *
* Frctn Loss (ft)       * 0.80   * Cum Volume (acre-ft) * 4.84  * 10.56 * 4.36 *
* C & E Loss (ft)       * 0.09   * Cum SA (acres)    * 2.42  * 1.87  * 2.42 *
*****

```

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
 This may indicate the need for additional cross sections.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
 REACH: main RS: 38

INPUT

Description:

Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	265.02	23.79	264.07	37.79	262.29	45.18	262.39	66.67	261.05
88.5	260.1	91.74	260.25	105.08	260.64	117.16	260.25	117.92	260.91
123.72	260.82	123.88	259.81	124.49	257.07	124.89	255.1	133.09	254.44
134.62	254.31	144.72	254.95	145.15	256.94	145.95	259.81	150.06	260.27
169.33	261.87	181.94	262.16	192.36	261.55	206.48	265.12	222.68	272.01

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	88.5	.02	123.88	.035	145.95	.02	181.94	.045
206.48	.1								

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	123.88	145.95		50.64	50.85		.1	.3

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 260.49	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 1.37	* Wt. n-Val.	*	* 0.035	*	*
* W.S. Elev (ft)	* 259.12	* Reach Len. (ft)	* 50.64	* 50.85	* 51.22	*
* Crit W.S. (ft)	*	* Flow Area (sq ft)	*	* 91.91	*	*
* E.G. Slope (ft/ft)	* 0.010185	* Area (sq ft)	*	* 91.91	*	*
* Q Total (cfs)	* 864.00	* Flow (cfs)	*	* 864.00	*	*
* Top Width (ft)	* 21.72	* Top Width (ft)	*	* 21.72	*	*
* Vel Total (ft/s)	* 9.40	* Avg. Vel. (ft/s)	*	* 9.40	*	*
* Max Chl Dpth (ft)	* 4.81	* Hydr. Depth (ft)	*	* 4.23	*	*
* Conv. Total (cfs)	* 8561.1	* Conv. (cfs)	*	* 8561.1	*	*
* Length Wtd. (ft)	* 50.85	* Wetted Per. (ft)	*	* 28.28	*	*
* Min Ch El (ft)	* 254.31	* Shear (lb/sq ft)	*	* 2.07	*	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 222.68	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.46	* Cum Volume (acre-ft)	* 1.53	* 6.07	* 0.93	*
* C & E Loss (ft)	* 0.05	* Cum SA (acres)	* 1.10	* 1.72	* 1.26	*

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 262.68	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 1.34	* Wt. n-Val.	* 0.025	* 0.035	* 0.020	*
* W.S. Elev (ft)	* 261.34	* Reach Len. (ft)	* 50.64	* 50.85	* 51.22	*
* Crit W.S. (ft)	* 261.63	* Flow Area (sq ft)	* 47.58	* 140.93	* 12.29	*
* E.G. Slope (ft/ft)	* 0.006862	* Area (sq ft)	* 47.58	* 140.93	* 12.29	*
* Q Total (cfs)	* 1659.00	* Flow (cfs)	* 199.23	* 1399.10	* 60.67	*
* Top Width (ft)	* 101.01	* Top Width (ft)	* 61.91	* 22.07	* 17.03	*
* Vel Total (ft/s)	* 8.26	* Avg. Vel. (ft/s)	* 4.19	* 9.93	* 4.94	*
* Max Chl Dpth (ft)	* 7.03	* Hydr. Depth (ft)	* 0.77	* 6.39	* 0.72	*
* Conv. Total (cfs)	* 20027.0	* Conv. (cfs)	* 2405.0	* 16889.5	* 732.4	*
* Length Wtd. (ft)	* 50.85	* Wetted Per. (ft)	* 63.06	* 29.71	* 17.10	*
* Min Ch El (ft)	* 254.31	* Shear (lb/sq ft)	* 0.32	* 2.03	* 0.31	*
* Alpha	* 1.26	* Stream Power (lb/ft s)	* 222.68	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.99	* Cum Volume (acre-ft)	* 3.54	* 8.95	* 3.23	*
* C & E Loss (ft)	* 0.14	* Cum SA (acres)	* 1.94	* 1.80	* 1.97	*

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 263.13	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 1.05	* Wt. n-Val.	* 0.025	* 0.035	* 0.020	*
* W.S. Elev (ft)	* 262.08	* Reach Len. (ft)	* 50.64	* 50.85	* 51.22	*

```

* Crit W.S. (ft)          * 262.09 * Flow Area (sq ft)      * 97.20 * 157.09 * 31.54 *
* E.G. Slope (ft/ft)     * 0.005221 * Area (sq ft)          * 97.20 * 157.09 * 31.54 *
* Q Total (cfs)          * 2110.00 * Flow (cfs)             * 503.21 * 1462.29 * 144.50 *
* Top Width (ft)         * 139.06 * Top Width (ft)         * 73.65 * 22.07 * 43.34 *
* Vel Total (ft/s)       * 7.38 * Avg. Vel. (ft/s)      * 5.18 * 9.31 * 4.58 *
* Max Chl Dpth (ft)     * 7.77 * Hydr. Depth (ft)      * 1.32 * 7.12 * 0.73 *
* Conv. Total (cfs)      * 29202.6 * Conv. (cfs)           * 6964.4 * 20238.3 * 1999.9 *
* Length Wtd. (ft)      * 50.84 * Wetted Per. (ft)      * 74.83 * 29.71 * 43.51 *
* Min Ch El (ft)        * 254.31 * Shear (lb/sq ft)      * 0.42 * 1.72 * 0.24 *
* Alpha                  * 1.25 * Stream Power (lb/ft s) * 222.68 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.86 * Cum Volume (acre-ft)  * 4.61 * 10.18 * 4.31 *
* C & E Loss (ft)       * 0.26 * Cum SA (acres)        * 2.18 * 1.81 * 2.36 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water

surface that had the least amount of error between computed and assumed values.

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

CROSS SECTION

RIVER: hudson

REACH: main

RS: 37

INPUT

Description:

Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	264	20	260.01	36.61	259.64	40.55	259.78	51.16	260.22
63.4	260.02	64.06	260.27	69.53	260.38	75.38	259.43	76.33	256.54
76.82	253.52	80.8	253.37	85.55	253.19	94.42	253.51	94.78	255.27
94.97	256.342	95.51	259.39	114.56	260	126.13	260.27	138.62	260.6
153.18	260.1	168.22	262.2						

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	40.55	.02	75.38	.035	95.51	.045	126.13	.02
153.18	.1								

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

75.38	95.51	63.51	64.27	60.78	.1	.3
-------	-------	-------	-------	-------	----	----

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
24.82	27.7	265	F

Blocked Obstructions num= 1

Sta L	Sta R	Elev
0	24.82	265

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)          * 259.98 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)          * 1.21 * Wt. n-Val.             *          * 0.035 *          *
* W.S. Elev (ft)         * 258.77 * Reach Len. (ft)        * 63.51 * 64.27 * 60.78 *
* Crit W.S. (ft)         * 257.60 * Flow Area (sq ft)      *          * 100.66 *          *
* E.G. Slope (ft/ft)     * 0.008014 * Area (sq ft)          *          * 100.66 *          *
* Q Total (cfs)          * 890.00 * Flow (cfs)             *          * 890.00 *          *
* Top Width (ft)         * 19.80 * Top Width (ft)         *          * 19.80 *          *
* Vel Total (ft/s)       * 8.84 * Avg. Vel. (ft/s)      *          * 8.84 *          *
* Max Chl Dpth (ft)     * 5.58 * Hydr. Depth (ft)      *          * 5.08 *          *
* Conv. Total (cfs)      * 9942.0 * Conv. (cfs)           *          * 9942.0 *          *
* Length Wtd. (ft)      * 64.27 * Wetted Per. (ft)      *          * 28.37 *          *
* Min Ch El (ft)        * 253.19 * Shear (lb/sq ft)      *          * 1.78 *          *
* Alpha                  * 1.00 * Stream Power (lb/ft s) * 168.22 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.71 * Cum Volume (acre-ft)  * 1.53 * 5.96 * 0.93 *
* C & E Loss (ft)       * 0.07 * Cum SA (acres)        * 1.10 * 1.70 * 1.26 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```
*****
* E.G. Elev (ft)          * 262.30 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)          * 1.44  * Wt. n-Val.            * 0.026  * 0.035  * 0.037  *
* W.S. Elev (ft)        * 260.86 * Reach Len. (ft)      * 63.51  * 64.27  * 60.78  *
* Crit W.S. (ft)        * 261.27 * Flow Area (sq ft)    * 41.74  * 142.65 * 45.46  *
* E.G. Slope (ft/ft)    * 0.007499 * Area (sq ft)        * 44.59  * 142.65 * 45.46  *
* Q Total (cfs)         * 1825.00 * Flow (cfs)          * 193.19 * 1493.14 * 138.67 *
* Top Width (ft)        * 133.81 * Top Width (ft)      * 50.56  * 20.13  * 63.12  *
* Vel Total (ft/s)      * 7.94  * Avg. Vel. (ft/s)    * 4.63  * 10.47  * 3.05  *
* Max Chl Dpth (ft)     * 7.67  * Hydr. Depth (ft)    * 0.88  * 7.09  * 0.72  *
* Conv. Total (cfs)     * 21074.1 * Conv. (cfs)         * 2230.8 * 17242.0 * 1601.3 *
* Length Wtd. (ft)     * 63.99 * Wetted Per. (ft)    * 47.82  * 29.69  * 63.20  *
* Min Ch El (ft)       * 253.19 * Shear (lb/sq ft)    * 0.41  * 2.25  * 0.34  *
* Alpha                * 1.47  * Stream Power (lb/ft s) * 168.22 * 0.00  * 0.00  *
* Frctn Loss (ft)      * 0.37  * Cum Volume (acre-ft) * 3.49  * 8.78  * 3.19  *
* C & E Loss (ft)      * 0.01  * Cum SA (acres)      * 1.87  * 1.77  * 1.92  *
*****
```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```
*****
* E.G. Elev (ft)          * 262.75 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)          * 1.55  * Wt. n-Val.            * 0.025  * 0.035  * 0.034  *
* W.S. Elev (ft)        * 261.20 * Reach Len. (ft)      * 63.51  * 64.27  * 60.78  *
* Crit W.S. (ft)        * 261.61 * Flow Area (sq ft)    * 57.66  * 149.37 * 66.94  *
* E.G. Slope (ft/ft)    * 0.008168 * Area (sq ft)        * 61.48  * 149.37 * 66.94  *
* Q Total (cfs)         * 2313.00 * Flow (cfs)          * 352.17 * 1682.62 * 278.21 *
* Top Width (ft)        * 136.20 * Top Width (ft)      * 50.56  * 20.13  * 65.51  *
* Vel Total (ft/s)      * 8.44  * Avg. Vel. (ft/s)    * 6.11  * 11.26  * 4.16  *
* Max Chl Dpth (ft)     * 8.01  * Hydr. Depth (ft)    * 1.21  * 7.42  * 1.02  *
* Conv. Total (cfs)     * 25592.4 * Conv. (cfs)         * 3896.6 * 18617.5 * 3078.3 *
* Length Wtd. (ft)     * 63.82 * Wetted Per. (ft)    * 47.82  * 29.69  * 65.62  *
* Min Ch El (ft)       * 253.19 * Shear (lb/sq ft)    * 0.61  * 2.57  * 0.52  *
* Alpha                * 1.40  * Stream Power (lb/ft s) * 168.22 * 0.00  * 0.00  *
* Frctn Loss (ft)      * 0.33  * Cum Volume (acre-ft) * 4.52  * 10.00 * 4.25  *
* C & E Loss (ft)      * 0.05  * Cum SA (acres)      * 2.11  * 1.79  * 2.30  *
*****
```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main RS: 36

INPUT

Description:

Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	261.81	18.27	260.05	31.92	258.51	38.67	258.86	48.77	259.26
63.07	259.14	63.8	259.62	68.79	259.63	78.21	259.56	85.38	259.39
95.85	258.62	96.33	255.18	96.88	253.12	104.68	252.84	105.34	252.93
111.53	253.8	116.04	253.82	116.53	255.43	117.13	258.54	134.15	259.47
148.83	260.07	164.32	260.56	184.71	266.62				

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	31.92	.02	68.79	.045	95.85	.035	117.13	.02
164.32	.1								

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 95.85 117.13 34 38.78 43.34 .1 .3

Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 0 10.17 270 F

CROSS SECTION OUTPUT Profile #10-YR

			* Left OB *	* Channel *	* Right OB *
* E.G. Elev (ft)	* 259.20	* Element	*	* 0.035	*
* Vel Head (ft)	* 1.93	* Wt. n-Val.	*	* 38.78	* 43.34
* W.S. Elev (ft)	* 257.28	* Reach Len. (ft)	* 34.00	* 79.91	*
* Crit W.S. (ft)	* 257.28	* Flow Area (sq ft)	*	* 79.91	*
* E.G. Slope (ft/ft)	* 0.016232	* Area (sq ft)	*	* 890.00	*
* Q Total (cfs)	* 890.00	* Flow (cfs)	*	* 20.85	*
* Top Width (ft)	* 20.85	* Top Width (ft)	*	* 11.14	*
* Vel Total (ft/s)	* 11.14	* Avg. Vel. (ft/s)	*	* 3.83	*
* Max Chl Dpth (ft)	* 4.44	* Hydr. Depth (ft)	*	* 6985.7	*
* Conv. Total (cfs)	* 6985.7	* Conv. (cfs)	*	* 27.04	*
* Length Wtd. (ft)	* 38.78	* Wetted Per. (ft)	*	* 2.99	*
* Min Ch El (ft)	* 252.84	* Shear (lb/sq ft)	*	* 184.71	* 0.00
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 184.71	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.57	* Cum Volume (acre-ft)	* 1.53	* 5.82	* 0.93
* C & E Loss (ft)	* 0.14	* Cum SA (acres)	* 1.10	* 1.67	* 1.26

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

			* Left OB *	* Channel *	* Right OB *
* E.G. Elev (ft)	* 261.69	* Element	*	* 0.035	* 0.020
* Vel Head (ft)	* 1.91	* Wt. n-Val.	*	* 38.78	* 43.34
* W.S. Elev (ft)	* 259.78	* Reach Len. (ft)	* 34.00	* 132.90	* 14.36
* Crit W.S. (ft)	* 260.45	* Flow Area (sq ft)	* 43.21	* 132.90	* 14.36
* E.G. Slope (ft/ft)	* 0.010496	* Area (sq ft)	* 43.21	* 1570.18	* 76.31
* Q Total (cfs)	* 1825.00	* Flow (cfs)	* 178.51	* 1570.18	* 76.31
* Top Width (ft)	* 121.07	* Top Width (ft)	* 75.19	* 21.28	* 24.60
* Vel Total (ft/s)	* 9.58	* Avg. Vel. (ft/s)	* 4.13	* 11.81	* 5.31
* Max Chl Dpth (ft)	* 6.94	* Hydr. Depth (ft)	* 0.57	* 6.25	* 0.58
* Conv. Total (cfs)	* 17813.9	* Conv. (cfs)	* 1742.5	* 15326.5	* 744.9
* Length Wtd. (ft)	* 38.64	* Wetted Per. (ft)	* 75.45	* 29.69	* 24.63
* Min Ch El (ft)	* 252.84	* Shear (lb/sq ft)	* 0.38	* 2.93	* 0.38
* Alpha	* 1.34	* Stream Power (lb/ft s)	* 184.71	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.56	* Cum Volume (acre-ft)	* 3.42	* 8.58	* 3.15
* C & E Loss (ft)	* 0.05	* Cum SA (acres)	* 1.78	* 1.74	* 1.86

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

			* Left OB *	* Channel *	* Right OB *
* E.G. Elev (ft)	* 262.11	* Element	*	* 0.035	* 0.020
* Vel Head (ft)	* 1.96	* Wt. n-Val.	*	* 38.78	* 43.34
* W.S. Elev (ft)	* 260.15	* Reach Len. (ft)	* 34.00	* 140.81	* 25.22
* Crit W.S. (ft)	* 260.82	* Flow Area (sq ft)	* 71.77	* 140.81	* 25.22
* E.G. Slope (ft/ft)	* 0.010837	* Area (sq ft)	* 71.77	* 1756.84	* 158.86
* Q Total (cfs)	* 2313.00	* Flow (cfs)	* 397.30	* 1756.84	* 158.86
* Top Width (ft)	* 134.19	* Top Width (ft)	* 78.63	* 21.28	* 34.28
* Vel Total (ft/s)	* 9.73	* Avg. Vel. (ft/s)	* 5.54	* 12.48	* 6.30
* Max Chl Dpth (ft)	* 7.31	* Hydr. Depth (ft)	* 0.91	* 6.62	* 0.74
* Conv. Total (cfs)	* 22218.9	* Conv. (cfs)	* 3816.5	* 16876.4	* 1526.0
* Length Wtd. (ft)	* 38.52	* Wetted Per. (ft)	* 78.92	* 29.69	* 34.32
* Min Ch El (ft)	* 252.84	* Shear (lb/sq ft)	* 0.62	* 3.21	* 0.50
* Alpha	* 1.33	* Stream Power (lb/ft s)	* 184.71	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.60	* Cum Volume (acre-ft)	* 4.42	* 9.79	* 4.19
* C & E Loss (ft)	* 0.04	* Cum SA (acres)	* 2.02	* 1.76	* 2.23

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main

RS: 35

INPUT

Description:

Station Elevation Data		num= 25		Sta Elev		Sta Elev		Sta Elev		Sta Elev	
0	272.29	12.72	268.66	14.93	263.32	22.97	258.48	24.24	258.47		
28.13	258.35	28.26	258.02	35.22	258.31	46.72	258.76	58.21	258.6		
62.8	258.53	65.06	258.27	65.77	258.45	66.39	258.71	97.96	258.28		
101.22	258.07	106.12	255.1	111.68	252.21	119.94	252.29	120.05	252.29		
126.93	252.72	131.27	254.45	138.58	257.73	150.13	262.76	157.42	263.01		

Manning's n Values		num= 5		Sta n Val		Sta n Val		Sta n Val		Sta n Val	
0	.045	28.13	.02	65.77	.045	101.22	.035	138.58	.1		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	101.22	138.58		69.27	79.77		.1	.3

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 258.24	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 2.79	* Wt. n-Val.	* 69.27	* 79.77	* 85.15
* W.S. Elev (ft)	* 255.45	* Reach Len. (ft)	* 69.27	* 79.77	* 85.15
* Crit W.S. (ft)	* 256.30	* Flow Area (sq ft)	* 66.45	* 66.45	* 66.45
* E.G. Slope (ft/ft)	* 0.033456	* Area (sq ft)	* 66.45	* 66.45	* 66.45
* Q Total (cfs)	* 890.00	* Flow (cfs)	* 890.00	* 890.00	* 890.00
* Top Width (ft)	* 27.97	* Top Width (ft)	* 27.97	* 27.97	* 27.97
* Vel Total (ft/s)	* 13.39	* Avg. Vel. (ft/s)	* 13.39	* 13.39	* 13.39
* Max Chl Dpth (ft)	* 3.24	* Hydr. Depth (ft)	* 2.38	* 2.38	* 2.38
* Conv. Total (cfs)	* 4865.8	* Conv. (cfs)	* 4865.8	* 4865.8	* 4865.8
* Length Wtd. (ft)	* 79.77	* Wetted Per. (ft)	* 29.34	* 29.34	* 29.34
* Min Ch El (ft)	* 252.21	* Shear (lb/sq ft)	* 4.73	* 4.73	* 4.73
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 157.42	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.87	* Cum Volume (acre-ft)	* 1.53	* 5.76	* 0.93
* C & E Loss (ft)	* 0.09	* Cum SA (acres)	* 1.10	* 1.65	* 1.26

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Program found supercritical flow starting at this cross section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 260.87	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 3.80	* Wt. n-Val.	* 69.27	* 79.77	* 85.15
* W.S. Elev (ft)	* 257.07	* Reach Len. (ft)	* 69.27	* 79.77	* 85.15
* Crit W.S. (ft)	* 259.08	* Flow Area (sq ft)	* 116.73	* 116.73	* 116.73
* E.G. Slope (ft/ft)	* 0.028682	* Area (sq ft)	* 116.73	* 116.73	* 116.73
* Q Total (cfs)	* 1825.00	* Flow (cfs)	* 1825.00	* 1825.00	* 1825.00
* Top Width (ft)	* 34.24	* Top Width (ft)	* 34.24	* 34.24	* 34.24
* Vel Total (ft/s)	* 15.63	* Avg. Vel. (ft/s)	* 15.63	* 15.63	* 15.63
* Max Chl Dpth (ft)	* 4.86	* Hydr. Depth (ft)	* 3.41	* 3.41	* 3.41
* Conv. Total (cfs)	* 10776.1	* Conv. (cfs)	* 10776.1	* 10776.1	* 10776.1
* Length Wtd. (ft)	* 79.77	* Wetted Per. (ft)	* 36.41	* 36.41	* 36.41
* Min Ch El (ft)	* 252.21	* Shear (lb/sq ft)	* 5.74	* 5.74	* 5.74
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 157.42	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.63	* Cum Volume (acre-ft)	* 3.40	* 8.47	* 3.14
* C & E Loss (ft)	* 0.19	* Cum SA (acres)	* 1.75	* 1.72	* 1.85

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 261.47	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 3.15	* Wt. n-Val.	* 0.023	* 0.035	* 0.100
* W.S. Elev (ft)	* 258.32	* Reach Len. (ft)	* 69.27	* 79.77	* 85.15
* Crit W.S. (ft)	* 259.57	* Flow Area (sq ft)	* 1.58	* 161.93	* 0.39
* E.G. Slope (ft/ft)	* 0.017458	* Area (sq ft)	* 1.58	* 161.93	* 0.39
* Q Total (cfs)	* 2313.00	* Flow (cfs)	* 3.30	* 2309.38	* 0.32
* Top Width (ft)	* 52.36	* Top Width (ft)	* 13.65	* 37.36	* 1.34

```

* Vel Total (ft/s)      * 14.11 * Avg. Vel. (ft/s)      * 2.09 * 14.26 * 0.82 *
* Max Chl Dpth (ft)    * 6.11 * Hydr. Depth (ft)     * 0.12 * 4.33 * 0.29 *
* Conv. Total (cfs)    * 17505.8 * Conv. (cfs)         * 25.0 * 17478.3 * 2.4 *
* Length Wtd. (ft)     * 79.76 * Wetted Per. (ft)     * 13.88 * 39.94 * 1.47 *
* Min Ch El (ft)       * 252.21 * Shear (lb/sq ft)     * 0.12 * 4.42 * 0.29 *
* Alpha                * 1.02 * Stream Power (lb/ft s) * 157.42 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 0.52 * Cum Volume (acre-ft) * 4.39 * 9.65 * 4.18 *
* C & E Loss (ft)      * 0.12 * Cum SA (acres)       * 1.98 * 1.73 * 2.21 *
*****

```

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: hudson

REACH: main RS: 34

INPUT

Description:

```

Station Elevation Data      num=      26
  Sta      Elev      Sta      Elev      Sta      Elev      Sta      Elev      Sta      Elev
*****
   0  270.86   5.82  269.22  16.88  263.73  17.79  259.61  22.7  257.28
  26.7  257.19  26.85  256.92  33.08  257.17  44.84  257.6  55.58  257.27
  59.49  257.15  61.23  256.88  62.36  256.99  63.12  257.26  82.27  256.72
  95.14  256.54  96.56  254.93  98.86  251.53  103.36  249.74  105.37  248.88
 113.05   249  116.46  249.69  123.31  251.6  126.88  255.05  132.96  260.69
 151.23  267.31

```

```

Manning's n Values      num=      6
  Sta      n Val      Sta      n Val      Sta      n Val      Sta      n Val      Sta      n Val
*****
   0   .045   22.7   .02   63.12   .045   96.56   .05  126.88   .045
 132.96   .1

```

```

Bank Sta: Left  Right  Lengths: Left Channel  Right  Coeff Contr.  Expan.
          96.56 126.88          59.8  61.46  61.27          .1          .3

```

```

Ineffective Flow      num=      1
  Sta L  Sta R  Elev  Permanent
   83.83   95   265   F

```

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)      * 255.01 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)      * 2.18  * Wt. n-Val.           *          * 0.050  *          *
* W.S. Elev (ft)     * 252.83 * Reach Len. (ft)      * 59.80  * 61.46  * 61.27  *
* Crit W.S. (ft)     * 253.29 * Flow Area (sq ft)    *          * 75.10  *          *
* E.G. Slope (ft/ft) * 0.043992 * Area (sq ft)        *          * 75.10  *          *
* Q Total (cfs)      * 890.00 * Flow (cfs)           *          * 890.00  *          *
* Top Width (ft)     * 26.61 * Top Width (ft)       *          * 26.61  *          *
* Vel Total (ft/s)   * 11.85 * Avg. Vel. (ft/s)     *          * 11.85  *          *
* Max Chl Dpth (ft)  * 3.95  * Hydr. Depth (ft)     *          * 2.82  *          *
* Conv. Total (cfs)  * 4243.3 * Conv. (cfs)          *          * 4243.3  *          *
* Length Wtd. (ft)   * 61.46 * Wetted Per. (ft)     *          * 28.65  *          *
* Min Ch El (ft)     * 248.88 * Shear (lb/sq ft)     *          * 7.20  *          *
* Alpha              * 1.00  * Stream Power (lb/ft s) * 151.23 * 0.00  * 0.00  *
* Frctn Loss (ft)    * 3.05  * Cum Volume (acre-ft) * 1.53  * 5.63  * 0.93  *
* C & E Loss (ft)    * 0.18  * Cum SA (acres)       * 1.10  * 1.60  * 1.26  *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)      * 257.96 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)      * 3.43  * Wt. n-Val.           *          * 0.050  *          *
* W.S. Elev (ft)     * 254.53 * Reach Len. (ft)      * 59.80  * 61.46  * 61.27  *
* Crit W.S. (ft)     * 255.33 * Flow Area (sq ft)    *          * 122.77  *          *
* E.G. Slope (ft/ft) * 0.043651 * Area (sq ft)        *          * 122.77  *          *
* Q Total (cfs)      * 1825.00 * Flow (cfs)           *          * 1825.00  *          *
* Top Width (ft)     * 29.51 * Top Width (ft)       *          * 29.51  *          *
* Vel Total (ft/s)   * 14.87 * Avg. Vel. (ft/s)     *          * 14.87  *          *

```

```

* Max Chl Dpth (ft)      * 5.65 * Hydr. Depth (ft)      *      * 4.16 *      *
* Conv. Total (cfs)     * 8735.0 * Conv. (cfs)          *      * 8735.0 *      *
* Length Wtd. (ft)     * 61.45 * Wetted Per. (ft)    *      * 33.14 *      *
* Min Ch El (ft)       * 248.88 * Shear (lb/sq ft)    *      * 10.09 *      *
* Alpha                 * 1.00 * Stream Power (lb/ft s) * 151.23 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 2.79 * Cum Volume (acre-ft) * 3.40 * 8.25 * 3.14 *
* C & E Loss (ft)      * 0.11 * Cum SA (acres)      * 1.75 * 1.66 * 1.85 *
*****

```

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)        * 259.27 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)        * 4.07  * Wt. n-Val.           * 0.045  * 0.050  * 0.045  *
* W.S. Elev (ft)       * 255.20 * Reach Len. (ft)     * 59.80  * 61.46  * 61.27  *
* Crit W.S. (ft)      * 256.18 * Flow Area (sq ft)   * 0.03   * 142.82 * 0.01   *
* E.G. Slope (ft/ft)   * 0.044453 * Area (sq ft)       * 0.03   * 142.82 * 0.01   *
* Q Total (cfs)        * 2313.00 * Flow (cfs)         * 0.04   * 2312.94 * 0.01   *
* Top Width (ft)      * 30.72 * Top Width (ft)     * 0.24   * 30.32  * 0.16   *
* Vel Total (ft/s)    * 16.19 * Avg. Vel. (ft/s)   * 1.39   * 16.19  * 1.00   *
* Max Chl Dpth (ft)   * 6.32  * Hydr. Depth (ft)   * 0.13   * 4.71   * 0.07   *
* Conv. Total (cfs)   * 10970.4 * Conv. (cfs)       * 0.2    * 10970.2 * 0.1    *
* Length Wtd. (ft)    * 61.37 * Wetted Per. (ft)   * 0.36   * 34.37  * 0.22   *
* Min Ch El (ft)     * 248.88 * Shear (lb/sq ft)   * 0.25   * 11.53  * 0.15   *
* Alpha              * 1.00 * Stream Power (lb/ft s) * 151.23 * 0.00 * 0.00 *
* Frctn Loss (ft)    * 2.10 * Cum Volume (acre-ft) * 4.39   * 9.37   * 4.18   *
* C & E Loss (ft)    * 0.09 * Cum SA (acres)     * 1.97   * 1.67   * 2.21   *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
REACH: main RS: 33

INPUT

Description:

Station Elevation Data num= 31

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	267.97	11.3	262.18	12.79	256.32	14.18	255.91	17.8	255.8
17.92	255.46	24.87	255.71	35.98	256.23	47.24	256.09	51.14	255.99
52.99	255.73	54.13	255.85	54.77	256.14	56.99	256.29	59.17	257.32
63.7	257.22	68.17	255.85	74.07	255.58	75.41	254.94	79.49	252.81
81.03	250.1	81.57	248.66	82.17	247.45	88.62	246.6	89.54	246.48
93.53	247.41	98.75	247.71	100.67	248.38	102.43	249.97	108.59	254.98
126.55	265.81								

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	14.18	.02	63.7	.045	79.49	.05	102.43	.045
108.59	.1								

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	79.49	108.59		21.85	21.89		21.7
						.1	.3
Ineffective Flow			num=	1			
	Sta L	Sta R	Elev	Permanent			
	65	79	265	F			

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)        * 253.65 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)        * 0.84  * Wt. n-Val.           *      * 0.049  *      *
* W.S. Elev (ft)       * 252.81 * Reach Len. (ft)     * 21.85  * 21.89  * 21.70  *

```

* Crit W.S. (ft)	* 251.31	* Flow Area (sq ft)	*	* 121.17	*	*
* E.G. Slope (ft/ft)	* 0.009926	* Area (sq ft)	*	* 121.17	*	*
* Q Total (cfs)	* 890.00	* Flow (cfs)	*	* 890.00	*	*
* Top Width (ft)	* 26.43	* Top Width (ft)	*	* 26.43	*	*
* Vel Total (ft/s)	* 7.34	* Avg. Vel. (ft/s)	*	* 7.34	*	*
* Max Chl Dpth (ft)	* 6.33	* Hydr. Depth (ft)	*	* 4.58	*	*
* Conv. Total (cfs)	* 8933.2	* Conv. (cfs)	*	* 8933.2	*	*
* Length Wtd. (ft)	* 21.89	* Wetted Per. (ft)	*	* 31.67	*	*
* Min Ch El (ft)	* 246.48	* Shear (lb/sq ft)	*	* 2.37	*	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 126.55	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.21	* Cum Volume (acre-ft)	* 1.53	* 5.49	* 0.93	*
* C & E Loss (ft)	* 0.02	* Cum SA (acres)	* 1.10	* 1.56	* 1.26	*

Note: Manning's n values were composited to a single value in the main channel.
 Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 257.07	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 1.16	* Wt. n-Val.	* 0.033	* 0.049	* 0.100	*
* W.S. Elev (ft)	* 255.92	* Reach Len. (ft)	* 21.85	* 21.89	* 21.70	*
* Crit W.S. (ft)	* 253.58	* Flow Area (sq ft)	* 4.74	* 208.67	* 0.73	*
* E.G. Slope (ft/ft)	* 0.007563	* Area (sq ft)	* 13.67	* 208.67	* 0.73	*
* Q Total (cfs)	* 1825.00	* Flow (cfs)	* 14.94	* 1809.55	* 0.51	*
* Top Width (ft)	* 59.90	* Top Width (ft)	* 29.25	* 29.10	* 1.55	*
* Vel Total (ft/s)	* 8.52	* Avg. Vel. (ft/s)	* 3.15	* 8.67	* 0.70	*
* Max Chl Dpth (ft)	* 9.44	* Hydr. Depth (ft)	* 0.26	* 7.17	* 0.47	*
* Conv. Total (cfs)	* 20985.8	* Conv. (cfs)	* 171.8	* 20808.1	* 5.9	*
* Length Wtd. (ft)	* 21.89	* Wetted Per. (ft)	* 18.55	* 35.11	* 1.81	*
* Min Ch El (ft)	* 246.48	* Shear (lb/sq ft)	* 0.12	* 2.81	* 0.19	*
* Alpha	* 1.03	* Stream Power (lb/ft s)	* 126.55	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.13	* Cum Volume (acre-ft)	* 3.39	* 8.01	* 3.14	*
* C & E Loss (ft)	* 0.15	* Cum SA (acres)	* 1.73	* 1.62	* 1.85	*

Warning: Divided flow computed for this cross-section.
 Note: Manning's n values were composited to a single value in the main channel.
 Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 258.01	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 1.10	* Wt. n-Val.	* 0.021	* 0.049	* 0.100	*
* W.S. Elev (ft)	* 256.91	* Reach Len. (ft)	* 21.85	* 21.89	* 21.70	*
* Crit W.S. (ft)	* 254.52	* Flow Area (sq ft)	* 44.52	* 237.72	* 3.10	*
* E.G. Slope (ft/ft)	* 0.006378	* Area (sq ft)	* 66.10	* 237.72	* 3.10	*
* Q Total (cfs)	* 2313.00	* Flow (cfs)	* 244.68	* 2065.08	* 3.25	*
* Top Width (ft)	* 92.77	* Top Width (ft)	* 60.46	* 29.10	* 3.21	*
* Vel Total (ft/s)	* 8.11	* Avg. Vel. (ft/s)	* 5.50	* 8.69	* 1.05	*
* Max Chl Dpth (ft)	* 10.43	* Hydr. Depth (ft)	* 0.96	* 8.17	* 0.97	*
* Conv. Total (cfs)	* 28961.9	* Conv. (cfs)	* 3063.7	* 25857.6	* 40.7	*
* Length Wtd. (ft)	* 21.88	* Wetted Per. (ft)	* 47.56	* 35.11	* 3.75	*
* Min Ch El (ft)	* 246.48	* Shear (lb/sq ft)	* 0.37	* 2.70	* 0.33	*
* Alpha	* 1.07	* Stream Power (lb/ft s)	* 126.55	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.09	* Cum Volume (acre-ft)	* 4.34	* 9.10	* 4.17	*
* C & E Loss (ft)	* 0.17	* Cum SA (acres)	* 1.93	* 1.63	* 2.20	*

Warning: Divided flow computed for this cross-section.
 Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.
 Note: Manning's n values were composited to a single value in the main channel.
 Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main

RS: 32

INPUT

Proposed (Concepts 1-7) Conditions HEC-RAS Output

High Flows Model

Description:

Station Elevation Data		num= 26		Sta		Elev		Sta		Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	266.84	9.53	261.29	11.26	255.77	14.67	255.03	17.66	254.94		
17.8	254.66	26.41	255.03	37.4	255.52	48.5	255.51	52.57	255.4		
54.31	255.14	55.62	255.34	56.23	255.61	65.26	255.59	74.5	255.3		
79.26	253.29	81.14	250.5	82.86	247.64	85.73	246.65	88.71	246.53		
92.02	246.39	101.96	248.55	106	251.15	112.23	255.1	119.71	256.72		
133.84	264.12										

Manning's n Values		num= 5		Sta		n Val		Sta		n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	14.67	.02	56.23	.045	79.26	.05	112.23	.1		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	79.26	112.23	24.44	27.61	26.31		.3	.5
Ineffective Flow			num=	1				
	Sta L	Sta R	Elev	Permanent				
	67.8	74.5	265	F				

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 253.42	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.77	* Wt. n-Val.	* 0.024	* 0.050	* 0.100
* W.S. Elev (ft)	* 252.65	* Reach Len. (ft)	* 2.00	* 2.00	* 2.00
* Crit W.S. (ft)	* 251.12	* Flow Area (sq ft)	* 54.33	* 236.57	* 2.46
* E.G. Slope (ft/ft)	* 0.009336	* Area (sq ft)	* 59.20	* 236.57	* 2.46
* Q Total (cfs)	* 890.00	* Flow (cfs)	* 207.38	* 1616.04	* 1.58
* Top Width (ft)	* 28.67	* Top Width (ft)	* 68.11	* 32.97	* 4.77
* Vel Total (ft/s)	* 7.03	* Avg. Vel. (ft/s)	* 3.82	* 6.83	* 0.64
* Max Chl Dpth (ft)	* 6.26	* Hydr. Depth (ft)	* 0.88	* 7.18	* 0.52
* Conv. Total (cfs)	* 9211.1	* Conv. (cfs)	* 3032.6	* 23632.2	* 23.1
* Length Wtd. (ft)	* 2.00	* Wetted Per. (ft)	* 62.45	* 38.39	* 4.88
* Min Ch El (ft)	* 246.39	* Shear (lb/sq ft)	* 0.25	* 1.80	* 0.15
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 133.84	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.02	* Cum Volume (acre-ft)	* 3.38	* 7.90	* 3.14
* C & E Loss (ft)	* 0.00	* Cum SA (acres)	* 1.71	* 1.60	* 1.85

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 256.80	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.67	* Wt. n-Val.	* 0.024	* 0.050	* 0.100
* W.S. Elev (ft)	* 256.13	* Reach Len. (ft)	* 2.00	* 2.00	* 2.00
* Crit W.S. (ft)	* 253.31	* Flow Area (sq ft)	* 54.33	* 236.57	* 2.46
* E.G. Slope (ft/ft)	* 0.004676	* Area (sq ft)	* 59.20	* 236.57	* 2.46
* Q Total (cfs)	* 1825.00	* Flow (cfs)	* 207.38	* 1616.04	* 1.58
* Top Width (ft)	* 105.85	* Top Width (ft)	* 68.11	* 32.97	* 4.77
* Vel Total (ft/s)	* 6.22	* Avg. Vel. (ft/s)	* 3.82	* 6.83	* 0.64
* Max Chl Dpth (ft)	* 9.74	* Hydr. Depth (ft)	* 0.88	* 7.18	* 0.52
* Conv. Total (cfs)	* 26687.9	* Conv. (cfs)	* 3032.6	* 23632.2	* 23.1
* Length Wtd. (ft)	* 2.00	* Wetted Per. (ft)	* 62.45	* 38.39	* 4.88
* Min Ch El (ft)	* 246.39	* Shear (lb/sq ft)	* 0.25	* 1.80	* 0.15
* Alpha	* 1.11	* Stream Power (lb/ft s)	* 133.84	* 0.00	* 0.00
* Frctn Loss (ft)	*	* Cum Volume (acre-ft)	* 3.38	* 7.90	* 3.14
* C & E Loss (ft)	*	* Cum SA (acres)	* 1.71	* 1.60	* 1.85

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 257.75	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.54	* Wt. n-Val.	* 0.024	* 0.050	* 0.100
* W.S. Elev (ft)	* 257.21	* Reach Len. (ft)	* 2.00	* 2.00	* 2.00
* Crit W.S. (ft)	* 254.26	* Flow Area (sq ft)	* 120.63	* 272.06	* 9.94
* E.G. Slope (ft/ft)	* 0.003125	* Area (sq ft)	* 132.71	* 272.06	* 9.94
* Q Total (cfs)	* 2313.00	* Flow (cfs)	* 636.34	* 1667.64	* 9.02
* Top Width (ft)	* 109.83	* Top Width (ft)	* 68.45	* 32.97	* 8.41
* Vel Total (ft/s)	* 5.74	* Avg. Vel. (ft/s)	* 5.28	* 6.13	* 0.91
* Max Chl Dpth (ft)	* 10.82	* Hydr. Depth (ft)	* 1.95	* 8.25	* 1.18
* Conv. Total (cfs)	* 41377.1	* Conv. (cfs)	* 11383.4	* 29832.3	* 161.4

```

* Length Wtd. (ft)      * 2.00 * Wetted Per. (ft)      * 63.58 * 38.39 * 8.71 *
* Min Ch El (ft)      * 246.39 * Shear (lb/sq ft)      * 0.37 * 1.38 * 0.22 *
* Alpha                * 1.05 * Stream Power (lb/ft s) * 133.84 * 0.00 * 0.00 *
* Frctn Loss (ft)      *      * Cum Volume (acre-ft)   * 4.29 * 8.98 * 4.17 *
* C & E Loss (ft)      *      * Cum SA (acres)         * 1.90 * 1.61 * 2.20 *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

BRIDGE

RIVER: hudson
REACH: main RS: 31.5

INPUT

Description:

Distance from Upstream XS = 2
Deck/Roadway Width = 18
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 4

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
65	265	255	109	265	255	109.1	265	250						
110	265	250												

Upstream Bridge Cross Section Data

Station Elevation Data num= 26

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	266.84	9.53	261.29	11.26	255.77	14.67	255.03	17.66	254.94
17.8	254.66	26.41	255.03	37.4	255.52	48.5	255.51	52.57	255.4
54.31	255.14	55.62	255.34	56.23	255.61	65.26	255.59	74.5	255.3
79.26	253.29	81.14	250.5	82.86	247.64	85.73	246.65	88.71	246.53
92.02	246.39	101.96	248.55	106	251.15	112.23	255.1	119.71	256.72
133.84	264.12								

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	14.67	.02	56.23	.045	79.26	.05	112.23	.1

Bank Sta: Left Right Coeff Contr. Expan.
79.26 112.23 .3 .5

Ineffective Flow num= 1
Sta L Sta R Elev Permanent
67.8 74.5 265 F

Downstream Deck/Roadway Coordinates

num= 4

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
68	265	255	112	265	255	112.1	265	250						
113	265	250												

Downstream Bridge Cross Section Data

Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	265.97	10.7	260.17	11.79	255.21	15.21	254.22	19.1	254.07
19.19	253.84	28.59	254.27	39.3	254.7	50.59	254.7	54.49	254.58
56.09	254.29	57.57	254.47	58.16	254.71	82.38	255.45	86.44	255.21
87.14	251.02	87.29	249.71	87.53	246.88	95.77	246.81	99.73	246.85
103.43	246.88	104.83	247.39	107.58	249.58	108.86	250.5	112.96	253.59
114.18	255.6	121.03	255.92	134	261.71				

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	15.21	.02	58.16	.045	86.44	.035	112.96	.1

Bank Sta: Left Right Coeff Contr. Expan.
86.44 112.96 .3 .5

Ineffective Flow num= 1
Sta L Sta R Elev Permanent
65.65 86.44 265 F

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical

Proposed (Concepts 1-7) Conditions HEC-RAS Output

High Flows Model

Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy
Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Pressure and Weir flow
Submerged Inlet Cd =
Submerged Inlet + Outlet Cd = .8
Max Low Cord =

Additional Bridge Parameters

Add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth
inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream energy grade line

BRIDGE OUTPUT Profile #10-YR

```
*****
* E.G. US. (ft) * 253.42 * Element *Inside BR US *Inside BR DS *
* W.S. US. (ft) * 252.65 * E.G. Elev (ft) * 253.40 * 253.12 *
* Q Total (cfs) * 890.00 * W.S. Elev (ft) * 252.62 * 251.95 *
* Q Bridge (cfs) * 890.00 * Crit W.S. (ft) * 251.12 * 251.07 *
* Q Weir (cfs) * * * Max Chl Dpth (ft) * 6.23 * 5.14 *
* Weir Sta Lft (ft) * * * Vel Total (ft/s) * 7.07 * 8.68 *
* Weir Sta Rgt (ft) * * * Flow Area (sq ft) * 125.80 * 102.54 *
* Weir Submerg * * * Froude # Chl * 0.59 * 0.74 *
* Weir Max Depth (ft) * * * Specif Force (cu ft) * 519.48 * 485.65 *
* Min El Weir Flow (ft) * 253.70 * Hydr Depth (ft) * 4.40 * 4.31 *
* Min El Prs (ft) * 255.00 * W.P. Total (ft) * 32.95 * 30.00 *
* Delta EG (ft) * 0.50 * Conv. Total (cfs) * 9133.1 * 9876.7 *
* Delta WS (ft) * 1.35 * Top Width (ft) * 28.61 * 23.80 *
* BR Open Area (sq ft) * 179.01 * Frctn Loss (ft) * 0.16 * 0.08 *
* BR Open Vel (ft/s) * 8.68 * C & E Loss (ft) * 0.12 * 0.13 *
* Coef of Q * * * Shear Total (lb/sq ft) * 2.26 * 1.73 *
* Br Sel Method *Energy only * Power Total (lb/ft s) * 0.00 * 0.00 *
*****
```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

BRIDGE OUTPUT Profile #50-YR

```
*****
* E.G. US. (ft) * 256.80 * Element *Inside BR US *Inside BR DS *
* W.S. US. (ft) * 256.13 * E.G. Elev (ft) * 256.80 * 256.10 *
* Q Total (cfs) * 1825.00 * W.S. Elev (ft) * 256.13 * 255.47 *
* Q Bridge (cfs) * 1532.73 * Crit W.S. (ft) * 253.29 * 253.38 *
* Q Weir (cfs) * 292.27 * Max Chl Dpth (ft) * 9.74 * 8.66 *
* Weir Sta Lft (ft) * 10.94 * Vel Total (ft/s) * 6.26 * 5.82 *
* Weir Sta Rgt (ft) * 119.86 * Flow Area (sq ft) * 291.76 * 313.72 *
* Weir Submerg * 0.00 * Froude # Chl * 0.42 * 0.48 *
* Weir Max Depth (ft) * 3.11 * Specif Force (cu ft) * 1375.89 * 1236.58 *
* Min El Weir Flow (ft) * 253.70 * Hydr Depth (ft) * 4.79 * 5.70 *
* Min El Prs (ft) * 255.00 * W.P. Total (ft) * 139.70 * 120.77 *
* Delta EG (ft) * 0.70 * Conv. Total (cfs) * * *
* Delta WS (ft) * 2.72 * Top Width (ft) * 60.85 * 57.37 *
* BR Open Area (sq ft) * 179.01 * Frctn Loss (ft) * * *
* BR Open Vel (ft/s) * 8.56 * C & E Loss (ft) * * *
* Coef of Q * * * Shear Total (lb/sq ft) * * *
* Br Sel Method * Press/Weir * Power Total (lb/ft s) * 0.00 * 0.00 *
*****
```

Note: The downstream water surface is below the minimum elevation for pressure flow. The sluice gate equations were used for pressure flow.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: For the cross section inside the bridge at the upstream end, the water surface and energy have been projected from the upstream cross section. The selected bridge modeling method does not compute answers inside the bridge.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: For the cross section inside the bridge at the downstream end, the water surface and energy are based on critical depth over the weir.

BRIDGE OUTPUT Profile #100-YR

```
*****
* E.G. US. (ft) * 257.75 * Element * Inside BR US * Inside BR DS *
* W.S. US. (ft) * 257.21 * E.G. Elev (ft) * 257.75 * 257.05 *
* Q Total (cfs) * 2313.00 * W.S. Elev (ft) * 257.21 * 256.11 *
* Q Bridge (cfs) * 1691.51 * Crit W.S. (ft) * 254.22 * 255.34 *
* Q Weir (cfs) * 621.49 * Max Chl Dpth (ft) * 10.82 * 9.30 *
* Weir Sta Lft (ft) * 10.64 * Vel Total (ft/s) * 6.54 * 6.16 *
* Weir Sta Rgt (ft) * 121.67 * Flow Area (sq ft) * 353.41 * 375.74 *
* Weir Submerg * 0.12 * Froude # Chl * 0.44 * 0.50 *
* Weir Max Depth (ft) * 4.06 * Specif Force (cu ft) * 1831.71 * 1570.13 *
* Min El Weir Flow (ft) * 253.70 * Hydr Depth (ft) * 5.45 * 6.01 *
* Min El Prs (ft) * 255.00 * W.P. Total (ft) * 146.82 * 129.51 *
* Delta EG (ft) * 0.74 * Conv. Total (cfs) * * *
* Delta WS (ft) * 1.63 * Top Width (ft) * 64.83 * 64.85 *
* BR Open Area (sq ft) * 179.01 * Frctn Loss (ft) * * *
* BR Open Vel (ft/s) * 9.45 * C & E Loss (ft) * * *
* Coef of Q * * Shear Total (lb/sq ft) * * *
* Br Sel Method * Press/Weir * Power Total (lb/ft s) * 0.00 * 0.00 *
*****
```

Note: The downstream water surface is above the minimum elevation required for orifice flow. The orifice flow equation was used for pressure flow.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: For the cross section inside the bridge at the upstream end, the water surface and energy have been projected from the upstream cross section. The selected bridge modeling method does not compute answers inside the bridge.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: For the cross section inside the bridge at the downstream end, the water surface and energy are based on critical depth over the weir.

CROSS SECTION

RIVER: hudson
REACH: main RS: 31

INPUT

Description:

Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	265.97	10.7	260.17	11.79	255.21	15.21	254.22	19.1	254.07
19.19	253.84	28.59	254.27	39.3	254.7	50.59	254.7	54.49	254.58
56.09	254.29	57.57	254.47	58.16	254.71	82.38	255.45	86.44	255.21
87.14	251.02	87.29	249.71	87.53	246.88	95.77	246.81	99.73	246.85
103.43	246.88	104.83	247.39	107.58	249.58	108.86	250.5	112.96	253.59
114.18	255.6	121.03	255.92	134	261.71				

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	15.21	.02	58.16	.045	86.44	.035	112.96	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
86.44 112.96 95.55 97.06 99 .3 .5

Ineffective Flow num= 1
Sta L Sta R Elev Permanent
65.65 86.44 265 F

CROSS SECTION OUTPUT Profile #10-YR

```
*****
* E.G. Elev (ft) * 252.91 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 1.61 * Wt. n-Val. * * 0.035 * *
* W.S. Elev (ft) * 251.30 * Reach Len. (ft) * 95.55 * 97.06 * 99.00 *
* Crit W.S. (ft) * 251.07 * Flow Area (sq ft) * * 87.28 * *
* E.G. Slope (ft/ft) * 0.012822 * Area (sq ft) * * 87.28 * *
* Q Total (cfs) * 890.00 * Flow (cfs) * * 890.00 * *
*****
```

* Top Width (ft)	* 22.83	* Top Width (ft)	* 22.83	*	*
* Vel Total (ft/s)	* 10.20	* Avg. Vel. (ft/s)	* 10.20	*	*
* Max Chl Dpth (ft)	* 4.49	* Hydr. Depth (ft)	* 3.82	*	*
* Conv. Total (cfs)	* 7859.7	* Conv. (cfs)	* 7859.7	*	*
* Length Wtd. (ft)	* 97.06	* Wetted Per. (ft)	* 28.25	*	*
* Min Ch El (ft)	* 246.81	* Shear (lb/sq ft)	* 2.47	*	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 134.00	* 0.00	* 0.00
* Frctn Loss (ft)	* 1.36	* Cum Volume (acre-ft)	* 1.53	* 5.36	* 0.93
* C & E Loss (ft)	* 0.10	* Cum SA (acres)	* 1.10	* 1.53	* 1.26

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 256.09	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 2.68	* Wt. n-Val.	*	* 0.035	*	*
* W.S. Elev (ft)	* 253.41	* Reach Len. (ft)	* 95.55	* 97.06	* 99.00	*
* Crit W.S. (ft)	* 253.41	* Flow Area (sq ft)	*	* 138.89	*	*
* E.G. Slope (ft/ft)	* 0.014618	* Area (sq ft)	*	* 138.89	*	*
* Q Total (cfs)	* 1825.00	* Flow (cfs)	*	* 1825.00	*	*
* Top Width (ft)	* 25.99	* Top Width (ft)	*	* 25.99	*	*
* Vel Total (ft/s)	* 13.14	* Avg. Vel. (ft/s)	*	* 13.14	*	*
* Max Chl Dpth (ft)	* 6.60	* Hydr. Depth (ft)	*	* 5.34	*	*
* Conv. Total (cfs)	* 15094.7	* Conv. (cfs)	*	* 15094.7	*	*
* Length Wtd. (ft)	* 97.00	* Wetted Per. (ft)	*	* 33.91	*	*
* Min Ch El (ft)	* 246.81	* Shear (lb/sq ft)	*	* 3.74	*	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 134.00	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.94	* Cum Volume (acre-ft)	* 3.35	* 7.79	* 3.14	*
* C & E Loss (ft)	* 0.78	* Cum SA (acres)	* 1.68	* 1.60	* 1.84	*

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 257.01	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 1.43	* Wt. n-Val.	* 0.021	* 0.035	* 0.100	*
* W.S. Elev (ft)	* 255.58	* Reach Len. (ft)	* 95.55	* 97.06	* 99.00	*
* Crit W.S. (ft)	* 255.58	* Flow Area (sq ft)	* 58.39	* 196.13	* 1.21	*
* E.G. Slope (ft/ft)	* 0.005915	* Area (sq ft)	* 65.92	* 196.13	* 1.21	*
* Q Total (cfs)	* 2313.00	* Flow (cfs)	* 330.22	* 1981.89	* 0.89	*
* Top Width (ft)	* 102.46	* Top Width (ft)	* 74.73	* 26.52	* 1.21	*
* Vel Total (ft/s)	* 9.05	* Avg. Vel. (ft/s)	* 5.66	* 10.11	* 0.74	*
* Max Chl Dpth (ft)	* 8.77	* Hydr. Depth (ft)	* 1.08	* 7.40	* 1.00	*
* Conv. Total (cfs)	* 30075.1	* Conv. (cfs)	* 4293.7	* 25769.9	* 11.5	*
* Length Wtd. (ft)	* 96.85	* Wetted Per. (ft)	* 54.65	* 36.02	* 2.33	*
* Min Ch El (ft)	* 246.81	* Shear (lb/sq ft)	* 0.39	* 2.01	* 0.19	*
* Alpha	* 1.13	* Stream Power (lb/ft s)	* 134.00	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.64	* Cum Volume (acre-ft)	* 4.24	* 8.85	* 4.17	*
* C & E Loss (ft)	* 0.04	* Cum SA (acres)	* 1.86	* 1.61	* 2.20	*

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: hudson
 REACH: main RS: 30

INPUT

Description:

Station Elevation Data num= 26

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	261.9	8.71	261.46	10.94	261.11	20.78	255.45	29.7	250.65
33.4	250.57	33.51	250.33	42.38	250.72	53.4	251.15	64.42	250.86
68.5	250.72	70.19	250.5	71.48	250.68	72.13	250.92	85.33	250.3
118.15	253.54	118.2	248.77	118.26	245.77	127.23	243.69	127.46	243.63
130.64	244.4	132.33	245.89	137.14	248.9	142.04	252.09	145.58	254.31
152.9	256.12								

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	29.7	.02	85.33	.045	118.15	.035	142.04	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 118.15 142.04 69.42 70.58 71.76 .1 .3

Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 88.6 115.6 260 F

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 251.45	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 1.96	* Wt. n-Val.	* 0.022	* 0.035	*
* W.S. Elev (ft)	* 249.49	* Reach Len. (ft)	* 69.42	* 70.58	* 71.76
* Crit W.S. (ft)	* 249.46	* Flow Area (sq ft)	*	* 79.19	*
* E.G. Slope (ft/ft)	* 0.015414	* Area (sq ft)	*	* 79.19	*
* Q Total (cfs)	* 890.00	* Flow (cfs)	*	* 890.00	*
* Top Width (ft)	* 19.85	* Top Width (ft)	*	* 19.85	*
* Vel Total (ft/s)	* 11.24	* Avg. Vel. (ft/s)	*	* 11.24	*
* Max Chl Dpth (ft)	* 5.86	* Hydr. Depth (ft)	*	* 3.99	*
* Conv. Total (cfs)	* 7168.5	* Conv. (cfs)	*	* 7168.5	*
* Length Wtd. (ft)	* 70.52	* Wetted Per. (ft)	*	* 25.43	*
* Min Ch El (ft)	* 243.63	* Shear (lb/sq ft)	*	* 3.00	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 152.90	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.91	* Cum Volume (acre-ft)	* 1.53	* 5.17	* 0.93
* C & E Loss (ft)	* 0.35	* Cum SA (acres)	* 1.10	* 1.48	* 1.26

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 254.30	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 3.14	* Wt. n-Val.	* 0.022	* 0.035	*
* W.S. Elev (ft)	* 251.16	* Reach Len. (ft)	* 69.42	* 70.58	* 71.76
* Crit W.S. (ft)	* 252.10	* Flow Area (sq ft)	* 25.16	* 114.59	*
* E.G. Slope (ft/ft)	* 0.020254	* Area (sq ft)	* 26.62	* 114.59	*
* Q Total (cfs)	* 1825.00	* Flow (cfs)	* 139.79	* 1685.21	*
* Top Width (ft)	* 87.73	* Top Width (ft)	* 65.29	* 22.44	*
* Vel Total (ft/s)	* 13.06	* Avg. Vel. (ft/s)	* 5.56	* 14.71	*
* Max Chl Dpth (ft)	* 7.53	* Hydr. Depth (ft)	* 0.42	* 5.11	*
* Conv. Total (cfs)	* 12823.4	* Conv. (cfs)	* 982.2	* 11841.2	*
* Length Wtd. (ft)	* 70.44	* Wetted Per. (ft)	* 60.26	* 30.18	*
* Min Ch El (ft)	* 243.63	* Shear (lb/sq ft)	* 0.53	* 4.80	*
* Alpha	* 1.18	* Stream Power (lb/ft s)	* 152.90	* 0.00	* 0.00
* Frctn Loss (ft)	* 1.66	* Cum Volume (acre-ft)	* 3.32	* 7.50	* 3.14
* C & E Loss (ft)	* 0.14	* Cum SA (acres)	* 1.61	* 1.55	* 1.84

Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

Table with 12 columns: Parameter, Value, Element, Left OB, Channel, Right OB. Rows include E.G. Elev, Vel Head, W.S. Elev, Crit W.S., E.G. Slope, Q Total, Top Width, Vel Total, Max Chl Dpth, Conv. Total, Length Wtd., Min Ch El, Alpha, Frctn Loss, C & E Loss.

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
REACH: main RS: 29

INPUT

Description:

Table with 10 columns: Station, Elev, Sta, Elev, Sta, Elev, Sta, Elev, Sta, Elev. Data points for various stations and elevations.

Table with 10 columns: Manning's n, Sta, n Val, Sta, n Val, Sta, n Val, Sta, n Val, Sta, n Val. Values for Manning's n and station numbers.

Table with 7 columns: Bank Sta, Left, Right, Lengths, Left Channel, Right, Coeff Contr, Expan. Values for bank stations and channel lengths.

Table with 5 columns: Ineffective Flow, Sta L, Sta R, Elev, Permanent. Values for ineffective flow and permanent elevation.

CROSS SECTION OUTPUT Profile #10-YR

Table with 12 columns: Parameter, Value, Element, Left OB, Channel, Right OB. Rows include E.G. Elev, Vel Head, W.S. Elev, Crit W.S., E.G. Slope, Q Total, Top Width.

* Vel Total (ft/s)	* 6.90	* Avg. Vel. (ft/s)	* 4.44	* 7.42	* *
* Max Chl Dpth (ft)	* 6.69	* Hydr. Depth (ft)	* 0.38	* 4.86	* *
* Conv. Total (cfs)	* 8485.7	* Conv. (cfs)	* 950.8	* 7534.9	* *
* Length Wtd. (ft)	* 57.90	* Wetted Per. (ft)	* 59.75	* 28.98	* *
* Min Ch El (ft)	* 242.70	* Shear (lb/sq ft)	* 0.26	* 2.52	* *
* Alpha	* 1.07	* Stream Power (lb/ft s)	* 159.15	* 0.00	* 0.00 *
* Frctn Loss (ft)	* 0.19	* Cum Volume (acre-ft)	* 1.51	* 5.02	* 0.93 *
* C & E Loss (ft)	* 0.17	* Cum SA (acres)	* 1.04	* 1.45	* 1.26 *

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 252.28	* Element	* Left OB	* Channel	* Right OB	* *
* Vel Head (ft)	* 2.74	* Wt. n-Val.	* 0.020	* 0.050	* *	* *
* W.S. Elev (ft)	* 249.54	* Reach Len. (ft)	* 57.00	* 58.22	* 61.16	* *
* Crit W.S. (ft)	* 250.31	* Flow Area (sq ft)	* 31.47	* 109.72	* *	* *
* E.G. Slope (ft/ft)	* 0.037757	* Area (sq ft)	* 39.45	* 109.72	* *	* *
* Q Total (cfs)	* 1825.00	* Flow (cfs)	* 300.00	* 1525.01	* *	* *
* Top Width (ft)	* 104.48	* Top Width (ft)	* 82.31	* 22.17	* *	* *
* Vel Total (ft/s)	* 12.93	* Avg. Vel. (ft/s)	* 9.53	* 13.90	* *	* *
* Max Chl Dpth (ft)	* 6.84	* Hydr. Depth (ft)	* 0.51	* 4.95	* *	* *
* Conv. Total (cfs)	* 9392.2	* Conv. (cfs)	* 1543.9	* 7848.3	* *	* *
* Length Wtd. (ft)	* 57.55	* Wetted Per. (ft)	* 61.66	* 29.38	* *	* *
* Min Ch El (ft)	* 242.70	* Shear (lb/sq ft)	* 1.20	* 8.80	* *	* *
* Alpha	* 1.06	* Stream Power (lb/ft s)	* 159.15	* 0.00	* 0.00	* *
* Frctn Loss (ft)	* 1.90	* Cum Volume (acre-ft)	* 3.27	* 7.32	* 3.14	* *
* C & E Loss (ft)	* 0.12	* Cum SA (acres)	* 1.49	* 1.51	* 1.84	* *

Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 252.81	* Element	* Left OB	* Channel	* Right OB	* *
* Vel Head (ft)	* 2.95	* Wt. n-Val.	* 0.021	* 0.050	* *	* *
* W.S. Elev (ft)	* 249.86	* Reach Len. (ft)	* 57.00	* 58.22	* 61.16	* *
* Crit W.S. (ft)	* 250.71	* Flow Area (sq ft)	* 51.80	* 117.03	* *	* *
* E.G. Slope (ft/ft)	* 0.038133	* Area (sq ft)	* 66.58	* 117.03	* *	* *
* Q Total (cfs)	* 2313.00	* Flow (cfs)	* 640.46	* 1672.54	* *	* *
* Top Width (ft)	* 107.07	* Top Width (ft)	* 84.35	* 22.72	* *	* *
* Vel Total (ft/s)	* 13.70	* Avg. Vel. (ft/s)	* 12.36	* 14.29	* *	* *
* Max Chl Dpth (ft)	* 7.16	* Hydr. Depth (ft)	* 0.82	* 5.15	* *	* *
* Conv. Total (cfs)	* 11844.7	* Conv. (cfs)	* 3279.7	* 8565.0	* *	* *
* Length Wtd. (ft)	* 57.50	* Wetted Per. (ft)	* 63.56	* 30.28	* *	* *
* Min Ch El (ft)	* 242.70	* Shear (lb/sq ft)	* 1.94	* 9.20	* *	* *
* Alpha	* 1.01	* Stream Power (lb/ft s)	* 159.15	* 0.00	* 0.00	* *
* Frctn Loss (ft)	* 2.16	* Cum Volume (acre-ft)	* 4.03	* 8.31	* 4.17	* *
* C & E Loss (ft)	* 0.27	* Cum SA (acres)	* 1.58	* 1.52	* 2.20	* *

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
REACH: main RS: 28

INPUT
Description:
Proposed (Concepts 1-7) Conditions HEC-RAS Output

Station Elevation Data num= 23
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev

 0 264.37 23.62 258.39 50.23 252 71.83 247.8 75.82 247.43
 75.84 247.3 94.09 247.92 107.87 247.74 110.08 247.7 111.03 248.12
 136.72 248.93 162.62 248.9 162.9 250.11 163.74 249.99 163.88 246.41
 164.27 242.97 171.24 242.92 171.44 242.91 178.26 243.18 186.65 247.92
 192.33 250.44 199.04 253.27 209.04 257.59

Manning's n Values num= 5
 Sta n Val Sta n Val Sta n Val Sta n Val Sta n Val

 0 .045 71.83 .02 111.03 .045 163.74 .035 192.33 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 163.74 192.33 46 46.77 46.35 .1 .3

Ineffective Flow num= 2
 Sta L Sta R Elev Permanent
 25.38 50.22 260 F
 124.9 163.74 260 F

Blocked Obstructions num= 1
 Sta L Sta R Elev

 50.22 61.56 260

CROSS SECTION OUTPUT Profile #10-YR

 * E.G. Elev (ft) * 249.83 * Element * Left OB * Channel * Right OB *
 * Vel Head (ft) * 0.23 * Wt. n-Val. * 0.022 * 0.035 * *
 * W.S. Elev (ft) * 249.59 * Reach Len. (ft) * 46.00 * 46.77 * 46.35 *
 * Crit W.S. (ft) * 248.37 * Flow Area (sq ft) * 99.87 * 131.53 * *
 * E.G. Slope (ft/ft) * 0.001501 * Area (sq ft) * 127.55 * 131.53 * *
 * Q Total (cfs) * 890.00 * Flow (cfs) * 361.07 * 528.94 * *
 * Top Width (ft) * 126.84 * Top Width (ft) * 100.18 * 26.67 * *
 * Vel Total (ft/s) * 3.85 * Avg. Vel. (ft/s) * 3.62 * 4.02 * *
 * Max Chl Dpth (ft) * 6.68 * Hydr. Depth (ft) * 1.60 * 4.93 * *
 * Conv. Total (cfs) * 22972.6 * Conv. (cfs) * 9319.8 * 13652.8 * *
 * Length Wtd. (ft) * 46.44 * Wetted Per. (ft) * 62.70 * 34.41 * *
 * Min Ch El (ft) * 242.91 * Shear (lb/sq ft) * 0.15 * 0.36 * *
 * Alpha * 1.01 * Stream Power (lb/ft s) * 209.04 * 0.00 * 0.00 *
 * Frctn Loss (ft) * 0.05 * Cum Volume (acre-ft) * 1.41 * 4.86 * 0.93 *
 * C & E Loss (ft) * 0.02 * Cum SA (acres) * 0.92 * 1.41 * 1.26 *

Warning: Divided flow computed for this cross-section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

 * E.G. Elev (ft) * 251.48 * Element * Left OB * Channel * Right OB *
 * Vel Head (ft) * 0.38 * Wt. n-Val. * 0.024 * 0.035 * 0.100 *
 * W.S. Elev (ft) * 251.09 * Reach Len. (ft) * 46.00 * 46.77 * 46.35 *
 * Crit W.S. (ft) * 249.39 * Flow Area (sq ft) * 194.84 * 173.64 * 0.51 *
 * E.G. Slope (ft/ft) * 0.001530 * Area (sq ft) * 280.41 * 173.64 * 0.51 *
 * Q Total (cfs) * 1825.00 * Flow (cfs) * 1015.05 * 809.82 * 0.13 *
 * Top Width (ft) * 132.32 * Top Width (ft) * 102.18 * 28.59 * 1.55 *
 * Vel Total (ft/s) * 4.95 * Avg. Vel. (ft/s) * 5.21 * 4.66 * 0.26 *
 * Max Chl Dpth (ft) * 8.18 * Hydr. Depth (ft) * 3.08 * 6.07 * 0.33 *
 * Conv. Total (cfs) * 46658.9 * Conv. (cfs) * 25951.3 * 20704.2 * 3.4 *
 * Length Wtd. (ft) * 46.33 * Wetted Per. (ft) * 65.07 * 36.89 * 1.68 *
 * Min Ch El (ft) * 242.91 * Shear (lb/sq ft) * 0.29 * 0.45 * 0.03 *
 * Alpha * 1.01 * Stream Power (lb/ft s) * 209.04 * 0.00 * 0.00 *
 * Frctn Loss (ft) * 0.06 * Cum Volume (acre-ft) * 3.06 * 7.13 * 3.14 *
 * C & E Loss (ft) * 0.03 * Cum SA (acres) * 1.37 * 1.48 * 1.84 *

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

 * E.G. Elev (ft) * 252.15 * Element * Left OB * Channel * Right OB *
 * Vel Head (ft) * 0.47 * Wt. n-Val. * 0.024 * 0.035 * 0.100 *
 * W.S. Elev (ft) * 251.68 * Reach Len. (ft) * 46.00 * 46.77 * 46.35 *
 * Crit W.S. (ft) * 249.79 * Flow Area (sq ft) * 231.98 * 190.40 * 1.83 *
 * E.G. Slope (ft/ft) * 0.001572 * Area (sq ft) * 340.32 * 190.40 * 1.83 *
 * Q Total (cfs) * 2313.00 * Flow (cfs) * 1354.94 * 957.32 * 0.74 *
 * Top Width (ft) * 133.71 * Top Width (ft) * 102.18 * 28.59 * 2.94 *
 * Vel Total (ft/s) * 5.45 * Avg. Vel. (ft/s) * 5.84 * 5.03 * 0.41 *

* Max Chl Dpth (ft)	* 8.77	* Hydr. Depth (ft)	* 3.66	* 6.66	* 0.62
* Conv. Total (cfs)	* 58329.0	* Conv. (cfs)	* 34168.7	* 24141.5	* 18.7
* Length Wtd. (ft)	* 46.31	* Wetted Per. (ft)	* 65.65	* 36.89	* 3.19
* Min Ch El (ft)	* 242.91	* Shear (lb/sq ft)	* 0.35	* 0.51	* 0.06
* Alpha	* 1.02	* Stream Power (lb/ft s)	* 209.04	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.06	* Cum Volume (acre-ft)	* 3.77	* 8.10	* 4.16
* C & E Loss (ft)	* 0.04	* Cum SA (acres)	* 1.46	* 1.48	* 2.19

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
REACH: main RS: 27

INPUT

Description:

Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	255.09	20	249.09	33.99	247.99	38.71	247.58	38.75	247.85
39.31	247.8	39.44	247.14	43.43	246.84	60.68	247.42	71.39	247.31
72.7	247.26	73.42	247.77	126.3	247.56	126.61	247.89	126.74	247.92
127.57	244.53	128.15	242.33	131.06	242.08	133	241.75	133.14	241.73
135.18	242.19	140.09	243.34	145.42	244.45	149.99	248.38	161	257.81

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	38.71	.02	73.42	.045	126.74	.035	149.99	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
126.74 149.99 60.75 61.7 65.02 .1 .3

Ineffective Flow num= 1
Sta L Sta R Elev Permanent
95.87 126.74 255 F

Blocked Obstructions num= 1
Sta L Sta R Elev
0 20 255

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 249.75	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.16	* Wt. n-Val.	* 0.025	* 0.035	* 0.100
* W.S. Elev (ft)	* 249.59	* Reach Len. (ft)	* 60.75	* 61.70	* 65.02
* Crit W.S. (ft)	* 247.96	* Flow Area (sq ft)	* 147.76	* 137.84	* 0.86
* E.G. Slope (ft/ft)	* 0.000874	* Area (sq ft)	* 208.57	* 137.84	* 0.86
* Q Total (cfs)	* 890.00	* Flow (cfs)	* 405.17	* 484.61	* 0.22
* Top Width (ft)	* 131.41	* Top Width (ft)	* 106.74	* 23.25	* 1.42
* Vel Total (ft/s)	* 3.11	* Avg. Vel. (ft/s)	* 2.74	* 3.52	* 0.26
* Max Chl Dpth (ft)	* 7.86	* Hydr. Depth (ft)	* 1.95	* 5.93	* 0.61
* Conv. Total (cfs)	* 30106.9	* Conv. (cfs)	* 13705.9	* 16393.3	* 7.6
* Length Wtd. (ft)	* 61.21	* Wetted Per. (ft)	* 77.40	* 29.40	* 1.86
* Min Ch El (ft)	* 241.73	* Shear (lb/sq ft)	* 0.10	* 0.26	* 0.03
* Alpha	* 1.05	* Stream Power (lb/ft s)	* 161.00	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.04	* Cum Volume (acre-ft)	* 1.23	* 4.72	* 0.93
* C & E Loss (ft)	* 0.02	* Cum SA (acres)	* 0.81	* 1.39	* 1.26

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 251.39	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.27	* Wt. n-Val.	* 0.027	* 0.035	* 0.100
* W.S. Elev (ft)	* 251.12	* Reach Len. (ft)	* 60.75	* 61.70	* 65.02
* Crit W.S. (ft)	* 249.00	* Flow Area (sq ft)	* 263.32	* 173.26	* 4.37
* E.G. Slope (ft/ft)	* 0.001012	* Area (sq ft)	* 371.16	* 173.26	* 4.37
* Q Total (cfs)	* 1825.00	* Flow (cfs)	* 1059.46	* 763.42	* 2.12
* Top Width (ft)	* 133.18	* Top Width (ft)	* 106.74	* 23.25	* 3.19
* Vel Total (ft/s)	* 4.14	* Avg. Vel. (ft/s)	* 4.02	* 4.41	* 0.48
* Max Chl Dpth (ft)	* 9.39	* Hydr. Depth (ft)	* 3.47	* 7.45	* 1.37
* Conv. Total (cfs)	* 57368.9	* Conv. (cfs)	* 33304.1	* 23998.2	* 66.6
* Length Wtd. (ft)	* 61.11	* Wetted Per. (ft)	* 78.92	* 29.40	* 4.21
* Min Ch El (ft)	* 241.73	* Shear (lb/sq ft)	* 0.21	* 0.37	* 0.07


```

* Alpha * 1.02 * Stream Power (lb/ft s) * 161.00 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.05 * Cum Volume (acre-ft) * 2.71 * 6.95 * 3.14 *
* C & E Loss (ft) * 0.02 * Cum SA (acres) * 1.26 * 1.45 * 1.84 *
*****

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Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

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*****
* E.G. Elev (ft) * 252.05 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.34 * Wt. n-Val. * 0.027 * 0.035 * 0.100 *
* W.S. Elev (ft) * 251.72 * Reach Len. (ft) * 60.75 * 61.70 * 65.02 *
* Crit W.S. (ft) * 249.40 * Flow Area (sq ft) * 308.84 * 187.21 * 6.50 *
* E.G. Slope (ft/ft) * 0.001085 * Area (sq ft) * 435.20 * 187.21 * 6.50 *
* Q Total (cfs) * 2313.00 * Flow (cfs) * 1409.85 * 899.42 * 3.72 *
* Top Width (ft) * 133.88 * Top Width (ft) * 106.74 * 23.25 * 3.89 *
* Vel Total (ft/s) * 4.60 * Avg. Vel. (ft/s) * 4.56 * 4.80 * 0.57 *
* Max Chl Dpth (ft) * 9.99 * Hydr. Depth (ft) * 4.07 * 8.05 * 1.67 *
* Conv. Total (cfs) * 70216.3 * Conv. (cfs) * 42799.2 * 27304.0 * 113.0 *
* Length Wtd. (ft) * 61.09 * Wetted Per. (ft) * 79.52 * 29.40 * 5.13 *
* Min Ch El (ft) * 241.73 * Shear (lb/sq ft) * 0.26 * 0.43 * 0.09 *
* Alpha * 1.02 * Stream Power (lb/ft s) * 161.00 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.05 * Cum Volume (acre-ft) * 3.36 * 7.90 * 4.16 *
* C & E Loss (ft) * 0.03 * Cum SA (acres) * 1.35 * 1.46 * 2.19 *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main RS: 26

INPUT

Description:

Station Elevation Data		num= 36	
Sta	Elev	Sta	Elev
0	257.78	20	251.78
24.56	249.63	29.3	248.97
40	246.47	53.02	246.87
71.18	247.08	74.6	247.24
112.26	248.1	112.8	247.58
117.57	241.91	118.99	240.94
134.13	247.88	136.05	249.09
152.72	258.34		

Manning's n Values

num= 5	
Sta	n Val
0	.045
33.54	.02
74.6	.045
112.8	.035
134.13	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
112.8 134.13 83.06 84.96 87.67 .1 .3

Blocked Obstructions

num= 1		
Sta L	Sta R	Elev
0	20	260

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft) * 249.69 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.10 * Wt. n-Val. * 0.025 * 0.035 * 0.100 *
* W.S. Elev (ft) * 249.59 * Reach Len. (ft) * 83.06 * 84.96 * 87.67 *
* Crit W.S. (ft) * * Flow Area (sq ft) * 205.36 * 138.33 * 2.18 *
* E.G. Slope (ft/ft) * 0.000557 * Area (sq ft) * 205.36 * 138.33 * 2.18 *
* Q Total (cfs) * 890.00 * Flow (cfs) * 511.11 * 378.24 * 0.64 *
* Top Width (ft) * 111.44 * Top Width (ft) * 87.93 * 21.33 * 2.18 *
* Vel Total (ft/s) * 2.57 * Avg. Vel. (ft/s) * 2.49 * 2.73 * 0.29 *
* Max Chl Dpth (ft) * 10.26 * Hydr. Depth (ft) * 2.34 * 6.49 * 1.00 *
* Conv. Total (cfs) * 37700.9 * Conv. (cfs) * 21651.0 * 16022.6 * 27.2 *
* Length Wtd. (ft) * 84.13 * Wetted Per. (ft) * 90.13 * 30.70 * 2.83 *
* Min Ch El (ft) * 239.33 * Shear (lb/sq ft) * 0.08 * 0.16 * 0.03 *
* Alpha * 1.02 * Stream Power (lb/ft s) * 152.72 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.04 * Cum Volume (acre-ft) * 0.94 * 4.52 * 0.93 *
* C & E Loss (ft) * 0.00 * Cum SA (acres) * 0.67 * 1.36 * 1.26 *
*****

```

CROSS SECTION OUTPUT Profile #50-YR

```
*****
* E.G. Elev (ft)          * 251.31 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.20  * Wt. n-Val.            * 0.026  * 0.035  * 0.100  *
* W.S. Elev (ft)        * 251.12 * Reach Len. (ft)      * 83.06  * 84.96  * 87.67  *
* Crit W.S. (ft)        *      * Flow Area (sq ft)    * 342.06 * 170.99 * 9.20   *
* E.G. Slope (ft/ft)    * 0.000684 * Area (sq ft)       * 342.06 * 170.99 * 9.20   *
* Q Total (cfs)         * 1825.00 * Flow (cfs)         * 1224.77 * 596.72 * 3.51   *
* Top Width (ft)       * 121.92 * Top Width (ft)     * 92.25  * 21.33  * 8.33   *
* Vel Total (ft/s)     * 3.49  * Avg. Vel. (ft/s)   * 3.58   * 3.49   * 0.38   *
* Max Chl Dpth (ft)    * 11.79 * Hydr. Depth (ft)   * 3.71   * 8.02   * 1.10   *
* Conv. Total (cfs)    * 69764.5 * Conv. (cfs)       * 46819.4 * 22811.0 * 134.1  *
* Length Wtd. (ft)     * 83.92 * Wetted Per. (ft)   * 95.53  * 30.70  * 9.47   *
* Min Ch El (ft)       * 239.33 * Shear (lb/sq ft)   * 0.15   * 0.24   * 0.04   *
* Alpha                 * 1.03  * Stream Power (lb/ft s) * 152.72 * 0.00   * 0.00   *
* Frctn Loss (ft)     * 0.05  * Cum Volume (acre-ft) * 2.22   * 6.70   * 3.13   *
* C & E Loss (ft)     * 0.00  * Cum SA (acres)     * 1.12   * 1.42   * 1.83   *
*****
```

CROSS SECTION OUTPUT Profile #100-YR

```
*****
* E.G. Elev (ft)          * 251.97 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.24  * Wt. n-Val.            * 0.027  * 0.035  * 0.100  *
* W.S. Elev (ft)        * 251.73 * Reach Len. (ft)      * 83.06  * 84.96  * 87.67  *
* Crit W.S. (ft)        *      * Flow Area (sq ft)    * 398.16 * 183.95 * 14.53  *
* E.G. Slope (ft/ft)    * 0.000739 * Area (sq ft)       * 398.16 * 183.95 * 14.53  *
* Q Total (cfs)         * 2313.00 * Flow (cfs)         * 1605.43 * 700.30 * 7.27   *
* Top Width (ft)       * 122.84 * Top Width (ft)     * 92.32  * 21.33  * 9.20   *
* Vel Total (ft/s)     * 3.88  * Avg. Vel. (ft/s)   * 4.03   * 3.81   * 0.50   *
* Max Chl Dpth (ft)    * 12.40 * Hydr. Depth (ft)   * 4.31   * 8.62   * 1.58   *
* Conv. Total (cfs)    * 85102.9 * Conv. (cfs)       * 59069.0 * 25766.2 * 267.7  *
* Length Wtd. (ft)     * 83.86 * Wetted Per. (ft)   * 96.15  * 30.70  * 10.53  *
* Min Ch El (ft)       * 239.33 * Shear (lb/sq ft)   * 0.19   * 0.28   * 0.06   *
* Alpha                 * 1.04  * Stream Power (lb/ft s) * 152.72 * 0.00   * 0.00   *
* Frctn Loss (ft)     * 0.06  * Cum Volume (acre-ft) * 2.77   * 7.64   * 4.14   *
* C & E Loss (ft)     * 0.00  * Cum SA (acres)     * 1.21   * 1.42   * 2.18   *
*****
```

CROSS SECTION

RIVER: hudson

REACH: main RS: 25

INPUT

Description:

Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	255.25	50	250.34	65.47	250.35	81.44	249.54	86.03	247.3
89.33	247.2	89.41	246.92	102.47	247.31	117.22	247.27	131.96	247.57
134.13	247.31	136.41	247.39	137.44	248.18	137.82	248.22	138.14	244.16
138.35	239.92	139.66	239.76	146.05	239.32	146.16	239.32	151.12	239.56
153.23	240.93	160.29	244.16	166.89	247.11	173.09	248.75	184.32	251.72
186.91	252.67	194.32	256.17						

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.02	131.96	.045	137.82	.035	166.89	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 137.82 166.89 29.59 30.248 33.09 .1 .3

Ineffective Flow num= 2
 Sta L Sta R Elev Permanent
 18 68 260 F
 184.35 189.68 265 F

CROSS SECTION OUTPUT Profile #10-YR

```
*****
* E.G. Elev (ft)          * 249.65 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.10  * Wt. n-Val.            * 0.021  * 0.035  * 0.100  *
* W.S. Elev (ft)        * 249.55 * Reach Len. (ft)      * 29.59  * 30.25  * 33.09  *
* Crit W.S. (ft)        * 244.28 * Flow Area (sq ft)    * 121.44 * 225.54 * 11.26  *
* E.G. Slope (ft/ft)    * 0.000386 * Area (sq ft)       * 121.44 * 225.54 * 11.26  *
* Q Total (cfs)         * 890.00 * Flow (cfs)         * 276.47 * 609.86 * 3.67   *
* Top Width (ft)       * 94.88 * Top Width (ft)     * 56.58  * 29.07  * 9.23   *
* Vel Total (ft/s)     * 2.48  * Avg. Vel. (ft/s)   * 2.28   * 2.70   * 0.33   *
* Max Chl Dpth (ft)    * 10.23 * Hydr. Depth (ft)   * 2.15   * 7.76   * 1.22   *
* Conv. Total (cfs)    * 45310.1 * Conv. (cfs)       * 14075.2 * 31048.2 * 186.7  *
* Length Wtd. (ft)     * 30.03 * Wetted Per. (ft)   * 57.61  * 38.63  * 9.54   *
*****
```

```

* Min Ch El (ft)      * 239.32 * Shear (lb/sq ft)      * 0.05 * 0.14 * 0.03 *
* Alpha              * 1.07  * Stream Power (lb/ft s) * 194.32 * 0.00 * 0.00 *
* Frctn Loss (ft)    * 0.01  * Cum Volume (acre-ft)  * 0.63 * 4.17 * 0.92 *
* C & E Loss (ft)    * 0.02  * Cum SA (acres)        * 0.53 * 1.31 * 1.25 *
*****

```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)      * 251.26 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)       * 0.21  * Wt. n-Val.            * 0.021 * 0.035 * 0.100 *
* W.S. Elev (ft)      * 251.05 * Reach Len. (ft)       * 29.59 * 30.25 * 33.09 *
* Crit W.S. (ft)      * 246.67 * Flow Area (sq ft)     * 221.79 * 269.17 * 29.36 *
* E.G. Slope (ft/ft)  * 0.000581 * Area (sq ft)         * 237.22 * 269.17 * 29.36 *
* Q Total (cfs)       * 1825.00 * Flow (cfs)           * 803.84 * 1005.00 * 16.16 *
* Top Width (ft)      * 139.03 * Top Width (ft)       * 95.06 * 29.07 * 14.90 *
* Vel Total (ft/s)    * 3.51  * Avg. Vel. (ft/s)     * 3.62 * 3.73 * 0.55 *
* Max Chl Dpth (ft)   * 11.73 * Hydr. Depth (ft)     * 3.18 * 9.26 * 1.97 *
* Conv. Total (cfs)   * 75707.6 * Conv. (cfs)         * 33346.0 * 41691.2 * 670.4 *
* Length Wtd. (ft)    * 29.94 * Wetted Per. (ft)     * 70.86 * 38.63 * 15.41 *
* Min Ch El (ft)      * 239.32 * Shear (lb/sq ft)     * 0.11 * 0.25 * 0.07 *
* Alpha              * 1.09  * Stream Power (lb/ft s) * 194.32 * 0.00 * 0.00 *
* Frctn Loss (ft)    * 0.02  * Cum Volume (acre-ft) * 1.66 * 6.27 * 3.09 *
* C & E Loss (ft)    * 0.00  * Cum SA (acres)       * 0.94 * 1.37 * 1.81 *
*****

```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)      * 251.91 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)       * 0.27  * Wt. n-Val.            * 0.021 * 0.035 * 0.100 *
* W.S. Elev (ft)      * 251.64 * Reach Len. (ft)       * 29.59 * 30.25 * 33.09 *
* Crit W.S. (ft)      * 248.49 * Flow Area (sq ft)     * 263.18 * 286.40 * 38.86 *
* E.G. Slope (ft/ft)  * 0.000637 * Area (sq ft)         * 295.36 * 286.40 * 38.86 *
* Q Total (cfs)       * 2313.00 * Flow (cfs)           * 1121.19 * 1167.21 * 24.59 *
* Top Width (ft)      * 147.31 * Top Width (ft)       * 101.10 * 29.07 * 17.14 *
* Vel Total (ft/s)    * 3.93  * Avg. Vel. (ft/s)     * 4.26 * 4.08 * 0.63 *
* Max Chl Dpth (ft)   * 12.32 * Hydr. Depth (ft)     * 3.77 * 9.85 * 2.27 *
* Conv. Total (cfs)   * 91618.1 * Conv. (cfs)         * 44410.5 * 46233.4 * 974.1 *
* Length Wtd. (ft)    * 29.91 * Wetted Per. (ft)     * 70.86 * 38.63 * 17.73 *
* Min Ch El (ft)      * 239.32 * Shear (lb/sq ft)     * 0.15 * 0.30 * 0.09 *
* Alpha              * 1.11  * Stream Power (lb/ft s) * 194.32 * 0.00 * 0.00 *
* Frctn Loss (ft)    * 0.02  * Cum Volume (acre-ft) * 2.11 * 7.18 * 4.09 *
* C & E Loss (ft)    * 0.00  * Cum SA (acres)       * 1.03 * 1.38 * 2.15 *
*****

```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main RS: 24

INPUT

Description:

Station Elevation Data		num= 26							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	254.15	60	249.15	72.46	248.78	93.03	247.76	97.13	247.24
109.77	247.72	125.05	247.56	126.78	247.48	128.29	247.42	129	247.97
134.47	248.34	134.6	249.05	135.81	248.92	136.29	242.7	136.51	238.47
137.41	237.99	142.41	237.72	142.42	237.71	147.58	238.1	148.73	238.76
148.9	242.62	149.32	249.18	149.64	249.21	149.95	249.15	171.17	251.7
181.17	253.7								

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.02	129	.045	135.81	.035	149.95	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 135.81 149.32 56.73 43.07 39.13 .1 .3

Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 0 70.7 260 F

Blocked Obstructions num= 1
 Sta L Sta R Elev
 171.7 181.17 260

CROSS SECTION OUTPUT Profile #10-YR

	*	249.62	*	Element	*	Left OB	*	Channel	*	Right OB	*
* E.G. Elev (ft)	*	0.04	*	Wt. n-Val.	*	0.021	*	0.035	*	0.063	*
* Vel Head (ft)	*	249.58	*	Reach Len. (ft)	*	56.73	*	43.07	*	39.13	*
* W.S. Elev (ft)	*	241.28	*	Flow Area (sq ft)	*	110.00	*	148.92	*	1.03	*
* Crit W.S. (ft)	*	0.000220	*	Area (sq ft)	*	117.47	*	148.92	*	1.03	*
* E.G. Slope (ft/ft)	*	420.00	*	Flow (cfs)	*	165.85	*	254.00	*	0.15	*
* Q Total (cfs)	*	98.76	*	Top Width (ft)	*	81.01	*	13.51	*	4.24	*
* Top Width (ft)	*	1.62	*	Avg. Vel. (ft/s)	*	1.51	*	1.71	*	0.14	*
* Vel Total (ft/s)	*	11.87	*	Hydr. Depth (ft)	*	1.69	*	11.02	*	0.24	*
* Max Chl Dpth (ft)	*	28289.2	*	Conv. (cfs)	*	11170.9	*	17108.4	*	9.8	*
* Conv. Total (cfs)	*	45.23	*	Wetted Per. (ft)	*	65.98	*	33.45	*	4.27	*
* Length Wtd. (ft)	*	237.71	*	Shear (lb/sq ft)	*	0.02	*	0.06	*	0.00	*
* Min Ch El (ft)	*	1.02	*	Stream Power (lb/ft s)	*	181.17	*	0.00	*	0.00	*
* Alpha	*	0.03	*	Cum Volume (acre-ft)	*	0.55	*	4.04	*	0.91	*
* Frctn Loss (ft)	*	0.04	*	Cum SA (acres)	*	0.49	*	1.29	*	1.24	*
* C & E Loss (ft)	*		*		*		*		*		*

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

	*	251.24	*	Element	*	Left OB	*	Channel	*	Right OB	*
* E.G. Elev (ft)	*	0.21	*	Wt. n-Val.	*	0.021	*	0.035	*	0.083	*
* Vel Head (ft)	*	251.03	*	Reach Len. (ft)	*	56.73	*	43.07	*	39.13	*
* W.S. Elev (ft)	*	245.18	*	Flow Area (sq ft)	*	204.44	*	168.51	*	15.93	*
* Crit W.S. (ft)	*	0.000672	*	Area (sq ft)	*	247.59	*	168.51	*	15.93	*
* E.G. Slope (ft/ft)	*	1355.00	*	Flow (cfs)	*	802.65	*	545.00	*	7.35	*
* Q Total (cfs)	*	128.23	*	Top Width (ft)	*	98.42	*	13.51	*	16.31	*
* Top Width (ft)	*	3.48	*	Avg. Vel. (ft/s)	*	3.93	*	3.23	*	0.46	*
* Vel Total (ft/s)	*	13.32	*	Hydr. Depth (ft)	*	3.14	*	12.47	*	0.98	*
* Max Chl Dpth (ft)	*	52267.5	*	Conv. (cfs)	*	30961.3	*	21022.6	*	283.6	*
* Conv. Total (cfs)	*	47.00	*	Wetted Per. (ft)	*	65.98	*	33.45	*	16.43	*
* Length Wtd. (ft)	*	237.71	*	Shear (lb/sq ft)	*	0.13	*	0.21	*	0.04	*
* Min Ch El (ft)	*	1.10	*	Stream Power (lb/ft s)	*	181.17	*	0.00	*	0.00	*
* Alpha	*	0.07	*	Cum Volume (acre-ft)	*	1.50	*	6.12	*	3.07	*
* Frctn Loss (ft)	*	0.07	*	Cum SA (acres)	*	0.88	*	1.35	*	1.80	*
* C & E Loss (ft)	*		*		*		*		*		*

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

	*	251.88	*	Element	*	Left OB	*	Channel	*	Right OB	*
* E.G. Elev (ft)	*	0.31	*	Wt. n-Val.	*	0.021	*	0.035	*	0.086	*
* Vel Head (ft)	*	251.57	*	Reach Len. (ft)	*	56.73	*	43.07	*	39.13	*
* W.S. Elev (ft)	*	246.78	*	Flow Area (sq ft)	*	239.41	*	175.77	*	25.89	*
* Crit W.S. (ft)	*	0.000849	*	Area (sq ft)	*	302.19	*	175.77	*	25.89	*
* E.G. Slope (ft/ft)	*	1843.00	*	Flow (cfs)	*	1170.82	*	656.95	*	15.22	*
* Q Total (cfs)	*	139.15	*	Top Width (ft)	*	104.86	*	13.51	*	20.78	*
* Top Width (ft)	*	4.18	*	Avg. Vel. (ft/s)	*	4.89	*	3.74	*	0.59	*
* Vel Total (ft/s)	*	13.86	*	Hydr. Depth (ft)	*	3.68	*	13.01	*	1.25	*
* Max Chl Dpth (ft)	*	63269.9	*	Conv. (cfs)	*	40194.2	*	22553.1	*	522.6	*
* Conv. Total (cfs)	*	47.37	*	Wetted Per. (ft)	*	65.98	*	33.45	*	20.93	*
* Length Wtd. (ft)	*	237.71	*	Shear (lb/sq ft)	*	0.19	*	0.28	*	0.07	*
* Min Ch El (ft)	*	1.16	*	Stream Power (lb/ft s)	*	181.17	*	0.00	*	0.00	*
* Alpha	*		*		*		*		*		*

```

* Frctn Loss (ft)          * 0.08 * Cum Volume (acre-ft) * 1.91 * 7.02 * 4.07 *
* C & E Loss (ft)         * 0.08 * Cum SA (acres) * 0.96 * 1.36 * 2.14 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
REACH: main RS: 23

INPUT

Description:

Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	254.07	15.27	252.06	55.01	251.27	84.23	250.85	85.26	252.54
95.97	251.03	137.5	248.34	155.94	247.85	164.02	247.66	175.66	248.1
191.18	247.93	191.2	247.93	192.2	247.92	193.74	247.81	194.32	247.97
201.36	248.28	223.71	250.13	236.5	251.33	259.04	252.83		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	15.27	.02	201.36	.065

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	137.5	175.66		137.63	144.4	148.07	.1 .3
Ineffective Flow	num= 3						
	Sta L	Sta R	Elev	Permanent			
	41.6	98	260	F			
	98	123.5	260	F			
	236.2	259.04	260	F			

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)          * 249.55 * Element * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.47 * Wt. n-Val. * 0.020 * 0.020 * 0.021 *
* W.S. Elev (ft)         * 249.08 * Reach Len. (ft) * 137.63 * 144.40 * 148.07 *
* Crit W.S. (ft)         * 249.08 * Flow Area (sq ft) * 4.25 * 42.92 * 30.94 *
* E.G. Slope (ft/ft)     * 0.005361 * Area (sq ft) * 4.25 * 42.92 * 30.94 *
* Q Total (cfs)          * 420.00 * Flow (cfs) * 11.93 * 252.44 * 155.63 *
* Top Width (ft)         * 85.01 * Top Width (ft) * 11.46 * 38.16 * 35.39 *
* Vel Total (ft/s)       * 5.38 * Avg. Vel. (ft/s) * 2.81 * 5.88 * 5.03 *
* Max Chl Dpth (ft)      * 1.42 * Hydr. Depth (ft) * 0.37 * 1.12 * 0.87 *
* Conv. Total (cfs)      * 5736.4 * Conv. (cfs) * 162.9 * 3447.9 * 2125.6 *
* Length Wtd. (ft)       * 145.00 * Wetted Per. (ft) * 11.48 * 38.18 * 35.46 *
* Min Ch El (ft)         * 247.66 * Shear (lb/sq ft) * 0.12 * 0.38 * 0.29 *
* Alpha                   * 1.05 * Stream Power (lb/ft s) * 259.04 * 0.00 * 0.00 *
* Frctn Loss (ft)        * 0.03 * Cum Volume (acre-ft) * 0.47 * 3.94 * 0.90 *
* C & E Loss (ft)        * 0.13 * Cum SA (acres) * 0.43 * 1.27 * 1.22 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)          * 251.10 * Element * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.92 * Wt. n-Val. * 0.020 * 0.020 * 0.023 *

```

* W.S. Elev (ft)	* 250.19	* Reach Len. (ft)	* 137.63	* 144.40	* 148.07	*
* Crit W.S. (ft)	* 250.19	* Flow Area (sq ft)	* 19.48	* 85.00	* 77.31	*
* E.G. Slope (ft/ft)	* 0.004629	* Area (sq ft)	* 26.28	* 85.00	* 77.31	*
* Q Total (cfs)	* 1355.00	* Flow (cfs)	* 122.58	* 732.66	* 499.76	*
* Top Width (ft)	* 115.28	* Top Width (ft)	* 28.48	* 38.16	* 48.64	*
* Vel Total (ft/s)	* 7.45	* Avg. Vel. (ft/s)	* 6.29	* 8.62	* 6.46	*
* Max Chl Dpth (ft)	* 2.52	* Hydr. Depth (ft)	* 1.39	* 2.23	* 1.59	*
* Conv. Total (cfs)	* 19915.5	* Conv. (cfs)	* 1801.6	* 10768.6	* 7345.3	*
* Length Wtd. (ft)	* 144.79	* Wetted Per. (ft)	* 14.03	* 38.18	* 48.75	*
* Min Ch El (ft)	* 247.66	* Shear (lb/sq ft)	* 0.40	* 0.64	* 0.46	*
* Alpha	* 1.06	* Stream Power (lb/ft s)	* 259.04	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.10	* Cum Volume (acre-ft)	* 1.32	* 6.00	* 3.03	*
* C & E Loss (ft)	* 0.23	* Cum SA (acres)	* 0.79	* 1.33	* 1.77	*

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 251.73	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 1.11	* Wt. n-Val.	* 0.020	* 0.020	* 0.024	*
* W.S. Elev (ft)	* 250.62	* Reach Len. (ft)	* 137.63	* 144.40	* 148.07	*
* Crit W.S. (ft)	* 250.62	* Flow Area (sq ft)	* 25.51	* 101.44	* 99.24	*
* E.G. Slope (ft/ft)	* 0.004519	* Area (sq ft)	* 39.97	* 101.44	* 99.24	*
* Q Total (cfs)	* 1843.00	* Flow (cfs)	* 189.83	* 971.91	* 681.27	*
* Top Width (ft)	* 126.52	* Top Width (ft)	* 35.13	* 38.16	* 53.23	*
* Vel Total (ft/s)	* 8.15	* Avg. Vel. (ft/s)	* 7.44	* 9.58	* 6.86	*
* Max Chl Dpth (ft)	* 2.96	* Hydr. Depth (ft)	* 1.82	* 2.66	* 1.86	*
* Conv. Total (cfs)	* 27415.2	* Conv. (cfs)	* 2823.7	* 14457.4	* 10134.1	*
* Length Wtd. (ft)	* 144.77	* Wetted Per. (ft)	* 14.03	* 38.18	* 53.36	*
* Min Ch El (ft)	* 247.66	* Shear (lb/sq ft)	* 0.51	* 0.75	* 0.52	*
* Alpha	* 1.08	* Stream Power (lb/ft s)	* 259.04	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.12	* Cum Volume (acre-ft)	* 1.69	* 6.88	* 4.01	*
* C & E Loss (ft)	* 0.27	* Cum SA (acres)	* 0.86	* 1.34	* 2.11	*

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main

RS: 22

INPUT

Description:

Station Elevation Data num= 19

Proposed (Concepts 1-7) Conditions HEC-RAS Output

High Flows Model

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	250.46	10	248.96	38.8	247.46	41.23	247.16	67.56	245.11
69.74	244.24	88.51	243.41	131.51	242.21	173.95	244.31	187.66	245.29
205	246.52	209.72	246.55	227.37	247.13	246.92	246.89	248.31	246.92
249.03	247.41	256.37	249.28	259.86	252.92	263.46	253.75		

Manning's n Values num= 2
 Sta n Val Sta n Val
 0 .02 249.03 .065

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 69.74 173.95 64.31 54.94 42.91 .1 .3
 Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 69.74 105 255 F
 Blocked Obstructions num= 1
 Sta L Sta R Elev
 10 38.8 260

CROSS SECTION OUTPUT Profile #10-YR
 * E.G. Elev (ft) * 246.80 * Element * Left OB * Channel * Right OB *
 * Vel Head (ft) * 0.03 * Wt. n-Val. * 0.020 * 0.020 * 0.020 *
 * W.S. Elev (ft) * 246.77 * Reach Len. (ft) * 64.31 * 54.94 * 42.91 *
 * Crit W.S. (ft) * 244.00 * Flow Area (sq ft) * 22.27 * 260.07 * 43.87 *
 * E.G. Slope (ft/ft) * 0.000066 * Area (sq ft) * 22.27 * 374.56 * 43.87 *
 * Q Total (cfs) * 420.00 * Flow (cfs) * 12.88 * 380.10 * 27.02 *
 * Top Width (ft) * 170.19 * Top Width (ft) * 23.51 * 104.21 * 42.47 *
 * Vel Total (ft/s) * 1.29 * Avg. Vel. (ft/s) * 0.58 * 1.46 * 0.62 *
 * Max Chl Dpth (ft) * 4.56 * Hydr. Depth (ft) * 0.95 * 3.77 * 1.03 *
 * Conv. Total (cfs) * 51701.6 * Conv. (cfs) * 1585.8 * 46790.1 * 3325.7 *
 * Length Wtd. (ft) * 54.45 * Wetted Per. (ft) * 23.74 * 69.01 * 42.56 *
 * Min Ch El (ft) * 242.21 * Shear (lb/sq ft) * 0.00 * 0.02 * 0.00 *
 * Alpha * 1.19 * Stream Power (lb/ft s) * 263.46 * 0.00 * 0.00 *
 * Frctn Loss (ft) * 0.00 * Cum Volume (acre-ft) * 0.43 * 3.25 * 0.77 *
 * C & E Loss (ft) * 0.00 * Cum SA (acres) * 0.37 * 1.03 * 1.09 *

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR
 * E.G. Elev (ft) * 247.89 * Element * Left OB * Channel * Right OB *
 * Vel Head (ft) * 0.15 * Wt. n-Val. * 0.020 * 0.020 * 0.020 *
 * W.S. Elev (ft) * 247.73 * Reach Len. (ft) * 64.31 * 54.94 * 42.91 *
 * Crit W.S. (ft) * 245.33 * Flow Area (sq ft) * 49.79 * 326.49 * 109.28 *
 * E.G. Slope (ft/ft) * 0.000262 * Area (sq ft) * 49.79 * 474.95 * 109.28 *
 * Q Total (cfs) * 1355.00 * Flow (cfs) * 81.24 * 1105.93 * 167.82 *
 * Top Width (ft) * 211.50 * Top Width (ft) * 30.94 * 104.21 * 76.35 *
 * Vel Total (ft/s) * 2.79 * Avg. Vel. (ft/s) * 1.63 * 3.39 * 1.54 *
 * Max Chl Dpth (ft) * 5.52 * Hydr. Depth (ft) * 1.61 * 4.74 * 1.43 *
 * Conv. Total (cfs) * 83754.1 * Conv. (cfs) * 5021.8 * 68358.9 * 10373.4 *
 * Length Wtd. (ft) * 54.05 * Wetted Per. (ft) * 31.48 * 69.01 * 76.63 *
 * Min Ch El (ft) * 242.21 * Shear (lb/sq ft) * 0.03 * 0.08 * 0.02 *
 * Alpha * 1.26 * Stream Power (lb/ft s) * 263.46 * 0.00 * 0.00 *
 * Frctn Loss (ft) * 0.02 * Cum Volume (acre-ft) * 1.20 * 5.07 * 2.71 *
 * C & E Loss (ft) * 0.00 * Cum SA (acres) * 0.70 * 1.09 * 1.56 *

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR
 * E.G. Elev (ft) * 248.30 * Element * Left OB * Channel * Right OB *
 * Vel Head (ft) * 0.22 * Wt. n-Val. * 0.020 * 0.020 * 0.020 *
 * W.S. Elev (ft) * 248.08 * Reach Len. (ft) * 64.31 * 54.94 * 42.91 *
 * Crit W.S. (ft) * 245.88 * Flow Area (sq ft) * 60.63 * 350.65 * 136.27 *
 * E.G. Slope (ft/ft) * 0.000348 * Area (sq ft) * 60.63 * 511.46 * 136.27 *
 * Q Total (cfs) * 1843.00 * Flow (cfs) * 129.13 * 1436.33 * 277.54 *
 * Top Width (ft) * 212.88 * Top Width (ft) * 30.94 * 104.21 * 77.73 *
 * Vel Total (ft/s) * 3.37 * Avg. Vel. (ft/s) * 2.13 * 4.10 * 2.04 *
 * Max Chl Dpth (ft) * 5.87 * Hydr. Depth (ft) * 1.96 * 5.09 * 1.75 *
 * Conv. Total (cfs) * 98795.3 * Conv. (cfs) * 6922.1 * 76995.4 * 14877.8 *
 * Length Wtd. (ft) * 53.81 * Wetted Per. (ft) * 31.83 * 69.01 * 78.05 *

```

* Min Ch El (ft)      * 242.21 * Shear (lb/sq ft)      * 0.04 * 0.11 * 0.04 *
* Alpha              * 1.24  * Stream Power (lb/ft s) * 263.46 * 0.00 * 0.00 *
* Frctn Loss (ft)    * 0.02  * Cum Volume (acre-ft)   * 1.53 * 5.87 * 3.61 *
* C & E Loss (ft)    * 0.00  * Cum SA (acres)         * 0.76 * 1.10 * 1.88 *
*****

```

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
REACH: main RS: 21

INPUT

Description:

```

Station Elevation Data      num=      27
  Sta      Elev      Sta      Elev      Sta      Elev      Sta      Elev      Sta      Elev
*****
    0      249.42    10.57    248.36    13.32    247.71    16.3     247.83    26.72    247.43
   78.36    244.83    131.7     244.06    176.63    243.25    179.14    242.74    180.46    242.71
  182.19    243.5     198.52    244.18    198.53    244.18    202.29    244.34    234.93    246.54
  235.11    246.71    238.89    246.66    238.97    246.53    256.85    247.09    273.74    246.59
  275.05    246.55    275.75    247.11    280.06    248.2     280.44    251.57    281.22    251.84
  281.48    252.03    288.6     253.57

```

```

Manning's n Values      num=      2
  Sta      n Val      Sta      n Val
*****
    0      .02     275.05    .065

```

```

Bank Sta: Left      Right      Lengths: Left Channel      Right      Coeff Contr.      Expan.
          131.7    198.53                58.42    63.24    66.37                .1        .3
Ineffective Flow      num=      3
  Sta L      Sta R      Elev      Permanent
    21.5     35.5     260        F
    81      93.3     260        F
    93.3     131     260        F

```

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)      * 246.80 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.04  * Wt. n-Val.           * 0.020  * 0.020  * 0.020  *
* W.S. Elev (ft)      * 246.76 * Reach Len. (ft)      * 58.42  * 63.24  * 66.37  *
* Crit W.S. (ft)      * 244.72 * Flow Area (sq ft)    * 44.04  * 208.34 * 54.43  *
* E.G. Slope (ft/ft)  * 0.000107 * Area (sq ft)        * 160.50 * 208.34 * 54.43  *
* Q Total (cfs)       * 420.00 * Flow (cfs)           * 35.04  * 340.47 * 44.49  *
* Top Width (ft)     * 213.63 * Top Width (ft)       * 91.68  * 66.83  * 55.12  *
* Vel Total (ft/s)    * 1.37  * Avg. Vel. (ft/s)     * 0.80   * 1.63   * 0.82   *
* Max Chl Dpth (ft)   * 4.05  * Hydr. Depth (ft)     * 1.06   * 3.12   * 0.99   *
* Conv. Total (cfs)   * 40648.1 * Conv. (cfs)          * 3391.2 * 32950.7 * 4306.3 *
* Length Wtd. (ft)    * 63.50 * Wetted Per. (ft)     * 41.73  * 67.07  * 55.42  *
* Min Ch El (ft)     * 242.71 * Shear (lb/sq ft)     * 0.01   * 0.02   * 0.01   *
* Alpha              * 1.22  * Stream Power (lb/ft s) * 288.60 * 0.00   * 0.00   *
* Frctn Loss (ft)    * 0.02  * Cum Volume (acre-ft) * 0.29   * 2.88   * 0.72   *
* C & E Loss (ft)    * 0.03  * Cum SA (acres)       * 0.29   * 0.92   * 1.04   *
*****

```

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)      * 247.87 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.15  * Wt. n-Val.           * 0.020  * 0.020  * 0.020  *
* W.S. Elev (ft)      * 247.72 * Reach Len. (ft)      * 58.42  * 63.24  * 66.37  *
* Crit W.S. (ft)      * 245.94 * Flow Area (sq ft)    * 88.03  * 272.57 * 125.74 *
* E.G. Slope (ft/ft)  * 0.000335 * Area (sq ft)        * 258.05 * 272.57 * 125.74 *
* Q Total (cfs)       * 1355.00 * Flow (cfs)           * 177.77 * 943.63 * 233.59 *
* Top Width (ft)     * 259.37 * Top Width (ft)       * 112.90 * 66.83  * 79.64  *
* Vel Total (ft/s)    * 2.79  * Avg. Vel. (ft/s)     * 2.02   * 3.46   * 1.86   *
* Max Chl Dpth (ft)   * 5.01  * Hydr. Depth (ft)     * 1.80   * 4.08   * 1.58   *
* Conv. Total (cfs)   * 74049.3 * Conv. (cfs)          * 9715.1 * 51568.5 * 12765.7 *
* Length Wtd. (ft)    * 63.49 * Wetted Per. (ft)     * 48.96  * 67.07  * 80.15  *
* Min Ch El (ft)     * 242.71 * Shear (lb/sq ft)     * 0.04   * 0.08   * 0.03   *

```



```

* Alpha * 1.22 * Stream Power (lb/ft s) * 288.60 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.05 * Cum Volume (acre-ft) * 0.97 * 4.60 * 2.60 *
* C & E Loss (ft) * 0.04 * Cum SA (acres) * 0.59 * 0.98 * 1.48 *
*****

```

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft) * 248.28 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.21 * Wt. n-Val. * 0.020 * 0.020 * 0.020 *
* W.S. Elev (ft) * 248.07 * Reach Len. (ft) * 58.42 * 63.24 * 66.37 *
* Crit W.S. (ft) * 246.38 * Flow Area (sq ft) * 107.06 * 295.98 * 153.89 *
* E.G. Slope (ft/ft) *0.000428 * Area (sq ft) * 299.51 * 295.98 * 153.89 *
* Q Total (cfs) * 1843.00 * Flow (cfs) * 253.40 * 1223.67 * 365.94 *
* Top Width (ft) * 267.76 * Top Width (ft) * 119.91 * 66.83 * 81.02 *
* Vel Total (ft/s) * 3.31 * Avg. Vel. (ft/s) * 2.37 * 4.13 * 2.38 *
* Max Chl Dpth (ft) * 5.36 * Hydr. Depth (ft) * 1.91 * 4.43 * 1.90 *
* Conv. Total (cfs) * 89104.3 * Conv. (cfs) * 12251.1 * 59161.0 * 17692.2 *
* Length Wtd. (ft) * 63.47 * Wetted Per. (ft) * 56.01 * 67.07 * 81.57 *
* Min Ch El (ft) * 242.71 * Shear (lb/sq ft) * 0.05 * 0.12 * 0.05 *
* Alpha * 1.21 * Stream Power (lb/ft s) * 288.60 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.07 * Cum Volume (acre-ft) * 1.26 * 5.36 * 3.47 *
* C & E Loss (ft) * 0.05 * Cum SA (acres) * 0.65 * 0.99 * 1.80 *
*****

```

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main

RS: 20

INPUT

Description:

```

Station Elevation Data num= 19
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
*****
0 250.1 27.97 246.72 66.05 246.66 146.74 246.48 188.12 244.94
205.56 245.09 206.64 245.08 207.66 245.42 207.74 245.42 240.48 246.54
266.2 246.35 270.04 246.11 270.1 245.88 288 246.13 304.71 245.49
306.15 245.36 306.76 245.54 311.69 246.58 322.54 252.8

```

Manning's n Values

num= 4

```

Sta n Val Sta n Val Sta n Val Sta n Val
*****
0 .02 207.66 .045 266.2 .02 306.76 .065

```

```

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
146.74 240.48 50.4 50.32 50 .1 .3

```

```

Ineffective Flow num= 1
Sta L Sta R Elev Permanent
239.6 255.3 260 F

```

```

Blocked Obstructions num= 1
Sta L Sta R Elev
*****
66 146.7 260

```

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft) * 246.75 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.31 * Wt. n-Val. * 0.022 * 0.022 * 0.021 *
* W.S. Elev (ft) * 246.43 * Reach Len. (ft) * 50.40 * 50.32 * 50.00 *
* Crit W.S. (ft) * 246.43 * Flow Area (sq ft) * 72.41 * 72.41 * 23.28 *
* E.G. Slope (ft/ft) *0.005865 * Area (sq ft) * 72.41 * 72.41 * 23.28 *
* Q Total (cfs) * 420.00 * Flow (cfs) * 341.66 * 341.66 * 78.34 *
* Top Width (ft) * 145.35 * Top Width (ft) * 89.34 * 89.34 * 56.01 *
* Vel Total (ft/s) * 4.39 * Avg. Vel. (ft/s) * 4.72 * 4.72 * 3.37 *
* Max Chl Dpth (ft) * 1.49 * Hydr. Depth (ft) * 0.81 * 0.81 * 0.42 *
* Conv. Total (cfs) * 5484.1 * Conv. (cfs) * 4461.2 * 4461.2 * 1022.8 *
* Length Wtd. (ft) * 50.20 * Wetted Per. (ft) * 89.44 * 89.44 * 56.02 *

```

```

* Min Ch El (ft)      * 244.94 * Shear (lb/sq ft)      *      * 0.30 * 0.15 *
* Alpha              * 1.05  * Stream Power (lb/ft s) * 322.54 * 0.00 * 0.00 *
* Frctn Loss (ft)    * 0.34  * Cum Volume (acre-ft)  * 0.19  * 2.68 * 0.66 *
* C & E Loss (ft)    * 0.00  * Cum SA (acres)        * 0.23  * 0.81 * 0.96 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)      * 247.77 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.58  * Wt. n-Val.             * 0.020  * 0.023  * 0.022  *
* W.S. Elev (ft)     * 247.19 * Reach Len. (ft)        * 50.40  * 50.32  * 50.00  *
* Crit W.S. (ft)     * 247.19 * Flow Area (sq ft)      * 19.83  * 142.31 * 66.07  *
* E.G. Slope (ft/ft) * 0.005606 * Area (sq ft)          * 19.83  * 142.89 * 76.46  *
* Q Total (cfs)      * 1355.00 * Flow (cfs)            * 66.25  * 925.96 * 362.80 *
* Top Width (ft)     * 207.94 * Top Width (ft)         * 41.93  * 93.74  * 72.27  *
* Vel Total (ft/s)   * 5.94  * Avg. Vel. (ft/s)      * 3.34   * 6.51   * 5.49   *
* Max Chl Dpth (ft)  * 2.25  * Hydr. Depth (ft)      * 0.47   * 1.53   * 1.15   *
* Conv. Total (cfs)  * 18097.9 * Conv. (cfs)           * 884.8  * 12367.4 * 4845.7 *
* Length Wtd. (ft)   * 50.20 * Wetted Per. (ft)      * 43.20  * 92.96  * 57.95  *
* Min Ch El (ft)     * 244.94 * Shear (lb/sq ft)      * 0.16   * 0.54   * 0.40   *
* Alpha              * 1.07  * Stream Power (lb/ft s) * 322.54 * 0.00   * 0.00   *
* Frctn Loss (ft)    * 0.29  * Cum Volume (acre-ft)  * 0.79   * 4.29   * 2.44   *
* C & E Loss (ft)    * 0.01  * Cum SA (acres)        * 0.49   * 0.87   * 1.36   *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)      * 248.16 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.70  * Wt. n-Val.             * 0.020  * 0.023  * 0.023  *
* W.S. Elev (ft)     * 247.46 * Reach Len. (ft)        * 50.40  * 50.32  * 50.00  *
* Crit W.S. (ft)     * 247.46 * Flow Area (sq ft)      * 31.80  * 168.12 * 82.10  *
* E.G. Slope (ft/ft) * 0.005530 * Area (sq ft)          * 31.80  * 168.94 * 96.62  *
* Q Total (cfs)      * 1843.00 * Flow (cfs)            * 139.03 * 1197.55 * 506.42 *
* Top Width (ft)     * 210.73 * Top Width (ft)         * 44.23  * 93.74  * 72.75  *
* Vel Total (ft/s)   * 6.54  * Avg. Vel. (ft/s)      * 4.37   * 7.12   * 6.17   *
* Max Chl Dpth (ft)  * 2.52  * Hydr. Depth (ft)      * 0.72   * 1.81   * 1.42   *
* Conv. Total (cfs)  * 24784.4 * Conv. (cfs)           * 1869.6 * 16104.5 * 6810.3 *
* Length Wtd. (ft)   * 50.21 * Wetted Per. (ft)      * 46.07  * 92.96  * 58.51  *
* Min Ch El (ft)     * 244.94 * Shear (lb/sq ft)      * 0.24   * 0.62   * 0.48   *
* Alpha              * 1.05  * Stream Power (lb/ft s) * 322.54 * 0.00   * 0.00   *
* Frctn Loss (ft)    * 0.29  * Cum Volume (acre-ft)  * 1.04   * 5.02   * 3.28   *
* C & E Loss (ft)    * 0.00  * Cum SA (acres)        * 0.54   * 0.88   * 1.69   *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

RIVER: hudson
REACH: main RS: 19

INPUT

Description:

Station Elevation Data		num= 23							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	249.17	10.14	247.21	40.08	245.78	63.51	245.96	144.43	245.9
152.09	245.89	186.64	245.23	206.02	245.14	207.02	245.12	208.03	245.52
210.09	245.43	210.11	245.43	237.84	244.21	277.45	244.92	281.37	244.84
281.48	244.67	299.96	244.83	317.01	244.17	318.45	244.1	319.17	244.64
322.71	245.07	324.29	246.01	334.19	254.28				

Manning's n Values		num= 4					
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.02	208.03	.045	277.45	.02	319.17	.065

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	208.03	277.45		54.63	54.11	54.18	.1 .3

Blocked Obstructions			num= 1
Sta L	Sta R	Elev	
63.5	144.4	260	

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 246.12	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.87	* Wt. n-Val.	* 0.020	* 0.045	* 0.021
* W.S. Elev (ft)	* 245.25	* Reach Len. (ft)	* 54.63	* 54.11	* 54.18
* Crit W.S. (ft)	* 245.54	* Flow Area (sq ft)	* 1.51	* 39.72	* 27.41
* E.G. Slope (ft/ft)	* 0.030723	* Area (sq ft)	* 1.51	* 39.72	* 27.41
* Q Total (cfs)	* 420.00	* Flow (cfs)	* 3.31	* 168.35	* 248.34
* Top Width (ft)	* 130.94	* Top Width (ft)	* 22.01	* 63.35	* 45.57
* Vel Total (ft/s)	* 6.12	* Avg. Vel. (ft/s)	* 2.18	* 4.24	* 9.06
* Max Chl Dpth (ft)	* 1.15	* Hydr. Depth (ft)	* 0.07	* 0.63	* 0.60
* Conv. Total (cfs)	* 2396.2	* Conv. (cfs)	* 18.9	* 960.5	* 1416.8
* Length Wtd. (ft)	* 54.13	* Wetted Per. (ft)	* 22.04	* 63.38	* 45.94
* Min Ch El (ft)	* 244.21	* Shear (lb/sq ft)	* 0.13	* 1.20	* 1.14
* Alpha	* 1.49	* Stream Power (lb/ft s)	* 334.19	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.57	* Cum Volume (acre-ft)	* 0.18	* 2.61	* 0.63
* C & E Loss (ft)	* 0.06	* Cum SA (acres)	* 0.21	* 0.72	* 0.90

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.
Note: Program found supercritical flow starting at this cross section.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 247.23	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 1.27	* Wt. n-Val.	* 0.020	* 0.045	* 0.021
* W.S. Elev (ft)	* 245.96	* Reach Len. (ft)	* 54.63	* 54.11	* 54.18
* Crit W.S. (ft)	* 246.34	* Flow Area (sq ft)	* 33.71	* 88.22	* 60.20
* E.G. Slope (ft/ft)	* 0.018491	* Area (sq ft)	* 33.71	* 88.22	* 60.20
* Q Total (cfs)	* 1355.00	* Flow (cfs)	* 200.36	* 464.57	* 690.07
* Top Width (ft)	* 207.11	* Top Width (ft)	* 90.92	* 69.42	* 46.76
* Vel Total (ft/s)	* 7.44	* Avg. Vel. (ft/s)	* 5.94	* 5.27	* 11.46
* Max Chl Dpth (ft)	* 1.86	* Hydr. Depth (ft)	* 0.37	* 1.27	* 1.29
* Conv. Total (cfs)	* 9964.7	* Conv. (cfs)	* 1473.4	* 3416.5	* 5074.8
* Length Wtd. (ft)	* 54.17	* Wetted Per. (ft)	* 91.08	* 69.46	* 47.32
* Min Ch El (ft)	* 244.21	* Shear (lb/sq ft)	* 0.43	* 1.47	* 1.47
* Alpha	* 1.48	* Stream Power (lb/ft s)	* 334.19	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.47	* Cum Volume (acre-ft)	* 0.76	* 4.16	* 2.37
* C & E Loss (ft)	* 0.07	* Cum SA (acres)	* 0.41	* 0.77	* 1.29

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.
 Note: Program found supercritical flow starting at this cross section.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```
*****
* E.G. Elev (ft)      * 247.63 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.45  * Wt. n-Val.      * 0.020  * 0.045  * 0.021  *
* W.S. Elev (ft)     * 246.18 * Reach Len. (ft) * 54.63  * 54.11  * 54.18  *
* Crit W.S. (ft)     * 246.60 * Flow Area (sq ft) * 53.54  * 102.99 * 70.18  *
* E.G. Slope (ft/ft) * 0.017786 * Area (sq ft)    * 53.54  * 102.99 * 70.18  *
* Q Total (cfs)      * 1843.00 * Flow (cfs)      * 385.65 * 589.80 * 867.55 *
* Top Width (ft)     * 211.84 * Top Width (ft)  * 95.38  * 69.42  * 47.04  *
* Vel Total (ft/s)   * 8.13  * Avg. Vel. (ft/s) * 7.20   * 5.73   * 12.36  *
* Max Chl Dpth (ft)  * 2.08  * Hydr. Depth (ft) * 0.56   * 1.48   * 1.49   *
* Conv. Total (cfs)  * 13819.4 * Conv. (cfs)     * 2891.8 * 4422.5 * 6505.2 *
* Length Wtd. (ft)  * 54.19 * Wetted Per. (ft) * 95.97  * 69.46  * 47.67  *
* Min Ch El (ft)    * 244.21 * Shear (lb/sq ft) * 0.62   * 1.65   * 1.63   *
* Alpha             * 1.41  * Stream Power (lb/ft s) * 334.19 * 0.00   * 0.00   *
* Frctn Loss (ft)   * 0.46  * Cum Volume (acre-ft) * 0.99   * 4.86   * 3.18   *
* C & E Loss (ft)   * 0.08  * Cum SA (acres)   * 0.46   * 0.78   * 1.62   *
*****
```

Warning: Divided flow computed for this cross-section.
 Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.
 Note: Program found supercritical flow starting at this cross section.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
 REACH: main RS: 18

INPUT

Description:

Station Elevation Data num= 31

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	246.82	32.11	245.59	51.75	245.87	132.72	245.92	152.37	245.71
172.73	245.31	190.25	244.44	196.83	244.75	197.88	244.81	198.85	245.1
203.97	244.42	212.3	243.32	216.07	241.33	218.3	240.17	224.65	239.93
227.6	240.96	258.5	240.69	271.3	241.06	279.1	241.91	279.34	243.72
281.3	243.82	281.39	243.65	285.08	243.75	289.1	243.99	289.2	243.77
307.48	244.13	323.92	243.45	325.33	243.32	325.82	243.89	331.71	243.83
339.55	248.25								

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.02	198.85	.045	285.08	.02	325.82	.065

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 216.07 271.3 42.13 39.37 34.94 .1 .3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
51.7	132.7	260

CROSS SECTION OUTPUT Profile #10-YR

```
*****
* E.G. Elev (ft)      * 243.01 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.53  * Wt. n-Val.      * 0.045  * 0.045  * 0.045  *
* W.S. Elev (ft)     * 241.48 * Reach Len. (ft) * 42.13  * 39.37  * 34.94  *
* Crit W.S. (ft)     * 241.94 * Flow Area (sq ft) * 0.02   * 41.78  * 0.81   *
* E.G. Slope (ft/ft) * 0.133715 * Area (sq ft)    * 0.02   * 41.78  * 0.81   *
* Q Total (cfs)      * 420.00 * Flow (cfs)      * 0.04   * 416.50 * 3.45   *
* Top Width (ft)     * 59.38 * Top Width (ft)  * 0.29   * 55.23  * 3.86   *
* Vel Total (ft/s)   * 9.86  * Avg. Vel. (ft/s) * 1.98   * 9.97   * 4.25   *
* Max Chl Dpth (ft)  * 1.55  * Hydr. Depth (ft) * 0.08   * 0.76   * 0.21   *
* Conv. Total (cfs)  * 1148.6 * Conv. (cfs)     * 0.1    * 1139.0 * 9.4    *
* Length Wtd. (ft)  * 39.35 * Wetted Per. (ft) * 0.32   * 55.70  * 3.88   *
* Min Ch El (ft)    * 239.93 * Shear (lb/sq ft) * 0.56   * 6.26   * 1.75   *
* Alpha             * 1.02  * Stream Power (lb/ft s) * 339.55 * 0.00   * 0.00   *
* Frctn Loss (ft)   * 3.04  * Cum Volume (acre-ft) * 0.18   * 2.56   * 0.62   *
*****
```

* C & E Loss (ft) * 0.07 * Cum SA (acres) * 0.20 * 0.65 * 0.87 *

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
 This may indicate the need for additional cross sections.
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-YR

 * E.G. Elev (ft) * 245.22 * Element * Left OB * Channel * Right OB *
 * Vel Head (ft) * 2.79 * Wt. n-Val. * 0.045 * 0.045 * 0.045 *
 * W.S. Elev (ft) * 242.43 * Reach Len. (ft) * 42.13 * 39.37 * 34.94 *
 * Crit W.S. (ft) * 243.25 * Flow Area (sq ft) * 1.15 * 94.20 * 7.39 *
 * E.G. Slope (ft/ft) * 0.084426 * Area (sq ft) * 1.15 * 94.20 * 7.39 *
 * Q Total (cfs) * 1355.00 * Flow (cfs) * 6.80 * 1282.99 * 65.21 *
 * Top Width (ft) * 65.18 * Top Width (ft) * 2.08 * 55.23 * 7.87 *
 * Vel Total (ft/s) * 13.19 * Avg. Vel. (ft/s) * 5.93 * 13.62 * 8.83 *
 * Max Chl Dpth (ft) * 2.50 * Hydr. Depth (ft) * 0.55 * 1.71 * 0.94 *
 * Conv. Total (cfs) * 4663.4 * Conv. (cfs) * 23.4 * 4415.5 * 224.4 *
 * Length Wtd. (ft) * 39.27 * Wetted Per. (ft) * 2.36 * 55.70 * 8.37 *
 * Min Ch El (ft) * 239.93 * Shear (lb/sq ft) * 2.56 * 8.91 * 4.65 *
 * Alpha * 1.03 * Stream Power (lb/ft s) * 339.55 * 0.00 * 0.00 *
 * Frctn Loss (ft) * 1.86 * Cum Volume (acre-ft) * 0.73 * 4.05 * 2.32 *
 * C & E Loss (ft) * 0.15 * Cum SA (acres) * 0.35 * 0.69 * 1.26 *

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
 This may indicate the need for additional cross sections.
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-YR

 * E.G. Elev (ft) * 245.85 * Element * Left OB * Channel * Right OB *
 * Vel Head (ft) * 2.90 * Wt. n-Val. * 0.045 * 0.045 * 0.045 *
 * W.S. Elev (ft) * 242.95 * Reach Len. (ft) * 42.13 * 39.37 * 34.94 *
 * Crit W.S. (ft) * 244.27 * Flow Area (sq ft) * 2.50 * 123.11 * 11.52 *
 * E.G. Slope (ft/ft) * 0.061758 * Area (sq ft) * 2.50 * 123.11 * 11.52 *
 * Q Total (cfs) * 1843.00 * Flow (cfs) * 16.42 * 1714.22 * 112.36 *
 * Top Width (ft) * 66.24 * Top Width (ft) * 3.08 * 55.23 * 7.94 *
 * Vel Total (ft/s) * 13.44 * Avg. Vel. (ft/s) * 6.58 * 13.92 * 9.75 *
 * Max Chl Dpth (ft) * 3.02 * Hydr. Depth (ft) * 0.81 * 2.23 * 1.45 *
 * Conv. Total (cfs) * 7416.1 * Conv. (cfs) * 66.1 * 6897.9 * 452.1 *
 * Length Wtd. (ft) * 39.25 * Wetted Per. (ft) * 3.48 * 55.70 * 8.90 *
 * Min Ch El (ft) * 239.93 * Shear (lb/sq ft) * 2.77 * 8.52 * 4.99 *
 * Alpha * 1.03 * Stream Power (lb/ft s) * 339.55 * 0.00 * 0.00 *
 * Frctn Loss (ft) * 1.63 * Cum Volume (acre-ft) * 0.96 * 4.72 * 3.13 *
 * C & E Loss (ft) * 0.14 * Cum SA (acres) * 0.40 * 0.70 * 1.58 *

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
 This may indicate the need for additional cross sections.
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: hudson
 REACH: main RS: 17

INPUT

Description:

Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	252.24	12.81	247.24	56.13	245.07	104.92	245.75	151.7	245.72
168.34	245.52	192.81	244.77	207.92	244	215.57	244.35	216.66	244.41

217.68	244.68	225.05	242.81	225.06	242.81	238.84	239.3	254.52	235.88
289.73	236.34	309.99	238.95	310.85	243.86	311.68	243.91	311.94	243.91
318.01	243.69	321.94	243.72	322.08	243.45	340.96	243.87	357.56	243.17
359.08	243.09	359.79	243.66	369.5	244.6	379.14	250.3		

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.02	217.68	.045	321.94	.02	359.79	.065

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

238.84	309.99	35.27	34.43	33.28	.1	.3
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Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
79.3	143.2	255	F

CROSS SECTION OUTPUT Profile #10-YR

```
*****
* E.G. Elev (ft) * 238.60 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 1.42 * Wt. n-Val. * * 0.045 * *
* W.S. Elev (ft) * 237.17 * Reach Len. (ft) * 35.27 * 34.43 * 33.28 *
* Crit W.S. (ft) * 237.62 * Flow Area (sq ft) * * 43.86 * *
* E.G. Slope (ft/ft) * 0.094287 * Area (sq ft) * * 43.86 * *
* Q Total (cfs) * 420.00 * Flow (cfs) * * 420.00 * *
* Top Width (ft) * 47.58 * Top Width (ft) * * 47.58 * *
* Vel Total (ft/s) * 9.58 * Avg. Vel. (ft/s) * * 9.58 * *
* Max Chl Dpth (ft) * 1.29 * Hydr. Depth (ft) * * 0.92 * *
* Conv. Total (cfs) * 1367.8 * Conv. (cfs) * * 1367.8 * *
* Length Wtd. (ft) * 34.43 * Wetted Per. (ft) * * 47.77 * *
* Min Ch El (ft) * 235.88 * Shear (lb/sq ft) * * 5.40 * *
* Alpha * 1.00 * Stream Power (lb/ft s) * 379.14 * 0.00 * 0.00 *
* Frctn Loss (ft) * 4.39 * Cum Volume (acre-ft) * 0.18 * 2.52 * 0.62 *
* C & E Loss (ft) * 0.03 * Cum SA (acres) * 0.20 * 0.60 * 0.87 *
*****
```

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```
*****
* E.G. Elev (ft) * 241.42 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 3.33 * Wt. n-Val. * * 0.045 * *
* W.S. Elev (ft) * 238.08 * Reach Len. (ft) * 35.27 * 34.43 * 33.28 *
* Crit W.S. (ft) * 239.11 * Flow Area (sq ft) * * 92.48 * *
* E.G. Slope (ft/ft) * 0.108646 * Area (sq ft) * * 92.48 * *
* Q Total (cfs) * 1355.00 * Flow (cfs) * * 1355.00 * *
* Top Width (ft) * 58.86 * Top Width (ft) * * 58.86 * *
* Vel Total (ft/s) * 14.65 * Avg. Vel. (ft/s) * * 14.65 * *
* Max Chl Dpth (ft) * 2.20 * Hydr. Depth (ft) * * 1.57 * *
* Conv. Total (cfs) * 4110.9 * Conv. (cfs) * * 4110.9 * *
* Length Wtd. (ft) * 34.43 * Wetted Per. (ft) * * 59.21 * *
* Min Ch El (ft) * 235.88 * Shear (lb/sq ft) * * 10.59 * *
* Alpha * 1.00 * Stream Power (lb/ft s) * 379.14 * 0.00 * 0.00 *
* Frctn Loss (ft) * 3.75 * Cum Volume (acre-ft) * 0.73 * 3.96 * 2.32 *
* C & E Loss (ft) * 0.05 * Cum SA (acres) * 0.35 * 0.64 * 1.26 *
*****
```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```
*****
* E.G. Elev (ft) * 242.53 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 4.11 * Wt. n-Val. * * 0.045 * *
* W.S. Elev (ft) * 238.43 * Reach Len. (ft) * 35.27 * 34.43 * 33.28 *
* Crit W.S. (ft) * 239.63 * Flow Area (sq ft) * * 113.31 * *
* E.G. Slope (ft/ft) * 0.112094 * Area (sq ft) * * 113.31 * *
* Q Total (cfs) * 1843.00 * Flow (cfs) * * 1843.00 * *
* Top Width (ft) * 63.08 * Top Width (ft) * * 63.08 * *
* Vel Total (ft/s) * 16.27 * Avg. Vel. (ft/s) * * 16.27 * *
* Max Chl Dpth (ft) * 2.55 * Hydr. Depth (ft) * * 1.80 * *
* Conv. Total (cfs) * 5504.7 * Conv. (cfs) * * 5504.7 * *
* Length Wtd. (ft) * 34.43 * Wetted Per. (ft) * * 63.49 * *
*****
```

```

* Min Ch El (ft)      * 235.88 * Shear (lb/sq ft)      *          * 12.49 *          *
* Alpha              * 1.00  * Stream Power (lb/ft s) * 379.14 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 3.19  * Cum Volume (acre-ft)  * 0.96  * 4.62 * 3.12 *
* C & E Loss (ft)   * 0.12  * Cum SA (acres)       * 0.39  * 0.65 * 1.58 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main RS: 16

INPUT

Description:

```

Station Elevation Data      num=      27
  Sta      Elev      Sta      Elev      Sta      Elev      Sta      Elev      Sta      Elev
*****
  0      248.66      8.9      247.05      55.49      245.53      80.35      245.1      130.5      243.95
 140.24      243.5      146.88      243.78      148.03      243.84      148.99      244.13      151.11      243.86
 158.54      241.29      169.54      237.49      185.53      233.35      225.81      234.05      242.37      235.56
 252.43      237.59      253.5      243.26      254.22      243.26      263.92      243.38      267.82      243.43
 268.04      243.16      287.05      243.44      303.61      242.86      305.08      242.77      305.78      243.34
 315.76      243.99      328.57      251.36

```

```

Manning's n Values      num=      5
  Sta      n Val      Sta      n Val      Sta      n Val      Sta      n Val      Sta      n Val
*****
  0      .02      140.24      .045      148.99      .045      263.92      .02      305.78      .065

```

```

Bank Sta: Left      Right      Lengths: Left Channel      Right      Coeff Contr.      Expan.
      169.54      252.43      60.38      60.35      62.62      .1      .3

```

```

Ineffective Flow      num=      2
  Sta L      Sta R      Elev      Permanent
  18      57.42      255      F
 219.7      254.2      255      F

```

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)      * 236.10 * Element      * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.17  * Wt. n-Val.   *          * 0.045 *          *
* W.S. Elev (ft)     * 234.92 * Reach Len. (ft) * 60.38 * 60.35 * 62.62 *
* Crit W.S. (ft)     * 235.23 * Flow Area (sq ft) *          * 48.28 *          *
* E.G. Slope (ft/ft) * 0.054785 * Area (sq ft) *          * 58.08 *          *
* Q Total (cfs)      * 420.00 * Flow (cfs) *          * 420.00 *          *
* Top Width (ft)     * 55.89 * Top Width (ft) *          * 55.89 *          *
* Vel Total (ft/s)   * 8.70  * Avg. Vel. (ft/s) *          * 8.70 *          *
* Max Chl Dpth (ft) * 1.57  * Hydr. Depth (ft) *          * 1.20 *          *
* Conv. Total (cfs) * 1794.4 * Conv. (cfs) *          * 1794.4 *          *
* Length Wtd. (ft)  * 60.35 * Wetted Per. (ft) *          * 40.44 *          *
* Min Ch El (ft)    * 233.35 * Shear (lb/sq ft) *          * 4.08 *          *
* Alpha             * 1.00  * Stream Power (lb/ft s) * 328.57 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 2.43  * Cum Volume (acre-ft) * 0.18 * 2.48 * 0.62 *
* C & E Loss (ft)   * 0.07  * Cum SA (acres) * 0.20 * 0.56 * 0.87 *
*****

```

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)      * 238.79 * Element      * Left OB * Channel * Right OB *
* Vel Head (ft)      * 2.50  * Wt. n-Val.   *          * 0.045 *          *
* W.S. Elev (ft)     * 236.28 * Reach Len. (ft) * 60.38 * 60.35 * 62.62 *
* Crit W.S. (ft)     * 237.00 * Flow Area (sq ft) *          * 106.72 *          *
* E.G. Slope (ft/ft) * 0.047973 * Area (sq ft) *          * 146.48 *          *
* Q Total (cfs)      * 1355.00 * Flow (cfs) *          * 1355.00 *          *
* Top Width (ft)     * 71.76 * Top Width (ft) *          * 71.76 *          *
* Vel Total (ft/s)   * 12.70 * Avg. Vel. (ft/s) *          * 12.70 *          *
* Max Chl Dpth (ft) * 2.93  * Hydr. Depth (ft) *          * 2.35 *          *
* Conv. Total (cfs) * 6186.4 * Conv. (cfs) *          * 6186.4 *          *

```

```

* Length Wtd. (ft)      * 60.35 * Wetted Per. (ft)      *      * 45.88 *      *
* Min Ch El (ft)      * 233.35 * Shear (lb/sq ft)      *      * 6.97 *      *
* Alpha                * 1.00 * Stream Power (lb/ft s) * 328.57 * 0.00 * 0.00 *
* Frctn Loss (ft)     * 2.38 * Cum Volume (acre-ft)  * 0.73 * 3.87 * 2.32 *
* C & E Loss (ft)     * 0.25 * Cum SA (acres)        * 0.35 * 0.59 * 1.26 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)      * 239.85 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)      * 3.02 * Wt. n-Val.             *      * 0.045 *      *
* W.S. Elev (ft)     * 236.83 * Reach Len. (ft)        * 60.38 * 60.35 * 62.62 *
* Crit W.S. (ft)     * 237.69 * Flow Area (sq ft)      *      * 132.13 *      *
* E.G. Slope (ft/ft) * 0.046326 * Area (sq ft)          *      * 186.96 *      *
* Q Total (cfs)      * 1843.00 * Flow (cfs)            *      * 1843.00 *      *
* Top Width (ft)     * 76.57 * Top Width (ft)         *      * 76.57 *      *
* Vel Total (ft/s)   * 13.95 * Avg. Vel. (ft/s)      *      * 13.95 *      *
* Max Chl Dpth (ft)  * 3.48 * Hydr. Depth (ft)      *      * 2.78 *      *
* Conv. Total (cfs)  * 8562.7 * Conv. (cfs)           *      * 8562.7 *      *
* Length Wtd. (ft)   * 60.35 * Wetted Per. (ft)      *      * 48.06 *      *
* Min Ch El (ft)     * 233.35 * Shear (lb/sq ft)      *      * 7.95 *      *
* Alpha              * 1.00 * Stream Power (lb/ft s) * 328.57 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 2.36 * Cum Volume (acre-ft)  * 0.96 * 4.50 * 3.12 *
* C & E Loss (ft)   * 0.33 * Cum SA (acres)        * 0.39 * 0.59 * 1.58 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
REACH: main RS: 15

INPUT

Description:

Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	251.16	30.88	248.27	57.65	245.5	102.63	242.6	103.28	242.94
103.77	242.55	106.54	242.28	119.76	238.62	126.62	236.72	146.13	232.44
171.15	231.06	189.12	231.6	220.29	233.79	241.23	235.96	241.87	243.3
248.42	243.04	251.36	242.84	255.24	242.9	255.42	242.71	275.46	242.93
292.11	242.43	293.55	242.38	294.28	242.88	302.64	243.5	312.17	251.33

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.02	106.54	.045	241.87	.045	251.36	.02	294.28	.065

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
146.13 220.29 55.51 47.74 42.02 .1 .3

Ineffective Flow num= 1
Sta L Sta R Elev Permanent
198.33 242 255 F

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)      * 233.53 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.67 * Wt. n-Val.             *      * 0.045 *      *
* W.S. Elev (ft)     * 232.86 * Reach Len. (ft)        * 55.51 * 47.74 * 42.02 *

```


* Crit W.S. (ft)	* 232.90	* Flow Area (sq ft)	* 0.39	* 63.66	* *
* E.G. Slope (ft/ft)	*0.030578	* Area (sq ft)	* 0.39	* 66.29	* *
* Q Total (cfs)	* 420.00	* Flow (cfs)	* 0.78	* 419.22	* *
* Top Width (ft)	* 62.75	* Top Width (ft)	* 1.89	* 60.86	* *
* Vel Total (ft/s)	* 6.56	* Avg. Vel. (ft/s)	* 1.99	* 6.59	* *
* Max Chl Dpth (ft)	* 1.80	* Hydr. Depth (ft)	* 0.21	* 1.22	* *
* Conv. Total (cfs)	* 2401.8	* Conv. (cfs)	* 4.5	* 2397.4	* *
* Length Wtd. (ft)	* 47.24	* Wetted Per. (ft)	* 1.94	* 52.27	* *
* Min Ch El (ft)	* 231.06	* Shear (lb/sq ft)	* 0.39	* 2.33	* *
* Alpha	* 1.01	* Stream Power (lb/ft s)	* 312.17	* 0.00	* 0.00 *
* Frctn Loss (ft)	* 2.42	* Cum Volume (acre-ft)	* 0.18	* 2.40	* 0.62 *
* C & E Loss (ft)	* 0.15	* Cum SA (acres)	* 0.20	* 0.48	* 0.87 *

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 235.90	* Element	* Left OB	* Channel	* Right OB	* *
* Vel Head (ft)	* 2.07	* Wt. n-Val.	* 0.045	* 0.045	* *	* *
* W.S. Elev (ft)	* 233.83	* Reach Len. (ft)	* 55.51	* 47.74	* 42.02	* *
* Crit W.S. (ft)	* 234.38	* Flow Area (sq ft)	* 4.41	* 114.59	* *	* *
* E.G. Slope (ft/ft)	*0.043480	* Area (sq ft)	* 4.41	* 132.44	* 0.01	* *
* Q Total (cfs)	* 1355.00	* Flow (cfs)	* 23.48	* 1331.52	* *	* *
* Top Width (ft)	* 80.90	* Top Width (ft)	* 6.34	* 74.16	* 0.40	* *
* Vel Total (ft/s)	* 11.39	* Avg. Vel. (ft/s)	* 5.32	* 11.62	* *	* *
* Max Chl Dpth (ft)	* 2.77	* Hydr. Depth (ft)	* 0.70	* 2.20	* *	* *
* Conv. Total (cfs)	* 6498.3	* Conv. (cfs)	* 112.6	* 6385.7	* *	* *
* Length Wtd. (ft)	* 46.84	* Wetted Per. (ft)	* 6.49	* 52.27	* *	* *
* Min Ch El (ft)	* 231.06	* Shear (lb/sq ft)	* 1.84	* 5.95	* *	* *
* Alpha	* 1.03	* Stream Power (lb/ft s)	* 312.17	* 0.00	* 0.00	* *
* Frctn Loss (ft)	* 2.75	* Cum Volume (acre-ft)	* 0.73	* 3.68	* 2.32	* *
* C & E Loss (ft)	* 0.13	* Cum SA (acres)	* 0.35	* 0.49	* 1.26	* *

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 236.95	* Element	* Left OB	* Channel	* Right OB	* *
* Vel Head (ft)	* 2.75	* Wt. n-Val.	* 0.045	* 0.045	* *	* *
* W.S. Elev (ft)	* 234.20	* Reach Len. (ft)	* 55.51	* 47.74	* 42.02	* *
* Crit W.S. (ft)	* 235.00	* Flow Area (sq ft)	* 7.06	* 133.86	* *	* *
* E.G. Slope (ft/ft)	*0.047178	* Area (sq ft)	* 7.06	* 159.82	* 0.81	* *
* Q Total (cfs)	* 1843.00	* Flow (cfs)	* 45.81	* 1797.19	* *	* *
* Top Width (ft)	* 86.15	* Top Width (ft)	* 8.02	* 74.16	* 3.96	* *
* Vel Total (ft/s)	* 13.08	* Avg. Vel. (ft/s)	* 6.49	* 13.43	* *	* *
* Max Chl Dpth (ft)	* 3.14	* Hydr. Depth (ft)	* 0.88	* 2.56	* *	* *
* Conv. Total (cfs)	* 8485.1	* Conv. (cfs)	* 210.9	* 8274.2	* *	* *
* Length Wtd. (ft)	* 46.76	* Wetted Per. (ft)	* 8.22	* 52.27	* *	* *
* Min Ch El (ft)	* 231.06	* Shear (lb/sq ft)	* 2.53	* 7.54	* *	* *
* Alpha	* 1.03	* Stream Power (lb/ft s)	* 312.17	* 0.00	* 0.00	* *
* Frctn Loss (ft)	* 2.82	* Cum Volume (acre-ft)	* 0.95	* 4.26	* 3.12	* *
* C & E Loss (ft)	* 0.08	* Cum SA (acres)	* 0.39	* 0.49	* 1.58	* *

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main RS: 14

INPUT

Description:

Station Elevation Data num= 27

Proposed (Concepts 1-7) Conditions HEC-RAS Output

High Flows Model

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	248.1	14.71	237.72	23.72	228.98	25.86	226.84	28.49	222.9
38.71	224.14	42.25	224.21	50.16	224.37	55.6	228.96	71.32	229.8
113.72	230.51	160.05	232.96	160.35	232.96	186.93	237.56	188.11	241.98
189.39	242.3	193.37	242.37	197.27	242.28	197.37	242.11	217.75	242.56
234.11	241.83	235.6	241.71	236.27	242.26	242.78	242.92	249.14	247.54
255.21	248.57	259.08	250.56						

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	28.49	.035	55.6	.045	186.93	.05	193.37	.02
236.27	.1								

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

23.72	55.6	32.61	35.44	36.08	.1	.3
-------	------	-------	-------	-------	----	----

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
147.8	188	255	F

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 231.45	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.24	* Wt. n-Val.	* 0.100	* 0.052	* 0.045
* W.S. Elev (ft)	* 231.20	* Reach Len. (ft)	* 32.61	* 35.44	* 36.08
* Crit W.S. (ft)	* 227.68	* Flow Area (sq ft)	* 2.55	* 206.53	* 77.77
* E.G. Slope (ft/ft)	* 0.002131	* Area (sq ft)	* 2.55	* 206.53	* 77.77
* Q Total (cfs)	* 990.00	* Flow (cfs)	* 1.51	* 862.89	* 125.61
* Top Width (ft)	* 105.43	* Top Width (ft)	* 2.29	* 31.88	* 71.26
* Vel Total (ft/s)	* 3.45	* Avg. Vel. (ft/s)	* 0.59	* 4.18	* 1.62
* Max Chl Dpth (ft)	* 8.30	* Hydr. Depth (ft)	* 1.11	* 6.48	* 1.09
* Conv. Total (cfs)	* 21444.6	* Conv. (cfs)	* 32.6	* 18691.2	* 2720.8
* Length Wtd. (ft)	* 35.48	* Wetted Per. (ft)	* 3.20	* 36.63	* 71.31
* Min Ch El (ft)	* 222.90	* Shear (lb/sq ft)	* 0.11	* 0.75	* 0.15
* Alpha	* 1.31	* Stream Power (lb/ft s)	* 259.08	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.14	* Cum Volume (acre-ft)	* 0.18	* 2.25	* 0.58
* C & E Loss (ft)	* 0.07	* Cum SA (acres)	* 0.19	* 0.43	* 0.83

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Manning's n values were composited to a single value in the main channel.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 233.04	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.34	* Wt. n-Val.	* 0.100	* 0.052	* 0.045
* W.S. Elev (ft)	* 232.70	* Reach Len. (ft)	* 32.61	* 35.44	* 36.08
* Crit W.S. (ft)	* 229.79	* Flow Area (sq ft)	* 7.15	* 254.30	* 204.32
* E.G. Slope (ft/ft)	* 0.002562	* Area (sq ft)	* 7.15	* 254.30	* 205.76
* Q Total (cfs)	* 1925.00	* Flow (cfs)	* 6.52	* 1338.31	* 580.17
* Top Width (ft)	* 135.31	* Top Width (ft)	* 3.84	* 31.88	* 99.59
* Vel Total (ft/s)	* 4.13	* Avg. Vel. (ft/s)	* 0.91	* 5.26	* 2.84
* Max Chl Dpth (ft)	* 9.80	* Hydr. Depth (ft)	* 1.86	* 7.98	* 2.22
* Conv. Total (cfs)	* 38028.0	* Conv. (cfs)	* 128.8	* 26438.0	* 11461.2
* Length Wtd. (ft)	* 35.57	* Wetted Per. (ft)	* 5.35	* 36.63	* 92.28
* Min Ch El (ft)	* 222.90	* Shear (lb/sq ft)	* 0.21	* 1.11	* 0.35
* Alpha	* 1.27	* Stream Power (lb/ft s)	* 259.08	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.14	* Cum Volume (acre-ft)	* 0.72	* 3.46	* 2.22
* C & E Loss (ft)	* 0.08	* Cum SA (acres)	* 0.34	* 0.43	* 1.21

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Manning's n values were composited to a single value in the main channel.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```

* E.G. Elev (ft)          * 233.58 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.40  * Wt. n-Val.      * 0.100 * 0.052 * 0.045 *
* W.S. Elev (ft)         * 233.18 * Reach Len. (ft) * 32.61 * 35.44 * 36.08 *
* Crit W.S. (ft)        * 231.19 * Flow Area (sq ft) * 9.10 * 269.55 * 248.44 *
* E.G. Slope (ft/ft)    * 0.002851 * Area (sq ft) * 9.10 * 269.55 * 255.33 *
* Q Total (cfs)         * 2413.00 * Flow (cfs) * 9.49 * 1555.72 * 847.78 *
* Top Width (ft)        * 142.24 * Top Width (ft) * 4.33 * 31.88 * 106.03 *
* Vel Total (ft/s)      * 4.58  * Avg. Vel. (ft/s) * 1.04 * 5.77 * 3.41 *
* Max Chl Dpth (ft)     * 10.28 * Hydr. Depth (ft) * 2.10 * 8.46 * 2.69 *
* Conv. Total (cfs)     * 45188.1 * Conv. (cfs) * 177.8 * 29133.9 * 15876.3 *
* Length Wtd. (ft)     * 35.60 * Wetted Per. (ft) * 6.03 * 36.63 * 92.28 *
* Min Ch El (ft)       * 222.90 * Shear (lb/sq ft) * 0.27 * 1.31 * 0.48 *
* Alpha                 * 1.22  * Stream Power (lb/ft s) * 259.08 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 0.15  * Cum Volume (acre-ft) * 0.94 * 4.02 * 3.00 *
* C & E Loss (ft)      * 0.08  * Cum SA (acres) * 0.38 * 0.43 * 1.53 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Manning's n values were composited to a single value in the main channel.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
REACH: main RS: 13

INPUT

Description:

Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	241.96	14.55	230.95	32.96	227.31	36.62	225.36	41.86	224.74
42.53	224.66	46.66	225.42	50.53	227.84	56.2	227.42	61.55	230.48
83.14	230.27	114.16	230.85	147.33	231.62	165.36	233	196.3	242.62
199.29	241.9	203.15	241.91	203.26	241.69	211.59	241.93	222.67	242.05
233.56	241.54	240.52	241.08	241.1	241.66	251.87	250.04		

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	14.55	.035	61.55	.045	199.29	.02	241.1	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
14.55 61.55 36.53 35.61 35.05 .1 .3

Ineffective Flow num= 1
Sta L Sta R Elev Permanent
157.7 165.4 255 F

Blocked Obstructions num= 1
Sta L Sta R Elev
165.4 196.3 255

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)          * 231.24 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.97  * Wt. n-Val.      * 36.53 * 0.035 * 35.05 *
* W.S. Elev (ft)         * 230.27 * Reach Len. (ft) * 36.53 * 35.61 * 35.05 *
* Crit W.S. (ft)        * 229.83 * Flow Area (sq ft) * 36.53 * 125.24 * 35.05 *
* E.G. Slope (ft/ft)    * 0.008992 * Area (sq ft) * 36.53 * 125.24 * 35.05 *
* Q Total (cfs)         * 990.00 * Flow (cfs) * 36.53 * 990.00 * 35.05 *
* Top Width (ft)        * 43.17 * Top Width (ft) * 36.53 * 43.17 * 35.05 *
* Vel Total (ft/s)      * 7.90  * Avg. Vel. (ft/s) * 36.53 * 7.90 * 35.05 *
* Max Chl Dpth (ft)     * 5.61  * Hydr. Depth (ft) * 36.53 * 2.90 * 35.05 *
* Conv. Total (cfs)     * 10439.9 * Conv. (cfs) * 36.53 * 10439.9 * 35.05 *
* Length Wtd. (ft)     * 35.61 * Wetted Per. (ft) * 36.53 * 45.52 * 35.05 *
* Min Ch El (ft)       * 224.66 * Shear (lb/sq ft) * 36.53 * 1.54 * 35.05 *
* Alpha                 * 1.00  * Stream Power (lb/ft s) * 36.53 * 251.87 * 35.05 *
* Frctn Loss (ft)      * 0.16  * Cum Volume (acre-ft) * 36.53 * 0.18 * 35.05 *
* C & E Loss (ft)      * 0.16  * Cum SA (acres) * 36.53 * 0.19 * 35.05 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```
*****
* E.G. Elev (ft)      * 232.82 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.11  * Wt. n-Val.      * 0.100  * 0.035  * 0.045  *
* W.S. Elev (ft)     * 231.71 * Reach Len. (ft) * 36.53  * 35.61  * 35.05  *
* Crit W.S. (ft)     * 231.71 * Flow Area (sq ft) * 0.38  * 191.83 * 80.23  *
* E.G. Slope (ft/ft) * 0.007247 * Area (sq ft)    * 0.38  * 191.83 * 80.23  *
* Q Total (cfs)      * 1925.00 * Flow (cfs)      * 0.22  * 1711.06 * 213.73 *
* Top Width (ft)     * 134.95 * Top Width (ft)  * 1.00  * 47.00  * 86.94  *
* Vel Total (ft/s)   * 7.07  * Avg. Vel. (ft/s) * 0.57  * 8.92  * 2.66  *
* Max Chl Dpth (ft) * 7.05  * Hydr. Depth (ft) * 0.38  * 4.08  * 0.92  *
* Conv. Total (cfs)  * 22613.0 * Conv. (cfs)     * 2.6  * 20099.8 * 2510.7 *
* Length Wtd. (ft)  * 35.55  * Wetted Per. (ft) * 1.26  * 49.48 * 86.96  *
* Min Ch El (ft)    * 224.66 * Shear (lb/sq ft) * 0.14  * 1.75  * 0.42  *
* Alpha             * 1.43  * Stream Power (lb/ft s) * 251.87 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 0.20  * Cum Volume (acre-ft) * 0.72  * 3.28  * 2.10  *
* C & E Loss (ft)   * 0.08  * Cum SA (acres)   * 0.34  * 0.40  * 1.13  *
*****
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```
*****
* E.G. Elev (ft)      * 233.34 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 1.21  * Wt. n-Val.      * 0.100  * 0.035  * 0.045  *
* W.S. Elev (ft)     * 232.13 * Reach Len. (ft) * 36.53  * 35.61  * 35.05  *
* Crit W.S. (ft)     * 232.13 * Flow Area (sq ft) * 0.92  * 211.61 * 117.97 *
* E.G. Slope (ft/ft) * 0.007290 * Area (sq ft)    * 0.92  * 211.61 * 117.97 *
* Q Total (cfs)      * 2413.00 * Flow (cfs)      * 0.71  * 2021.08 * 391.22 *
* Top Width (ft)     * 141.00 * Top Width (ft)  * 1.56  * 47.00  * 92.44  *
* Vel Total (ft/s)   * 7.30  * Avg. Vel. (ft/s) * 0.77  * 9.55  * 3.32  *
* Max Chl Dpth (ft) * 7.47  * Hydr. Depth (ft) * 0.59  * 4.50  * 1.28  *
* Conv. Total (cfs)  * 28260.8 * Conv. (cfs)     * 8.3  * 23670.6 * 4581.9 *
* Length Wtd. (ft)  * 35.52  * Wetted Per. (ft) * 1.96  * 49.48 * 92.48  *
* Min Ch El (ft)    * 224.66 * Shear (lb/sq ft) * 0.21  * 1.95  * 0.58  *
* Alpha             * 1.47  * Stream Power (lb/ft s) * 251.87 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 0.19  * Cum Volume (acre-ft) * 0.94  * 3.83  * 2.85  *
* C & E Loss (ft)   * 0.10  * Cum SA (acres)   * 0.38  * 0.40  * 1.44  *
*****
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main

RS: 12

INPUT

Description:

```
Station Elevation Data      num=      27
  Sta   Elev      Sta   Elev      Sta   Elev      Sta   Elev      Sta   Elev
*****
    0  235.97    4.29  233.19    9.01  229.89   17.76  227.7    28.61  225.14
   36.48  224.53   37.83  224.73   40.71  225.18   43.81  227.25   55.11  226.71
   56.34  228.17   57.5  230.17   63.19  230.16   67.64  229.97  122.51  230.61
  158.38  231.61  163.21  231.75  184.45  232.71  185.11  234.3   200.8  234.38
```

201.16 240.02 206.05 240.52 209.96 240.56 228.22 240.92 246.17 240.16
246.99 240.76 255.05 247.12

Manning's n Values num= 5
Sta n Val Sta n Val Sta n Val Sta n Val Sta n Val

0 .1 9.01 .035 57.5 .045 206.05 .02 246.99 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
9.01 57.5 43.41 42.27 41.38 .1 .3
Ineffective Flow num= 1
Sta L Sta R Elev Permanent
179.23 201.87 250 F

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft) * 230.91 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.42 * Wt. n-Val. * 0.100 * 0.035 * 0.045 *
* W.S. Elev (ft) * 230.48 * Reach Len. (ft) * 43.41 * 42.27 * 41.38 *
* Crit W.S. (ft) * 228.88 * Flow Area (sq ft) * 0.25 * 185.26 * 19.26 *
* E.G. Slope (ft/ft) * 0.002789 * Area (sq ft) * 0.25 * 185.26 * 19.26 *
* Q Total (cfs) * 990.00 * Flow (cfs) * 0.08 * 973.85 * 16.08 *
* Top Width (ft) * 107.49 * Top Width (ft) * 0.85 * 48.49 * 58.15 *
* Vel Total (ft/s) * 4.83 * Avg. Vel. (ft/s) * 0.31 * 5.26 * 0.83 *
* Max Chl Dpth (ft) * 5.95 * Hydr. Depth (ft) * 0.30 * 3.82 * 0.33 *
* Conv. Total (cfs) * 18746.3 * Conv. (cfs) * 1.5 * 18440.4 * 304.4 *
* Length Wtd. (ft) * 42.27 * Wetted Per. (ft) * 1.04 * 51.60 * 58.15 *
* Min Ch El (ft) * 224.53 * Shear (lb/sq ft) * 0.04 * 0.63 * 0.06 *
* Alpha * 1.16 * Stream Power (lb/ft s) * 255.05 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.21 * Cum Volume (acre-ft) * 0.18 * 1.99 * 0.54 *
* C & E Loss (ft) * 0.10 * Cum SA (acres) * 0.19 * 0.36 * 0.78 *

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft) * 232.19 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.83 * Wt. n-Val. * 0.100 * 0.035 * 0.045 *
* W.S. Elev (ft) * 231.35 * Reach Len. (ft) * 43.41 * 42.27 * 41.38 *
* Crit W.S. (ft) * 230.73 * Flow Area (sq ft) * 1.53 * 227.37 * 85.17 *
* E.G. Slope (ft/ft) * 0.004519 * Area (sq ft) * 1.53 * 227.37 * 85.17 *
* Q Total (cfs) * 1925.00 * Flow (cfs) * 1.09 * 1743.90 * 180.01 *
* Top Width (ft) * 142.22 * Top Width (ft) * 2.09 * 48.49 * 91.64 *
* Vel Total (ft/s) * 6.13 * Avg. Vel. (ft/s) * 0.71 * 7.67 * 2.11 *
* Max Chl Dpth (ft) * 6.82 * Hydr. Depth (ft) * 0.73 * 4.69 * 0.93 *
* Conv. Total (cfs) * 28637.1 * Conv. (cfs) * 16.2 * 25943.0 * 2677.9 *
* Length Wtd. (ft) * 42.14 * Wetted Per. (ft) * 2.55 * 51.60 * 91.66 *
* Min Ch El (ft) * 224.53 * Shear (lb/sq ft) * 0.17 * 1.24 * 0.26 *
* Alpha * 1.43 * Stream Power (lb/ft s) * 255.05 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.19 * Cum Volume (acre-ft) * 0.72 * 3.11 * 2.04 *
* C & E Loss (ft) * 0.01 * Cum SA (acres) * 0.34 * 0.36 * 1.06 *

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft) * 232.78 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.87 * Wt. n-Val. * 0.100 * 0.035 * 0.045 *
* W.S. Elev (ft) * 231.91 * Reach Len. (ft) * 43.41 * 42.27 * 41.38 *
* Crit W.S. (ft) * 231.33 * Flow Area (sq ft) * 2.93 * 254.55 * 141.96 *
* E.G. Slope (ft/ft) * 0.004269 * Area (sq ft) * 2.93 * 254.55 * 141.96 *
* Q Total (cfs) * 2413.00 * Flow (cfs) * 2.51 * 2046.03 * 364.46 *
* Top Width (ft) * 160.70 * Top Width (ft) * 2.89 * 48.49 * 109.32 *
* Vel Total (ft/s) * 6.04 * Avg. Vel. (ft/s) * 0.86 * 8.04 * 2.57 *
* Max Chl Dpth (ft) * 7.38 * Hydr. Depth (ft) * 1.01 * 5.25 * 1.30 *
* Conv. Total (cfs) * 36933.1 * Conv. (cfs) * 38.4 * 31316.3 * 5578.4 *
* Length Wtd. (ft) * 42.08 * Wetted Per. (ft) * 3.53 * 51.60 * 109.34 *
* Min Ch El (ft) * 224.53 * Shear (lb/sq ft) * 0.22 * 1.31 * 0.35 *
* Alpha * 1.53 * Stream Power (lb/ft s) * 255.05 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.16 * Cum Volume (acre-ft) * 0.93 * 3.63 * 2.74 *
* C & E Loss (ft) * 0.06 * Cum SA (acres) * 0.38 * 0.36 * 1.36 *

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
REACH: main RS: 11

INPUT

Description:

Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	245.96	10.1	239.95	27.61	230.25	50	227.94	56.91	224.69
62.67	224.26	62.68	224.25	63.08	224.22	69.01	224.83	75.79	227.38
81.94	229.34	113.15	229.54	159.41	229.57	197.32	230.73	229.05	232.56
241.65	238.86	245.59	238.88	245.71	238.5	252.11	238.68	263.49	238.91
274.3	238.47	281.62	238.2	282.41	238.74	288.52	243.68	297.15	245.07

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	50	.035	81.94	.045	229.05	.05	241.65	.02
282.41	.1								

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

50	81.94	42.45	41.39	40	.1	.3
----	-------	-------	-------	----	----	----

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 230.59	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 1.45	* Wt. n-Val.	* 0.100	* 0.035	*	*
* W.S. Elev (ft)	* 229.14	* Reach Len. (ft)	* 42.45	* 41.39	* 40.00	*
* Crit W.S. (ft)	* 229.08	* Flow Area (sq ft)	* 6.93	* 101.06	*	*
* E.G. Slope (ft/ft)	* 0.011692	* Area (sq ft)	* 6.93	* 101.06	*	*
* Q Total (cfs)	* 990.00	* Flow (cfs)	* 7.87	* 982.13	*	*
* Top Width (ft)	* 42.89	* Top Width (ft)	* 11.59	* 31.30	*	*
* Vel Total (ft/s)	* 9.17	* Avg. Vel. (ft/s)	* 1.14	* 9.72	*	*
* Max Chl Dpth (ft)	* 4.92	* Hydr. Depth (ft)	* 0.60	* 3.23	*	*
* Conv. Total (cfs)	* 9155.6	* Conv. (cfs)	* 72.8	* 9082.8	*	*
* Length Wtd. (ft)	* 41.37	* Wetted Per. (ft)	* 11.65	* 32.81	*	*
* Min Ch El (ft)	* 224.22	* Shear (lb/sq ft)	* 0.43	* 2.25	*	*
* Alpha	* 1.11	* Stream Power (lb/ft s)	* 297.15	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.32	* Cum Volume (acre-ft)	* 0.18	* 1.85	* 0.53	*
* C & E Loss (ft)	* 0.19	* Cum SA (acres)	* 0.19	* 0.32	* 0.75	*

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 231.98	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 0.79	* Wt. n-Val.	* 0.100	* 0.035	* 0.045	*
* W.S. Elev (ft)	* 231.20	* Reach Len. (ft)	* 42.45	* 41.39	* 40.00	*
* Crit W.S. (ft)	* 230.98	* Flow Area (sq ft)	* 47.83	* 166.79	* 172.17	*
* E.G. Slope (ft/ft)	* 0.004449	* Area (sq ft)	* 47.83	* 166.79	* 172.17	*
* Q Total (cfs)	* 1925.00	* Flow (cfs)	* 74.14	* 1377.56	* 473.30	*
* Top Width (ft)	* 179.48	* Top Width (ft)	* 24.10	* 31.94	* 123.45	*
* Vel Total (ft/s)	* 4.98	* Avg. Vel. (ft/s)	* 1.55	* 8.26	* 2.75	*
* Max Chl Dpth (ft)	* 6.98	* Hydr. Depth (ft)	* 1.99	* 5.22	* 1.39	*
* Conv. Total (cfs)	* 28858.9	* Conv. (cfs)	* 1111.5	* 20651.9	* 7095.5	*
* Length Wtd. (ft)	* 41.05	* Wetted Per. (ft)	* 24.46	* 33.49	* 123.48	*
* Min Ch El (ft)	* 224.22	* Shear (lb/sq ft)	* 0.54	* 1.38	* 0.39	*
* Alpha	* 2.05	* Stream Power (lb/ft s)	* 297.15	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.12	* Cum Volume (acre-ft)	* 0.70	* 2.92	* 1.91	*
* C & E Loss (ft)	* 0.11	* Cum SA (acres)	* 0.33	* 0.32	* 0.96	*

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 232.56	* Element	* Left OB	* Channel	* Right OB	*
------------------	----------	-----------	-----------	-----------	------------	---

Proposed (Concepts 1-7) Conditions HEC-RAS Output High Flows Model

```

* Vel Head (ft) * 0.67 * Wt. n-Val. * 0.100 * 0.035 * 0.045 *
* W.S. Elev (ft) * 231.88 * Reach Len. (ft) * 42.45 * 41.39 * 40.00 *
* Crit W.S. (ft) * * * Flow Area (sq ft) * 64.81 * 188.73 * 261.04 *
* E.G. Slope (ft/ft) *0.003549 * Area (sq ft) * 64.81 * 188.73 * 261.04 *
* Q Total (cfs) * 2413.00 * Flow (cfs) * 105.81 * 1511.73 * 795.46 *
* Top Width (ft) * 192.63 * Top Width (ft) * 25.34 * 31.94 * 135.36 *
* Vel Total (ft/s) * 4.69 * Avg. Vel. (ft/s) * 1.63 * 8.01 * 3.05 *
* Max Chl Dpth (ft) * 7.66 * Hydr. Depth (ft) * 2.56 * 5.91 * 1.93 *
* Conv. Total (cfs) * 40502.4 * Conv. (cfs) * 1776.0 * 25374.5 * 13351.9 *
* Length Wtd. (ft) * 40.96 * Wetted Per. (ft) * 25.88 * 33.49 * 135.41 *
* Min Ch El (ft) * 224.22 * Shear (lb/sq ft) * 0.55 * 1.25 * 0.43 *
* Alpha * 1.97 * Stream Power (lb/ft s) * 297.15 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.11 * Cum Volume (acre-ft) * 0.90 * 3.42 * 2.55 *
* C & E Loss (ft) * 0.08 * Cum SA (acres) * 0.36 * 0.32 * 1.25 *
*****

```

CROSS SECTION

RIVER: hudson
REACH: main RS: 10

INPUT

Description:

```

Station Elevation Data num= 27
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
*****
0 254.32 27.86 234.84 35.17 229.78 70.22 228.43 73.71 226.78
79.05 224.24 84.97 223.61 84.98 223.61 85.18 223.59 91.53 224.07
98.22 226.6 103.1 228.6 141.3 228.97 185.05 229.06 221.96 230.91
249.71 232.98 255.38 233.62 263.5 236.98 267.35 237.07 267.53 236.24
273.96 236.72 285.11 236.99 295.42 236.53 296.92 236.06 297.07 236.98
300.37 237.15 316.57 238.76

```

```

Manning's n Values num= 6
Sta n Val Sta n Val Sta n Val Sta n Val Sta n Val
*****
0 .1 27.86 .085 70.22 .035 103.1 .045 263.5 .02
300.37 .05

```

```

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
70.22 103.1 57.02 54.55 53 .1 .3

```

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft) * 230.09 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.83 * Wt. n-Val. * 0.085 * 0.035 * 0.045 *
* W.S. Elev (ft) * 229.26 * Reach Len. (ft) * 57.02 * 54.55 * 53.00 *
* Crit W.S. (ft) * 228.38 * Flow Area (sq ft) * 8.84 * 127.26 * 28.86 *
* E.G. Slope (ft/ft) *0.005469 * Area (sq ft) * 8.84 * 127.26 * 28.86 *
* Q Total (cfs) * 990.00 * Flow (cfs) * 6.33 * 949.59 * 34.08 *
* Top Width (ft) * 140.16 * Top Width (ft) * 21.43 * 32.88 * 85.85 *
* Vel Total (ft/s) * 6.00 * Avg. Vel. (ft/s) * 0.72 * 7.46 * 1.18 *
* Max Chl Dpth (ft) * 5.67 * Hydr. Depth (ft) * 0.41 * 3.87 * 0.34 *
* Conv. Total (cfs) * 13387.0 * Conv. (cfs) * 85.6 * 12840.5 * 460.8 *
* Length Wtd. (ft) * 54.52 * Wetted Per. (ft) * 21.44 * 34.73 * 85.85 *
* Min Ch El (ft) * 223.59 * Shear (lb/sq ft) * 0.14 * 1.25 * 0.11 *
* Alpha * 1.48 * Stream Power (lb/ft s) * 316.57 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.23 * Cum Volume (acre-ft) * 0.17 * 1.74 * 0.52 *
* C & E Loss (ft) * 0.08 * Cum SA (acres) * 0.17 * 0.29 * 0.71 *
*****

```

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft) * 231.74 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.41 * Wt. n-Val. * 0.085 * 0.035 * 0.045 *
* W.S. Elev (ft) * 231.34 * Reach Len. (ft) * 57.02 * 54.55 * 53.00 *
* Crit W.S. (ft) * * * Flow Area (sq ft) * 80.04 * 195.76 * 250.39 *
* E.G. Slope (ft/ft) *0.002122 * Area (sq ft) * 80.04 * 195.76 * 250.39 *
* Q Total (cfs) * 1925.00 * Flow (cfs) * 106.26 * 1212.45 * 606.29 *
* Top Width (ft) * 194.79 * Top Width (ft) * 37.30 * 32.88 * 124.61 *
* Vel Total (ft/s) * 3.66 * Avg. Vel. (ft/s) * 1.33 * 6.19 * 2.42 *
* Max Chl Dpth (ft) * 7.75 * Hydr. Depth (ft) * 2.15 * 5.95 * 2.01 *
* Conv. Total (cfs) * 41788.8 * Conv. (cfs) * 2306.7 * 26320.3 * 13161.7 *
* Length Wtd. (ft) * 54.21 * Wetted Per. (ft) * 37.81 * 34.73 * 124.67 *
* Min Ch El (ft) * 223.59 * Shear (lb/sq ft) * 0.28 * 0.75 * 0.27 *
* Alpha * 1.95 * Stream Power (lb/ft s) * 316.57 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.10 * Cum Volume (acre-ft) * 0.63 * 2.75 * 1.72 *
* C & E Loss (ft) * 0.03 * Cum SA (acres) * 0.30 * 0.29 * 0.84 *
*****

```

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)          * 232.37 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.40  * Wt. n-Val.      * 0.085  * 0.035  * 0.045  *
* W.S. Elev (ft)        * 231.97 * Reach Len. (ft) * 57.02  * 54.55  * 53.00  *
* Crit W.S. (ft)        *      * Flow Area (sq ft) * 103.86 * 216.50 * 331.68 *
* E.G. Slope (ft/ft)    * 0.001942 * Area (sq ft)    * 103.86 * 216.50 * 331.68 *
* Q Total (cfs)         * 2413.00 * Flow (cfs)      * 153.95 * 1372.06 * 886.99 *
* Top Width (ft)        * 204.16 * Top Width (ft)  * 38.21  * 32.88  * 133.06 *
* Vel Total (ft/s)      * 3.70  * Avg. Vel. (ft/s) * 1.48  * 6.34  * 2.67  *
* Max Chl Dpth (ft)     * 8.38  * Hydr. Depth (ft) * 2.72  * 6.58  * 2.49  *
* Conv. Total (cfs)     * 54750.2 * Conv. (cfs)     * 3493.1 * 31131.5 * 20125.6 *
* Length Wtd. (ft)     * 54.16  * Wetted Per. (ft) * 38.92  * 34.73  * 133.15 *
* Min Ch El (ft)       * 223.59 * Shear (lb/sq ft) * 0.32  * 0.76  * 0.30  *
* Alpha                 * 1.87  * Stream Power (lb/ft s) * 316.57 * 0.00  * 0.00  *
* Frctn Loss (ft)      * 0.09  * Cum Volume (acre-ft) * 0.82  * 3.23  * 2.28  *
* C & E Loss (ft)      * 0.02  * Cum SA (acres)   * 0.33  * 0.29  * 1.12  *
*****

```

CROSS SECTION

RIVER: hudson
 REACH: main RS: 9

INPUT

Description:

Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	238.33	24.58	229.92	45.06	228.52	69.24	226.93	73.73	223.36
80	223.1	80.81	223.12	88.24	223.37	92.16	226.13	95.78	228.73
133.97	228.37	138.72	228.37	155.61	228.1	193.63	229.24	249.29	234.89
254.41	235.12	258.27	235.18	258.47	234.69	265.15	234.88	276.18	235.08
287.68	234.68	288.3	235.23	303.88	237.07				

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	45.06	.085	69.24	.035	95.78	.045	254.41	.02
288.3	.05								

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 69.24 95.78 55.45 51.85 50.87 .1 .3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
193.6	249.3	250

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)          * 229.78 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.57  * Wt. n-Val.      * 0.085  * 0.035  * 0.045  *
* W.S. Elev (ft)        * 229.21 * Reach Len. (ft) * 55.45  * 51.85  * 50.87  *
* Crit W.S. (ft)        * 227.85 * Flow Area (sq ft) * 39.44  * 128.98 * 66.36  *
* E.G. Slope (ft/ft)    * 0.003319 * Area (sq ft)    * 39.44  * 128.98 * 66.36  *
* Q Total (cfs)         * 990.00 * Flow (cfs)      * 48.56  * 843.37 * 98.07  *
* Top Width (ft)        * 157.74 * Top Width (ft)  * 34.30  * 26.54  * 96.90  *
* Vel Total (ft/s)      * 4.22  * Avg. Vel. (ft/s) * 1.23  * 6.54  * 1.48  *
* Max Chl Dpth (ft)     * 6.11  * Hydr. Depth (ft) * 1.15  * 4.86  * 0.68  *
* Conv. Total (cfs)     * 17183.2 * Conv. (cfs)     * 842.9  * 14638.1 * 1702.2 *
* Length Wtd. (ft)     * 51.87  * Wetted Per. (ft) * 34.37  * 29.51  * 96.92  *
* Min Ch El (ft)       * 223.10 * Shear (lb/sq ft) * 0.24  * 0.91  * 0.14  *
* Alpha                 * 2.06  * Stream Power (lb/ft s) * 303.88 * 0.00  * 0.00  *
* Frctn Loss (ft)      * 0.12  * Cum Volume (acre-ft) * 0.14  * 1.58  * 0.46  *
* C & E Loss (ft)      * 0.07  * Cum SA (acres)   * 0.13  * 0.25  * 0.60  *
*****

```

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)          * 231.62 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.32  * Wt. n-Val.      * 0.088  * 0.035  * 0.045  *
* W.S. Elev (ft)        * 231.30 * Reach Len. (ft) * 55.45  * 51.85  * 50.87  *
* Crit W.S. (ft)        *      * Flow Area (sq ft) * 131.93 * 184.46 * 270.85 *
* E.G. Slope (ft/ft)    * 0.001575 * Area (sq ft)    * 131.93 * 184.46 * 270.85 *
* Q Total (cfs)         * 1925.00 * Flow (cfs)      * 180.27 * 1054.65 * 690.08 *
* Top Width (ft)        * 173.06 * Top Width (ft)  * 48.70  * 26.54  * 97.82  *
* Vel Total (ft/s)      * 3.28  * Avg. Vel. (ft/s) * 1.37  * 5.72  * 2.55  *
* Max Chl Dpth (ft)     * 8.20  * Hydr. Depth (ft) * 2.71  * 6.95  * 2.77  *
* Conv. Total (cfs)     * 48506.5 * Conv. (cfs)     * 4542.4 * 26575.2 * 17388.8 *
* Length Wtd. (ft)     * 51.75  * Wetted Per. (ft) * 49.03  * 29.51  * 99.90  *

```



```

* Min Ch El (ft)      * 223.10 * Shear (lb/sq ft)      * 0.26 * 0.61 * 0.27 *
* Alpha              * 1.90  * Stream Power (lb/ft s) * 303.88 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 0.06  * Cum Volume (acre-ft)  * 0.49 * 2.51 * 1.40 *
* C & E Loss (ft)   * 0.03  * Cum SA (acres)        * 0.24 * 0.25 * 0.71 *
*****

```

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)     * 232.26 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)     * 0.34  * Wt. n-Val.             * 0.089 * 0.035 * 0.045 *
* W.S. Elev (ft)    * 231.92 * Reach Len. (ft)       * 55.45 * 51.85 * 50.87 *
* Crit W.S. (ft)    *        * Flow Area (sq ft)     * 162.46 * 200.79 * 331.05 *
* E.G. Slope (ft/ft) * 0.001565 * Area (sq ft)         * 162.46 * 200.79 * 331.05 *
* Q Total (cfs)     * 2413.00 * Flow (cfs)           * 244.40 * 1211.19 * 957.41 *
* Top Width (ft)    * 174.86 * Top Width (ft)       * 50.50 * 26.54 * 97.82 *
* Vel Total (ft/s)  * 3.48  * Avg. Vel. (ft/s)     * 1.50 * 6.03 * 2.89 *
* Max Chl Dpth (ft) * 8.82  * Hydr. Depth (ft)    * 3.22 * 7.57 * 3.38 *
* Conv. Total (cfs) * 60987.3 * Conv. (cfs)         * 6177.1 * 30612.2 * 24198.1 *
* Length Wtd. (ft) * 51.75 * Wetted Per. (ft)    * 50.93 * 29.51 * 100.52 *
* Min Ch El (ft)   * 223.10 * Shear (lb/sq ft)    * 0.31 * 0.67 * 0.32 *
* Alpha            * 1.81  * Stream Power (lb/ft s) * 303.88 * 0.00 * 0.00 *
* Frctn Loss (ft)  * 0.06  * Cum Volume (acre-ft) * 0.64 * 2.97 * 1.87 *
* C & E Loss (ft)  * 0.03  * Cum SA (acres)      * 0.27 * 0.25 * 0.98 *
*****

```

CROSS SECTION

RIVER: hudson
REACH: main RS: 8

INPUT

Description:

Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	232.66	10	231.25	20	230.58	45.39	228.78	62.29	226.96
73.22	226.75	78.86	222.87	84.37	222.42	85.34	222.48	91.4	222.85
93.16	222.95	100.51	227.98	129.11	227.53	173.64	228.25	221.13	229.38
256.1	234.43	261.75	233.86	265.78	233.85	265.89	233.49	272.62	233.6
283.68	233.78	295	233.52	295.71	234.03	308.74	235.94		

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	73.22	.035	100.51	.045	261.75	.02	295	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
73.22 100.51 84.59 69.8 31.19 .1 .3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
221.13	256.1	250

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)     * 229.59 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)     * 0.33  * Wt. n-Val.             * 0.100 * 0.035 * 0.045 *
* W.S. Elev (ft)    * 229.26 * Reach Len. (ft)       * 84.59 * 69.80 * 31.19 *
* Crit W.S. (ft)    *        * Flow Area (sq ft)     * 51.26 * 147.09 * 125.00 *
* E.G. Slope (ft/ft) * 0.001801 * Area (sq ft)         * 51.26 * 147.09 * 125.00 *
* Q Total (cfs)     * 990.00 * Flow (cfs)           * 41.95 * 763.33 * 184.71 *
* Top Width (ft)    * 177.23 * Top Width (ft)       * 34.54 * 27.29 * 115.40 *
* Vel Total (ft/s)  * 3.06  * Avg. Vel. (ft/s)     * 0.82 * 5.19 * 1.48 *
* Max Chl Dpth (ft) * 6.84  * Hydr. Depth (ft)    * 1.48 * 5.39 * 1.08 *
* Conv. Total (cfs) * 23329.5 * Conv. (cfs)         * 988.7 * 17988.1 * 4352.8 *
* Length Wtd. (ft) * 61.83 * Wetted Per. (ft)    * 34.66 * 30.09 * 115.42 *
* Min Ch El (ft)   * 222.42 * Shear (lb/sq ft)    * 0.17 * 0.55 * 0.12 *
* Alpha            * 2.26  * Stream Power (lb/ft s) * 308.74 * 0.00 * 0.00 *
* Frctn Loss (ft)  * 0.11  * Cum Volume (acre-ft) * 0.08 * 1.41 * 0.35 *
* C & E Loss (ft)  * 0.05  * Cum SA (acres)      * 0.09 * 0.22 * 0.48 *
*****

```

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)     * 231.52 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)     * 0.22  * Wt. n-Val.             * 0.100 * 0.035 * 0.045 *
* W.S. Elev (ft)    * 231.31 * Reach Len. (ft)       * 84.59 * 69.80 * 31.19 *
* Crit W.S. (ft)    *        * Flow Area (sq ft)     * 152.03 * 203.09 * 372.18 *
* E.G. Slope (ft/ft) * 0.001009 * Area (sq ft)         * 152.03 * 203.09 * 372.18 *
* Q Total (cfs)     * 1925.00 * Flow (cfs)           * 128.01 * 978.32 * 818.67 *

```

```

* Top Width (ft)          * 211.54 * Top Width (ft)          * 63.63 * 27.29 * 120.62 *
* Vel Total (ft/s)       * 2.65  * Avg. Vel. (ft/s)       * 0.84  * 4.82  * 2.20  *
* Max Chl Dpth (ft)     * 8.89  * Hydr. Depth (ft)      * 2.39  * 7.44  * 3.09  *
* Conv. Total (cfs)     * 60595.4 * Conv. (cfs)           * 4029.6 * 30795.5 * 25770.2 *
* Length Wtd. (ft)      * 53.92 * Wetted Per. (ft)      * 63.82 * 30.09 * 122.57 *
* Min Ch El (ft)        * 222.42 * Shear (lb/sq ft)      * 0.15  * 0.43  * 0.19  *
* Alpha                  * 1.98  * Stream Power (lb/ft s) * 308.74 * 0.00  * 0.00  *
* Frctn Loss (ft)       * 0.06  * Cum Volume (acre-ft)  * 0.31  * 2.28  * 1.03  *
* C & E Loss (ft)        * 0.02  * Cum SA (acres)        * 0.17  * 0.22  * 0.58  *
*****

```

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)         * 232.16 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)         * 0.23  * Wt. n-Val.             * 0.100  * 0.035  * 0.045  *
* W.S. Elev (ft)        * 231.93 * Reach Len. (ft)       * 84.59  * 69.80  * 31.19  *
* Crit W.S. (ft)        *         * Flow Area (sq ft)     * 192.78 * 219.98 * 446.85 *
* E.G. Slope (ft/ft)    * 0.001015 * Area (sq ft)         * 192.78 * 219.98 * 446.85 *
* Q Total (cfs)         * 2413.00 * Flow (cfs)           * 182.36 * 1120.87 * 1109.78 *
* Top Width (ft)        * 215.93 * Top Width (ft)       * 68.02  * 27.29  * 120.62 *
* Vel Total (ft/s)     * 2.81  * Avg. Vel. (ft/s)     * 0.95  * 5.10  * 2.48  *
* Max Chl Dpth (ft)    * 9.51  * Hydr. Depth (ft)     * 2.83  * 8.06  * 3.70  *
* Conv. Total (cfs)     * 75741.0 * Conv. (cfs)          * 5724.0 * 35182.5 * 34834.5 *
* Length Wtd. (ft)     * 52.78 * Wetted Per. (ft)     * 68.25  * 30.09  * 123.19 *
* Min Ch El (ft)       * 222.42 * Shear (lb/sq ft)     * 0.18  * 0.46  * 0.23  *
* Alpha                 * 1.90  * Stream Power (lb/ft s) * 308.74 * 0.00  * 0.00  *
* Frctn Loss (ft)     * 0.06  * Cum Volume (acre-ft) * 0.42  * 2.72  * 1.42  *
* C & E Loss (ft)      * 0.01  * Cum SA (acres)       * 0.20  * 0.22  * 0.85  *
*****

```

CROSS SECTION

RIVER: hudson

REACH: main RS: 7

INPUT

Description:

Station Elevation Data		num= 33	
Sta	Elev	Sta	Elev
0	234.04	10	230.35
50.48	222.23	52	221.26
58.62	221.31	70.98	222.8
102.57	228.06	126.88	227.25
209.92	229.21	212.72	229.36
253.93	233.54	254.06	233.18
283.75	233.74	295.85	234.97

Manning's n Values		num= 7	
Sta	n Val	Sta	n Val
0	.1	49.25	.05
249.97	.02	283.75	.05

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	49.25	82.97		20.21	31	42.19		.1	.3

Blocked Obstructions			num= 1
Sta L	Sta R	Elev	
191.3	244.3	250	

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)         * 229.43 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)         * 0.17  * Wt. n-Val.             * 0.100  * 0.050  * 0.051  *
* W.S. Elev (ft)        * 229.26 * Reach Len. (ft)       * 20.21  * 31.00  * 42.19  *
* Crit W.S. (ft)        *         * Flow Area (sq ft)     * 15.43  * 211.37 * 159.44 *
* E.G. Slope (ft/ft)    * 0.001660 * Area (sq ft)         * 15.43  * 211.37 * 159.44 *
* Q Total (cfs)         * 1038.00 * Flow (cfs)           * 6.16  * 779.75 * 252.09 *
* Top Width (ft)        * 170.83 * Top Width (ft)       * 28.77  * 33.72  * 108.33 *
* Vel Total (ft/s)     * 2.69  * Avg. Vel. (ft/s)     * 0.40  * 3.69  * 1.58  *
* Max Chl Dpth (ft)    * 8.39  * Hydr. Depth (ft)     * 0.54  * 6.27  * 1.47  *
* Conv. Total (cfs)     * 25474.0 * Conv. (cfs)          * 151.3  * 19136.1 * 6186.6 *
* Length Wtd. (ft)     * 32.75 * Wetted Per. (ft)     * 28.79  * 39.75  * 108.90 *
* Min Ch El (ft)       * 220.87 * Shear (lb/sq ft)     * 0.06  * 0.55  * 0.15  *
* Alpha                 * 1.50  * Stream Power (lb/ft s) * 305.80 * 0.00  * 0.00  *
* Frctn Loss (ft)     * 0.05  * Cum Volume (acre-ft) * 0.02  * 1.13  * 0.25  *
* C & E Loss (ft)      * 0.01  * Cum SA (acres)       * 0.03  * 0.17  * 0.40  *
*****

```

CROSS SECTION OUTPUT Profile #50-YR

```
*****
* E.G. Elev (ft)          * 231.45 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.15  * Wt. n-Val.            * 0.100  * 0.050  * 0.051  *
* W.S. Elev (ft)         * 231.29 * Reach Len. (ft)       * 20.21  * 31.00  * 42.19  *
* Crit W.S. (ft)         *        * Flow Area (sq ft)     * 90.63  * 279.83 * 379.39 *
* E.G. Slope (ft/ft)     * 0.001198 * Area (sq ft)         * 90.63  * 279.83 * 379.39 *
* Q Total (cfs)          * 2017.00 * Flow (cfs)           * 77.79  * 1057.45 * 881.77 *
* Top Width (ft)         * 183.85 * Top Width (ft)       * 41.80  * 33.72  * 108.33 *
* Vel Total (ft/s)       * 2.69  * Avg. Vel. (ft/s)     * 0.86   * 3.78   * 2.32   *
* Max Chl Dpth (ft)      * 10.42 * Hydr. Depth (ft)     * 2.17   * 8.30   * 3.50   *
* Conv. Total (cfs)      * 58263.7 * Conv. (cfs)          * 2246.9 * 30545.8 * 25471.0 *
* Length Wtd. (ft)       * 34.00 * Wetted Per. (ft)     * 42.05  * 39.75  * 110.93 *
* Min Ch El (ft)        * 220.87 * Shear (lb/sq ft)     * 0.16   * 0.53   * 0.26   *
* Alpha                  * 1.36  * Stream Power (lb/ft s) * 305.80 * 0.00   * 0.00   *
* Frctn Loss (ft)       * 0.05  * Cum Volume (acre-ft) * 0.08   * 1.89   * 0.76   *
* C & E Loss (ft)       * 0.04  * Cum SA (acres)       * 0.07   * 0.17   * 0.50   *
*****
```

CROSS SECTION OUTPUT Profile #100-YR

```
*****
* E.G. Elev (ft)          * 232.08 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.18  * Wt. n-Val.            * 0.100  * 0.050  * 0.051  *
* W.S. Elev (ft)         * 231.90 * Reach Len. (ft)       * 20.21  * 31.00  * 42.19  *
* Crit W.S. (ft)         *        * Flow Area (sq ft)     * 116.58 * 300.37 * 445.35 *
* E.G. Slope (ft/ft)     * 0.001308 * Area (sq ft)         * 116.58 * 300.37 * 445.35 *
* Q Total (cfs)          * 2562.00 * Flow (cfs)           * 120.31 * 1243.04 * 1198.65 *
* Top Width (ft)         * 185.50 * Top Width (ft)       * 43.45  * 33.72  * 108.33 *
* Vel Total (ft/s)       * 2.97  * Avg. Vel. (ft/s)     * 1.03   * 4.14   * 2.69   *
* Max Chl Dpth (ft)      * 11.03 * Hydr. Depth (ft)     * 2.68   * 8.91   * 4.11   *
* Conv. Total (cfs)      * 70842.9 * Conv. (cfs)          * 3326.7 * 34371.7 * 33144.5 *
* Length Wtd. (ft)       * 34.15 * Wetted Per. (ft)     * 43.81  * 39.75  * 111.54 *
* Min Ch El (ft)        * 220.87 * Shear (lb/sq ft)     * 0.22   * 0.62   * 0.33   *
* Alpha                  * 1.33  * Stream Power (lb/ft s) * 305.80 * 0.00   * 0.00   *
* Frctn Loss (ft)       * 0.06  * Cum Volume (acre-ft) * 0.12   * 2.30   * 1.10   *
* C & E Loss (ft)       * 0.05  * Cum SA (acres)       * 0.09   * 0.17   * 0.77   *
*****
```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: hudson
 REACH: main RS: 6

INPUT

Description:

Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	232.81	5	230.96	33.91	229.84	59.4	227.76	60.24	222.1
63.1	220.81	66.12	220.29	66.23	220.27	69.39	220.61	76.64	221.39
91.29	227.87	96.51	227.85	109.84	226.87	129.26	226.95	146.31	227.92
180.09	228.74	190.82	229.33	212.5	233.18	218.13	232.45	222.02	232.45
222.21	232.15	228.69	232.32	239.79	232.57	251.13	232.34	251.79	232.87
264	234.33	274.08	241.19						

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	59.4	.035	91.29	.1	218.13	.02	251.79	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 59.4 91.29 19.21 30.14 38.14 .1 .3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
159	208.5	250

CROSS SECTION OUTPUT Profile #10-YR

```
*****
* E.G. Elev (ft)          * 229.37 * Element                * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.32  * Wt. n-Val.            * 0.100  * 0.035  * 0.100  *
* W.S. Elev (ft)         * 229.05 * Reach Len. (ft)       * 19.21  * 30.14  * 38.14  *
* Crit W.S. (ft)         *        * Flow Area (sq ft)     * 10.19  * 202.12 * 110.19 *
* E.G. Slope (ft/ft)     * 0.001348 * Area (sq ft)         * 10.19  * 202.12 * 110.19 *
* Q Total (cfs)          * 1038.00 * Flow (cfs)           * 4.14   * 951.40 * 82.46  *
* Top Width (ft)         * 115.40 * Top Width (ft)       * 15.80  * 31.89  * 67.71  *
* Vel Total (ft/s)       * 3.22  * Avg. Vel. (ft/s)     * 0.41   * 4.71   * 0.75   *
*****
```

```

* Max Chl Dpth (ft)      * 8.78 * Hydr. Depth (ft)      * 0.64 * 6.34 * 1.63 *
* Conv. Total (cfs)     * 28268.1 * Conv. (cfs)          * 112.7 * 25909.8 * 2245.6 *
* Length Wtd. (ft)     * 30.52 * Wetted Per. (ft)    * 15.86 * 38.52 * 68.60 *
* Min Ch El (ft)       * 220.27 * Shear (lb/sq ft)    * 0.05 * 0.44 * 0.14 *
* Alpha                 * 1.96 * Stream Power (lb/ft s) * 274.08 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 0.07 * Cum Volume (acre-ft) * 0.01 * 0.98 * 0.12 *
* C & E Loss (ft)      * 0.07 * Cum SA (acres)      * 0.02 * 0.15 * 0.31 *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)        * 231.36 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)        * 0.52  * Wt. n-Val.          * 0.100 * 0.035 * 0.100 *
* W.S. Elev (ft)       * 230.84 * Reach Len. (ft)     * 19.21 * 30.14 * 38.14 *
* Crit W.S. (ft)       *        * Flow Area (sq ft)    * 64.92 * 259.24 * 231.44 *
* E.G. Slope (ft/ft)   * 0.001769 * Area (sq ft)        * 64.92 * 259.24 * 231.44 *
* Q Total (cfs)        * 2017.00 * Flow (cfs)           * 47.40 * 1649.78 * 319.82 *
* Top Width (ft)       * 150.91 * Top Width (ft)      * 51.31 * 31.89 * 67.71 *
* Vel Total (ft/s)     * 3.63  * Avg. Vel. (ft/s)    * 0.73 * 6.36 * 1.38 *
* Max Chl Dpth (ft)   * 10.57 * Hydr. Depth (ft)    * 1.27 * 8.13 * 3.42 *
* Conv. Total (cfs)    * 47958.8 * Conv. (cfs)         * 1127.1 * 39227.3 * 7604.4 *
* Length Wtd. (ft)    * 31.92 * Wetted Per. (ft)    * 51.42 * 38.52 * 70.39 *
* Min Ch El (ft)      * 220.27 * Shear (lb/sq ft)    * 0.14 * 0.74 * 0.36 *
* Alpha                * 2.54  * Stream Power (lb/ft s) * 274.08 * 0.00 * 0.00 *
* Frctn Loss (ft)     * 0.07  * Cum Volume (acre-ft) * 0.04 * 1.70 * 0.46 *
* C & E Loss (ft)     * 0.02  * Cum SA (acres)      * 0.04 * 0.15 * 0.41 *
*****

```

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)        * 231.98 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)        * 0.69  * Wt. n-Val.          * 0.100 * 0.035 * 0.100 *
* W.S. Elev (ft)       * 231.28 * Reach Len. (ft)     * 19.21 * 30.14 * 38.14 *
* Crit W.S. (ft)       *        * Flow Area (sq ft)    * 88.98 * 273.36 * 261.44 *
* E.G. Slope (ft/ft)   * 0.002256 * Area (sq ft)        * 88.98 * 273.36 * 261.44 *
* Q Total (cfs)        * 2562.00 * Flow (cfs)           * 86.08 * 2035.29 * 440.64 *
* Top Width (ft)       * 154.87 * Top Width (ft)      * 55.27 * 31.89 * 67.71 *
* Vel Total (ft/s)     * 4.11  * Avg. Vel. (ft/s)    * 0.97 * 7.45 * 1.69 *
* Max Chl Dpth (ft)   * 11.01 * Hydr. Depth (ft)    * 1.61 * 8.57 * 3.86 *
* Conv. Total (cfs)    * 53944.2 * Conv. (cfs)         * 1812.4 * 42854.0 * 9277.8 *
* Length Wtd. (ft)    * 32.08 * Wetted Per. (ft)    * 55.44 * 38.52 * 70.83 *
* Min Ch El (ft)      * 220.27 * Shear (lb/sq ft)    * 0.23 * 1.00 * 0.52 *
* Alpha                * 2.64  * Stream Power (lb/ft s) * 274.08 * 0.00 * 0.00 *
* Frctn Loss (ft)     * 0.09  * Cum Volume (acre-ft) * 0.07 * 2.09 * 0.76 *
* C & E Loss (ft)     * 0.02  * Cum SA (acres)      * 0.07 * 0.15 * 0.69 *
*****

```

CROSS SECTION

RIVER: hudson
REACH: main RS: 5

INPUT

Description:

Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	237.05	19.33	231.35	34.54	230.9	49.16	226.44	49.71	221.74
54.79	221.59	60	219.53	61.57	219.8	61.58	219.8	62.02	219.88
63.98	219.98	66.43	226.23	69.34	227.52	113.51	228.23	150.48	227.88
173.2	229.28	184.22	231	187	231.13	190.89	231.01	190.99	230.72
197.15	230.94	207.98	231.26	218.02	231.1	225.62	230.81	226.28	231.35
242.65	238.23	244.51	238.31						

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	49.16	.035	69.34	.045	150.48	.05	187	.02
226.28	.05								

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
49.16 66.43 33.07 34.23 33.12 .1 .3

Ineffective Flow num= 1
Sta L Sta R Elev Permanent

CROSS SECTION OUTPUT Profile #10-YR

```
*****
* E.G. Elev (ft)          * 229.22 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 1.04  * Wt. n-Val.      * 0.100  * 0.035  * 0.041  *
* W.S. Elev (ft)         * 228.18 * Reach Len. (ft) * 33.07  * 34.23  * 33.12  *
* Crit W.S. (ft)         * 225.98 * Flow Area (sq ft) * 4.98  * 120.81 * 19.33  *
* E.G. Slope (ft/ft)     * 0.004982 * Area (sq ft)    * 4.98  * 120.81 * 23.01  *
* Q Total (cfs)          * 1038.00 * Flow (cfs)      * 4.62  * 1004.41 * 28.97  *
* Top Width (ft)         * 103.93 * Top Width (ft)  * 5.71  * 17.27  * 80.94  *
* Vel Total (ft/s)       * 7.15  * Avg. Vel. (ft/s) * 0.93  * 8.31  * 1.50  *
* Max Chl Dpth (ft)      * 8.65  * Hydr. Depth (ft) * 0.87  * 7.00  * 0.30  *
* Conv. Total (cfs)      * 14705.8 * Conv. (cfs)     * 65.5  * 14230.0 * 410.4  *
* Length Wtd. (ft)       * 34.21  * Wetted Per. (ft) * 5.97  * 26.14  * 64.34  *
* Min Ch El (ft)         * 219.53 * Shear (lb/sq ft) * 0.26  * 1.44  * 0.09  *
* Alpha                  * 1.31  * Stream Power (lb/ft s) * 244.51 * 0.00  * 0.00  *
* Frctn Loss (ft)       * 0.14  * Cum Volume (acre-ft) * 0.01  * 0.87  * 0.06  *
* C & E Loss (ft)        * 0.11  * Cum SA (acres)   * 0.01  * 0.13  * 0.25  *
*****
```

Warning: Divided flow computed for this cross-section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```
*****
* E.G. Elev (ft)          * 231.27 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.69  * Wt. n-Val.      * 0.100  * 0.035  * 0.044  *
* W.S. Elev (ft)         * 230.58 * Reach Len. (ft) * 33.07  * 34.23  * 33.12  *
* Crit W.S. (ft)         * 229.62 * Flow Area (sq ft) * 28.04  * 162.15 * 197.03 *
* E.G. Slope (ft/ft)     * 0.003074 * Area (sq ft)    * 28.04  * 162.15 * 274.00 *
* Q Total (cfs)          * 2017.00 * Flow (cfs)      * 36.39  * 1288.37 * 692.24 *
* Top Width (ft)         * 145.90 * Top Width (ft)  * 13.56  * 17.27  * 115.07 *
* Vel Total (ft/s)       * 5.21  * Avg. Vel. (ft/s) * 1.30  * 7.95  * 3.51  *
* Max Chl Dpth (ft)      * 11.05 * Hydr. Depth (ft) * 2.07  * 9.39  * 2.45  *
* Conv. Total (cfs)      * 36382.0 * Conv. (cfs)     * 656.5  * 23239.1 * 12486.4 *
* Length Wtd. (ft)       * 34.03 * Wetted Per. (ft) * 14.17  * 26.14  * 80.75  *
* Min Ch El (ft)         * 219.53 * Shear (lb/sq ft) * 0.38  * 1.19  * 0.47  *
* Alpha                  * 1.64  * Stream Power (lb/ft s) * 244.51 * 0.00  * 0.00  *
* Frctn Loss (ft)       * 0.18  * Cum Volume (acre-ft) * 0.02  * 1.55  * 0.24  *
* C & E Loss (ft)        * 0.18  * Cum SA (acres)   * 0.03  * 0.13  * 0.33  *
*****
```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```
*****
* E.G. Elev (ft)          * 231.86 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.86  * Wt. n-Val.      * 0.100  * 0.035  * 0.044  *
* W.S. Elev (ft)         * 231.00 * Reach Len. (ft) * 33.07  * 34.23  * 33.12  *
* Crit W.S. (ft)         * 230.16 * Flow Area (sq ft) * 34.23  * 169.47 * 233.30 *
* E.G. Slope (ft/ft)     * 0.003747 * Area (sq ft)    * 34.23  * 169.47 * 324.98 *
* Q Total (cfs)          * 2562.00 * Flow (cfs)      * 46.65  * 1531.13 * 984.22 *
* Top Width (ft)         * 166.55 * Top Width (ft)  * 18.00  * 17.27  * 131.28 *
* Vel Total (ft/s)       * 5.86  * Avg. Vel. (ft/s) * 1.36  * 9.03  * 4.22  *
* Max Chl Dpth (ft)      * 11.47 * Hydr. Depth (ft) * 1.90  * 9.81  * 2.42  *
* Conv. Total (cfs)      * 41855.9 * Conv. (cfs)     * 762.2  * 25014.3 * 16079.4 *
* Length Wtd. (ft)       * 33.90 * Wetted Per. (ft) * 18.66  * 26.14  * 97.27  *
* Min Ch El (ft)         * 219.53 * Shear (lb/sq ft) * 0.43  * 1.52  * 0.56  *
* Alpha                  * 1.62  * Stream Power (lb/ft s) * 244.51 * 0.00  * 0.00  *
* Frctn Loss (ft)       * 0.14  * Cum Volume (acre-ft) * 0.04  * 1.94  * 0.50  *
* C & E Loss (ft)        * 0.03  * Cum SA (acres)   * 0.05  * 0.13  * 0.60  *
*****
```

Warning: Divided flow computed for this cross-section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson
REACH: main

RS: 4

INPUT

Description:

Station Elevation Data		num= 25		Sta Elev		Sta Elev		Sta Elev		Sta Elev	
0	236.53	25.81	231.56	34.44	227.61	36.43	225.45	40.94	219.23		
43.91	218.9	46.89	219.58	48.04	219.84	56.6	224.71	62	228.28		
77.44	229.09	101.22	231.33	123.11	228.43	154.18	229.18	167.64	229.57		
171.48	229.63	171.59	229.32	177.83	229.47	188.28	229.72	198.64	229.54		
206.83	229.21	207.55	229.77	218.65	234.17	221.38	234.44	232.87	234.82		

Manning's n Values		num= 7		Sta n Val		Sta n Val		Sta n Val		Sta n Val	
0	.1	34.44	.035	62	.05	77.44	.045	167.64	.02		
207.55	.05	218.65	.02								

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.	
	34.44	62		47.24	49.31	53.94	.1	.3

Ineffective Flow		num= 1		Sta L Sta R		Elev Permanent	
	131	139.6	250	F			

CROSS SECTION OUTPUT Profile #10-YR

* E.G. Elev (ft)	* 228.98	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.69	* Wt. n-Val.	* 0.100	* 0.035	* 0.000
* W.S. Elev (ft)	* 228.29	* Reach Len. (ft)	* 47.24	* 49.31	* 53.94
* Crit W.S. (ft)	* 225.64	* Flow Area (sq ft)	* 0.51	* 155.78	* 0.00
* E.G. Slope (ft/ft)	* 0.003257	* Area (sq ft)	* 0.51	* 155.78	* 0.00
* Q Total (cfs)	* 1038.00	* Flow (cfs)	* 0.20	* 1037.80	* 0.00
* Top Width (ft)	* 29.26	* Top Width (ft)	* 1.49	* 27.56	* 0.21
* Vel Total (ft/s)	* 6.64	* Avg. Vel. (ft/s)	* 0.39	* 6.66	* 0.05
* Max Chl Dpth (ft)	* 9.39	* Hydr. Depth (ft)	* 0.34	* 5.65	* 0.01
* Conv. Total (cfs)	* 18188.3	* Conv. (cfs)	* 3.4	* 18184.8	* 0.0
* Length Wtd. (ft)	* 49.58	* Wetted Per. (ft)	* 1.64	* 34.17	* 0.21
* Min Ch El (ft)	* 218.90	* Shear (lb/sq ft)	* 0.06	* 0.93	*
* Alpha	* 1.01	* Stream Power (lb/ft s)	* 232.87	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.07	* Cum Volume (acre-ft)	* 0.00	* 0.76	* 0.05
* C & E Loss (ft)	* 0.15	* Cum SA (acres)	* 0.01	* 0.11	* 0.22

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 230.91	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 2.47	* Wt. n-Val.	* 0.100	* 0.035	* 0.050
* W.S. Elev (ft)	* 228.44	* Reach Len. (ft)	* 47.24	* 49.31	* 53.94
* Crit W.S. (ft)	* 228.13	* Flow Area (sq ft)	* 0.76	* 159.99	* 0.26
* E.G. Slope (ft/ft)	* 0.011246	* Area (sq ft)	* 0.76	* 159.99	* 0.26
* Q Total (cfs)	* 2017.00	* Flow (cfs)	* 0.63	* 2016.22	* 0.15
* Top Width (ft)	* 33.19	* Top Width (ft)	* 1.82	* 27.56	* 3.80
* Vel Total (ft/s)	* 12.53	* Avg. Vel. (ft/s)	* 0.83	* 12.60	* 0.59
* Max Chl Dpth (ft)	* 9.54	* Hydr. Depth (ft)	* 0.42	* 5.81	* 0.07
* Conv. Total (cfs)	* 19019.8	* Conv. (cfs)	* 5.9	* 19012.4	* 1.4
* Length Wtd. (ft)	* 49.98	* Wetted Per. (ft)	* 2.00	* 34.17	* 3.81
* Min Ch El (ft)	* 218.90	* Shear (lb/sq ft)	* 0.27	* 3.29	* 0.05
* Alpha	* 1.01	* Stream Power (lb/ft s)	* 232.87	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.13	* Cum Volume (acre-ft)	* 0.01	* 1.43	* 0.14
* C & E Loss (ft)	* 0.64	* Cum SA (acres)	* 0.02	* 0.12	* 0.29

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 231.70	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 1.18	* Wt. n-Val.	* 0.100	* 0.035	* 0.036
* W.S. Elev (ft)	* 230.51	* Reach Len. (ft)	* 47.24	* 49.31	* 53.94

```

* Crit W.S. (ft)          * 230.51 * Flow Area (sq ft)      * 9.20 * 216.98 * 148.28 *
* E.G. Slope (ft/ft)     * 0.004326 * Area (sq ft)          * 9.20 * 216.98 * 163.65 *
* Q Total (cfs)          * 2562.00 * Flow (cfs)            * 10.81 * 2077.84 * 473.35 *
* Top Width (ft)         * 166.46 * Top Width (ft)        * 6.34 * 27.56 * 132.56 *
* Vel Total (ft/s)       * 6.84 * Avg. Vel. (ft/s)      * 1.18 * 9.58 * 3.19 *
* Max Chl Dpth (ft)     * 11.61 * Hydr. Depth (ft)      * 1.45 * 7.87 * 1.20 *
* Conv. Total (cfs)      * 38953.1 * Conv. (cfs)           * 164.4 * 31591.8 * 7196.9 *
* Length Wtd. (ft)      * 50.55 * Wetted Per. (ft)      * 6.97 * 34.17 * 124.76 *
* Min Ch El (ft)        * 218.90 * Shear (lb/sq ft)      * 0.36 * 1.72 * 0.32 *
* Alpha                  * 1.63 * Stream Power (lb/ft s) * 232.87 * 0.00 * 0.00 *
* Frctn Loss (ft)       * 0.11 * Cum Volume (acre-ft)  * 0.03 * 1.79 * 0.32 *
* C & E Loss (ft)       * 0.24 * Cum SA (acres)        * 0.04 * 0.12 * 0.50 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: hudson

REACH: main

RS: 3

INPUT

Description:

```

Station Elevation Data      num=      29
*****
Sta   Elev   Sta   Elev   Sta   Elev   Sta   Elev   Sta   Elev
*****
  0   234.33  12.74  233.78  27.06  229.74  36.02  226.32  41.07  223.02
 45.32 220.34  49.21  217.7  50.93  217.52  51.14  217.5  54.29  218.25
 59.95 222.39  65.56  225.54  72.74  228.64  102.54 228.16  121.2  229.93
135.83 227.74 149.63  227.65 153.57  227.69  153.67 227.23  159.35 227.29
169.96 227.5  180.29  227.5  188.17  227.34  188.91 227.93  191.54 227.85
192.54 229.42  203.14  230.82  206.02  230.85  216.02 232.35

```

```

Manning's n Values      num=      4
*****
Sta   n Val   Sta   n Val   Sta   n Val   Sta   n Val
*****
  0   .1   36.02   .035   65.56   .045   149.63   .02

```

```

Bank Sta: Left  Right  Lengths: Left Channel  Right  Coeff Contr.  Expan.
          36.02  65.56          112.21 120.13 138.27          .3          .5

```

```

Ineffective Flow      num=      1
Sta L   Sta R   Elev  Permanent
 207.91 216.02   245      F

```

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)      * 228.77 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.19  * Wt. n-Val.           * 0.100  * 0.035  * 0.025  *
* W.S. Elev (ft)     * 228.57 * Reach Len. (ft)      * 112.21 * 120.13 * 138.27 *
* Crit W.S. (ft)     * 224.00 * Flow Area (sq ft)    * 6.65  * 213.59 * 77.67  *
* E.G. Slope (ft/ft) * 0.000678 * Area (sq ft)        * 6.65  * 213.59 * 77.67  *
* Q Total (cfs)      * 918.00 * Flow (cfs)           * 2.66  * 797.90 * 117.44 *
* Top Width (ft)     * 134.14 * Top Width (ft)      * 5.90  * 29.54  * 98.70  *
* Vel Total (ft/s)   * 3.08  * Avg. Vel. (ft/s)    * 0.40  * 3.74  * 1.51  *
* Max Chl Dpth (ft) * 11.07  * Hydr. Depth (ft)    * 1.13  * 7.23  * 0.79  *
* Conv. Total (cfs)  * 35254.7 * Conv. (cfs)         * 102.1 * 30642.5 * 4510.1 *
* Length Wtd. (ft)  * 120.13 * Wetted Per. (ft)    * 6.32  * 34.38 * 100.39 *
* Min Ch El (ft)    * 217.50 * Shear (lb/sq ft)    * 0.04  * 0.26  * 0.03  *
* Alpha              * 1.31  * Stream Power (lb/ft s) * 216.02 * 0.00  * 0.00  *
* Frctn Loss (ft)   *        * Cum Volume (acre-ft) * 0.00  * 0.55  * 0.00  *
* C & E Loss (ft)   *        * Cum SA (acres)      * 0.01  * 0.08  * 0.16  *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)      * 230.14 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.33  * Wt. n-Val.      * 0.100  * 0.035  * 0.027  *
* W.S. Elev (ft)     * 229.81 * Reach Len. (ft) * 112.21 * 120.13 * 138.27 *
* Crit W.S. (ft)     * 226.40 * Flow Area (sq ft) * 15.98  * 250.21 * 219.55 *
* E.G. Slope (ft/ft) * 0.001077 * Area (sq ft)    * 15.98  * 250.21 * 219.55 *
* Q Total (cfs)      * 1887.00 * Flow (cfs)      * 10.75  * 1309.26 * 566.99 *
* Top Width (ft)     * 166.67 * Top Width (ft)  * 9.22   * 29.54  * 127.92 *
* Vel Total (ft/s)   * 3.88  * Avg. Vel. (ft/s) * 0.67   * 5.23   * 2.58   *
* Max Chl Dpth (ft)  * 12.31 * Hydr. Depth (ft) * 1.73   * 8.47   * 1.72   *
* Conv. Total (cfs)  * 57494.1 * Conv. (cfs)     * 327.6  * 39891.1 * 17275.4 *
* Length Wtd. (ft)   * 120.13 * Wetted Per. (ft) * 9.86   * 34.38  * 130.27 *
* Min Ch El (ft)     * 217.50 * Shear (lb/sq ft) * 0.11   * 0.49   * 0.11   *
* Alpha              * 1.39  * Stream Power (lb/ft s) * 216.02 * 0.00   * 0.00   *
* Frctn Loss (ft)    *        * Cum Volume (acre-ft) * 0.00   * 1.20   * 0.00   *
* C & E Loss (ft)    *        * Cum SA (acres)   * 0.02   * 0.08   * 0.21   *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)      * 230.72 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 0.37  * Wt. n-Val.      * 0.100  * 0.035  * 0.028  *
* W.S. Elev (ft)     * 230.35 * Reach Len. (ft) * 112.21 * 120.13 * 138.27 *
* Crit W.S. (ft)     * 228.58 * Flow Area (sq ft) * 21.48  * 266.19 * 290.83 *
* E.G. Slope (ft/ft) * 0.001182 * Area (sq ft)    * 21.48  * 266.19 * 290.83 *
* Q Total (cfs)      * 2412.00 * Flow (cfs)      * 16.32  * 1520.55 * 875.13 *
* Top Width (ft)     * 174.72 * Top Width (ft)  * 11.13  * 29.54  * 134.04 *
* Vel Total (ft/s)   * 4.17  * Avg. Vel. (ft/s) * 0.76   * 5.71   * 3.01   *
* Max Chl Dpth (ft)  * 12.85 * Hydr. Depth (ft) * 1.93   * 9.01   * 2.17   *
* Conv. Total (cfs)  * 70155.3 * Conv. (cfs)     * 474.6  * 44226.7 * 25454.1 *
* Length Wtd. (ft)   * 120.13 * Wetted Per. (ft) * 11.85  * 34.38  * 136.44 *
* Min Ch El (ft)     * 217.50 * Shear (lb/sq ft) * 0.13   * 0.57   * 0.16   *
* Alpha              * 1.37  * Stream Power (lb/ft s) * 216.02 * 0.00   * 0.00   *
* Frctn Loss (ft)    *        * Cum Volume (acre-ft) * 0.01   * 1.52   * 0.03   *
* C & E Loss (ft)    *        * Cum SA (acres)   * 0.03   * 0.08   * 0.34   *
*****

```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CULVERT

RIVER: hudson

REACH: main RS: 2.5

INPUT

Description:

Distance from Upstream XS = 13

Deck/Roadway Width = 95

Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num= 6

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
25		229			33.33		229			41.09		228.5		
54.48		227.93			67.7		228			90		228		

Upstream Bridge Cross Section Data

Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	234.33	12.74	233.78	27.06	229.74	36.02	226.32	41.07	223.02
45.32	220.34	49.21	217.7	50.93	217.52	51.14	217.5	54.29	218.25
59.95	222.39	65.56	225.54	72.74	228.64	102.54	228.16	121.2	229.93
135.83	227.74	149.63	227.65	153.57	227.69	153.67	227.23	159.35	227.29
169.96	227.5	180.29	227.5	188.17	227.34	188.91	227.93	191.54	227.85
192.54	229.42	203.14	230.82	206.02	230.85	216.02	232.35		

Manning's n Values num= 4

Sta	n	Val	Sta	n	Val	Sta	n	Val	Sta	n	Val
0	.1	36.02	.035	65.56	.045	149.63	.02				

Bank Sta: Left Right Coeff Contr. Expan.

Proposed (Concepts 1-7) Conditions HEC-RAS Output

High Flows Model

36.02 65.56 .3 .5
 Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 207.91 216.02 245 F

Downstream Deck/Roadway Coordinates
 num= 7
 Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord

 0 225 24 225 24.8 229
 34.2 228.5 49 227.93 50 225
 90 225

Downstream Bridge Cross Section Data
 Station Elevation Data num= 25
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev

 0 227.98 20.1 224.25 30.05 222.24 30.41 219.53 30.82 217.54
 31.07 215.18 39.03 214.76 40.17 214.78 46.05 214.86 46.12 217.7
 46.53 219.53 47.08 222.67 75.26 224.24 87.23 224.69 122.58 225.91
 127.5 225.75 127.65 225.43 133.54 225.65 143.95 225.88 153.46 225.71
 159.5 225.41 160.11 225.99 160.7 226 161.7 228.68 177.81 229.82

Manning's n Values num= 4
 Sta n Val Sta n Val Sta n Val Sta n Val

 0 .045 31.07 .035 47.08 .045 122.58 .02

Bank Sta: Left Right Coeff Contr. Expan.
 30.41 46.53 .3 .5
 Ineffective Flow num= 2
 Sta L Sta R Elev Permanent
 56.4 111.4 240 F
 171.08 177.81 240 F
 Blocked Obstructions num= 1
 Sta L Sta R Elev

 14.6 21.6 230

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
 Downstream Embankment side slope = 0 horiz. to 1.0 vertical
 Maximum allowable submergence for weir flow = .98
 Elevation at which weir flow begins =
 Energy head used in spillway design =
 Spillway height used in design =
 Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name Shape Rise Span
 Culvert #1 Circular 8
 FHWA Chart # 1 - Concrete Pipe Culvert
 FHWA Scale # 1 - Square edge entrance with headwall
 Solution Criteria = Highest U.S. EG
 Culvert Upstrm Dist Length Top n Bottom n Depth Blocked Entrance Loss Coef Exit Loss Coef
 13.5 94.77 .024 .024 0 .5 1
 Upstream Elevation = 216.95
 Centerline Station = 51.14
 Downstream Elevation = 215.35
 Centerline Station = 39.16

CULVERT OUTPUT Profile #10-YR Culv Group: Culvert #1

 * Q Culv Group (cfs) * 643.83 * Culv Full Len (ft) * *
 * # Barrels * 1 * Culv Vel US (ft/s) * 14.56 *
 * Q Barrel (cfs) * 643.83 * Culv Vel DS (ft/s) * 14.84 *
 * E.G. US. (ft) * 228.77 * Culv Inv El Up (ft) * 216.95 *
 * W.S. US. (ft) * 228.57 * Culv Inv El Dn (ft) * 215.35 *
 * E.G. DS (ft) * 222.09 * Culv Frctn Ls (ft) * 1.61 *
 * W.S. DS (ft) * 219.77 * Culv Exit Loss (ft) * 3.12 *
 * Delta EG (ft) * 6.68 * Culv Entr Loss (ft) * 1.95 *
 * Delta WS (ft) * 8.81 * Q Weir (cfs) * 274.17 *
 * E.G. IC (ft) * 228.77 * Weir Sta Lft (ft) * 37.00 *
 * E.G. OC (ft) * 228.72 * Weir Sta Rgt (ft) * 192.12 *
 * Culvert Control * Inlet * Weir Submerg * 0.00 *
 * Culv WS Inlet (ft) * 223.53 * Weir Max Depth (ft) * 1.53 *
 * Culv WS Outlet (ft) * 221.79 * Weir Avg Depth (ft) * 0.79 *
 * Culv Nml Depth (ft) * 6.58 * Weir Flow Area (sq ft) * 107.32 *
 * Culv Crt Depth (ft) * 6.44 * Min El Weir Flow (ft) * 227.24 *

CULVERT OUTPUT Profile #50-YR Culv Group: Culvert #1

 * Q Culv Group (cfs) * 708.01 * Culv Full Len (ft) * 78.07 *
 * # Barrels * 1 * Culv Vel US (ft/s) * 14.09 *
 * Q Barrel (cfs) * 708.01 * Culv Vel DS (ft/s) * 14.10 *
 * E.G. US. (ft) * 230.14 * Culv Inv El Up (ft) * 216.95 *
 * W.S. US. (ft) * 229.81 * Culv Inv El Dn (ft) * 215.35 *
 * E.G. DS (ft) * 226.37 * Culv Frctn Ls (ft) * 2.23 *
 * W.S. DS (ft) * 222.74 * Culv Exit Loss (ft) * 0.00 *
 * Delta EG (ft) * 3.77 * Culv Entr Loss (ft) * 1.54 *
 * Delta WS (ft) * 7.07 * Q Weir (cfs) * 1178.99 *
 * E.G. IC (ft) * 230.14 * Weir Sta Lft (ft) * 25.74 *
 * E.G. OC (ft) * 230.06 * Weir Sta Rgt (ft) * 197.78 *
 * Culvert Control * Inlet * Weir Submerg * 0.00 *
 * Culv WS Inlet (ft) * 224.95 * Weir Max Depth (ft) * 2.88 *
 * Culv WS Outlet (ft) * 223.28 * Weir Avg Depth (ft) * 1.85 *
 * Culv Nml Depth (ft) * 8.00 * Weir Flow Area (sq ft) * 318.14 *
 * Culv Crt Depth (ft) * 6.72 * Min El Weir Flow (ft) * 227.24 *

Note: The normal depth exceeds the height of the culvert. The program assumes that the normal depth is equal to the height of the culvert.
 Note: During the supercritical calculations a hydraulic jump occurred inside of the culvert.

CULVERT OUTPUT Profile #100-YR Culv Group: Culvert #1

 * Q Culv Group (cfs) * 644.61 * Culv Full Len (ft) * 94.77 *
 * # Barrels * 1 * Culv Vel US (ft/s) * 12.82 *
 * Q Barrel (cfs) * 644.61 * Culv Vel DS (ft/s) * 12.82 *
 * E.G. US. (ft) * 230.72 * Culv Inv El Up (ft) * 216.95 *
 * W.S. US. (ft) * 230.35 * Culv Inv El Dn (ft) * 215.35 *
 * E.G. DS (ft) * 227.83 * Culv Frctn Ls (ft) * 1.61 *
 * W.S. DS (ft) * 224.85 * Culv Exit Loss (ft) * 0.00 *
 * Delta EG (ft) * 2.89 * Culv Entr Loss (ft) * 1.28 *
 * Delta WS (ft) * 5.50 * Q Weir (cfs) * 1767.39 *
 * E.G. IC (ft) * 230.65 * Weir Sta Lft (ft) * 23.60 *
 * E.G. OC (ft) * 230.72 * Weir Sta Rgt (ft) * 202.36 *
 * Culvert Control * Outlet * Weir Submerg * 0.00 *
 * Culv WS Inlet (ft) * 224.95 * Weir Max Depth (ft) * 3.49 *
 * Culv WS Outlet (ft) * 223.35 * Weir Avg Depth (ft) * 2.37 *
 * Culv Nml Depth (ft) * * Weir Flow Area (sq ft) * 424.27 *
 * Culv Crt Depth (ft) * 6.44 * Min El Weir Flow (ft) * 227.24 *

CROSS SECTION

RIVER: hudson
 REACH: main RS: 2

INPUT

Description:

Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	227.98	20.1	224.25	30.05	222.24	30.41	219.53	30.82	217.54
31.07	215.18	39.03	214.76	40.17	214.78	46.05	214.86	46.12	217.7
46.53	219.53	47.08	222.67	75.26	224.24	87.23	224.69	122.58	225.91
127.5	225.75	127.65	225.43	133.54	225.65	143.95	225.88	153.46	225.71
159.5	225.41	160.11	225.99	160.7	226	161.7	228.68	177.81	229.82

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	31.07	.035	47.08	.045	122.58	.02

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 30.41 46.53 46.04 48.67 51.13 .3 .5

Ineffective Flow num= 2
 Sta L Sta R Elev Permanent
 56.4 111.4 240 F
 171.08 177.81 240 F

Blocked Obstructions num= 1
 Sta L Sta R Elev
 14.6 21.6 230

CROSS SECTION OUTPUT Profile #10-YR

 * E.G. Elev (ft) * 222.09 * Element * Left OB * Channel * Right OB *
 Proposed (Concepts 1-7) Conditions HEC-RAS Output High Flows Model

* Vel Head (ft)	* 2.32	* Wt. n-Val.	* 0.000	* 0.037	* 0.035	*
* W.S. Elev (ft)	* 219.77	* Reach Len. (ft)	* 46.04	* 48.67	* 51.13	*
* Crit W.S. (ft)	* 219.77	* Flow Area (sq ft)	* 0.00	* 75.02	* 0.00	*
* E.G. Slope (ft/ft)	* 0.020355	* Area (sq ft)	* 0.00	* 75.02	* 0.00	*
* Q Total (cfs)	* 918.00	* Flow (cfs)	* 0.00	* 918.00	* 0.00	*
* Top Width (ft)	* 16.19	* Top Width (ft)	* 0.03	* 16.12	* 0.04	*
* Vel Total (ft/s)	* 12.23	* Avg. Vel. (ft/s)	* 0.29	* 12.24	* 0.45	*
* Max Chl Dpth (ft)	* 5.01	* Hydr. Depth (ft)	* 0.12	* 4.65	* 0.12	*
* Conv. Total (cfs)	* 6434.3	* Conv. (cfs)	* 0.0	* 6434.3	* 0.0	*
* Length Wtd. (ft)	* 48.67	* Wetted Per. (ft)	* 0.24	* 24.11	* 0.24	*
* Min Ch El (ft)	* 214.76	* Shear (lb/sq ft)	*	* 3.95	* 0.03	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 177.81	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.86	* Cum Volume (acre-ft)	* 0.00	* 0.08	* 0.00	*
* C & E Loss (ft)	* 0.21	* Cum SA (acres)	* 0.00	* 0.02	* 0.00	*

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50-YR

* E.G. Elev (ft)	* 226.37	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 3.63	* Wt. n-Val.	* 0.045	* 0.037	* 0.035	*
* W.S. Elev (ft)	* 222.74	* Reach Len. (ft)	* 46.04	* 48.67	* 51.13	*
* Crit W.S. (ft)	* 222.74	* Flow Area (sq ft)	* 1.29	* 122.99	* 0.95	*
* E.G. Slope (ft/ft)	* 0.016483	* Area (sq ft)	* 1.29	* 122.99	* 0.95	*
* Q Total (cfs)	* 1887.00	* Flow (cfs)	* 2.14	* 1882.72	* 2.14	*
* Top Width (ft)	* 20.79	* Top Width (ft)	* 2.84	* 16.12	* 1.83	*
* Vel Total (ft/s)	* 15.07	* Avg. Vel. (ft/s)	* 1.66	* 15.31	* 2.26	*
* Max Chl Dpth (ft)	* 7.98	* Hydr. Depth (ft)	* 0.45	* 7.63	* 0.52	*
* Conv. Total (cfs)	* 14697.8	* Conv. (cfs)	* 16.7	* 14664.4	* 16.7	*
* Length Wtd. (ft)	* 48.67	* Wetted Per. (ft)	* 5.27	* 24.11	* 4.47	*
* Min Ch El (ft)	* 214.76	* Shear (lb/sq ft)	* 0.25	* 5.25	* 0.22	*
* Alpha	* 1.03	* Stream Power (lb/ft s)	* 177.81	* 0.00	* 0.00	*
* Frctn Loss (ft)	* 0.45	* Cum Volume (acre-ft)	* 0.00	* 0.13	* 0.00	*
* C & E Loss (ft)	* 1.14	* Cum SA (acres)	* 0.00	* 0.02	* 0.00	*

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100-YR

* E.G. Elev (ft)	* 227.83	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 2.98	* Wt. n-Val.	* 0.045	* 0.037	* 0.044	*
* W.S. Elev (ft)	* 224.85	* Reach Len. (ft)	* 46.04	* 48.67	* 51.13	*
* Crit W.S. (ft)	* 224.85	* Flow Area (sq ft)	* 16.26	* 156.96	* 19.95	*
* E.G. Slope (ft/ft)	* 0.010407	* Area (sq ft)	* 16.26	* 156.96	* 46.29	*
* Q Total (cfs)	* 2412.00	* Flow (cfs)	* 66.11	* 2246.28	* 99.61	*
* Top Width (ft)	* 70.22	* Top Width (ft)	* 8.81	* 16.12	* 45.29	*
* Vel Total (ft/s)	* 12.49	* Avg. Vel. (ft/s)	* 4.07	* 14.31	* 4.99	*
* Max Chl Dpth (ft)	* 10.09	* Hydr. Depth (ft)	* 1.85	* 9.74	* 2.02	*

```

* Conv. Total (cfs)      * 23643.7 * Conv. (cfs)          * 648.1 * 22019.2 * 976.4 *
* Length Wtd. (ft)     * 48.72  * Wetted Per. (ft)    * 12.26 * 24.11 * 12.52 *
* Min Ch El (ft)      * 214.76 * Shear (lb/sq ft)    * 0.86  * 4.23 * 1.03 *
* Alpha                * 1.23   * Stream Power (lb/ft s) * 177.81 * 0.00 * 0.00 *
* Frctn Loss (ft)     * 0.39   * Cum Volume (acre-ft) * 0.01  * 0.16 * 0.03 *
* C & E Loss (ft)     * 0.70   * Cum SA (acres)      * 0.01  * 0.02 * 0.05 *
*****

```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: hudson
 REACH: main RS: 1

INPUT

Description:

Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	230.14	25.94	222.15	37.57	221.8	42.97	220.18	43.67	218.62
44.08	217.3	45.37	214.42	51.45	214.18	52.87	214.13	61	214.53
62.45	217.58	63.27	219.47	63.72	220.69	65.96	220.54	105.43	221.17
130.89	223.8	152.14	226.21	154.82	225.97	160.48	226.02	170.65	226.19
180.49	226	187.04	225.77	187.73	226.32	190.41	226.66	200	229.64

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	45.37	.035	63.72	.02	190.41	.045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 43.67 63.27 0 0 0 .1 .3

Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 103.5 146.6 240 F

CROSS SECTION OUTPUT Profile #10-YR

```

*****
* E.G. Elev (ft)      * 220.97 * Element              * Left OB * Channel * Right OB *
* Vel Head (ft)      * 2.52  * Wt. n-Val.          *          * 0.037 *          *
* W.S. Elev (ft)     * 218.46 * Reach Len. (ft)     *          *          *          *
* Crit W.S. (ft)     * 218.85 * Flow Area (sq ft)   *          * 72.11 *          *
* E.G. Slope (ft/ft) * 0.023477 * Area (sq ft)       *          * 72.11 *          *
* Q Total (cfs)      * 918.00 * Flow (cfs)          *          * 918.00 *          *
* Top Width (ft)     * 19.11 * Top Width (ft)      *          * 19.11 *          *
* Vel Total (ft/s)   * 12.73 * Avg. Vel. (ft/s)    *          * 12.73 *          *
* Max Chl Dpth (ft) * 4.33  * Hydr. Depth (ft)    *          * 3.77 *          *
* Conv. Total (cfs) * 5991.2 * Conv. (cfs)         *          * 5991.2 *          *
* Length Wtd. (ft)  *          * Wetted Per. (ft)    *          * 24.34 *          *
* Min Ch El (ft)    * 214.13 * Shear (lb/sq ft)    *          * 4.34 *          *
* Alpha              * 1.00  * Stream Power (lb/ft s) * 200.00 * 0.00 * 0.00 *
* Frctn Loss (ft)   * 1.06  * Cum Volume (acre-ft) *          *          *          *
* C & E Loss (ft)   * 0.06  * Cum SA (acres)      *          *          *          *
*****

```

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50-YR

```

*****
* E.G. Elev (ft)      * 225.02 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 4.72  * Wt. n-Val.      * 0.045  * 0.037  * 0.035  *
* W.S. Elev (ft)     * 220.30 * Reach Len. (ft) *        *        *        *
* Crit W.S. (ft)     * 222.25 * Flow Area (sq ft) * 0.65  * 108.03 * 0.13  *
* E.G. Slope (ft/ft) * 0.027521 * Area (sq ft)    * 0.65  * 108.03 * 0.13  *
* Q Total (cfs)      * 1887.00 * Flow (cfs)      * 1.63  * 1885.13 * 0.24  *
* Top Width (ft)     * 21.00  * Top Width (ft)  * 1.10  * 19.60  * 0.31  *
* Vel Total (ft/s)   * 17.34  * Avg. Vel. (ft/s) * 2.50  * 17.45  * 1.93  *
* Max Chl Dpth (ft)  * 6.17   * Hydr. Depth (ft) * 0.60  * 5.51   * 0.41  *
* Conv. Total (cfs)  * 11374.7 * Conv. (cfs)     * 9.8   * 11363.4 * 1.5   *
* Length Wtd. (ft)  *        * Wetted Per. (ft) * 2.13  * 25.62  * 0.88  *
* Min Ch El (ft)    * 214.13 * Shear (lb/sq ft) * 0.53  * 7.24   * 0.25  *
* Alpha             * 1.01   * Stream Power (lb/ft s) * 200.00 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 1.02   * Cum Volume (acre-ft) *        *        *        *
* C & E Loss (ft)   * 0.33   * Cum SA (acres)   *        *        *        *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100-YR

```

*****
* E.G. Elev (ft)      * 226.39 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)      * 5.24  * Wt. n-Val.      * 0.045  * 0.037  * 0.020  *
* W.S. Elev (ft)     * 221.15 * Reach Len. (ft) *        *        *        *
* Crit W.S. (ft)     * 222.74 * Flow Area (sq ft) * 2.79  * 124.70 * 13.34  *
* E.G. Slope (ft/ft) * 0.026006 * Area (sq ft)    * 2.79  * 124.70 * 13.34  *
* Q Total (cfs)      * 2412.00 * Flow (cfs)      * 9.98  * 2327.81 * 74.22  *
* Top Width (ft)     * 64.45  * Top Width (ft)  * 3.93  * 19.60  * 40.91  *
* Vel Total (ft/s)   * 17.13  * Avg. Vel. (ft/s) * 3.57  * 18.67  * 5.56  *
* Max Chl Dpth (ft)  * 7.02   * Hydr. Depth (ft) * 0.71  * 6.36   * 0.33  *
* Conv. Total (cfs)  * 14956.9 * Conv. (cfs)     * 61.9  * 14434.8 * 460.2  *
* Length Wtd. (ft)  *        * Wetted Per. (ft) * 5.09  * 25.62  * 41.09  *
* Min Ch El (ft)    * 214.13 * Shear (lb/sq ft) * 0.89  * 7.90   * 0.53  *
* Alpha             * 1.15   * Stream Power (lb/ft s) * 200.00 * 0.00  * 0.00  *
* Frctn Loss (ft)   * 0.76   * Cum Volume (acre-ft) *        *        *        *
* C & E Loss (ft)   * 0.68   * Cum SA (acres)   *        *        *        *
*****

```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Note: Program found supercritical flow starting at this cross section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

SUMMARY OF MANNING'S N VALUES

River: hudson

```

*****
*
* Reach      * River Sta. * n1 * n2 * n3 * n4 * n5 * n6 * n7
*
*****
*main      * 40        * .085 * .045 * .02 * .045 * .035 * .045 *
*
*main      * 39        * .045 * .02 * .035 * .045 * * *
*
*main      * 38        * .045 * .02 * .035 * .02 * .045 * .1 *
*

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*main      * 37      * .045* .02* .035* .045* .02* .1*
*
*main      * 36      * .045* .02* .045* .035* .02* .1*
*
*main      * 35      * .045* .02* .045* .035* .1* *
*
*main      * 34      * .045* .02* .045* .05* .045* .1*
*
*main      * 33      * .045* .02* .045* .05* .045* .1*
*
*main      * 32      * .045* .02* .045* .05* .1* *
*
*main      * 31.5    *Bridge* * * * * * *
*main      * 31      * .045* .02* .045* .035* .1* *
*
*main      * 30      * .045* .02* .045* .035* .1* *
*
*main      * 29      * .045* .02* .045* .05* .1* *
*
*main      * 28      * .045* .02* .045* .035* .1* *
*
*main      * 27      * .045* .02* .045* .035* .1* *
*
*main      * 26      * .045* .02* .045* .035* .1* *
*
*main      * 25      * .02* .045* .035* .1* * *
*
*main      * 24      * .02* .045* .035* .1* * *
*
*main      * 23      * .045* .02* .065* * * *
*
*main      * 22      * .02* .065* * * * *
*
*main      * 21      * .02* .065* * * * *
*
*main      * 20      * .02* .045* .02* .065* * *
*
*main      * 19      * .02* .045* .02* .065* * *
*
*main      * 18      * .02* .045* .02* .065* * *
*
*main      * 17      * .02* .045* .02* .065* * *
*
*main      * 16      * .02* .045* .045* .02* .065* *
*
*main      * 15      * .02* .045* .045* .02* .065* *
*
*main      * 14      * .1* .035* .045* .05* .02* .1*
*
*main      * 13      * .1* .035* .045* .02* .1* *
*
*main      * 12      * .1* .035* .045* .02* .1* *
*
*main      * 11      * .1* .035* .045* .05* .02* .1*
*
*main      * 10      * .1* .085* .035* .045* .02* .05*
*
*main      * 9       * .1* .085* .035* .045* .02* .05*
*
*main      * 8       * .1* .035* .045* .02* .05* *
*
*main      * 7       * .1* .05* .1* .045* .05* .02*
*.05*
*main      * 6       * .1* .035* .1* .02* .05* *
*
*main      * 5       * .1* .035* .045* .05* .02* .05*
*
*main      * 4       * .1* .035* .05* .045* .02* .05*
*.02*
*main      * 3       * .1* .035* .045* .02* * *
*
*main      * 2.5    *Culvert* * * * * * *
*main      * 2       * .045* .035* .045* .02* * *
*
*main      * 1       * .045* .035* .02* .045* * *
*
*****
*
*****

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SUMMARY OF REACH LENGTHS

River: hudson

```

*****
* Reach * River Sta. * Left * Channel * Right *
*****
*main * 40 * 93.6* 97.1* 92.95*
*main * 39 * 113.96* 114.57* 114.59*
*main * 38 * 50.64* 50.85* 51.22*
*main * 37 * 63.51* 64.27* 60.78*
*main * 36 * 34* 38.78* 43.34*
*main * 35 * 69.27* 79.77* 85.15*
*main * 34 * 59.8* 61.46* 61.27*
*main * 33 * 21.85* 21.89* 21.7*
*main * 32 * 24.44* 27.61* 26.31*
*main * 31.5 *Bridge* * *
*main * 31 * 95.55* 97.06* 99*
*main * 30 * 69.42* 70.58* 71.76*
*main * 29 * 57* 58.22* 61.16*
*main * 28 * 46* 46.77* 46.35*
*main * 27 * 60.75* 61.7* 65.02*
*main * 26 * 83.06* 84.96* 87.67*
*main * 25 * 29.59* 30.248* 33.09*
*main * 24 * 56.73* 43.07* 39.13*
*main * 23 * 137.63* 144.4* 148.07*
*main * 22 * 64.31* 54.94* 42.91*
*main * 21 * 58.42* 63.24* 66.37*
*main * 20 * 50.4* 50.32* 50*
*main * 19 * 54.63* 54.11* 54.18*
*main * 18 * 42.13* 39.37* 34.94*
*main * 17 * 35.27* 34.43* 33.28*
*main * 16 * 60.38* 60.35* 62.62*
*main * 15 * 55.51* 47.74* 42.02*
*main * 14 * 32.61* 35.44* 36.08*
*main * 13 * 36.53* 35.61* 35.05*
*main * 12 * 43.41* 42.27* 41.38*
*main * 11 * 42.45* 41.39* 40*
*main * 10 * 57.02* 54.55* 53*
*main * 9 * 55.45* 51.85* 50.87*
*main * 8 * 84.59* 69.8* 31.19*
*main * 7 * 20.21* 31* 42.19*
*main * 6 * 19.21* 30.14* 38.14*
*main * 5 * 33.07* 34.23* 33.12*
*main * 4 * 47.24* 49.31* 53.94*
*main * 3 * 112.21* 120.13* 138.27*
*main * 2.5 *Culvert* * *
*main * 2 * 46.04* 48.67* 51.13*
*main * 1 * 0* 0* 0*
*****

```

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: hudson

```

*****
* Reach * River Sta. * Contr. * Expan. *
*****
*main * 40 * .1* .3*
*main * 39 * .1* .3*
*main * 38 * .1* .3*
*main * 37 * .1* .3*
*main * 36 * .1* .3*
*main * 35 * .1* .3*
*main * 34 * .1* .3*
*main * 33 * .1* .3*
*main * 32 * .3* .5*
*main * 31.5 *Bridge* * *
*main * 31 * .3* .5*
*main * 30 * .1* .3*
*main * 29 * .1* .3*
*main * 28 * .1* .3*
*main * 27 * .1* .3*
*main * 26 * .1* .3*
*main * 25 * .1* .3*
*main * 24 * .1* .3*
*main * 23 * .1* .3*
*main * 22 * .1* .3*
*main * 21 * .1* .3*
*main * 20 * .1* .3*
*main * 19 * .1* .3*

```

```

*main      *   18      *      .1*      .3*
*main      *   17      *      .1*      .3*
*main      *   16      *      .1*      .3*
*main      *   15      *      .1*      .3*
*main      *   14      *      .1*      .3*
*main      *   13      *      .1*      .3*
*main      *   12      *      .1*      .3*
*main      *   11      *      .1*      .3*
*main      *   10      *      .1*      .3*
*main      *    9      *      .1*      .3*
*main      *    8      *      .1*      .3*
*main      *    7      *      .1*      .3*
*main      *    6      *      .1*      .3*
*main      *    5      *      .1*      .3*
*main      *    4      *      .1*      .3*
*main      *    3      *      .3*      .5*
*main      *   2.5    *Culvert *      *
*main      *    2      *      .3*      .5*
*main      *    1      *      .1*      .3*
*****

```


Profile Output Table - Standard Table 1

* Reach	* River Sta	* Profile	* Q Total (cfs)	* Min Ch El (ft)	* W.S. Elev (ft)	* Crit W.S. (ft)	* E.G. Elev (ft)	* E.G. Slope (ft/ft)	* Vel Chnl (ft/s)	* Flow Area (sq ft)	* Top Width (ft)	* Froude #	* Chl
* main	* 40	* 10-YR	* 864.00	* 256.38	* 261.69	* 261.43	* 263.20	* 0.012083	* 9.85	* 87.95	* 27.06	* 0.91	* *
* main	* 40	* 50-YR	* 1659.00	* 256.38	* 263.71	* 263.71	* 264.64	* 0.005654	* 8.68	* 243.36	* 114.68	* 0.66	* *
* main	* 40	* 100-YR	* 2110.00	* 256.38	* 264.07	* 264.07	* 265.12	* 0.006069	* 9.38	* 285.29	* 119.84	* 0.69	* *
* main	* 39	* 10-YR	* 864.00	* 254.87	* 260.26	* 260.06	* 261.93	* 0.013857	* 10.36	* 83.41	* 21.56	* 0.93	* *
* main	* 39	* 50-YR	* 1659.00	* 254.87	* 262.02	* 262.67	* 263.81	* 0.011301	* 11.49	* 172.64	* 124.42	* 0.86	* *
* main	* 39	* 100-YR	* 2110.00	* 254.87	* 262.33	* 262.95	* 264.24	* 0.011964	* 12.27	* 213.48	* 137.79	* 0.90	* *
* main	* 38	* 10-YR	* 864.00	* 254.31	* 259.12	* 260.49	* 260.49	* 0.010185	* 9.40	* 91.91	* 21.72	* 0.81	* *
* main	* 38	* 50-YR	* 1659.00	* 254.31	* 261.34	* 261.63	* 262.68	* 0.006862	* 9.93	* 200.80	* 101.01	* 0.69	* *
* main	* 38	* 100-YR	* 2110.00	* 254.31	* 262.08	* 262.09	* 263.13	* 0.005221	* 9.31	* 285.83	* 139.06	* 0.61	* *
* main	* 37	* 10-YR	* 890.00	* 253.19	* 258.77	* 257.60	* 259.98	* 0.008014	* 8.84	* 100.66	* 19.80	* 0.69	* *
* main	* 37	* 50-YR	* 1825.00	* 253.19	* 260.86	* 261.27	* 262.30	* 0.007499	* 10.47	* 229.84	* 133.81	* 0.69	* *
* main	* 37	* 100-YR	* 2313.00	* 253.19	* 261.20	* 261.61	* 262.75	* 0.008168	* 11.26	* 273.97	* 136.20	* 0.73	* *
* main	* 36	* 10-YR	* 890.00	* 252.84	* 257.28	* 257.28	* 259.20	* 0.016232	* 11.14	* 79.91	* 20.85	* 1.00	* *
* main	* 36	* 50-YR	* 1825.00	* 252.84	* 259.78	* 260.45	* 261.69	* 0.010496	* 11.81	* 190.48	* 121.07	* 0.83	* *
* main	* 36	* 100-YR	* 2313.00	* 252.84	* 260.15	* 260.82	* 262.11	* 0.010837	* 12.48	* 237.80	* 134.19	* 0.85	* *
* main	* 35	* 10-YR	* 890.00	* 252.21	* 255.45	* 256.30	* 258.24	* 0.033456	* 13.39	* 66.45	* 27.97	* 1.53	* *
* main	* 35	* 50-YR	* 1825.00	* 252.21	* 257.07	* 259.08	* 260.87	* 0.028682	* 15.63	* 116.73	* 34.24	* 1.49	* *
* main	* 35	* 100-YR	* 2313.00	* 252.21	* 258.32	* 259.57	* 261.47	* 0.017458	* 14.26	* 163.90	* 52.36	* 1.21	* *
* main	* 34	* 10-YR	* 890.00	* 248.88	* 252.83	* 253.29	* 255.01	* 0.043992	* 11.85	* 75.10	* 26.61	* 1.24	* *
* main	* 34	* 50-YR	* 1825.00	* 248.88	* 254.53	* 255.33	* 257.96	* 0.043651	* 14.87	* 122.77	* 29.51	* 1.28	* *
* main	* 34	* 100-YR	* 2313.00	* 248.88	* 255.20	* 256.18	* 259.27	* 0.044453	* 16.19	* 142.86	* 30.72	* 1.31	* *
* main	* 33	* 10-YR	* 890.00	* 246.48	* 252.81	* 251.31	* 253.65	* 0.009926	* 7.34	* 121.17	* 26.43	* 0.60	* *
* main	* 33	* 50-YR	* 1825.00	* 246.48	* 255.92	* 253.58	* 257.07	* 0.007563	* 8.67	* 214.13	* 59.90	* 0.57	* *
* main	* 33	* 100-YR	* 2313.00	* 246.48	* 256.91	* 254.52	* 258.01	* 0.006378	* 8.69	* 285.35	* 92.77	* 0.54	* *
* main	* 32	* 10-YR	* 890.00	* 246.39	* 252.65	* 251.12	* 253.42	* 0.009336	* 7.03	* 126.57	* 28.67	* 0.59	* *
* main	* 32	* 50-YR	* 1825.00	* 246.39	* 256.13	* 253.31	* 256.80	* 0.004676	* 6.83	* 293.36	* 105.85	* 0.45	* *
* main	* 32	* 100-YR	* 2313.00	* 246.39	* 257.21	* 254.26	* 257.75	* 0.003125	* 6.13	* 402.63	* 109.83	* 0.38	* *
* main	* 31.5	* Bridge	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
* main	* 31	* 10-YR	* 890.00	* 246.81	* 251.30	* 251.07	* 252.91	* 0.012822	* 10.20	* 87.28	* 22.83	* 0.92	* *
* main	* 31	* 50-YR	* 1825.00	* 246.81	* 253.41	* 253.41	* 256.09	* 0.014618	* 13.14	* 138.89	* 25.99	* 1.00	* *
* main	* 31	* 100-YR	* 2313.00	* 246.81	* 255.58	* 255.58	* 257.01	* 0.005915	* 10.11	* 255.72	* 102.46	* 0.65	* *
* main	* 30	* 10-YR	* 890.00	* 243.63	* 249.49	* 249.46	* 251.45	* 0.015414	* 11.24	* 79.19	* 19.85	* 0.99	* *
* main	* 30	* 50-YR	* 1825.00	* 243.63	* 251.16	* 252.10	* 254.30	* 0.020254	* 14.71	* 139.75	* 87.73	* 1.15	* *
* main	* 30	* 100-YR	* 2313.00	* 243.63	* 251.38	* 252.45	* 255.25	* 0.025234	* 16.66	* 158.23	* 90.76	* 1.28	* *
* main	* 29	* 10-YR	* 890.00	* 242.70	* 249.39	* 248.04	* 250.18	* 0.011000	* 7.42	* 128.96	* 102.26	* 0.59	* *
* main	* 29	* 50-YR	* 1825.00	* 242.70	* 249.54	* 250.31	* 252.28	* 0.037757	* 13.90	* 141.19	* 104.48	* 1.10	* *
* main	* 29	* 100-YR	* 2313.00	* 242.70	* 249.86	* 250.71	* 252.81	* 0.038133	* 14.29	* 168.83	* 107.07	* 1.11	* *
* main	* 28	* 10-YR	* 890.00	* 242.91	* 249.59	* 248.37	* 249.83	* 0.001501	* 4.02	* 231.40	* 126.84	* 0.32	* *
* main	* 28	* 50-YR	* 1825.00	* 242.91	* 251.09	* 249.39	* 251.48	* 0.001530	* 4.66	* 368.98	* 132.32	* 0.33	* *
* main	* 28	* 100-YR	* 2313.00	* 242.91	* 251.68	* 249.79	* 252.15	* 0.001572	* 5.03	* 424.20	* 133.71	* 0.34	* *

* main	* 27	* 10-YR	* 890.00 *	241.73 *	249.59 *	247.96 *	249.75 *	0.000874 *	3.52 *	286.46 *	131.41 *	0.25 *
* main	* 27	* 50-YR	* 1825.00 *	241.73 *	251.12 *	249.00 *	251.39 *	0.001012 *	4.41 *	440.95 *	133.18 *	0.28 *
* main	* 27	* 100-YR	* 2313.00 *	241.73 *	251.72 *	249.40 *	252.05 *	0.001085 *	4.80 *	502.55 *	133.88 *	0.30 *
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 26	* 10-YR	* 890.00 *	239.33 *	249.59 *	*	249.69 *	0.000557 *	2.73 *	345.87 *	111.44 *	0.19 *
* main	* 26	* 50-YR	* 1825.00 *	239.33 *	251.12 *	*	251.31 *	0.000684 *	3.49 *	522.25 *	121.92 *	0.22 *
* main	* 26	* 100-YR	* 2313.00 *	239.33 *	251.73 *	*	251.97 *	0.000739 *	3.81 *	596.64 *	122.84 *	0.23 *
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 25	* 10-YR	* 890.00 *	239.32 *	249.55 *	244.28 *	249.65 *	0.000386 *	2.70 *	358.24 *	94.88 *	0.17 *
* main	* 25	* 50-YR	* 1825.00 *	239.32 *	251.05 *	246.67 *	251.26 *	0.000581 *	3.73 *	520.32 *	139.03 *	0.22 *
* main	* 25	* 100-YR	* 2313.00 *	239.32 *	251.64 *	248.49 *	251.91 *	0.000637 *	4.08 *	588.43 *	147.31 *	0.23 *
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 24	* 10-YR	* 420.00 *	237.71 *	249.58 *	241.28 *	249.62 *	0.000220 *	1.71 *	259.95 *	98.76 *	0.09 *
* main	* 24	* 50-YR	* 1355.00 *	237.71 *	251.03 *	245.18 *	251.24 *	0.000672 *	3.23 *	388.88 *	128.23 *	0.16 *
* main	* 24	* 100-YR	* 1843.00 *	237.71 *	251.57 *	246.78 *	251.88 *	0.000849 *	3.74 *	441.08 *	139.15 *	0.18 *
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 23	* 10-YR	* 420.00 *	247.66 *	249.08 *	249.08 *	249.55 *	0.005361 *	5.88 *	78.11 *	85.01 *	0.98 *
* main	* 23	* 50-YR	* 1355.00 *	247.66 *	250.19 *	250.19 *	251.10 *	0.004629 *	8.62 *	181.79 *	115.28 *	1.02 *
* main	* 23	* 100-YR	* 1843.00 *	247.66 *	250.62 *	250.62 *	251.73 *	0.004519 *	9.58 *	226.19 *	126.52 *	1.04 *
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 22	* 10-YR	* 420.00 *	242.21 *	246.77 *	244.00 *	246.80 *	0.000066 *	1.46 *	326.20 *	170.19 *	0.13 *
* main	* 22	* 50-YR	* 1355.00 *	242.21 *	247.73 *	245.33 *	247.89 *	0.000262 *	3.39 *	485.55 *	211.50 *	0.27 *
* main	* 22	* 100-YR	* 1843.00 *	242.21 *	248.08 *	245.88 *	248.30 *	0.000348 *	4.10 *	547.55 *	212.88 *	0.32 *
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 21	* 10-YR	* 420.00 *	242.71 *	246.76 *	244.72 *	246.80 *	0.000107 *	1.63 *	306.80 *	213.63 *	0.16 *
* main	* 21	* 50-YR	* 1355.00 *	242.71 *	247.72 *	245.94 *	247.87 *	0.000335 *	3.46 *	486.34 *	259.37 *	0.30 *
* main	* 21	* 100-YR	* 1843.00 *	242.71 *	248.07 *	246.38 *	248.28 *	0.000428 *	4.13 *	556.93 *	267.76 *	0.35 *
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 20	* 10-YR	* 420.00 *	244.94 *	246.43 *	246.43 *	246.75 *	0.005865 *	4.72 *	95.69 *	145.35 *	0.92 *
* main	* 20	* 50-YR	* 1355.00 *	244.94 *	247.19 *	247.19 *	247.77 *	0.005606 *	6.51 *	228.20 *	207.94 *	0.93 *
* main	* 20	* 100-YR	* 1843.00 *	244.94 *	247.46 *	247.46 *	248.16 *	0.005530 *	7.12 *	282.02 *	210.73 *	0.93 *
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 19	* 10-YR	* 420.00 *	244.21 *	245.25 *	245.54 *	246.12 *	0.030723 *	4.24 *	68.64 *	130.94 *	0.94 *
* main	* 19	* 50-YR	* 1355.00 *	244.21 *	245.96 *	246.34 *	247.23 *	0.018491 *	5.27 *	182.13 *	207.11 *	0.82 *
* main	* 19	* 100-YR	* 1843.00 *	244.21 *	246.18 *	246.60 *	247.63 *	0.017786 *	5.73 *	226.71 *	211.84 *	0.83 *
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 18	* 10-YR	* 420.00 *	239.93 *	241.48 *	241.94 *	243.01 *	0.133715 *	9.97 *	42.62 *	59.38 *	2.02 *
* main	* 18	* 50-YR	* 1355.00 *	239.93 *	242.43 *	243.25 *	245.22 *	0.084426 *	13.62 *	102.74 *	65.18 *	1.84 *
* main	* 18	* 100-YR	* 1843.00 *	239.93 *	242.95 *	244.27 *	245.85 *	0.061758 *	13.92 *	137.13 *	66.24 *	1.64 *
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 17	* 10-YR	* 420.00 *	235.88 *	237.17 *	237.62 *	238.60 *	0.094287 *	9.58 *	43.86 *	47.58 *	1.76 *
* main	* 17	* 50-YR	* 1355.00 *	235.88 *	238.08 *	239.11 *	241.42 *	0.108646 *	14.65 *	92.48 *	58.86 *	2.06 *
* main	* 17	* 100-YR	* 1843.00 *	235.88 *	238.43 *	239.63 *	242.53 *	0.112094 *	16.27 *	113.31 *	63.08 *	2.14 *
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 16	* 10-YR	* 420.00 *	233.35 *	234.92 *	235.23 *	236.10 *	0.054785 *	8.70 *	48.28 *	55.89 *	1.40 *
* main	* 16	* 50-YR	* 1355.00 *	233.35 *	236.28 *	237.00 *	238.79 *	0.047973 *	12.70 *	106.72 *	71.76 *	1.46 *
* main	* 16	* 100-YR	* 1843.00 *	233.35 *	236.83 *	237.69 *	239.85 *	0.046326 *	13.95 *	132.13 *	76.57 *	1.48 *
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 15	* 10-YR	* 420.00 *	231.06 *	232.86 *	232.90 *	233.53 *	0.030578 *	6.59 *	64.05 *	62.75 *	1.05 *
* main	* 15	* 50-YR	* 1355.00 *	231.06 *	233.83 *	234.38 *	235.90 *	0.043480 *	11.62 *	119.00 *	80.90 *	1.38 *
* main	* 15	* 100-YR	* 1843.00 *	231.06 *	234.20 *	235.00 *	236.95 *	0.047178 *	13.43 *	140.93 *	86.15 *	1.48 *
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 14	* 10-YR	* 990.00 *	222.90 *	231.20 *	227.68 *	231.45 *	0.002131 *	4.18 *	286.85 *	105.43 *	0.29 *
* main	* 14	* 50-YR	* 1925.00 *	222.90 *	232.70 *	229.79 *	233.04 *	0.002562 *	5.26 *	465.76 *	135.31 *	0.33 *
* main	* 14	* 100-YR	* 2413.00 *	222.90 *	233.18 *	231.19 *	233.58 *	0.002851 *	5.77 *	527.09 *	142.24 *	0.35 *
*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 13	* 10-YR	* 990.00 *	224.66 *	230.27 *	229.83 *	231.24 *	0.008992 *	7.90 *	125.24 *	43.17 *	0.82 *
* main	* 13	* 50-YR	* 1925.00 *	224.66 *	231.71 *	231.71 *	232.82 *	0.007247 *	8.92 *	272.44 *	134.95 *	0.78 *
* main	* 13	* 100-YR	* 2413.00 *	224.66 *	232.13 *	232.13 *	233.34 *	0.007290 *	9.55 *	330.50 *	141.00 *	0.79 *

*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 12	* 10-YR	* 990.00	* 224.53	* 230.48	* 228.88	* 230.91	* 0.002789	* 5.26	* 204.77	* 107.49	* 0.47	*	
* main	* 12	* 50-YR	* 1925.00	* 224.53	* 231.35	* 230.73	* 232.19	* 0.004519	* 7.67	* 314.06	* 142.22	* 0.62	*	
* main	* 12	* 100-YR	* 2413.00	* 224.53	* 231.91	* 231.33	* 232.78	* 0.004269	* 8.04	* 399.43	* 160.70	* 0.62	*	
*	*	*	*	*	*	*	*	*	*	*	*	*	*	
* main	* 11	* 10-YR	* 990.00	* 224.22	* 229.14	* 229.08	* 230.59	* 0.011692	* 9.72	* 107.99	* 42.89	* 0.95	*	
* main	* 11	* 50-YR	* 1925.00	* 224.22	* 231.20	* 230.98	* 231.98	* 0.004449	* 8.26	* 386.79	* 179.48	* 0.64	*	
* main	* 11	* 100-YR	* 2413.00	* 224.22	* 231.88	* 231.88	* 232.56	* 0.003549	* 8.01	* 514.58	* 192.63	* 0.58	*	
*	*	*	*	*	*	*	*	*	*	*	*	*	*	
* main	* 10	* 10-YR	* 990.00	* 223.59	* 229.26	* 228.38	* 230.09	* 0.005469	* 7.46	* 164.96	* 140.16	* 0.67	*	
* main	* 10	* 50-YR	* 1925.00	* 223.59	* 231.34	* 231.74	* 231.74	* 0.002122	* 6.19	* 526.19	* 194.79	* 0.45	*	
* main	* 10	* 100-YR	* 2413.00	* 223.59	* 231.97	* 232.37	* 232.37	* 0.001942	* 6.34	* 652.04	* 204.16	* 0.44	*	
*	*	*	*	*	*	*	*	*	*	*	*	*	*	
* main	* 9	* 10-YR	* 990.00	* 223.10	* 229.21	* 227.85	* 229.78	* 0.003319	* 6.54	* 234.78	* 157.74	* 0.52	*	
* main	* 9	* 50-YR	* 1925.00	* 223.10	* 231.30	* 231.62	* 231.62	* 0.001575	* 5.72	* 587.24	* 173.06	* 0.38	*	
* main	* 9	* 100-YR	* 2413.00	* 223.10	* 231.92	* 232.26	* 232.26	* 0.001565	* 6.03	* 694.30	* 174.86	* 0.39	*	
*	*	*	*	*	*	*	*	*	*	*	*	*	*	
* main	* 8	* 10-YR	* 990.00	* 222.42	* 229.26	* 229.59	* 229.59	* 0.001801	* 5.19	* 323.34	* 177.23	* 0.39	*	
* main	* 8	* 50-YR	* 1925.00	* 222.42	* 231.31	* 231.52	* 231.52	* 0.001009	* 4.82	* 727.31	* 211.54	* 0.31	*	
* main	* 8	* 100-YR	* 2413.00	* 222.42	* 231.93	* 232.16	* 232.16	* 0.001015	* 5.10	* 859.62	* 215.93	* 0.32	*	
*	*	*	*	*	*	*	*	*	*	*	*	*	*	
* main	* 7	* 10-YR	* 1038.00	* 220.87	* 229.26	* 229.43	* 229.43	* 0.001660	* 3.69	* 386.24	* 170.83	* 0.26	*	
* main	* 7	* 50-YR	* 2017.00	* 220.87	* 231.29	* 231.45	* 231.45	* 0.001198	* 3.78	* 749.85	* 183.85	* 0.23	*	
* main	* 7	* 100-YR	* 2562.00	* 220.87	* 231.90	* 232.08	* 232.08	* 0.001308	* 4.14	* 862.30	* 185.50	* 0.24	*	
*	*	*	*	*	*	*	*	*	*	*	*	*	*	
* main	* 6	* 10-YR	* 1038.00	* 220.27	* 229.05	* 229.37	* 229.37	* 0.001348	* 4.71	* 322.50	* 115.40	* 0.33	*	
* main	* 6	* 50-YR	* 2017.00	* 220.27	* 230.84	* 231.36	* 231.36	* 0.001769	* 6.36	* 555.60	* 150.91	* 0.39	*	
* main	* 6	* 100-YR	* 2562.00	* 220.27	* 231.28	* 231.98	* 231.98	* 0.002256	* 7.45	* 623.77	* 154.87	* 0.45	*	
*	*	*	*	*	*	*	*	*	*	*	*	*	*	
* main	* 5	* 10-YR	* 1038.00	* 219.53	* 228.18	* 225.98	* 229.22	* 0.004982	* 8.31	* 145.12	* 103.93	* 0.55	*	
* main	* 5	* 50-YR	* 2017.00	* 219.53	* 230.58	* 229.62	* 231.27	* 0.003074	* 7.95	* 387.22	* 145.90	* 0.46	*	
* main	* 5	* 100-YR	* 2562.00	* 219.53	* 231.00	* 230.16	* 231.86	* 0.003747	* 9.03	* 437.00	* 166.55	* 0.51	*	
*	*	*	*	*	*	*	*	*	*	*	*	*	*	
* main	* 4	* 10-YR	* 1038.00	* 218.90	* 228.29	* 225.64	* 228.98	* 0.003257	* 6.66	* 156.29	* 29.26	* 0.49	*	
* main	* 4	* 50-YR	* 2017.00	* 218.90	* 228.44	* 228.13	* 230.91	* 0.011246	* 12.60	* 161.01	* 33.19	* 0.92	*	
* main	* 4	* 100-YR	* 2562.00	* 218.90	* 230.51	* 230.51	* 231.70	* 0.004326	* 9.58	* 374.46	* 166.46	* 0.60	*	
*	*	*	*	*	*	*	*	*	*	*	*	*	*	
* main	* 3	* 10-YR	* 918.00	* 217.50	* 228.57	* 224.00	* 228.77	* 0.000678	* 3.74	* 297.90	* 134.14	* 0.24	*	
* main	* 3	* 50-YR	* 1887.00	* 217.50	* 229.81	* 226.40	* 230.14	* 0.001077	* 5.23	* 485.74	* 166.67	* 0.32	*	
* main	* 3	* 100-YR	* 2412.00	* 217.50	* 230.35	* 228.58	* 230.72	* 0.001182	* 5.71	* 578.50	* 174.72	* 0.34	*	
*	*	*	*	*	*	*	*	*	*	*	*	*	*	
* main	* 2.5		* Culvert	*	*	*	*	*	*	*	*	*	*	
*	*	*	*	*	*	*	*	*	*	*	*	*	*	
* main	* 2	* 10-YR	* 918.00	* 214.76	* 219.77	* 219.77	* 222.09	* 0.020355	* 12.24	* 75.03	* 16.19	* 1.00	*	
* main	* 2	* 50-YR	* 1887.00	* 214.76	* 222.74	* 222.74	* 226.37	* 0.016483	* 15.31	* 125.22	* 20.79	* 0.98	*	
* main	* 2	* 100-YR	* 2412.00	* 214.76	* 224.85	* 224.85	* 227.83	* 0.010407	* 14.31	* 193.16	* 70.22	* 0.81	*	
*	*	*	*	*	*	*	*	*	*	*	*	*	*	
* main	* 1	* 10-YR	* 918.00	* 214.13	* 218.46	* 218.85	* 220.97	* 0.023477	* 12.73	* 72.11	* 19.11	* 1.15	*	
* main	* 1	* 50-YR	* 1887.00	* 214.13	* 220.30	* 222.25	* 225.02	* 0.027521	* 17.45	* 108.81	* 21.00	* 1.31	*	
* main	* 1	* 100-YR	* 2412.00	* 214.13	* 221.15	* 222.74	* 226.39	* 0.026006	* 18.67	* 140.83	* 64.45	* 1.30	*	

Profile Output Table - Standard Table 2

* Reach	* River Sta	* Profile	* E.G. Elev (ft)	* W.S. Elev (ft)	* Vel Head (ft)	* Frctn Loss (ft)	* C & E Loss (ft)	* Q Left (cfs)	* Q Channel (cfs)	* Q Right (cfs)	* Top Width (ft)
* main	* 40	* 10-YR	* 263.20	* 261.69	* 1.51	* 1.25	* 0.02	* 0.20	* 863.80	*	* 27.06
* main	* 40	* 50-YR	* 264.64	* 263.71	* 0.93	* 0.49	* 0.05	* 449.31	* 1209.47	* 0.22	* 114.68
* main	* 40	* 100-YR	* 265.12	* 264.07	* 1.05	* 0.53	* 0.06	* 714.62	* 1394.96	* 0.42	* 119.84
* main	* 39	* 10-YR	* 261.93	* 260.26	* 1.67	* 1.35	* 0.09	*	* 864.00	*	* 21.56
* main	* 39	* 50-YR	* 263.81	* 262.02	* 1.80	* 0.75	* 0.09	* 256.51	* 1401.44	* 1.05	* 124.42
* main	* 39	* 100-YR	* 264.24	* 262.33	* 1.91	* 0.80	* 0.09	* 524.04	* 1581.40	* 4.56	* 137.79
* main	* 38	* 10-YR	* 260.49	* 259.12	* 1.37	* 0.46	* 0.05	*	* 864.00	*	* 21.72
* main	* 38	* 50-YR	* 262.68	* 261.34	* 1.34	* 0.99	* 0.14	* 199.23	* 1399.10	* 60.67	* 101.01
* main	* 38	* 100-YR	* 263.13	* 262.08	* 1.05	* 0.86	* 0.26	* 503.21	* 1462.29	* 144.50	* 139.06
* main	* 37	* 10-YR	* 259.98	* 258.77	* 1.21	* 0.71	* 0.07	*	* 890.00	*	* 19.80
* main	* 37	* 50-YR	* 262.30	* 260.86	* 1.44	* 0.37	* 0.01	* 193.19	* 1493.14	* 138.67	* 133.81
* main	* 37	* 100-YR	* 262.75	* 261.20	* 1.55	* 0.33	* 0.05	* 352.17	* 1682.62	* 278.21	* 136.20
* main	* 36	* 10-YR	* 259.20	* 257.28	* 1.93	* 0.57	* 0.14	*	* 890.00	*	* 20.85
* main	* 36	* 50-YR	* 261.69	* 259.78	* 1.91	* 0.56	* 0.05	* 178.51	* 1570.18	* 76.31	* 121.07
* main	* 36	* 100-YR	* 262.11	* 260.15	* 1.96	* 0.60	* 0.04	* 397.30	* 1756.84	* 158.86	* 134.19
* main	* 35	* 10-YR	* 258.24	* 255.45	* 2.79	* 0.87	* 0.09	*	* 890.00	*	* 27.97
* main	* 35	* 50-YR	* 260.87	* 257.07	* 3.80	* 0.63	* 0.19	*	* 1825.00	*	* 34.24
* main	* 35	* 100-YR	* 261.47	* 258.32	* 3.15	* 0.52	* 0.12	* 3.30	* 2309.38	* 0.32	* 52.36
* main	* 34	* 10-YR	* 255.01	* 252.83	* 2.18	* 3.05	* 0.18	*	* 890.00	*	* 26.61
* main	* 34	* 50-YR	* 257.96	* 254.53	* 3.43	* 2.79	* 0.11	*	* 1825.00	*	* 29.51
* main	* 34	* 100-YR	* 259.27	* 255.20	* 4.07	* 2.10	* 0.09	* 0.04	* 2312.94	* 0.01	* 30.72
* main	* 33	* 10-YR	* 253.65	* 252.81	* 0.84	* 0.21	* 0.02	*	* 890.00	*	* 26.43
* main	* 33	* 50-YR	* 257.07	* 255.92	* 1.16	* 0.13	* 0.15	* 14.94	* 1809.55	* 0.51	* 59.90
* main	* 33	* 100-YR	* 258.01	* 256.91	* 1.10	* 0.09	* 0.17	* 244.68	* 2065.08	* 3.25	* 92.77
* main	* 32	* 10-YR	* 253.42	* 252.65	* 0.77	* 0.02	* 0.00	*	* 890.00	*	* 28.67
* main	* 32	* 50-YR	* 256.80	* 256.13	* 0.67	*	*	* 207.38	* 1616.04	* 1.58	* 105.85
* main	* 32	* 100-YR	* 257.75	* 257.21	* 0.54	*	*	* 636.34	* 1667.64	* 9.02	* 109.83
* main	* 31.5	*	Bridge	*	*	*	*	*	*	*	*
* main	* 31	* 10-YR	* 252.91	* 251.30	* 1.61	* 1.36	* 0.10	*	* 890.00	*	* 22.83
* main	* 31	* 50-YR	* 256.09	* 253.41	* 2.68	* 0.94	* 0.78	*	* 1825.00	*	* 25.99
* main	* 31	* 100-YR	* 257.01	* 255.58	* 1.43	* 0.64	* 0.04	* 330.22	* 1981.89	* 0.89	* 102.46
* main	* 30	* 10-YR	* 251.45	* 249.49	* 1.96	* 0.91	* 0.35	*	* 890.00	*	* 19.85
* main	* 30	* 50-YR	* 254.30	* 251.16	* 3.14	* 1.66	* 0.14	* 139.79	* 1685.21	*	* 87.73
* main	* 30	* 100-YR	* 255.25	* 251.38	* 3.86	* 1.04	* 0.73	* 319.47	* 1993.53	*	* 90.76
* main	* 29	* 10-YR	* 250.18	* 249.39	* 0.79	* 0.19	* 0.17	* 99.72	* 790.28	*	* 102.26
* main	* 29	* 50-YR	* 252.28	* 249.54	* 2.74	* 1.90	* 0.12	* 300.00	* 1525.01	*	* 104.48
* main	* 29	* 100-YR	* 252.81	* 249.86	* 2.95	* 2.16	* 0.27	* 640.46	* 1672.54	*	* 107.07

*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 28	* 10-YR	*	249.83	* 249.59	* 0.23	* 0.05	* 0.02	* 361.07	* 528.94	*	*	126.84	*
* main	* 28	* 50-YR	*	251.48	* 251.09	* 0.38	* 0.06	* 0.03	* 1015.05	* 809.82	* 0.13	*	132.32	*
* main	* 28	* 100-YR	*	252.15	* 251.68	* 0.47	* 0.06	* 0.04	* 1354.94	* 957.32	* 0.74	*	133.71	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 27	* 10-YR	*	249.75	* 249.59	* 0.16	* 0.04	* 0.02	* 405.17	* 484.61	* 0.22	*	131.41	*
* main	* 27	* 50-YR	*	251.39	* 251.12	* 0.27	* 0.05	* 0.02	* 1059.46	* 763.42	* 2.12	*	133.18	*
* main	* 27	* 100-YR	*	252.05	* 251.72	* 0.34	* 0.05	* 0.03	* 1409.85	* 899.42	* 3.72	*	133.88	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 26	* 10-YR	*	249.69	* 249.59	* 0.10	* 0.04	* 0.00	* 511.11	* 378.24	* 0.64	*	111.44	*
* main	* 26	* 50-YR	*	251.31	* 251.12	* 0.20	* 0.05	* 0.00	* 1224.77	* 596.72	* 3.51	*	121.92	*
* main	* 26	* 100-YR	*	251.97	* 251.73	* 0.24	* 0.06	* 0.00	* 1605.43	* 700.30	* 7.27	*	122.84	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 25	* 10-YR	*	249.65	* 249.55	* 0.10	* 0.01	* 0.02	* 276.47	* 609.86	* 3.67	*	94.88	*
* main	* 25	* 50-YR	*	251.26	* 251.05	* 0.21	* 0.02	* 0.00	* 803.84	* 1005.00	* 16.16	*	139.03	*
* main	* 25	* 100-YR	*	251.91	* 251.64	* 0.27	* 0.02	* 0.00	* 1121.19	* 1167.21	* 24.59	*	147.31	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 24	* 10-YR	*	249.62	* 249.58	* 0.04	* 0.03	* 0.04	* 165.85	* 254.00	* 0.15	*	98.76	*
* main	* 24	* 50-YR	*	251.24	* 251.03	* 0.21	* 0.07	* 0.07	* 802.65	* 545.00	* 7.35	*	128.23	*
* main	* 24	* 100-YR	*	251.88	* 251.57	* 0.31	* 0.08	* 0.08	* 1170.82	* 656.95	* 15.22	*	139.15	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 23	* 10-YR	*	249.55	* 249.08	* 0.47	* 0.03	* 0.13	* 11.93	* 252.44	* 155.63	*	85.01	*
* main	* 23	* 50-YR	*	251.10	* 250.19	* 0.92	* 0.10	* 0.23	* 122.58	* 732.66	* 499.76	*	115.28	*
* main	* 23	* 100-YR	*	251.73	* 250.62	* 1.11	* 0.12	* 0.27	* 189.83	* 971.91	* 681.27	*	126.52	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 22	* 10-YR	*	246.80	* 246.77	* 0.03	* 0.00	* 0.00	* 12.88	* 380.10	* 27.02	*	170.19	*
* main	* 22	* 50-YR	*	247.89	* 247.73	* 0.15	* 0.02	* 0.00	* 81.24	* 1105.93	* 167.82	*	211.50	*
* main	* 22	* 100-YR	*	248.30	* 248.08	* 0.22	* 0.02	* 0.00	* 129.13	* 1436.33	* 277.54	*	212.88	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 21	* 10-YR	*	246.80	* 246.76	* 0.04	* 0.02	* 0.03	* 35.04	* 340.47	* 44.49	*	213.63	*
* main	* 21	* 50-YR	*	247.87	* 247.72	* 0.15	* 0.05	* 0.04	* 177.77	* 943.63	* 233.59	*	259.37	*
* main	* 21	* 100-YR	*	248.28	* 248.07	* 0.21	* 0.07	* 0.05	* 253.40	* 1223.67	* 365.94	*	267.76	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 20	* 10-YR	*	246.75	* 246.43	* 0.31	* 0.34	* 0.00	*	* 341.66	* 78.34	*	145.35	*
* main	* 20	* 50-YR	*	247.77	* 247.19	* 0.58	* 0.29	* 0.01	* 66.25	* 925.96	* 362.80	*	207.94	*
* main	* 20	* 100-YR	*	248.16	* 247.46	* 0.70	* 0.29	* 0.00	* 139.03	* 1197.55	* 506.42	*	210.73	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 19	* 10-YR	*	246.12	* 245.25	* 0.87	* 0.57	* 0.06	* 3.31	* 168.35	* 248.34	*	130.94	*
* main	* 19	* 50-YR	*	247.23	* 245.96	* 1.27	* 0.47	* 0.07	* 200.36	* 464.57	* 690.07	*	207.11	*
* main	* 19	* 100-YR	*	247.63	* 246.18	* 1.45	* 0.46	* 0.08	* 385.65	* 589.80	* 867.55	*	211.84	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 18	* 10-YR	*	243.01	* 241.48	* 1.53	* 3.04	* 0.07	* 0.04	* 416.50	* 3.45	*	59.38	*
* main	* 18	* 50-YR	*	245.22	* 242.43	* 2.79	* 1.86	* 0.15	* 6.80	* 1282.99	* 65.21	*	65.18	*
* main	* 18	* 100-YR	*	245.85	* 242.95	* 2.90	* 1.63	* 0.14	* 16.42	* 1714.22	* 112.36	*	66.24	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 17	* 10-YR	*	238.60	* 237.17	* 1.42	* 4.39	* 0.03	*	* 420.00	*	*	47.58	*
* main	* 17	* 50-YR	*	241.42	* 238.08	* 3.33	* 3.75	* 0.05	*	* 1355.00	*	*	58.86	*
* main	* 17	* 100-YR	*	242.53	* 238.43	* 4.11	* 3.19	* 0.12	*	* 1843.00	*	*	63.08	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 16	* 10-YR	*	236.10	* 234.92	* 1.17	* 2.43	* 0.07	*	* 420.00	*	*	55.89	*
* main	* 16	* 50-YR	*	238.79	* 236.28	* 2.50	* 2.38	* 0.25	*	* 1355.00	*	*	71.76	*
* main	* 16	* 100-YR	*	239.85	* 236.83	* 3.02	* 2.36	* 0.33	*	* 1843.00	*	*	76.57	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
* main	* 15	* 10-YR	*	233.53	* 232.86	* 0.67	* 2.42	* 0.15	* 0.78	* 419.22	*	*	62.75	*
* main	* 15	* 50-YR	*	235.90	* 233.83	* 2.07	* 2.75	* 0.13	* 23.48	* 1331.52	*	*	80.90	*

* main	* 15	* 100-YR	* 236.95	* 234.20	* 2.75	* 2.82	* 0.08	* 45.81	* 1797.19	* 86.15
* main	* 14	* 10-YR	* 231.45	* 231.20	* 0.24	* 0.14	* 0.07	* 1.51	* 862.89	* 125.61
* main	* 14	* 50-YR	* 233.04	* 232.70	* 0.34	* 0.14	* 0.08	* 6.52	* 1338.31	* 580.17
* main	* 14	* 100-YR	* 233.58	* 233.18	* 0.40	* 0.15	* 0.08	* 9.49	* 1555.72	* 847.78
* main	* 13	* 10-YR	* 231.24	* 230.27	* 0.97	* 0.16	* 0.16	* 990.00	* 43.17	
* main	* 13	* 50-YR	* 232.82	* 231.71	* 1.11	* 0.20	* 0.08	* 0.22	* 1711.06	* 213.73
* main	* 13	* 100-YR	* 233.34	* 232.13	* 1.21	* 0.19	* 0.10	* 0.71	* 2021.08	* 391.22
* main	* 12	* 10-YR	* 230.91	* 230.48	* 0.42	* 0.21	* 0.10	* 0.08	* 973.85	* 16.08
* main	* 12	* 50-YR	* 232.19	* 231.35	* 0.83	* 0.19	* 0.01	* 1.09	* 1743.90	* 180.01
* main	* 12	* 100-YR	* 232.78	* 231.91	* 0.87	* 0.16	* 0.06	* 2.51	* 2046.03	* 364.46
* main	* 11	* 10-YR	* 230.59	* 229.14	* 1.45	* 0.32	* 0.19	* 7.87	* 982.13	* 42.89
* main	* 11	* 50-YR	* 231.98	* 231.20	* 0.79	* 0.12	* 0.11	* 74.14	* 1377.56	* 473.30
* main	* 11	* 100-YR	* 232.56	* 231.88	* 0.67	* 0.11	* 0.08	* 105.81	* 1511.73	* 795.46
* main	* 10	* 10-YR	* 230.09	* 229.26	* 0.83	* 0.23	* 0.08	* 6.33	* 949.59	* 34.08
* main	* 10	* 50-YR	* 231.74	* 231.34	* 0.41	* 0.10	* 0.03	* 106.26	* 1212.45	* 606.29
* main	* 10	* 100-YR	* 232.37	* 231.97	* 0.40	* 0.09	* 0.02	* 153.95	* 1372.06	* 886.99
* main	* 9	* 10-YR	* 229.78	* 229.21	* 0.57	* 0.12	* 0.07	* 48.56	* 843.37	* 98.07
* main	* 9	* 50-YR	* 231.62	* 231.30	* 0.32	* 0.06	* 0.03	* 180.27	* 1054.65	* 690.08
* main	* 9	* 100-YR	* 232.26	* 231.92	* 0.34	* 0.06	* 0.03	* 244.40	* 1211.19	* 957.41
* main	* 8	* 10-YR	* 229.59	* 229.26	* 0.33	* 0.11	* 0.05	* 41.95	* 763.33	* 184.71
* main	* 8	* 50-YR	* 231.52	* 231.31	* 0.22	* 0.06	* 0.02	* 128.01	* 978.32	* 818.67
* main	* 8	* 100-YR	* 232.16	* 231.93	* 0.23	* 0.06	* 0.01	* 182.36	* 1120.87	* 1109.78
* main	* 7	* 10-YR	* 229.43	* 229.26	* 0.17	* 0.05	* 0.01	* 6.16	* 779.75	* 252.09
* main	* 7	* 50-YR	* 231.45	* 231.29	* 0.15	* 0.05	* 0.04	* 77.79	* 1057.45	* 881.77
* main	* 7	* 100-YR	* 232.08	* 231.90	* 0.18	* 0.06	* 0.05	* 120.31	* 1243.04	* 1198.65
* main	* 6	* 10-YR	* 229.37	* 229.05	* 0.32	* 0.07	* 0.07	* 4.14	* 951.40	* 82.46
* main	* 6	* 50-YR	* 231.36	* 230.84	* 0.52	* 0.07	* 0.02	* 47.40	* 1649.78	* 319.82
* main	* 6	* 100-YR	* 231.98	* 231.28	* 0.69	* 0.09	* 0.02	* 86.08	* 2035.29	* 440.64
* main	* 5	* 10-YR	* 229.22	* 228.18	* 1.04	* 0.14	* 0.11	* 4.62	* 1004.41	* 28.97
* main	* 5	* 50-YR	* 231.27	* 230.58	* 0.69	* 0.18	* 0.18	* 36.39	* 1288.37	* 692.24
* main	* 5	* 100-YR	* 231.86	* 231.00	* 0.86	* 0.14	* 0.03	* 46.65	* 1531.13	* 984.22
* main	* 4	* 10-YR	* 228.98	* 228.29	* 0.69	* 0.07	* 0.15	* 0.20	* 1037.80	* 0.00
* main	* 4	* 50-YR	* 230.91	* 228.44	* 2.47	* 0.13	* 0.64	* 0.63	* 2016.22	* 0.15
* main	* 4	* 100-YR	* 231.70	* 230.51	* 1.18	* 0.11	* 0.24	* 10.81	* 2077.84	* 473.35
* main	* 3	* 10-YR	* 228.77	* 228.57	* 0.19	* 0.07	* 0.07	* 2.66	* 797.90	* 117.44
* main	* 3	* 50-YR	* 230.14	* 229.81	* 0.33	* 0.07	* 0.07	* 10.75	* 1309.26	* 566.99
* main	* 3	* 100-YR	* 230.72	* 230.35	* 0.37	* 0.07	* 0.07	* 16.32	* 1520.55	* 875.13
* main	* 2.5		Culvert							
* main	* 2	* 10-YR	* 222.09	* 219.77	* 2.32	* 0.86	* 0.21	* 0.00	* 918.00	* 0.00
* main	* 2	* 50-YR	* 226.37	* 222.74	* 3.63	* 0.45	* 1.14	* 2.14	* 1882.72	* 2.14
* main	* 2	* 100-YR	* 227.83	* 224.85	* 2.98	* 0.39	* 0.70	* 66.11	* 2246.28	* 99.61

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*          *          *          *          *          *          *          *          *          *          *          *
* main    * 1          * 10-YR   * 220.97 * 218.46 * 2.52 * 1.06 * 0.06 *          * 918.00 *          * 19.11 *
* main    * 1          * 50-YR   * 225.02 * 220.30 * 4.72 * 1.02 * 0.33 * 1.63 * 1885.13 * 0.24 * 21.00 *
* main    * 1          * 100-YR  * 226.39 * 221.15 * 5.24 * 0.76 * 0.68 * 9.98 * 2327.81 * 74.22 * 64.45 *
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