UNDERSTANDING MODEL INPUT/OUTPUT (TR-20, HEC-HMS, HEC-RAS)

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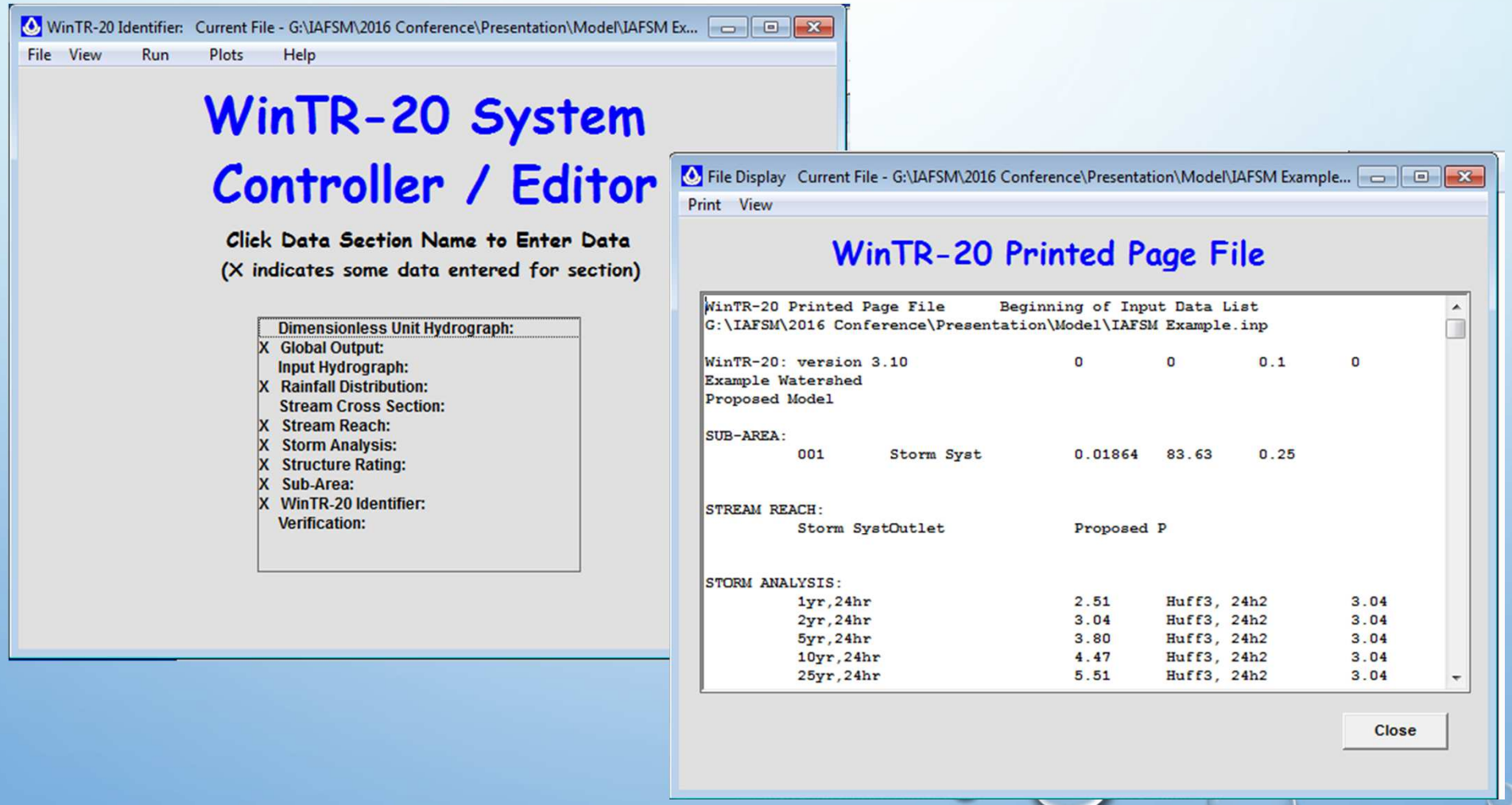
IAFSM

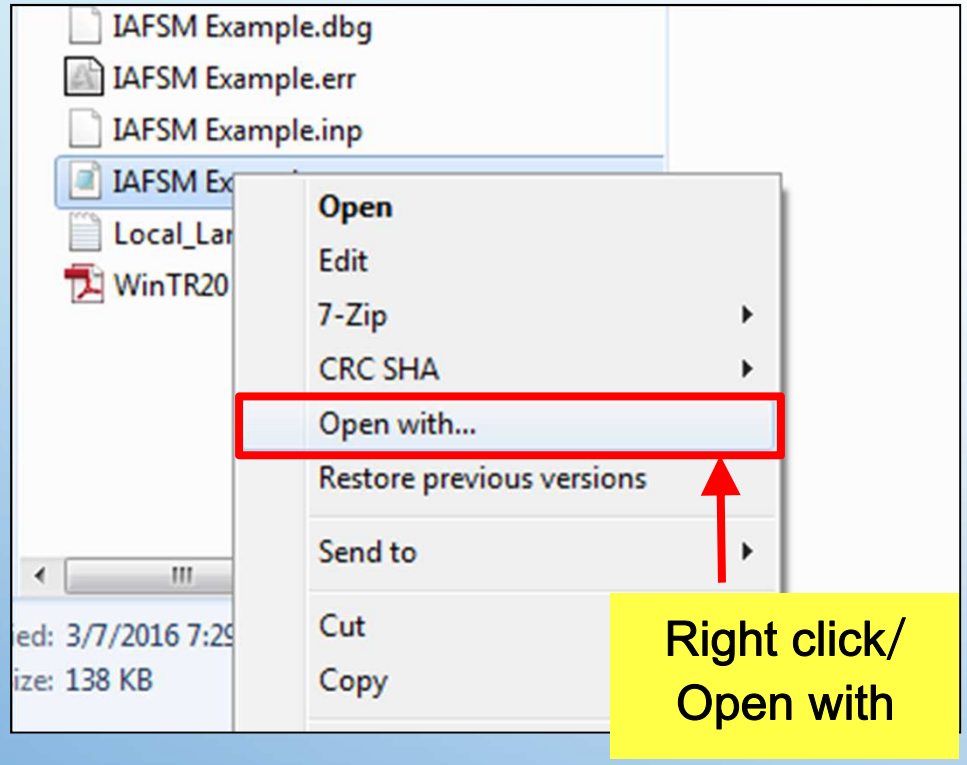
Illinois Association for Floodplain and Stormwater Management

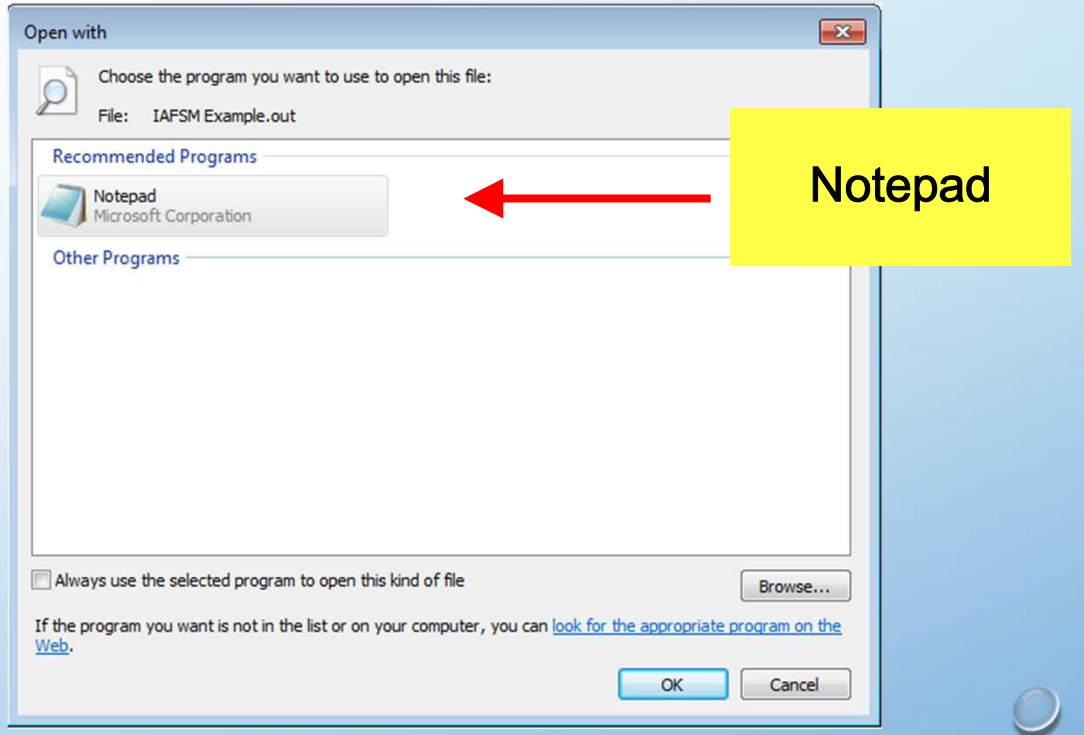
TR-20

Access the report by clicking run on the home screen.



Once the model has run, an output file of the report is saved in the project folder.





Input for the model is summarized in the WinTR-20 report.

File Name

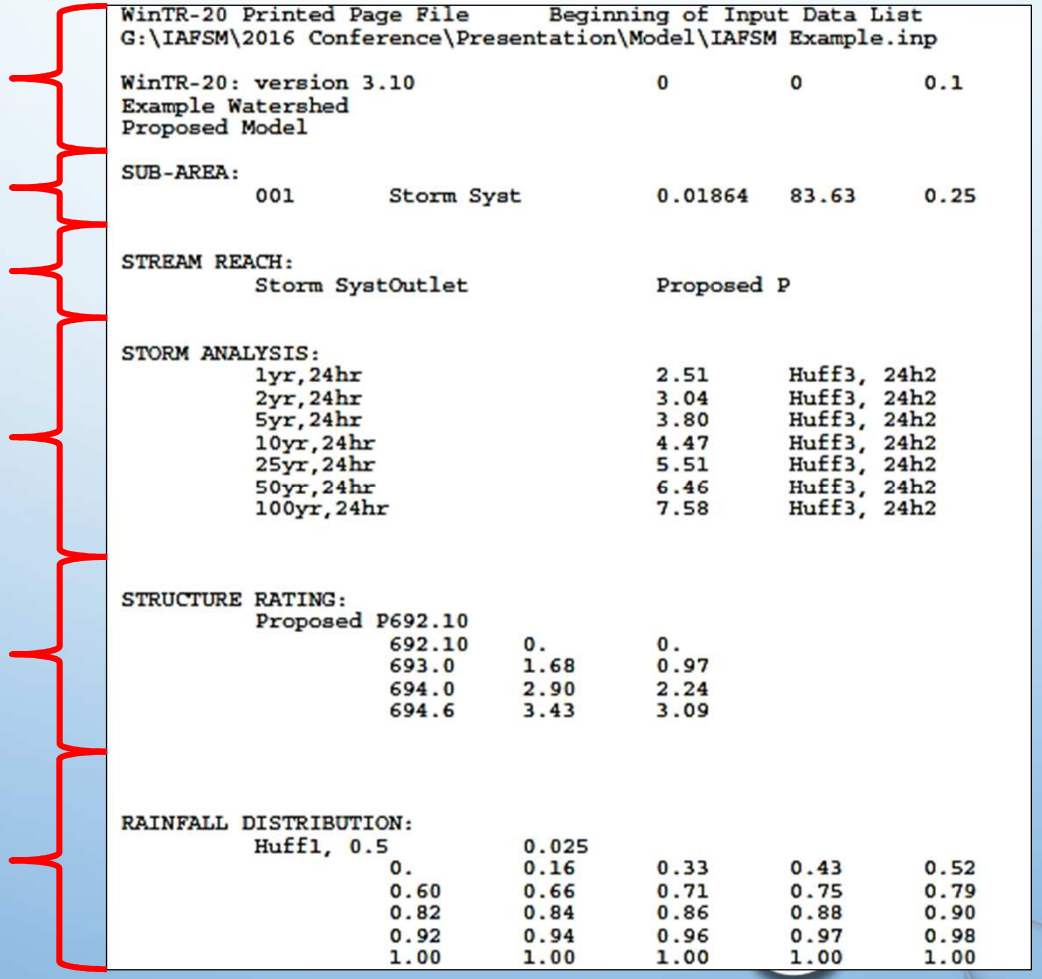
Sub-Area

Stream Reach

Storm Analysis

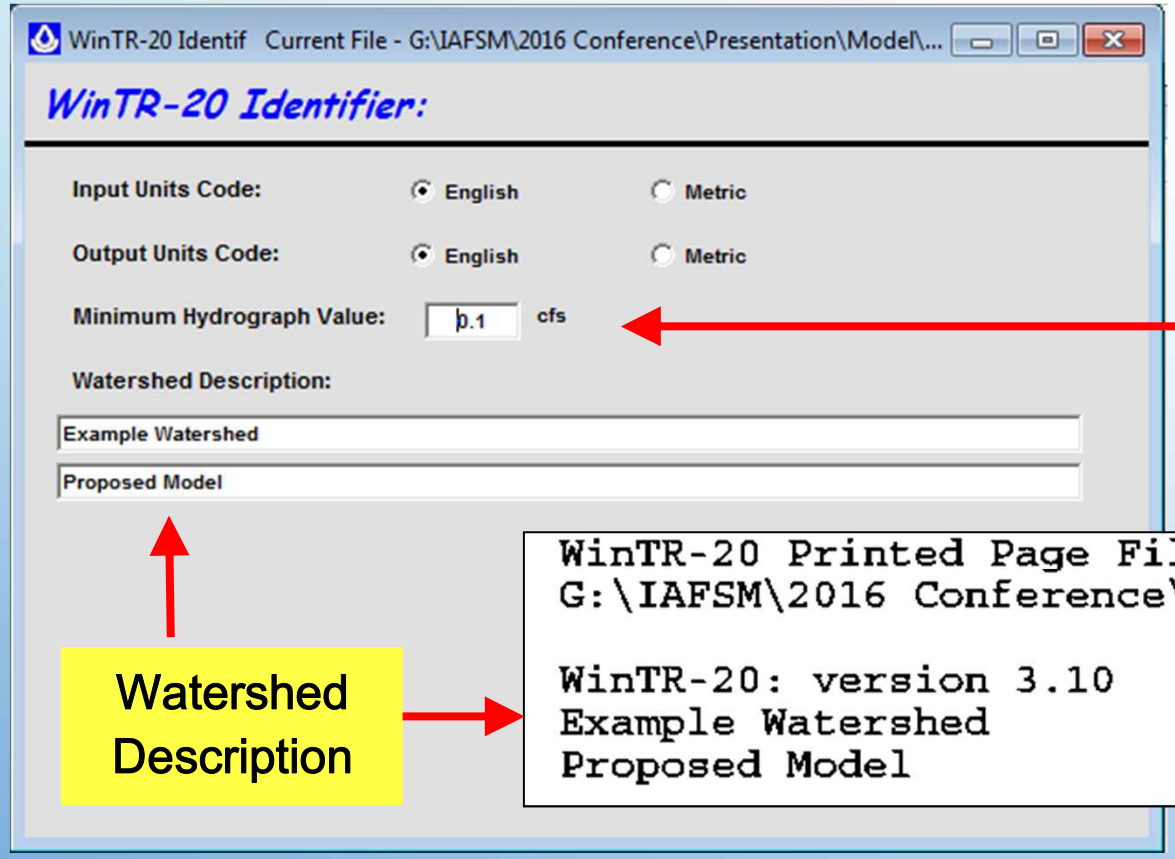
Structure Rating

Rainfall Distribution



```
WinTR-20 Printed Page File      Beginning of Input Data List
G:\IAFSM\2016 Conference\Presentation\Model\IAFSM Example.inp

WinTR-20: version 3.10                  0         0         0.1
Example Watershed
Proposed Model

SUB-AREA:
          001       Storm Syst          0.01864   83.63     0.25


STREAM REACH:
          Storm SystOutlet              Proposed P


STORM ANALYSIS:
          1yr,24hr                      2.51      Huff3, 24h2
          2yr,24hr                      3.04      Huff3, 24h2
          5yr,24hr                      3.80      Huff3, 24h2
          10yr,24hr                     4.47      Huff3, 24h2
          25yr,24hr                     5.51      Huff3, 24h2
          50yr,24hr                     6.46      Huff3, 24h2
          100yr,24hr                    7.58      Huff3, 24h2


STRUCTURE RATING:
          Proposed P692.10
                    692.10    0.        0.
                    693.0     1.68      0.97
                    694.0     2.90      2.24
                    694.6     3.43      3.09


RAINFALL DISTRIBUTION:
          Huff1, 0.5          0.025
                    0.        0.16      0.33      0.43      0.52
                    0.60      0.66      0.71      0.75      0.79
                    0.82      0.84      0.86      0.88      0.90
                    0.92      0.94      0.96      0.97      0.98
                    1.00      1.00      1.00      1.00      1.00
```

The first few lines in the WinTR-20 Report provide the file location and watershed description.

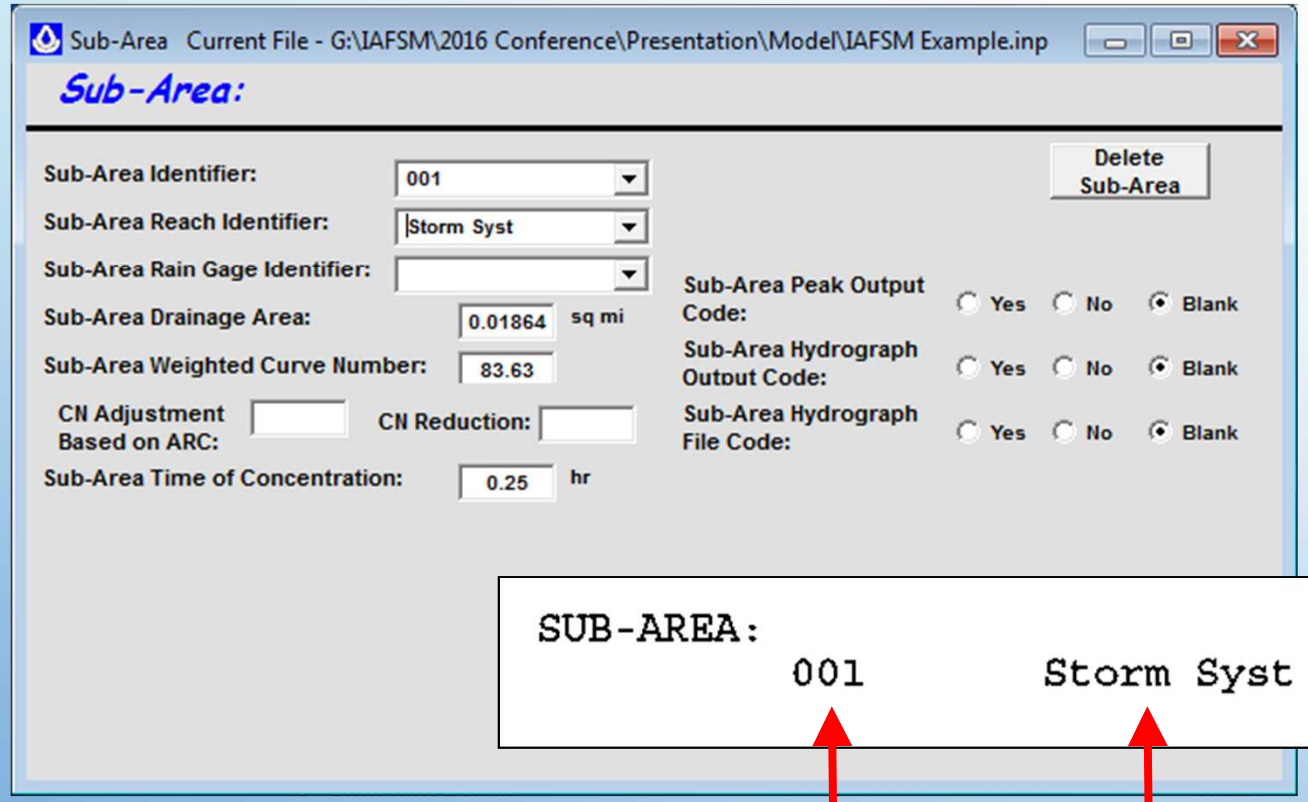


Min. Hydrograph Value = 0.001 cfs

Watershed Description

```
WinTR-20 Printed Page File      Beginning of Input Data List
G:\IAFSM\2016 Conference\Presentation\Model\IAFSM Example.inp

WinTR-20: version 3.10                    0          0          0.1        0
Example Watershed
Proposed Model
```

Information about the drainage area analyzed is provided.



<u>Note:</u>
Review drainage area, CN, and Tc for accuracy.

```
SUB-AREA:
          001        Storm Syst              0.01864    83.63      0.25
```

Sub-Area ID

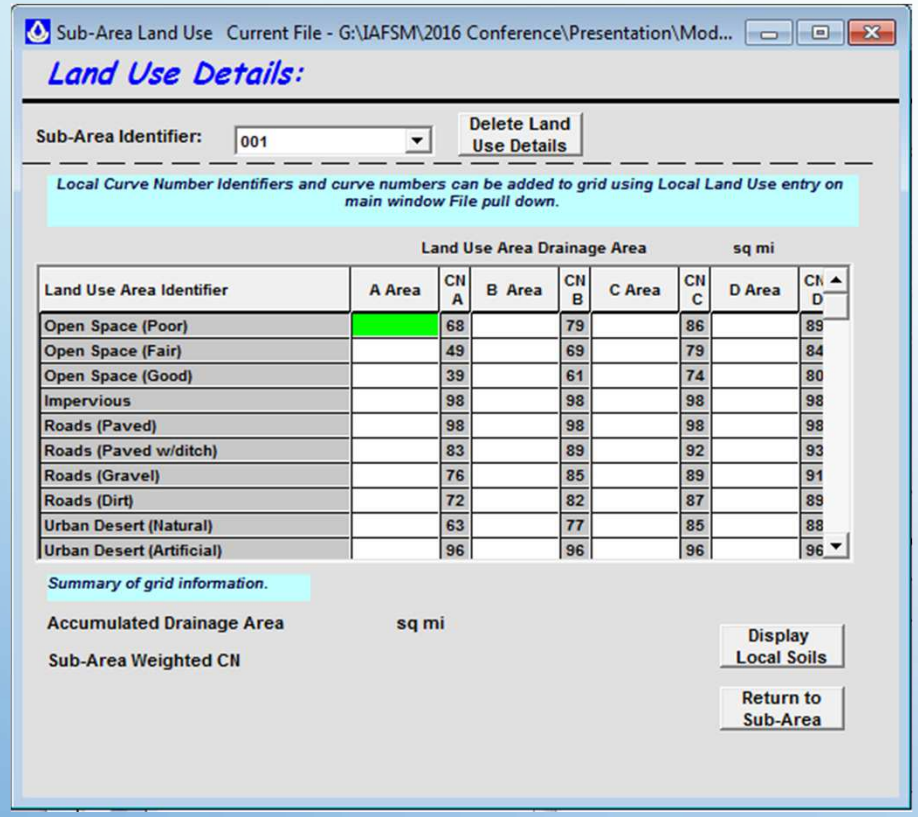
Sub-Area Reach ID

Drainage Area (sq. mi.)

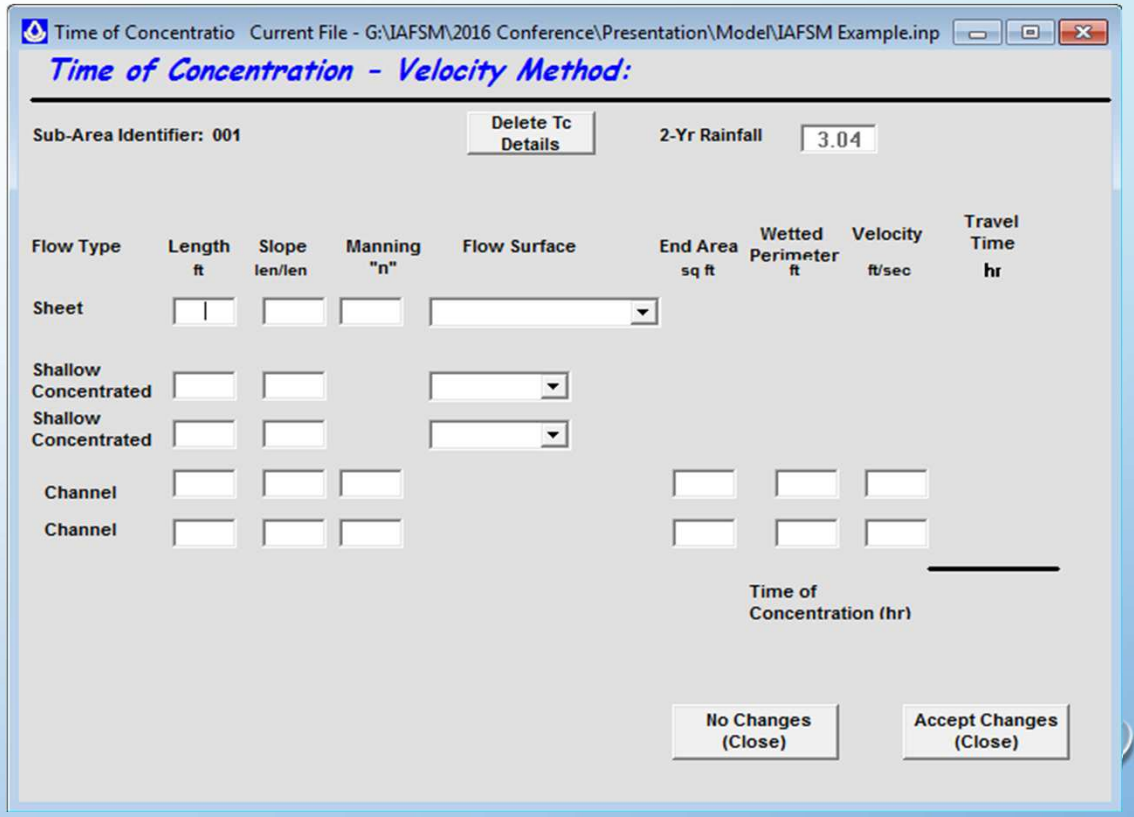
CN

Tc (hr)

Within the sub-area menu, the CN and Tc can be calculated.

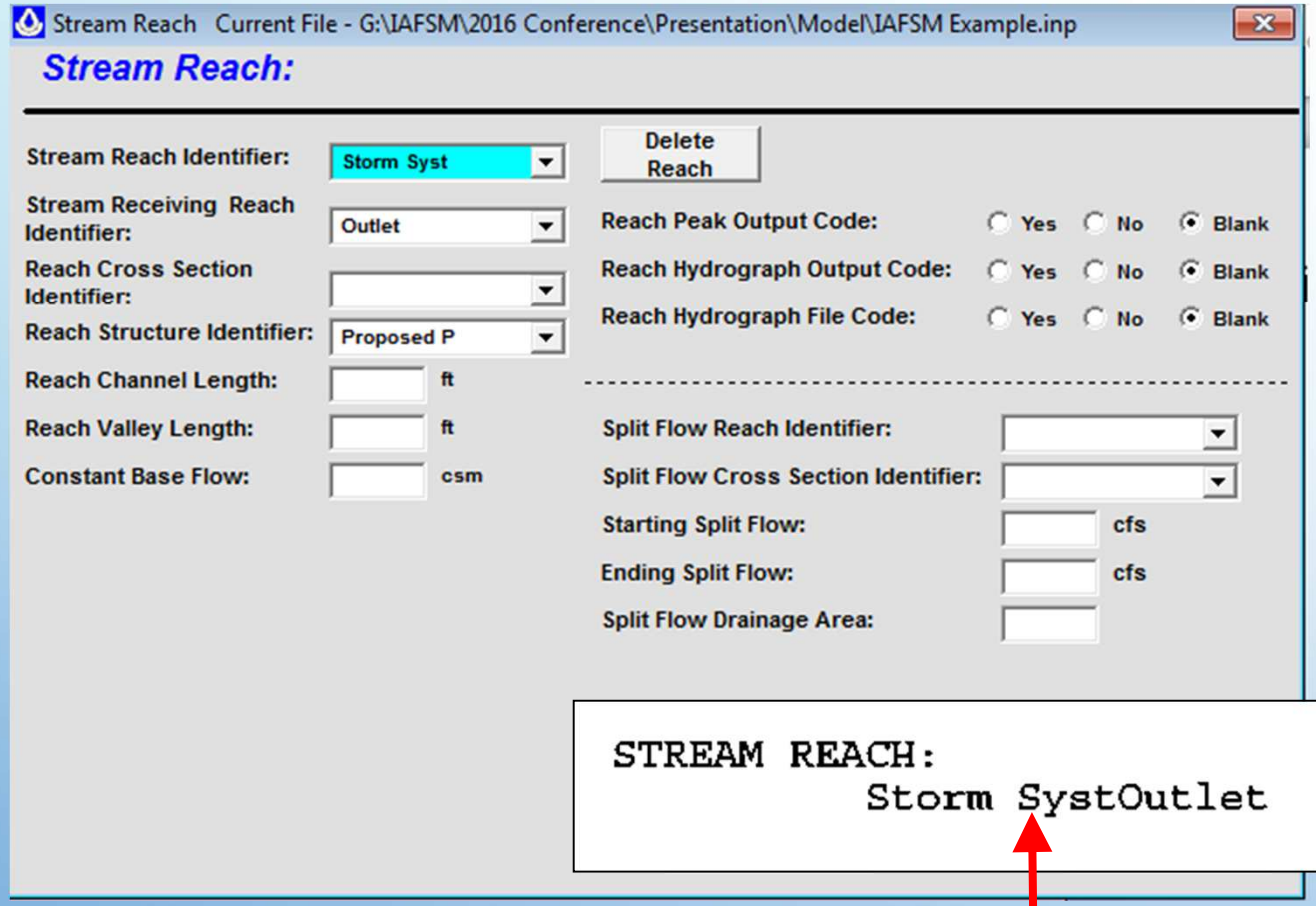


Enter the area (sq mi) of each land use for a weighted CN



Enter the length, slope, n value and flow surface for sheet flow, shallow concentrated flow, and channel flow for a Tc

The stream reach data shows the routing of stormwater.



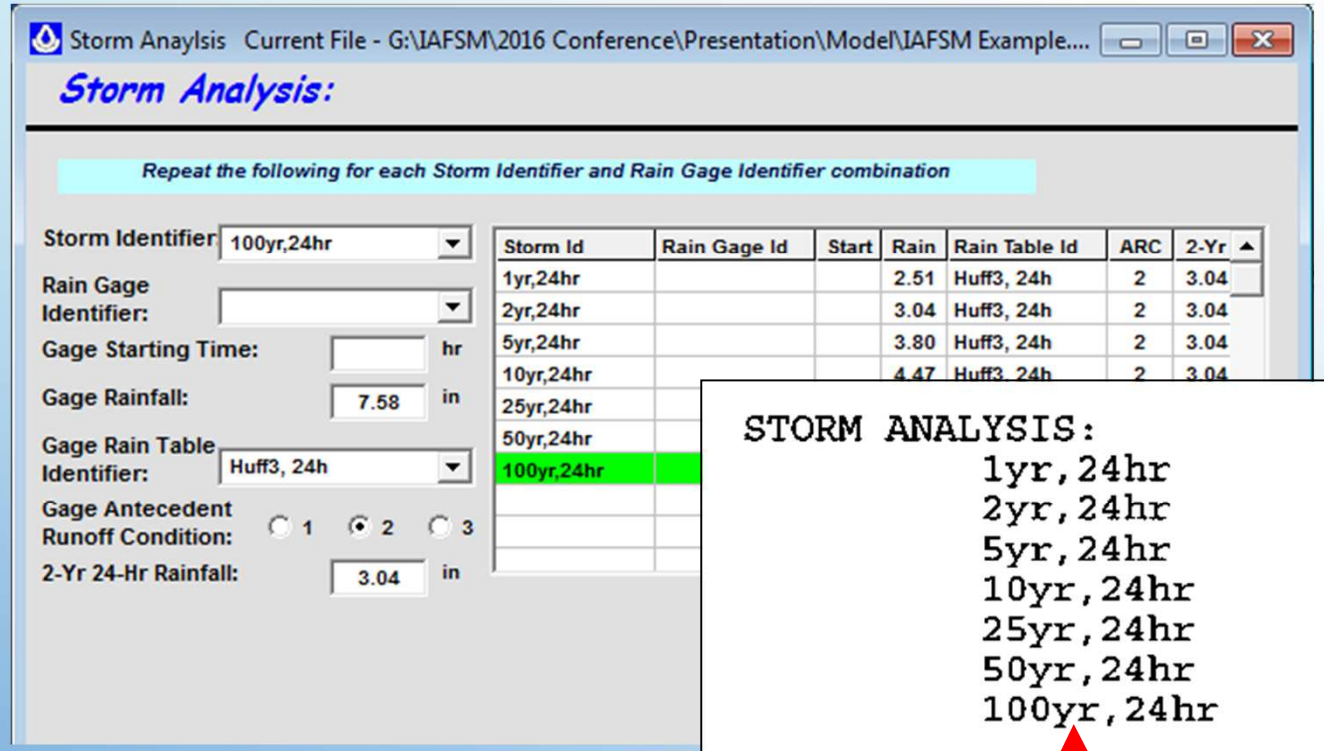
<u>Note:</u>
Check the routing to ensure unrestricted areas are not routed through the detention basin.

```
STREAM REACH:
          Storm SystOutlet                    Proposed P
```

Stream Reach ID

Reach Structure ID

Under Storm Analysis, all of the storm events analyzed are summarized.



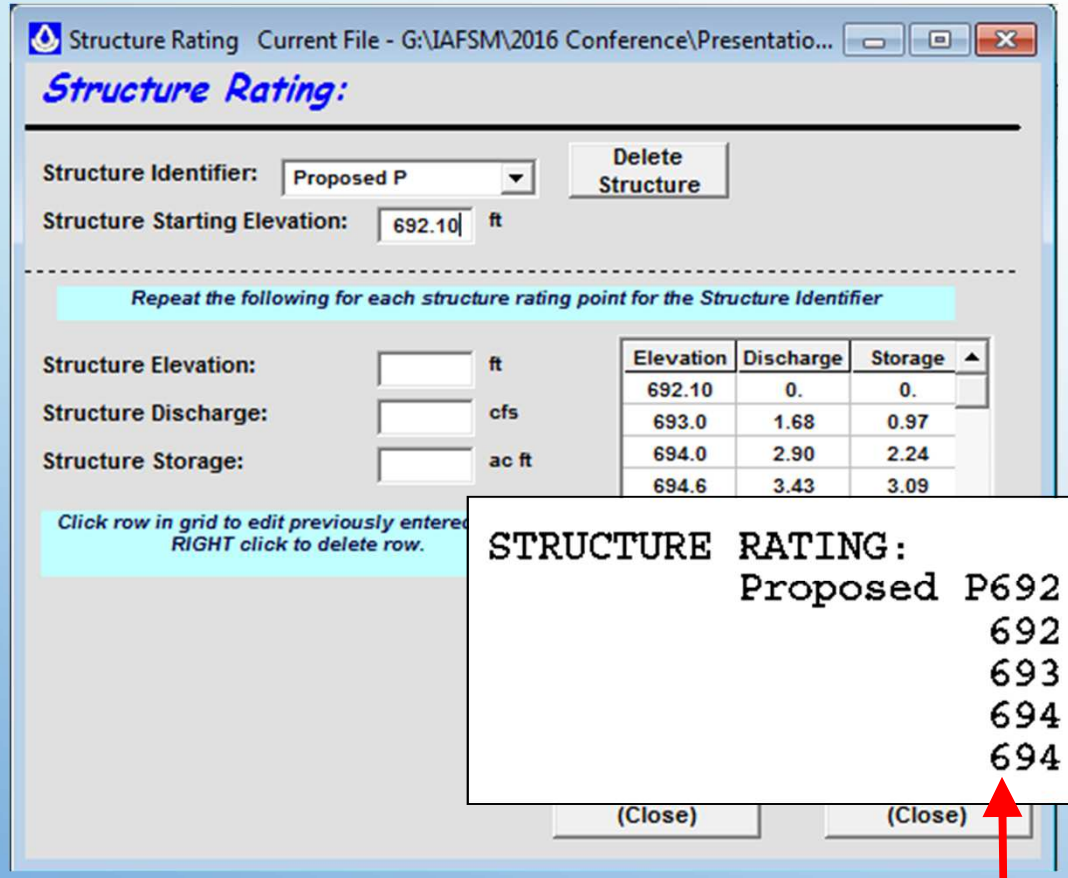

```
STORM ANALYSIS:
          1yr,24hr                2.51      Huff3, 24h2
          2yr,24hr                3.04      Huff3, 24h2
          5yr,24hr                3.80      Huff3, 24h2
          10yr,24hr               4.47      Huff3, 24h2
          25yr,24hr               5.51      Huff3, 24h2
          50yr,24hr               6.46      Huff3, 24h2
          100yr,24hr              7.58      Huff3, 24h2
```

Storm ID

Rainfall (in.)

Rainfall Distribution

A table for the proposed detention pond is provided.




```
STRUCTURE RATING:
          Proposed P692.10
                    692.10     0.          0.
                    693.0      1.68        0.97
                    694.0      2.90        2.24
                    694.6      3.43        3.09
```

Elevation (ft)

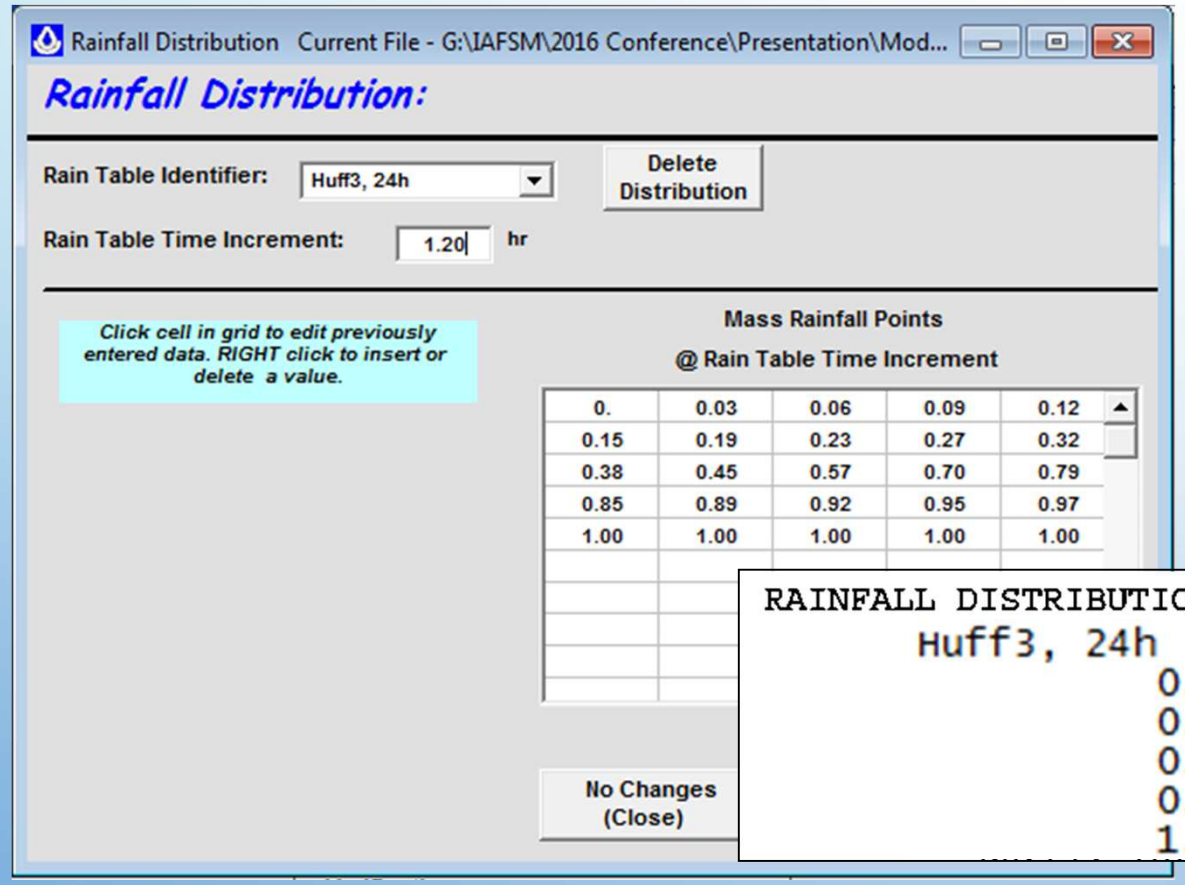
Discharge (cfs)

Storage (ac-ft)

Notes:

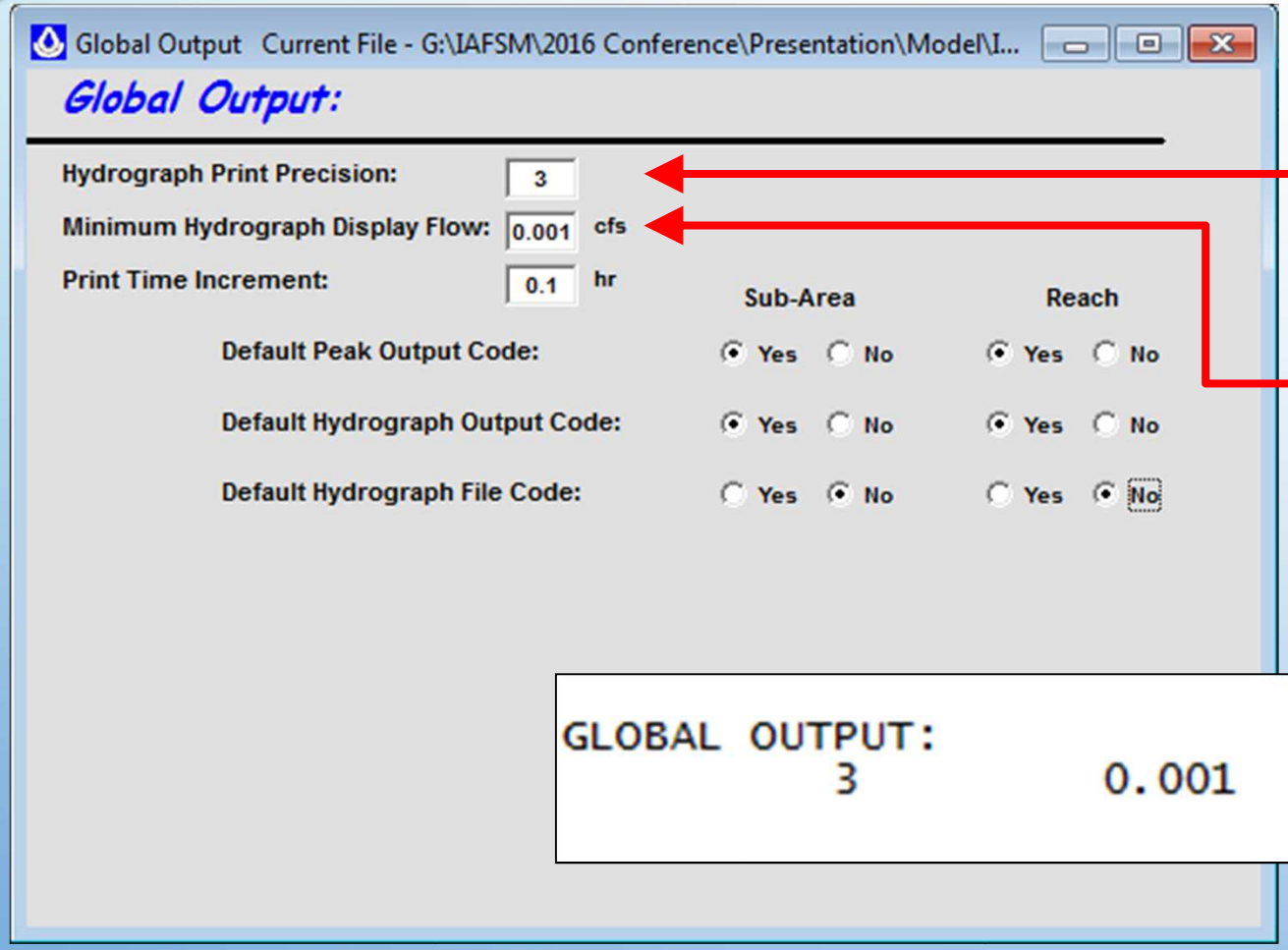
1. Take note of the order (Stage/Discharge/Storage)
2. Compare the 100-yr elevation in the output table to the pond elevations.

Review the rainfall distribution used by the model.




```
RAINFALL DISTRIBUTION:
      Huff3, 24h          1.20
                  0.      0.03    0.06    0.09    0.12
                  0.15    0.19    0.23    0.27    0.32
                  0.38    0.45    0.57    0.70    0.79
                  0.85    0.89    0.92    0.95    0.97
                  1.00    1.00    1.00    1.00    1.00
```

Check the output parameters.



Set to 2 or 3 for maximum accuracy

Larger values (>0.1) may cut off beginning and ending tails of hydrograph for a lower discharge

```
GLOBAL  OUTPUT:
          3          0.001       0.1          YY   N       YY   N
```

A summary of the output is provided on the last page.

Example Watershed
Proposed Model

Area or Reach Identifier	Drainage Area (sq mi)	Peak Flow by Storm 1yr,24hr (cfs)	2yr,24hr (cfs)	5yr,24hr (cfs)	10yr,24hr (cfs)	25yr,24hr (cfs)
001	0.019	2.10	2.81	3.85	4.77	6.20
Storm Syst	0.019	2.10	2.81	3.85	4.77	6.20
DOWNSTREAM		0.88	1.21	1.69	1.97	2.44
OUTLET	0.019	0.88	1.21	1.69	1.97	2.44

Area or Reach Identifier	Drainage Area (sq mi)	Peak Flow by Storm 50yr,24hr (cfs)	100yr,24hr (cfs)	(cfs)	(cfs)	(cfs)
001	0.019	7.51	9.04			
Storm Syst	0.019	7.51	9.04			
DOWNSTREAM		2.88	3.25			
OUTLET	0.019	2.88	3.25			

Discharge from
100-yr Storm

Within the output, look for the storm event of interest.

STORM 100yr,24hr

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
001	0.019		5.648		15.60	9.04	484.79

Line Start Time (hr)	Flow Values @ time increment of 0.100 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
2.400	0.0	0.05	0.14	0.18	0.22	0.26	0.29

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
Storm Syst	0.019	Downstream	5.584	694.39	18.23	3.25	174.10

Storm event of interest

Elevation of 100-yr storm

Discharge of 100-yr storm

Parameter Selection for Desired Change in WinTR-20 Runoff Volume.

WinTR-20 Parameter to be Changed, Independent of Others	Desired Change in Runoff Volume (%)							
	-50%	**-25%**	**-10%**	**-5%**	**+5%**	**+10%**	**+25%**	**+50%**
Required Change in Drainage Area	-50%	-25%	-10%	-5%	+5%	+10%	+25%	+50%
Required Change in Rainfall	-26%	-13%	-5%	-2.5%	+2.5%	+5%	+12.5%	+23%
Required Change in CN	-17%	-8%	-2%	-1%	+1%	+2%	+7%	+13%
Required Change in Tc	N/C	N/C	N/C	N/C	N/C	N/C	N/C	N/C

N/C signifies, No Change possible to alter volume. This parameter does not effect volume prediction.

Source: NRCS

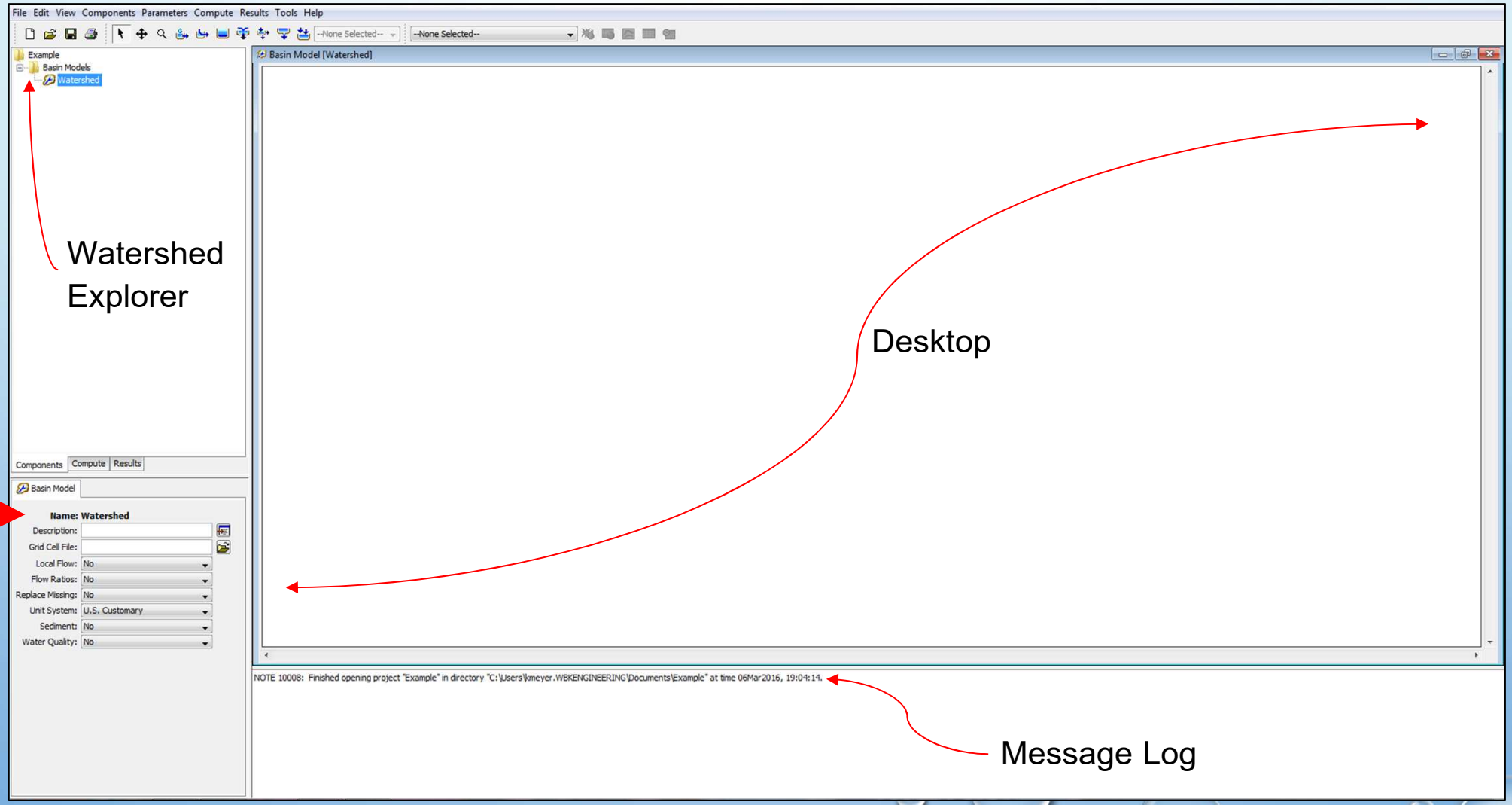
Parameter Selection for Desired Change in WinTR-20 Peak Runoff.

WinTR-20 Parameter to be Changed, Independent of Others	Desired Change in Runoff Peak (%)							
	-50%	**-25%**	**-10%**	**-5%**	**+5%**	**+10%**	**+25%**	**+50%**
Required Change in Drainage Area	-50%	-25%	-10%	-5%	+5%	+10%	+25%	+50%
Required Change in Rainfall	-24%	-12%	-5%	-2.50%	+2.5%	+5%	+11%	+21%
Required Change in CN	-13.5%	-6%	-2%	-1%	+1%	+2%	+5.5%	+11%
Required Change in Tc	+150%	+50%	+15%	+7%	-6%	-12%	-26.5%	-44%

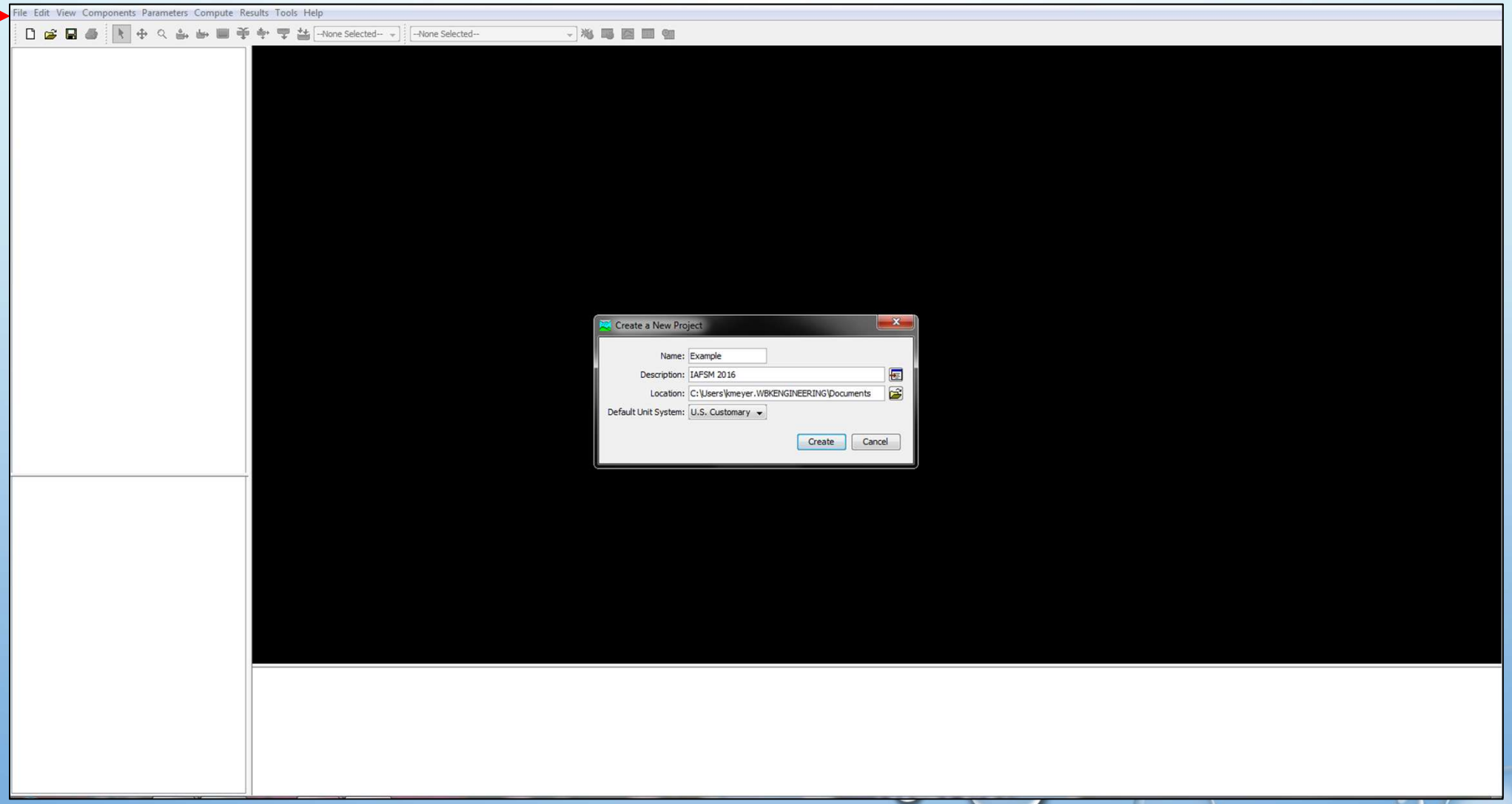
Source: NRCS

HEC-HMS

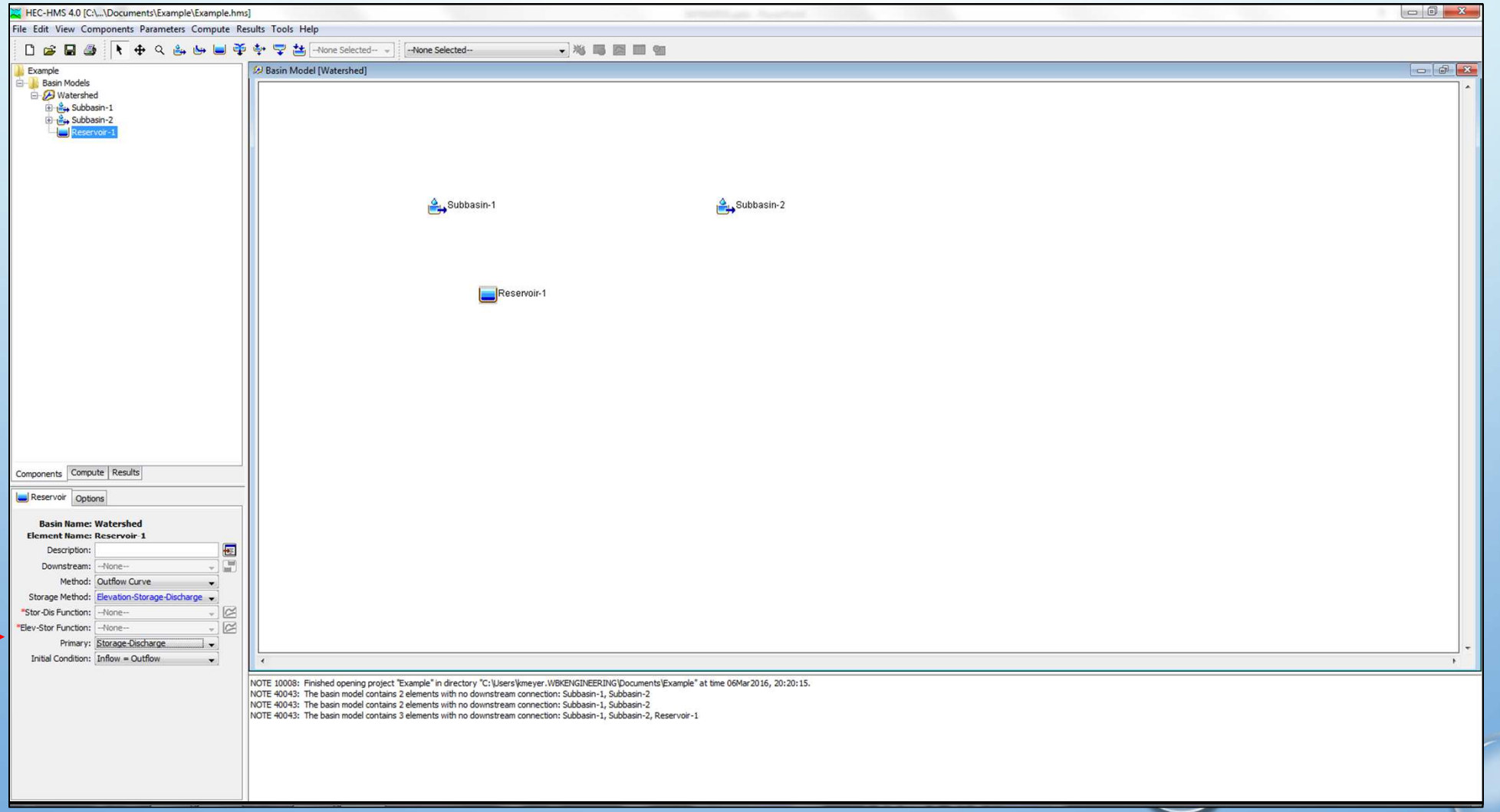
Program Screen



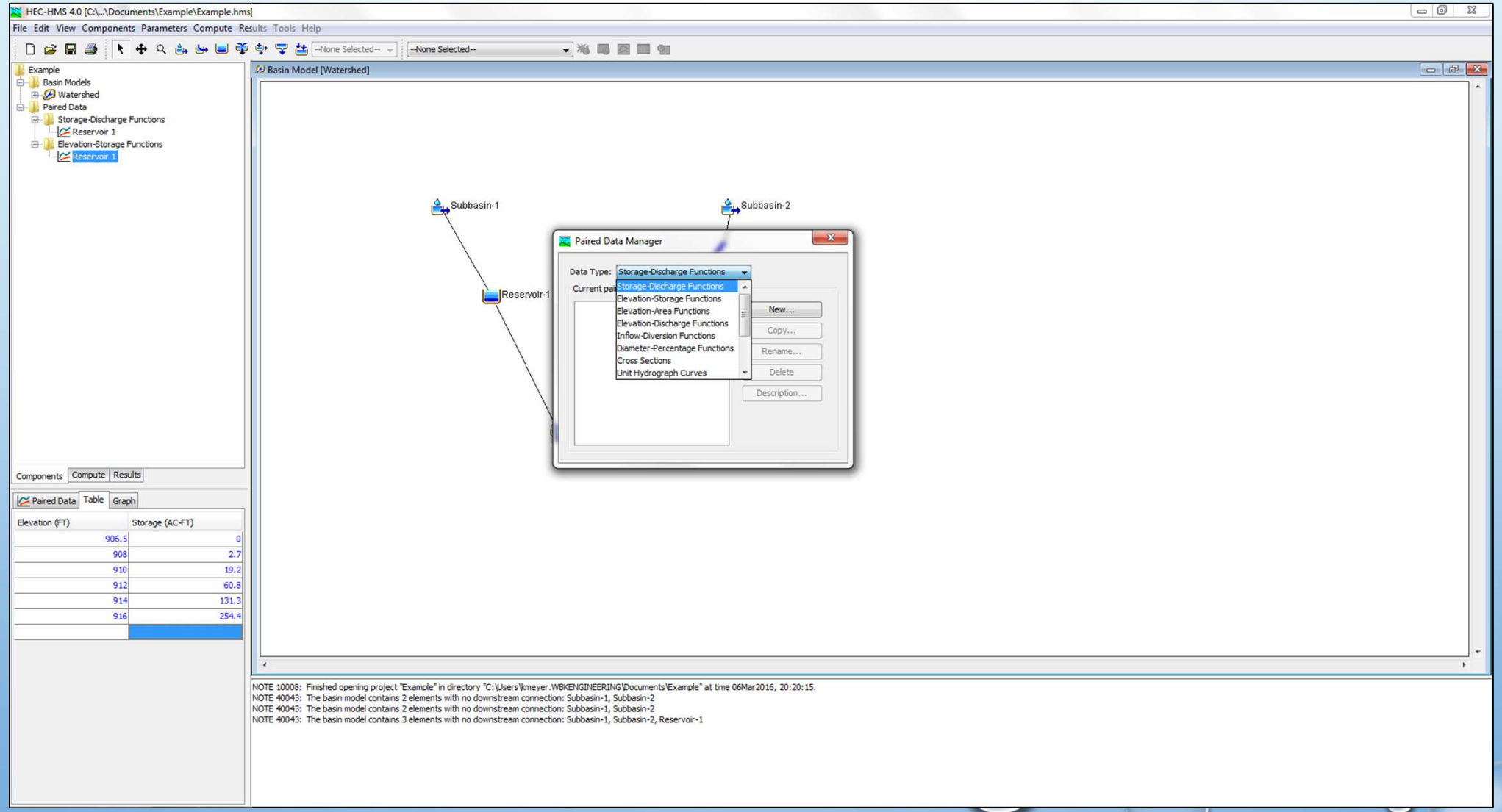
Starting a New Project & Toolbars



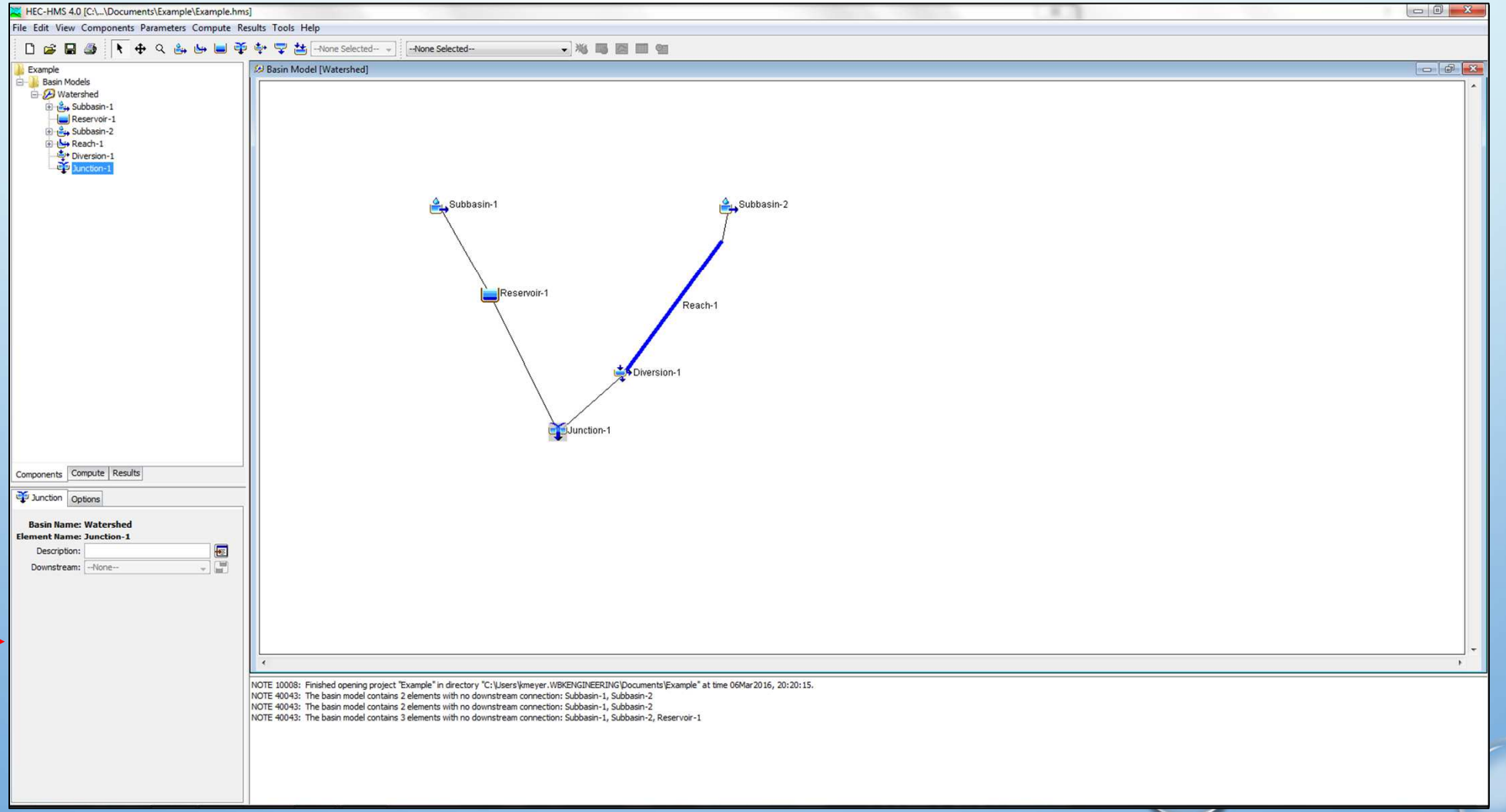
Basin Model Manager:
Input Subbasin, Reservoirs, Reach, Diversion, Junction



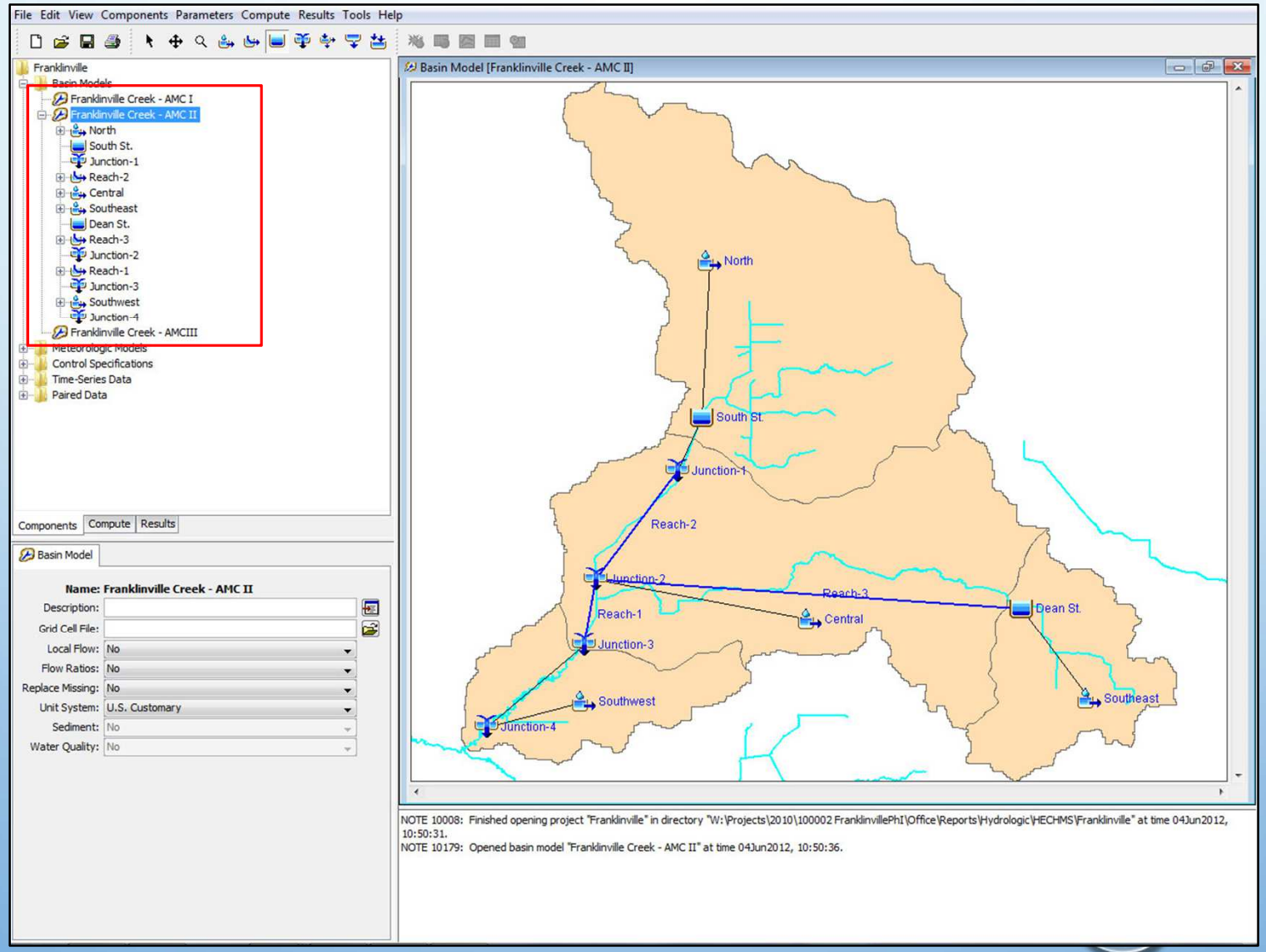
Reservoirs: Paired Data



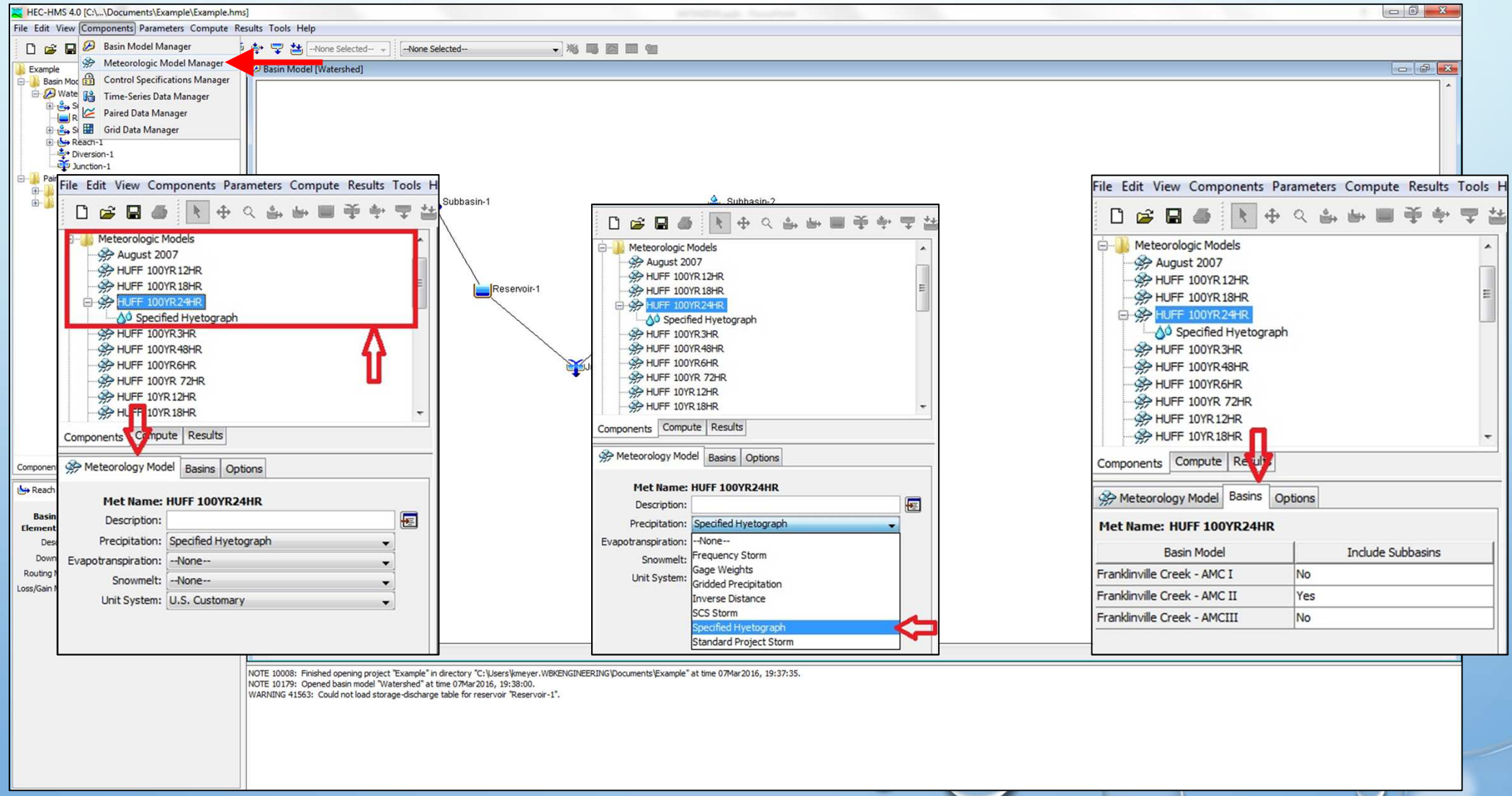
Basin Model Manager:
Input Subbasin, Reservoirs, Reach, Diversion, Junction



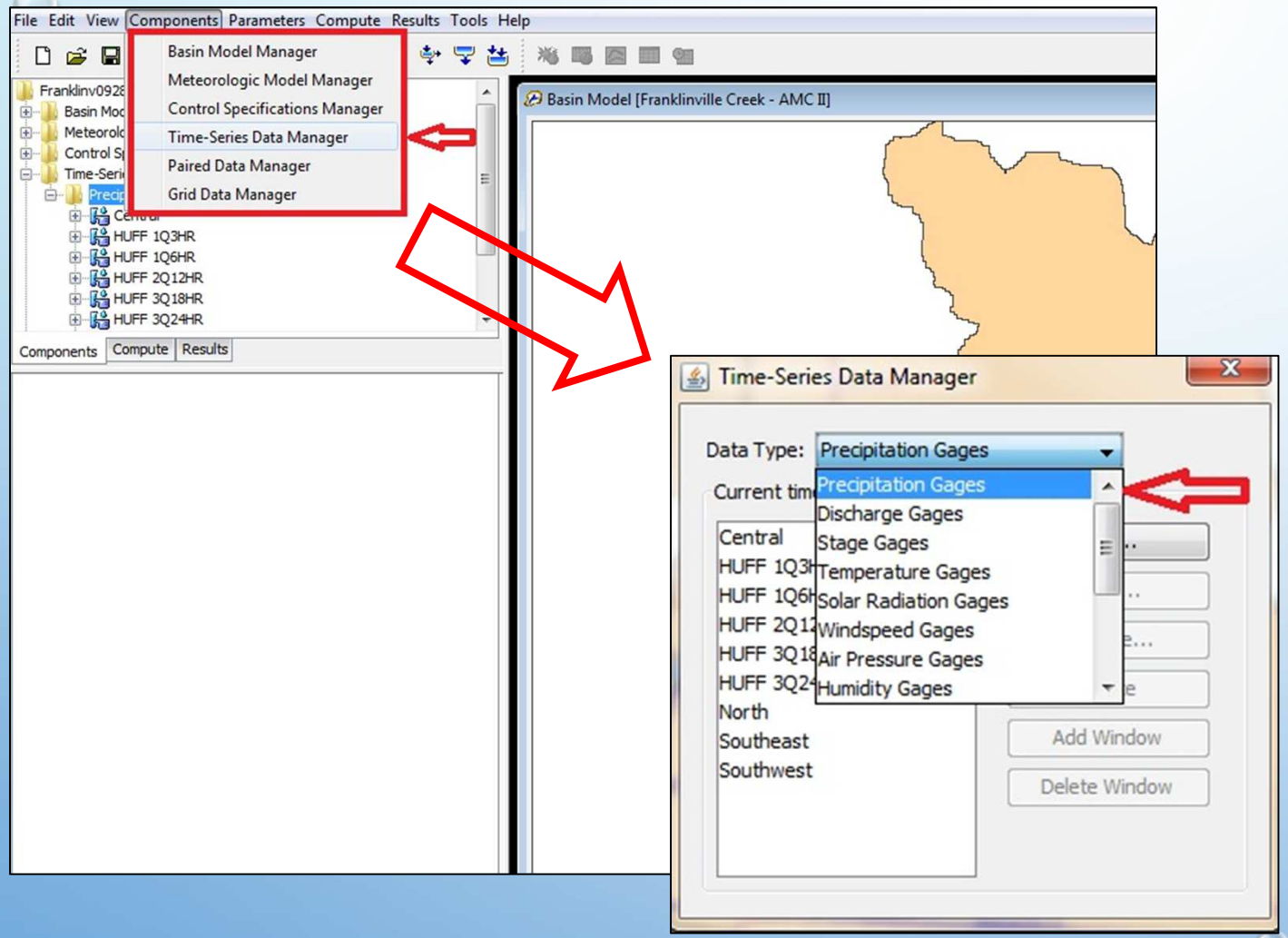
Completed Basin Model Manger

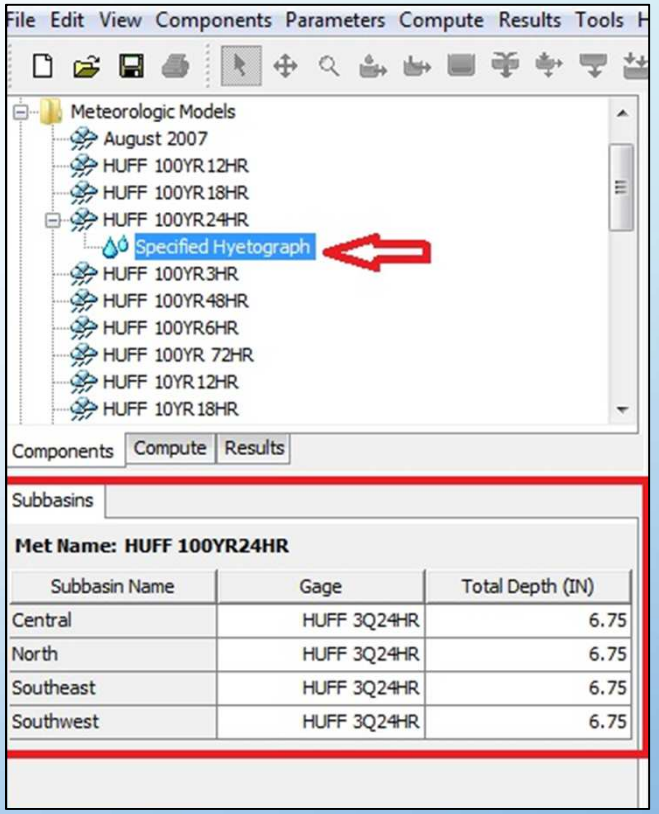


Meteorological Model

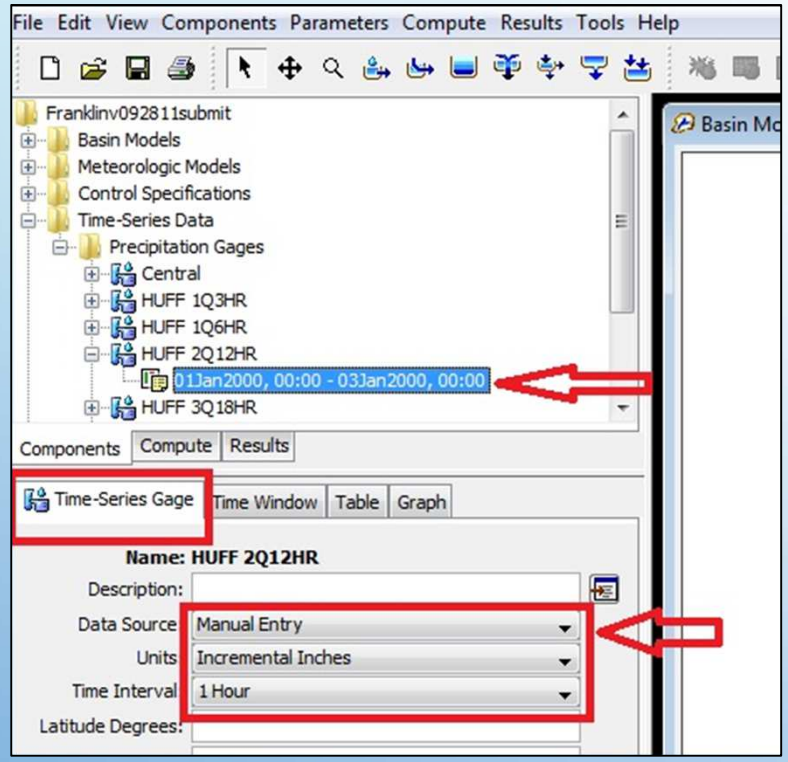


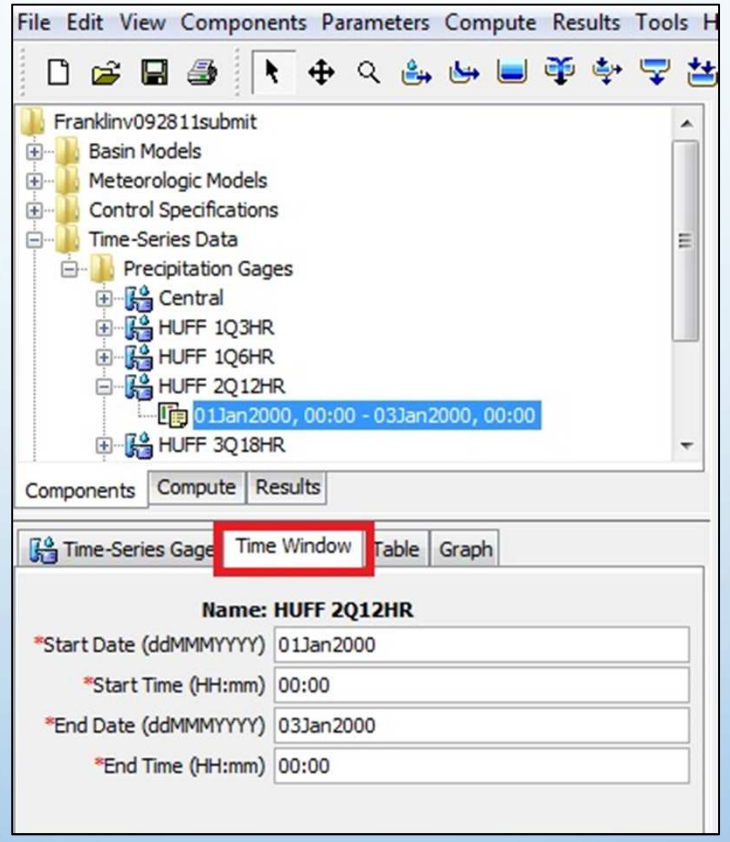
Rainfall Data

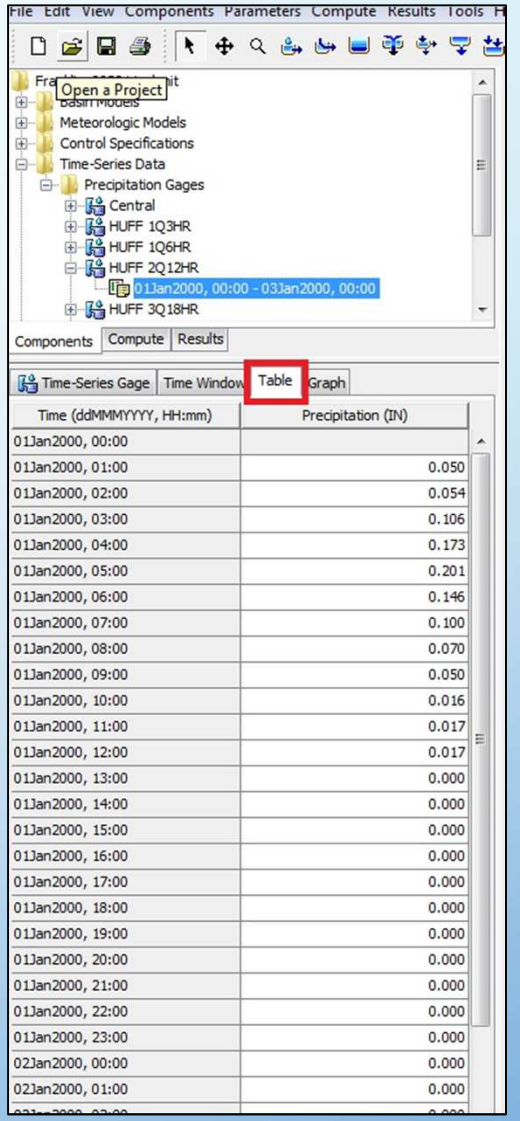




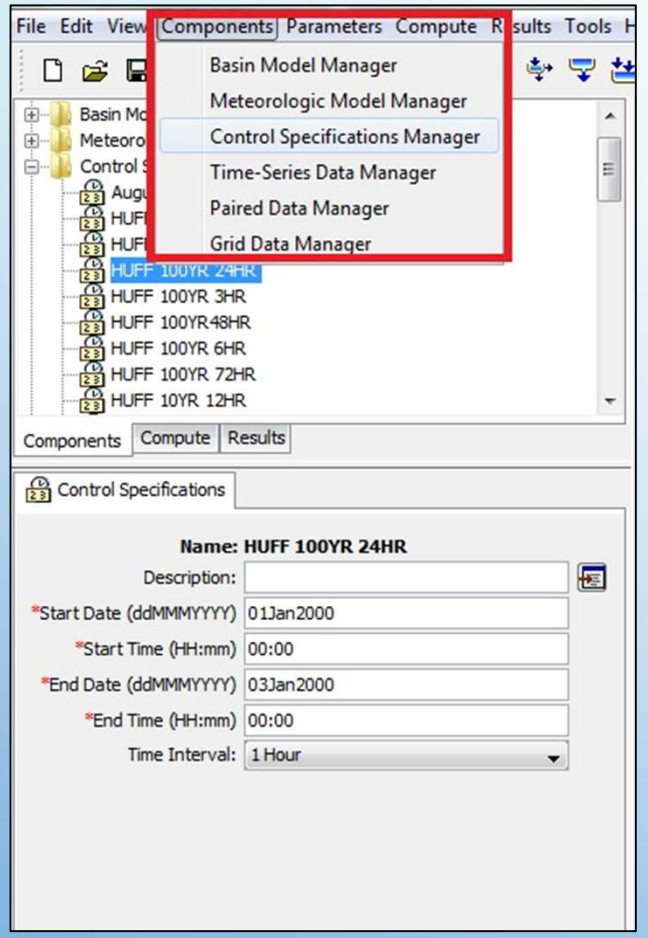
Rainfall Data

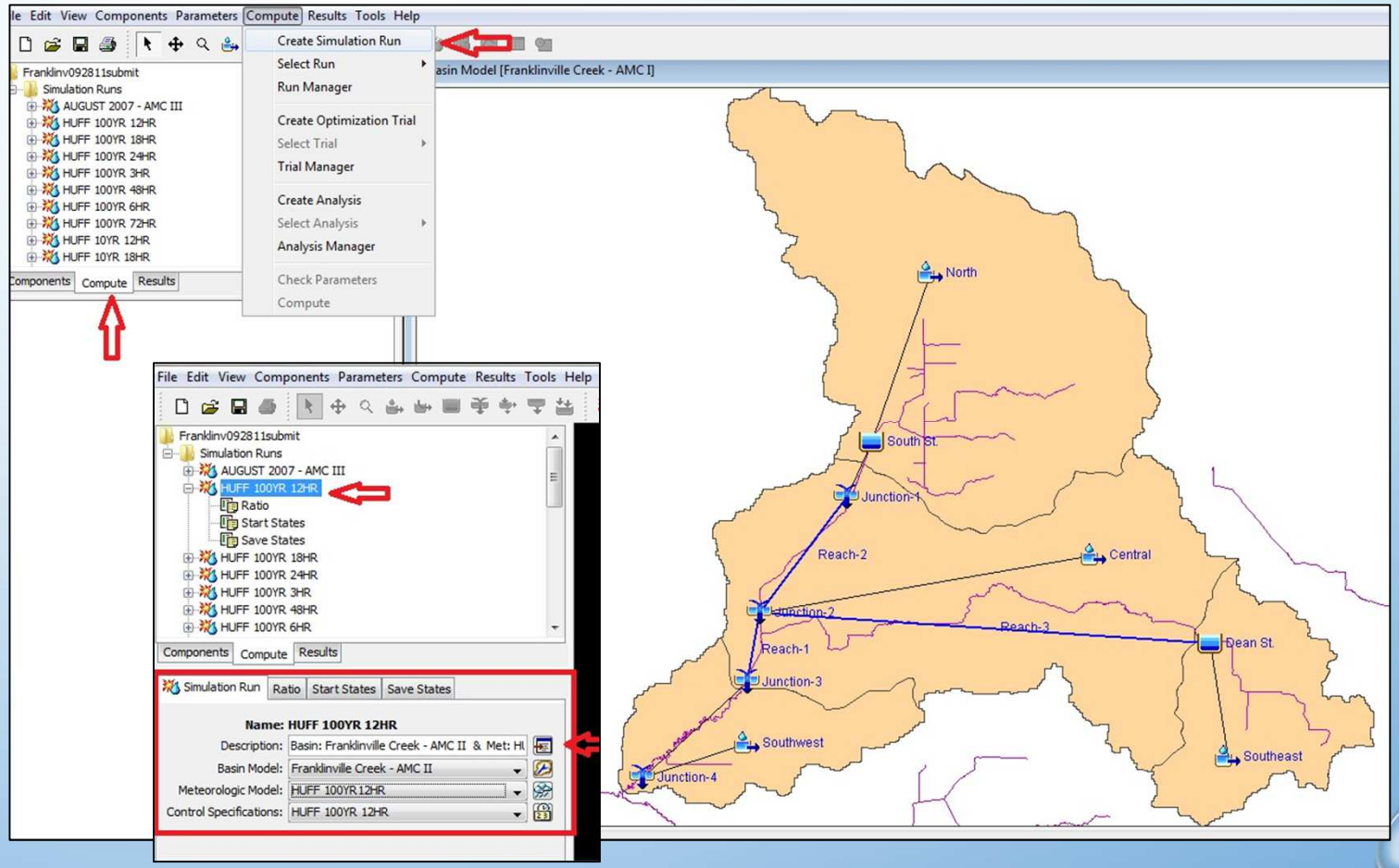




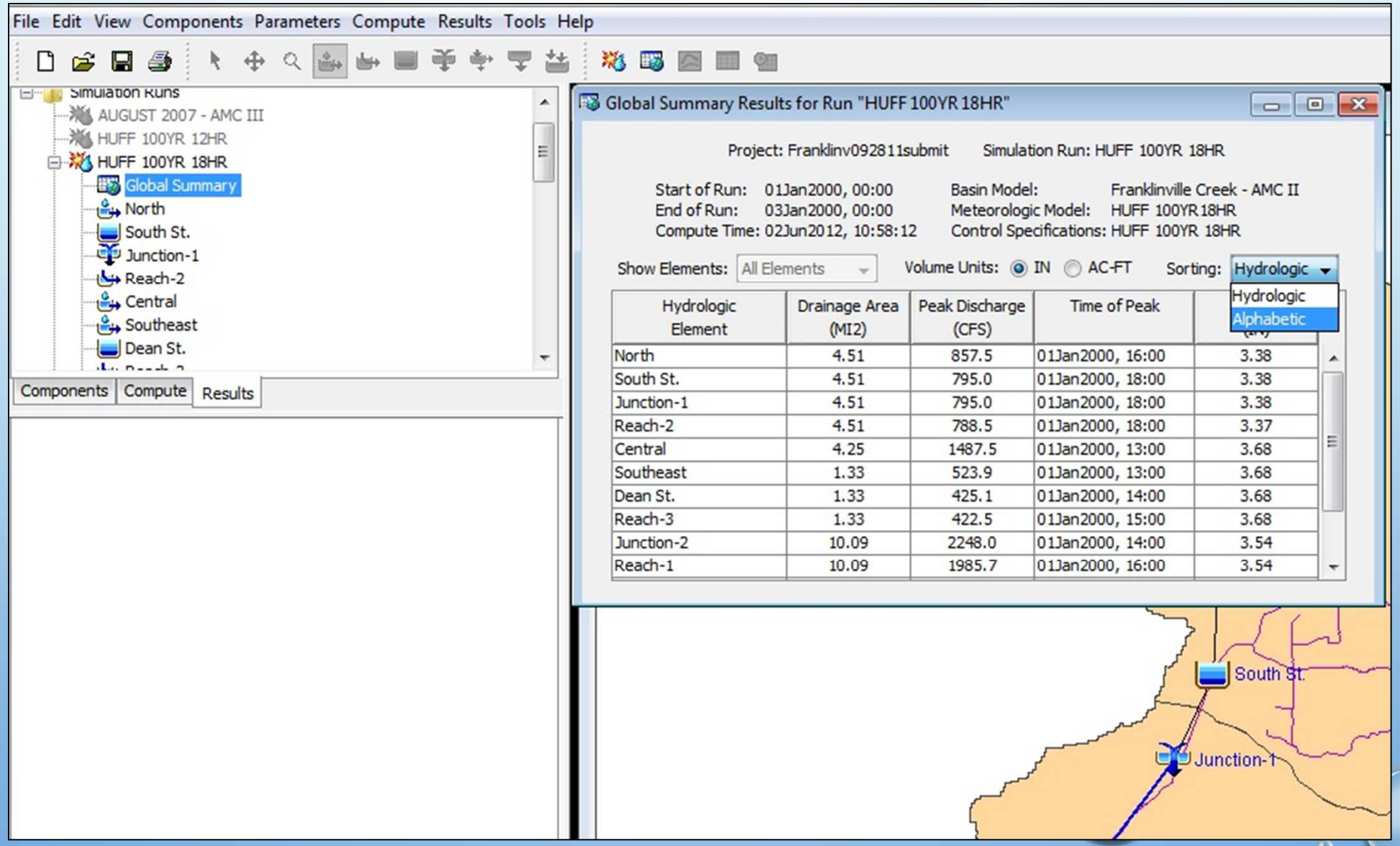


Control Specification & Simulation Run

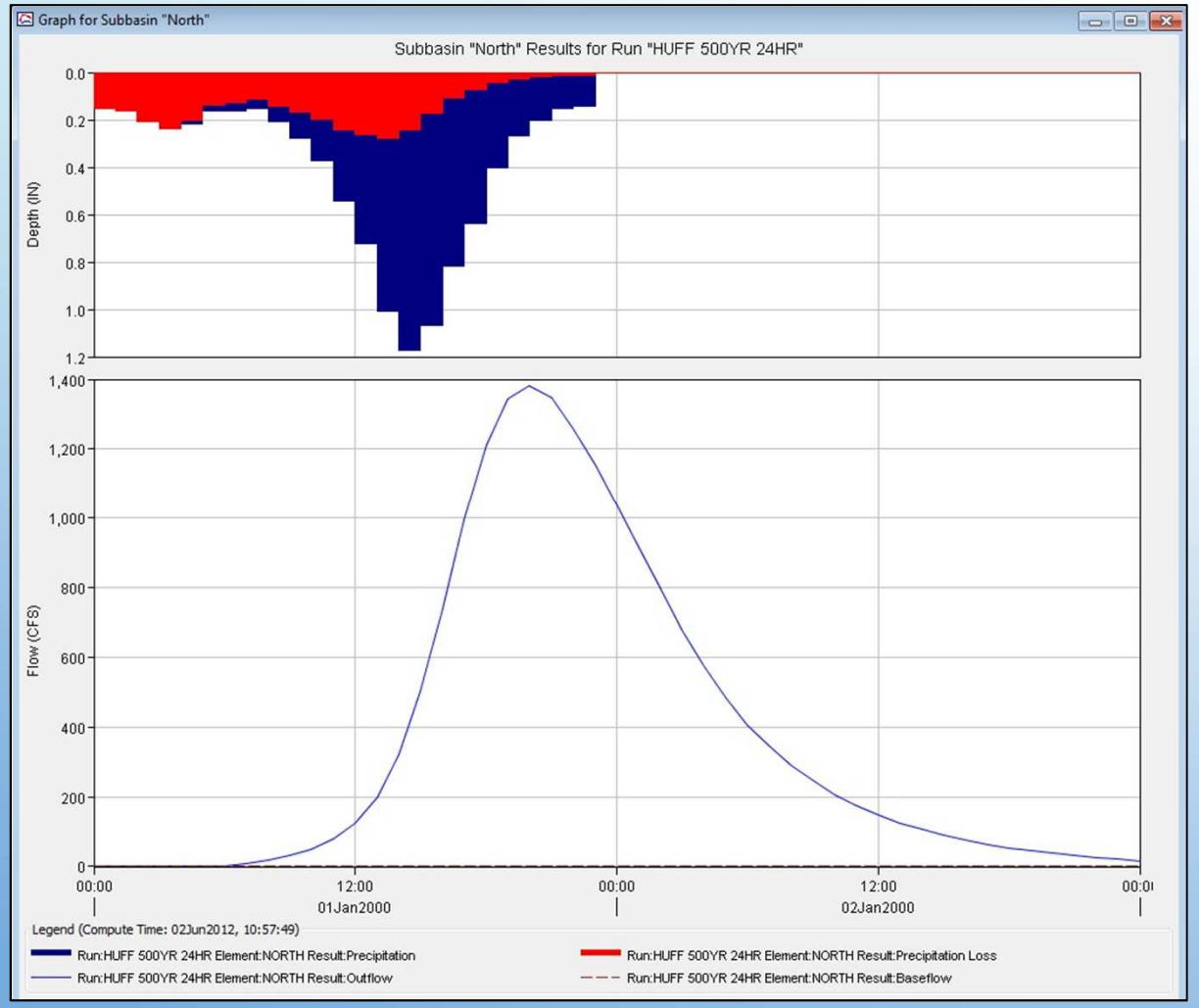


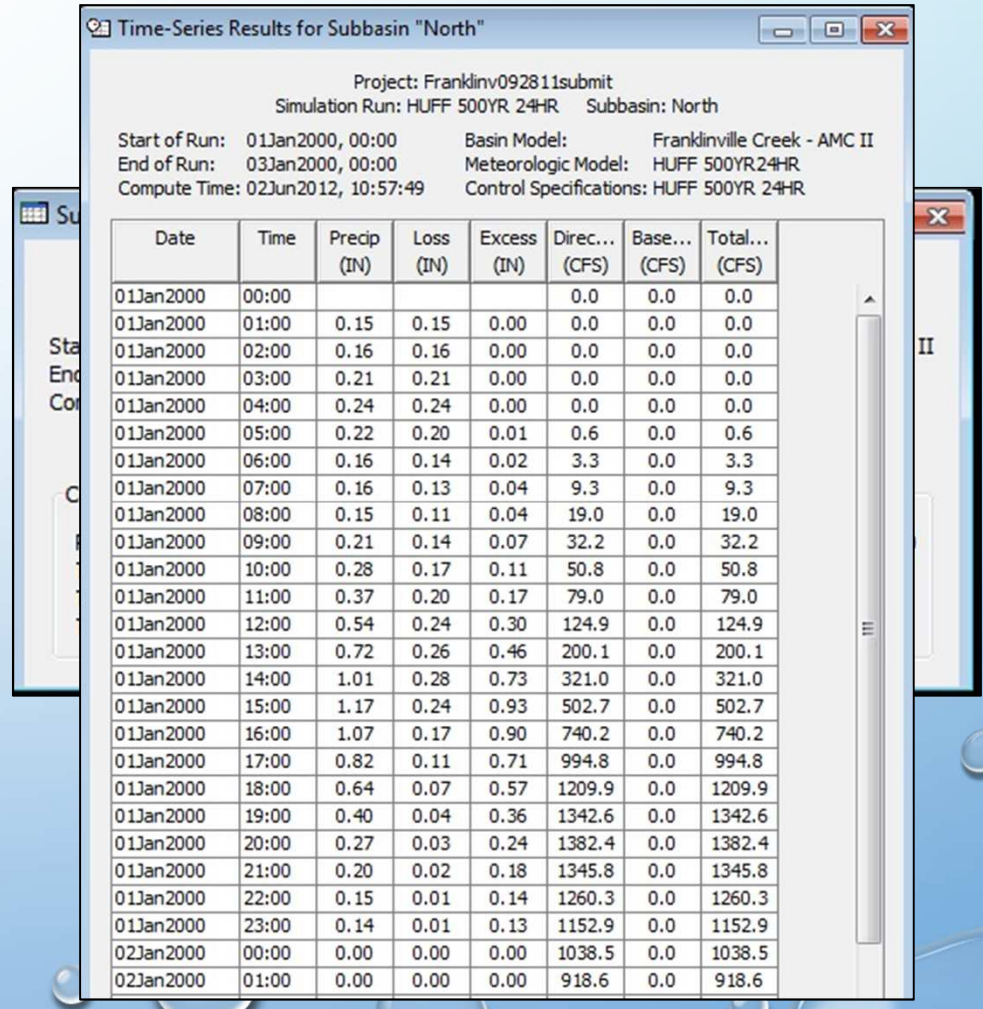


Reading The Output



Reading The Output





Time-Series Results for Subbasin "North"

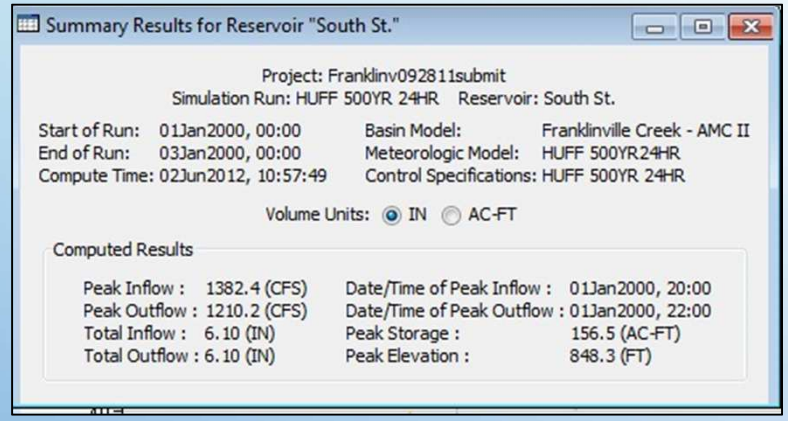
Project: Franklinv092811submit
Simulation Run: HUFF 500YR 24HR Subbasin: North

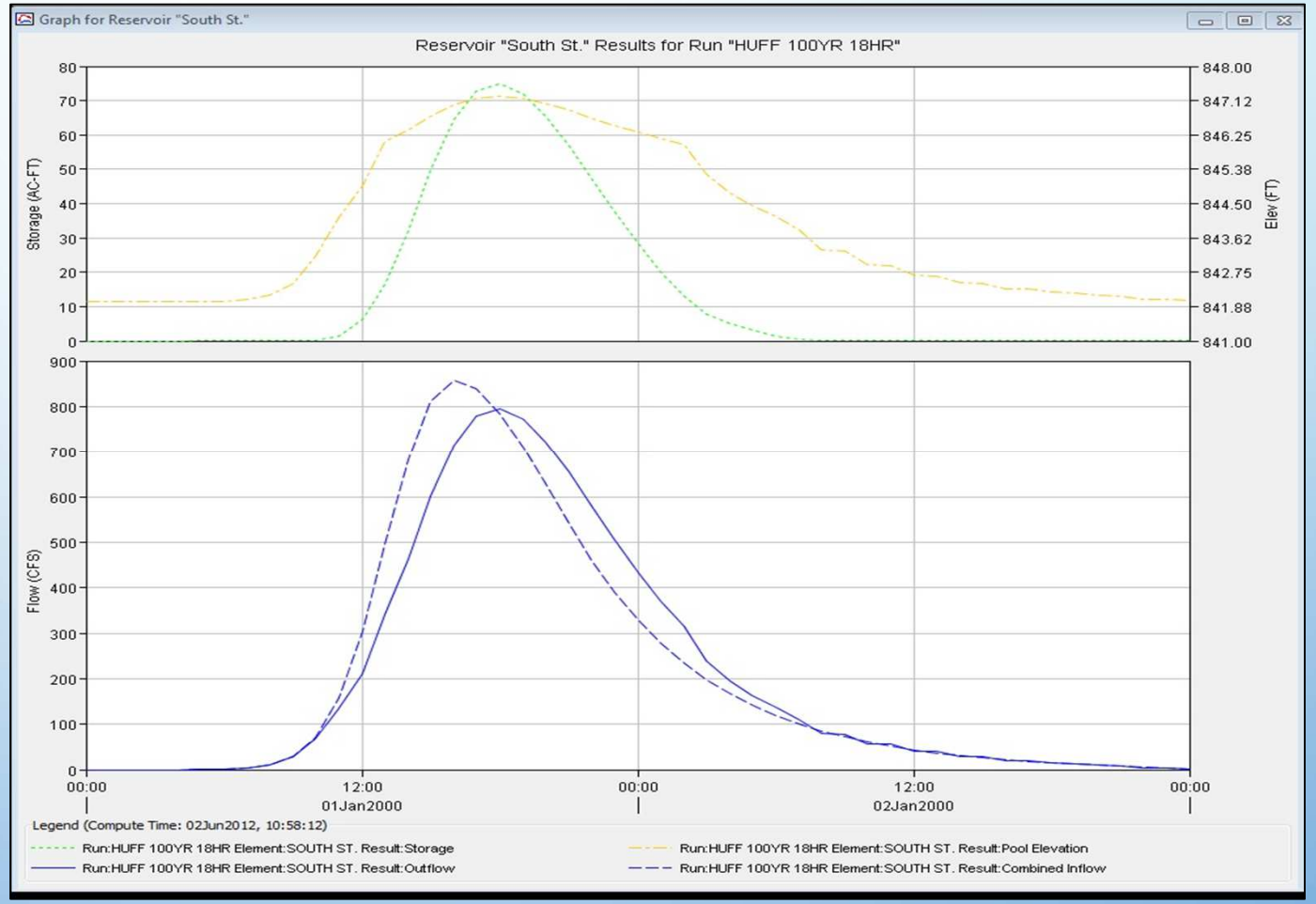
Start of Run: 01Jan2000, 00:00
End of Run: 03Jan2000, 00:00
Compute Time: 02Jun2012, 10:57:49

Basin Model: Franklinville Creek - AMC II
Meteorologic Model: HUFF 500YR24HR
Control Specifications: HUFF 500YR 24HR

Date	Time	Precip (IN)	Loss (IN)	Excess (IN)	Direc... (CFS)	Base... (CFS)	Total... (CFS)
01Jan2000	00:00				0.0	0.0	0.0
01Jan2000	01:00	0.15	0.15	0.00	0.0	0.0	0.0
01Jan2000	02:00	0.16	0.16	0.00	0.0	0.0	0.0
01Jan2000	03:00	0.21	0.21	0.00	0.0	0.0	0.0
01Jan2000	04:00	0.24	0.24	0.00	0.0	0.0	0.0
01Jan2000	05:00	0.22	0.20	0.01	0.6	0.0	0.6
01Jan2000	06:00	0.16	0.14	0.02	3.3	0.0	3.3
01Jan2000	07:00	0.16	0.13	0.04	9.3	0.0	9.3
01Jan2000	08:00	0.15	0.11	0.04	19.0	0.0	19.0
01Jan2000	09:00	0.21	0.14	0.07	32.2	0.0	32.2
01Jan2000	10:00	0.28	0.17	0.11	50.8	0.0	50.8
01Jan2000	11:00	0.37	0.20	0.17	79.0	0.0	79.0
01Jan2000	12:00	0.54	0.24	0.30	124.9	0.0	124.9
01Jan2000	13:00	0.72	0.26	0.46	200.1	0.0	200.1
01Jan2000	14:00	1.01	0.28	0.73	321.0	0.0	321.0
01Jan2000	15:00	1.17	0.24	0.93	502.7	0.0	502.7
01Jan2000	16:00	1.07	0.17	0.90	740.2	0.0	740.2
01Jan2000	17:00	0.82	0.11	0.71	994.8	0.0	994.8
01Jan2000	18:00	0.64	0.07	0.57	1209.9	0.0	1209.9
01Jan2000	19:00	0.40	0.04	0.36	1342.6	0.0	1342.6
01Jan2000	20:00	0.27	0.03	0.24	1382.4	0.0	1382.4
01Jan2000	21:00	0.20	0.02	0.18	1345.8	0.0	1345.8
01Jan2000	22:00	0.15	0.01	0.14	1260.3	0.0	1260.3
01Jan2000	23:00	0.14	0.01	0.13	1152.9	0.0	1152.9
02Jan2000	00:00	0.00	0.00	0.00	1038.5	0.0	1038.5
02Jan2000	01:00	0.00	0.00	0.00	918.6	0.0	918.6

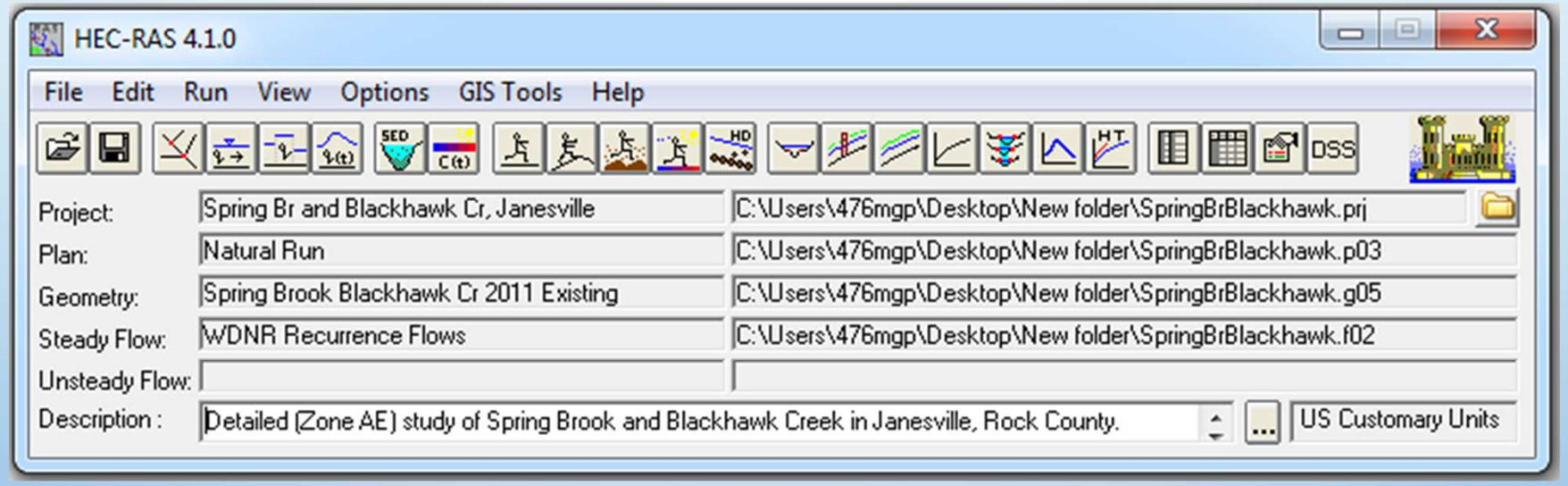
Reading The Output



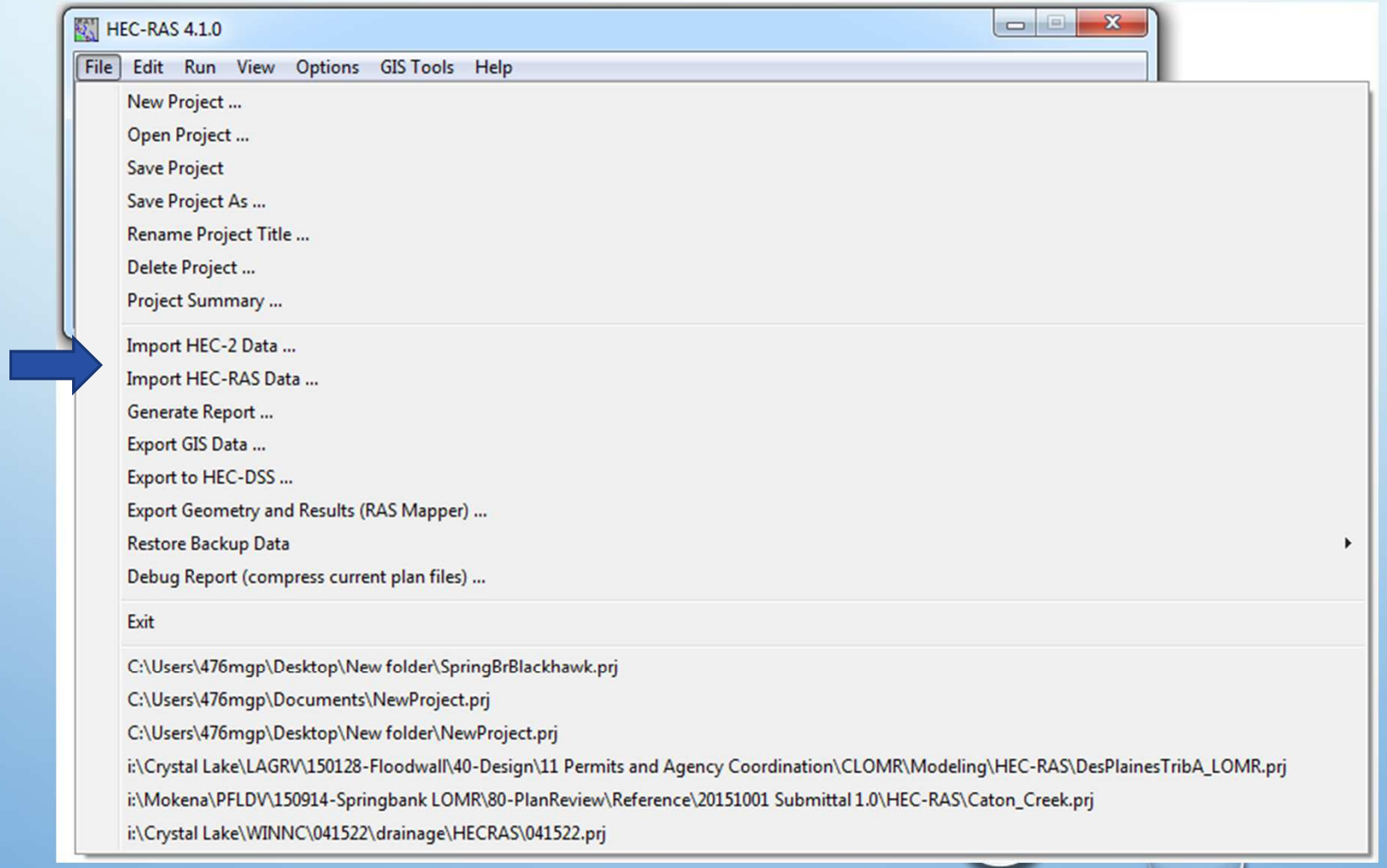


HEC-RAS

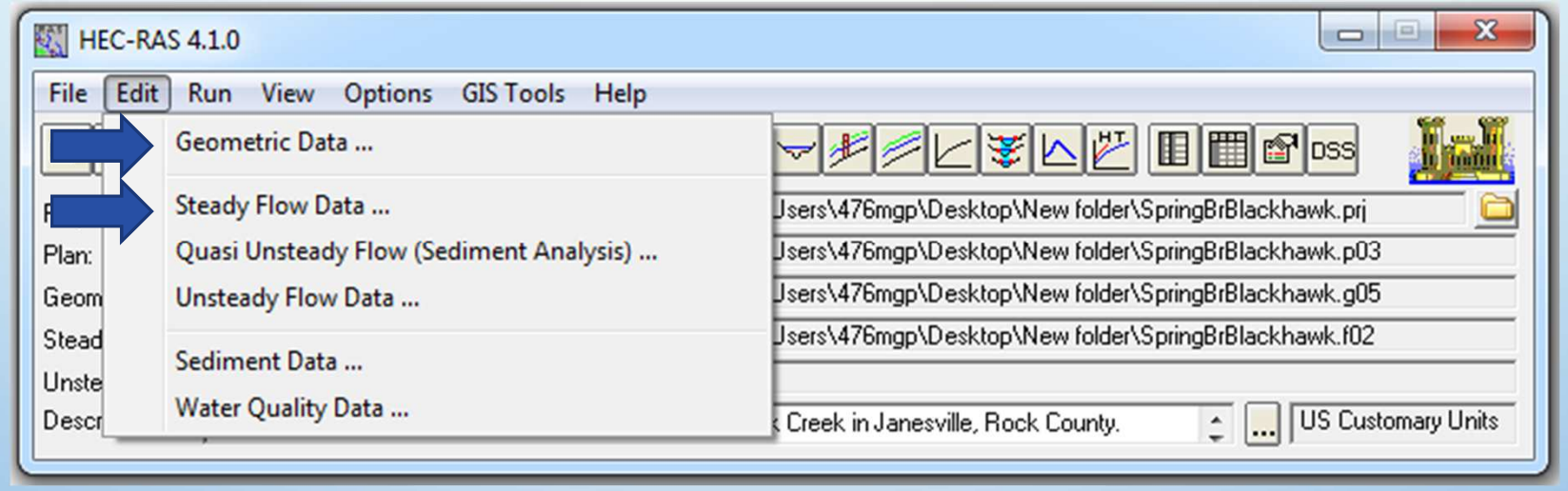
HEC-RAS


HEC-RAS 4.1.0
File Edit Run View Options GIS Tools Help
DSS
Project: Spring Br and Blackhawk Cr, Janesville C:\Users\476mgp\Desktop\New folder\SpringBrBlackhawk.prj
Plan: Natural Run C:\Users\476mgp\Desktop\New folder\SpringBrBlackhawk.p03
Geometry: Spring Brook Blackhawk Cr 2011 Existing C:\Users\476mgp\Desktop\New folder\SpringBrBlackhawk.g05
Steady Flow: WDNR Recurrence Flows C:\Users\476mgp\Desktop\New folder\SpringBrBlackhawk.f02
Unsteady Flow:
Description : Detailed (Zone AE) study of Spring Brook and Blackhawk Creek in Janesville, Rock County.
US Customary Units

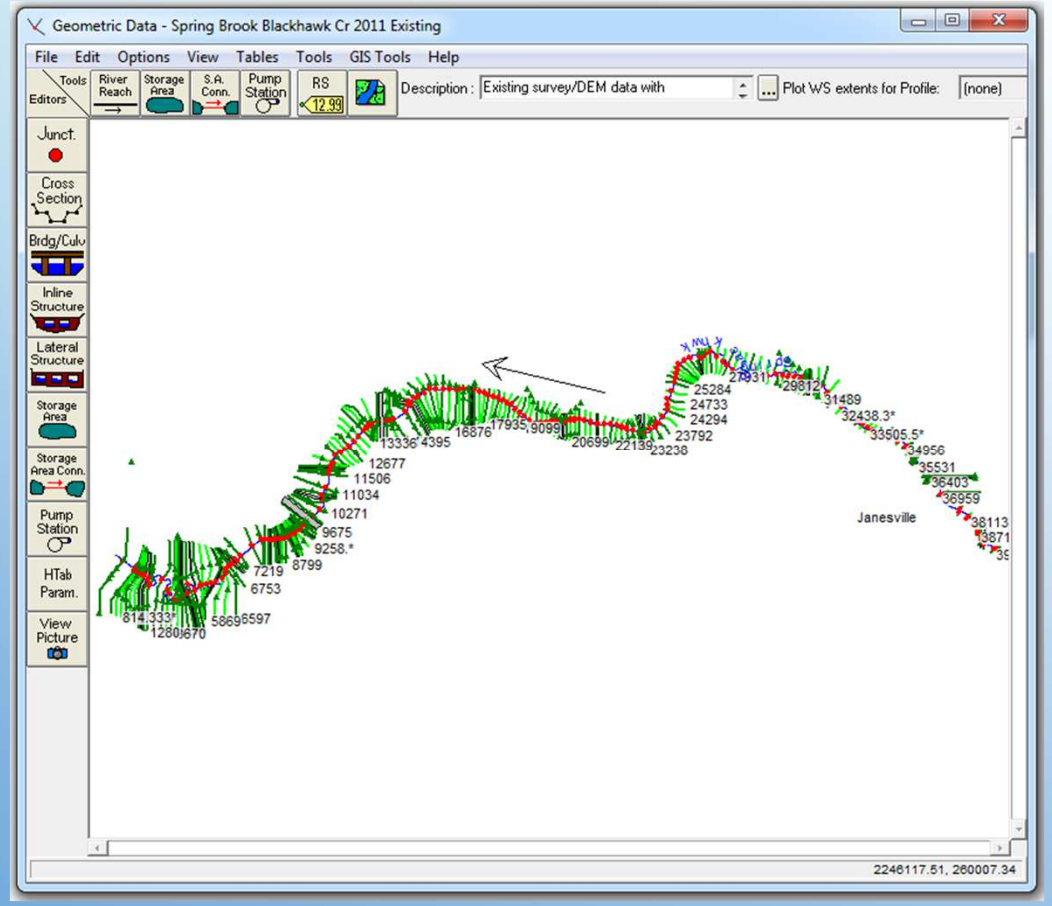
IMPORTING DATA



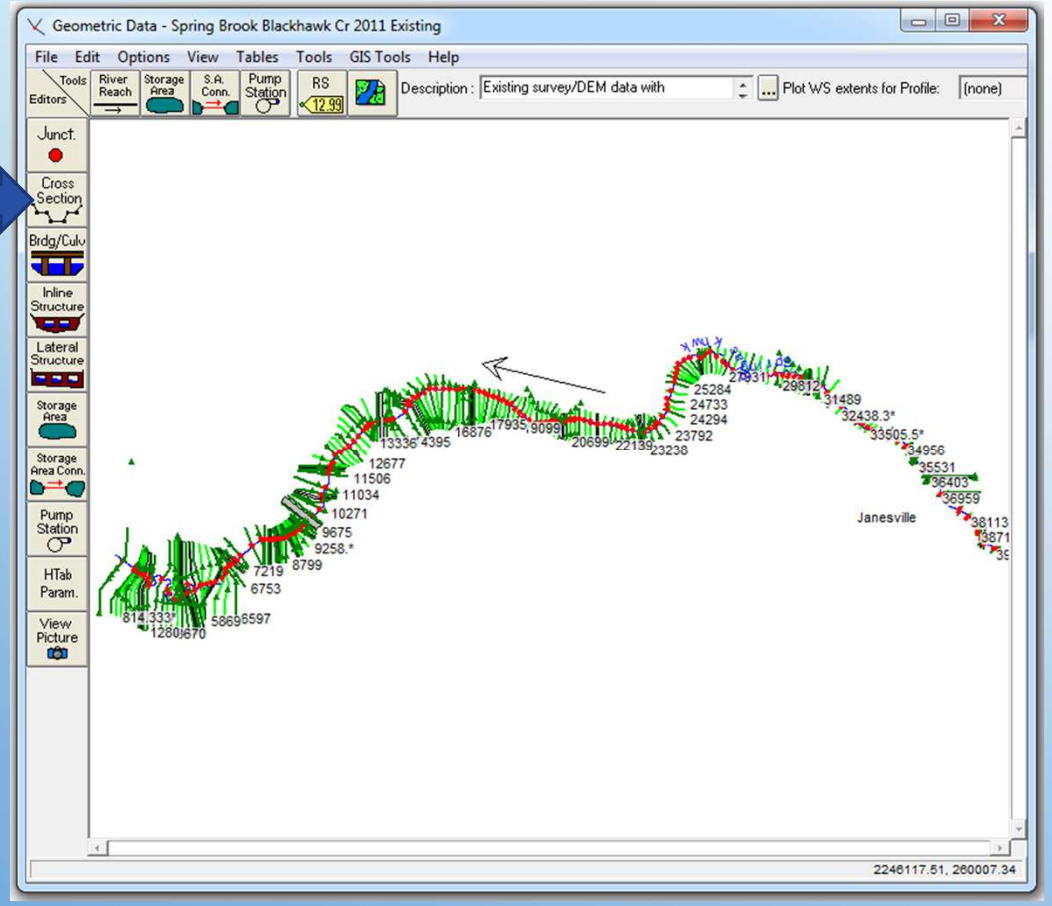
DATA INPUT
GEOMETRIC DATA AND FLOW DATA

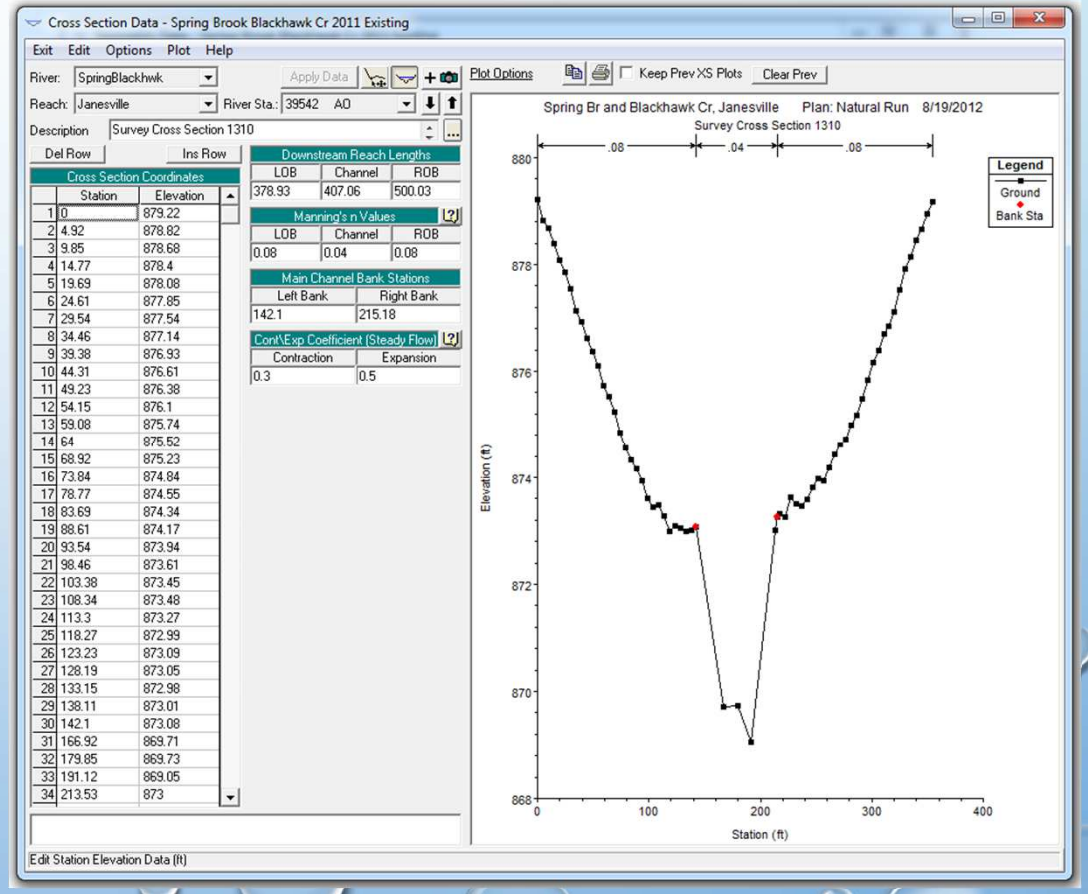


DATA INPUT
GEOMETRIC DATA EDITOR

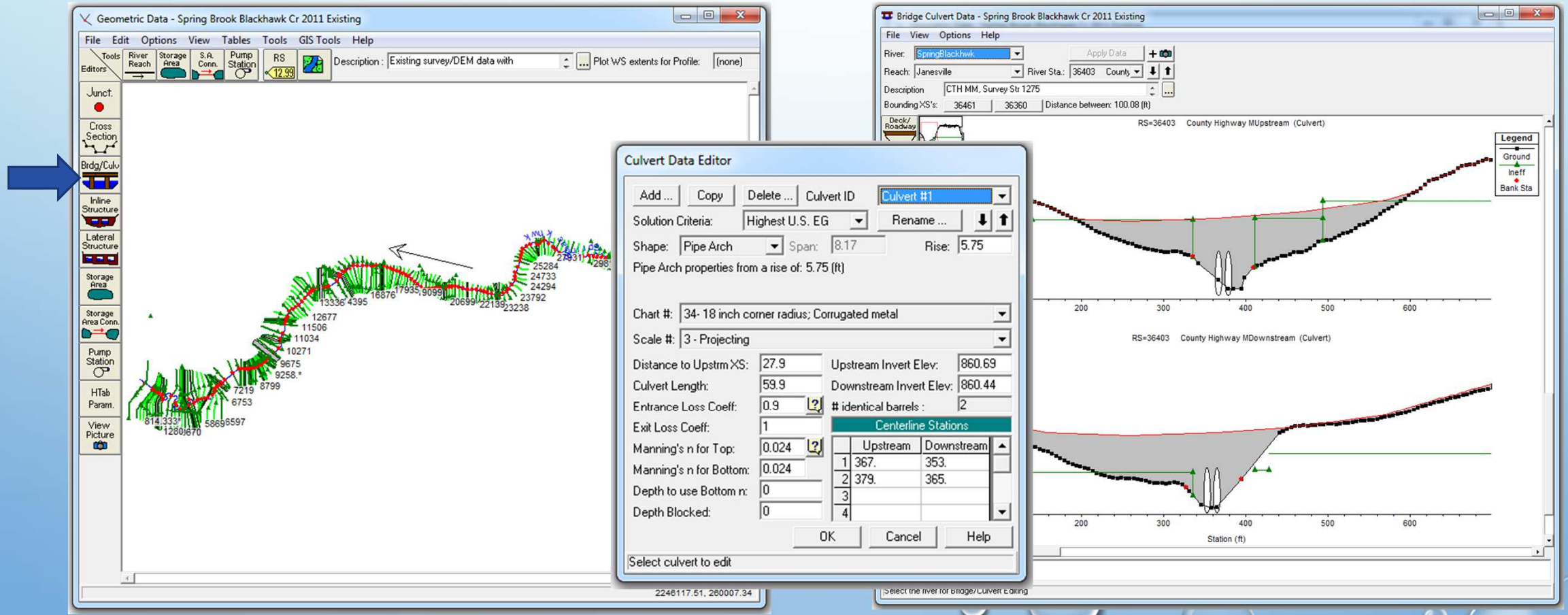


DATA INPUT
GEOMETRIC DATA - CROSS SECTIONS





DATA INPUT
GEOMETRIC DATA - CULVERTS



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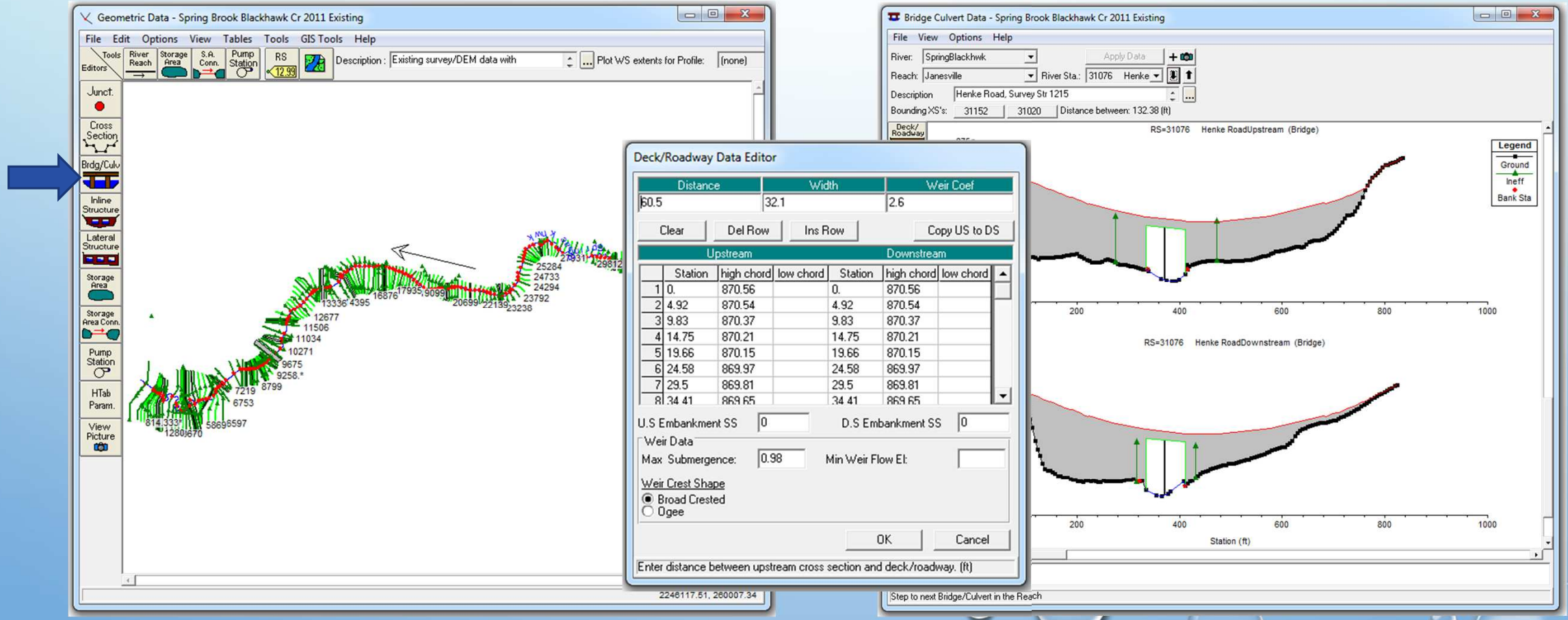
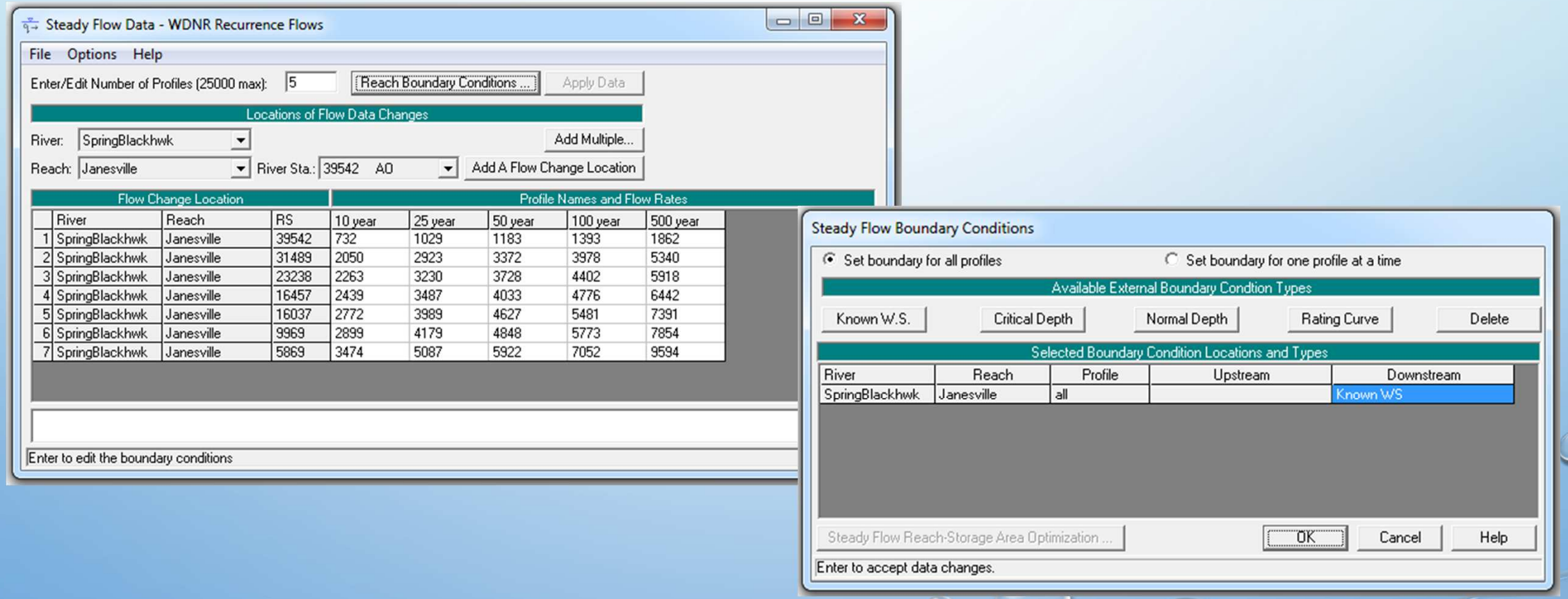
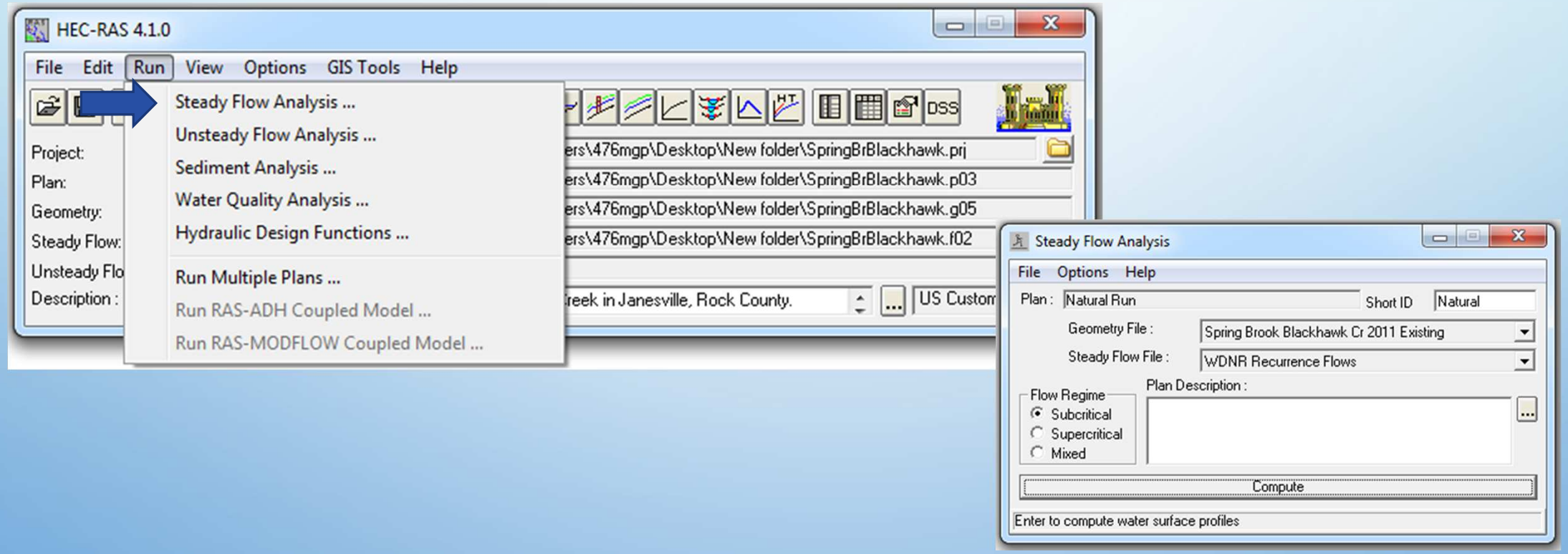
GEOMETRIC DATA - BRIDGES



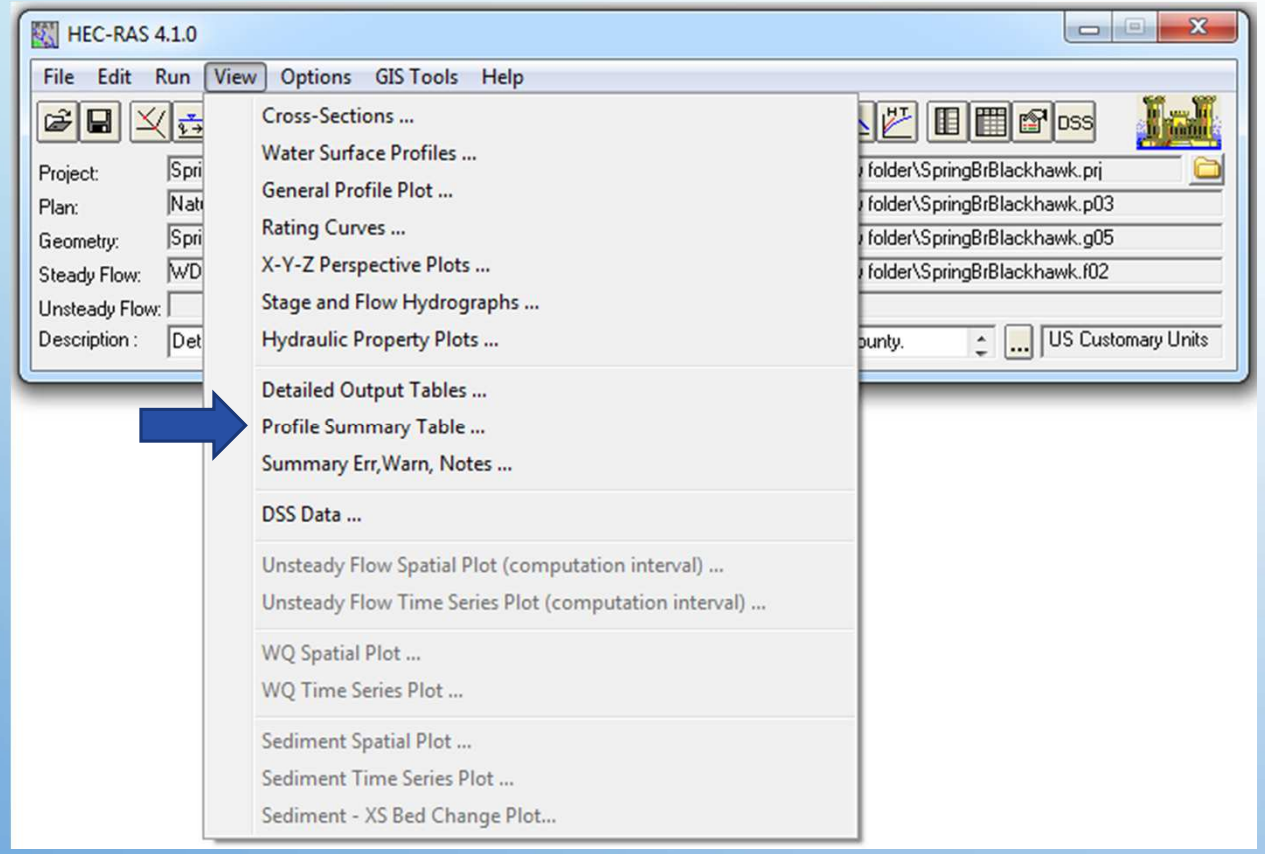
DATA INPUT
FLOW DATA – STEADY FLOW

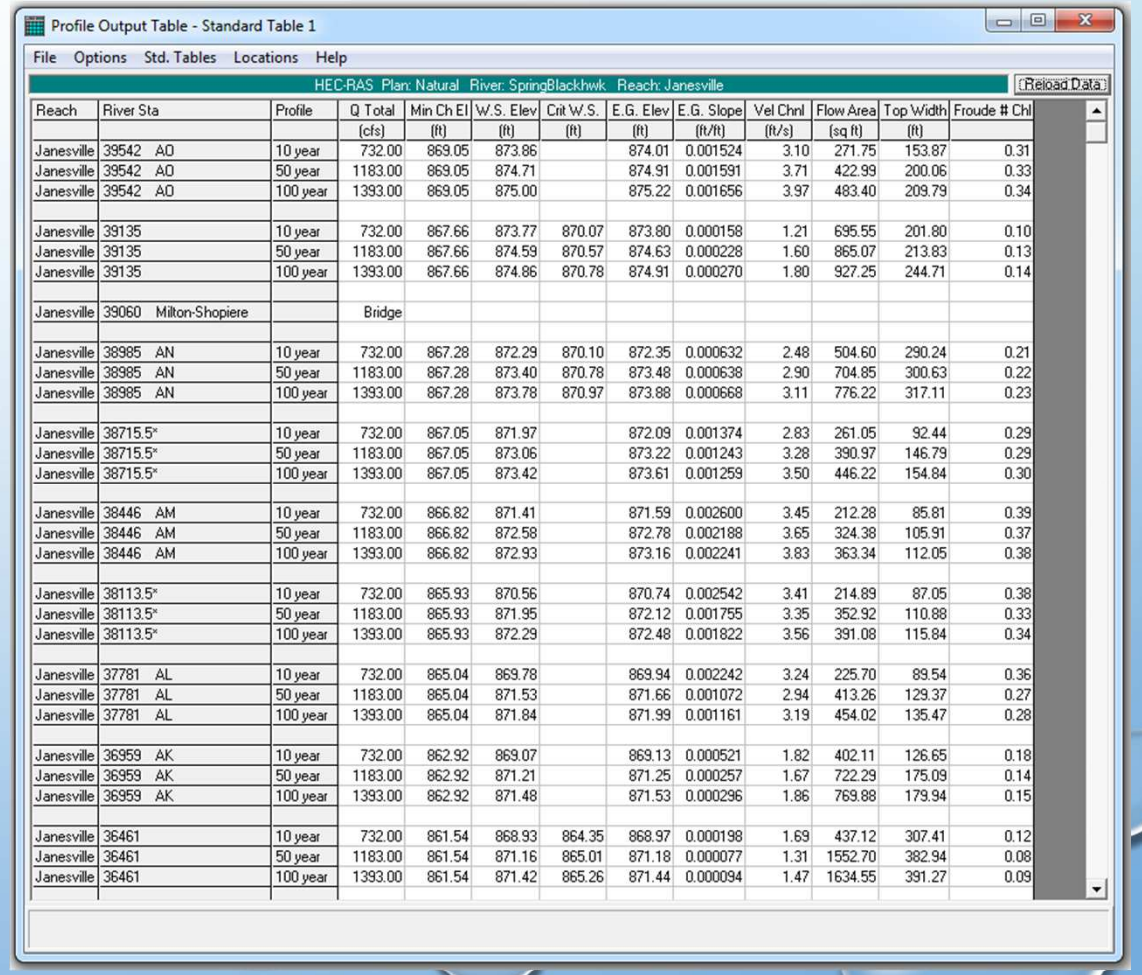


RUNNING THE MODEL
PLAN



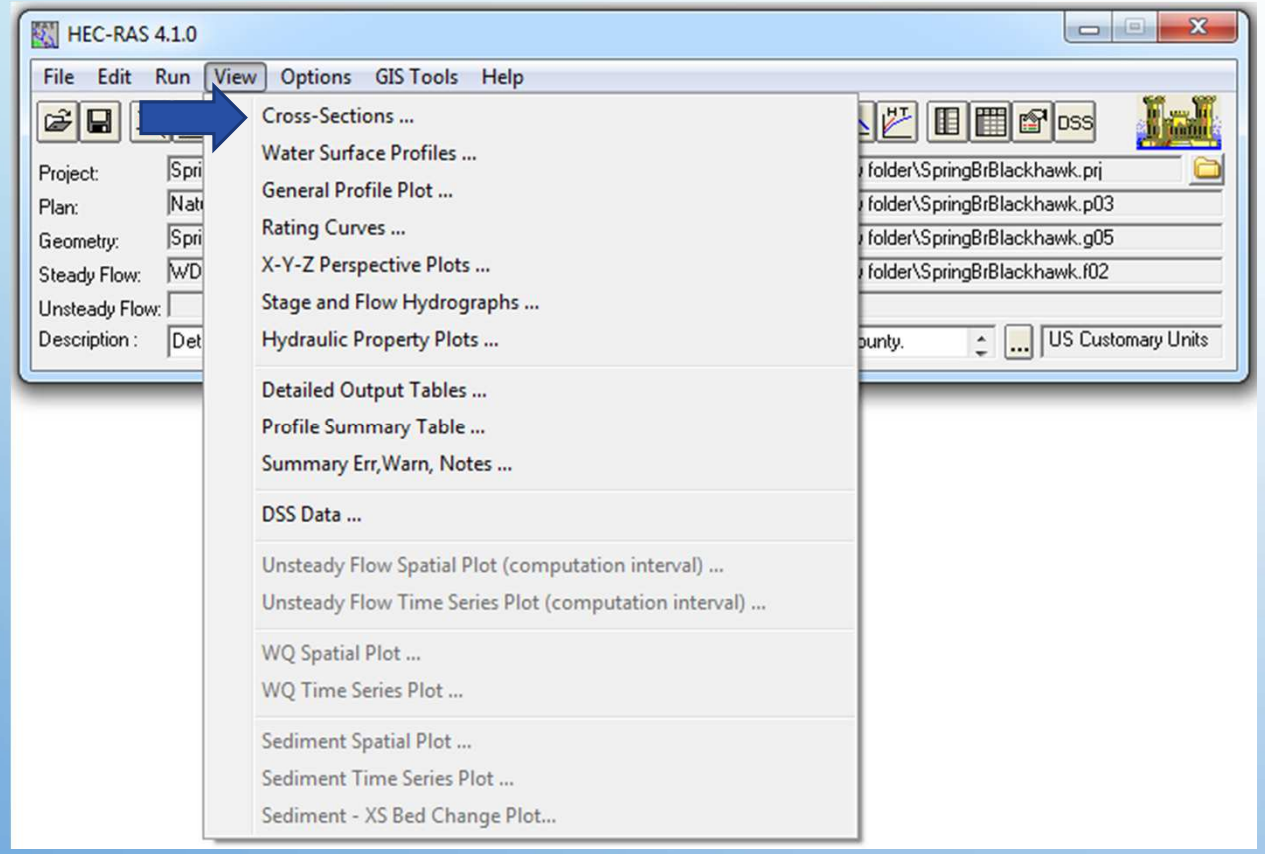
REVIEWING OUTPUT DATA
PROFILE SUMMARY TABLE

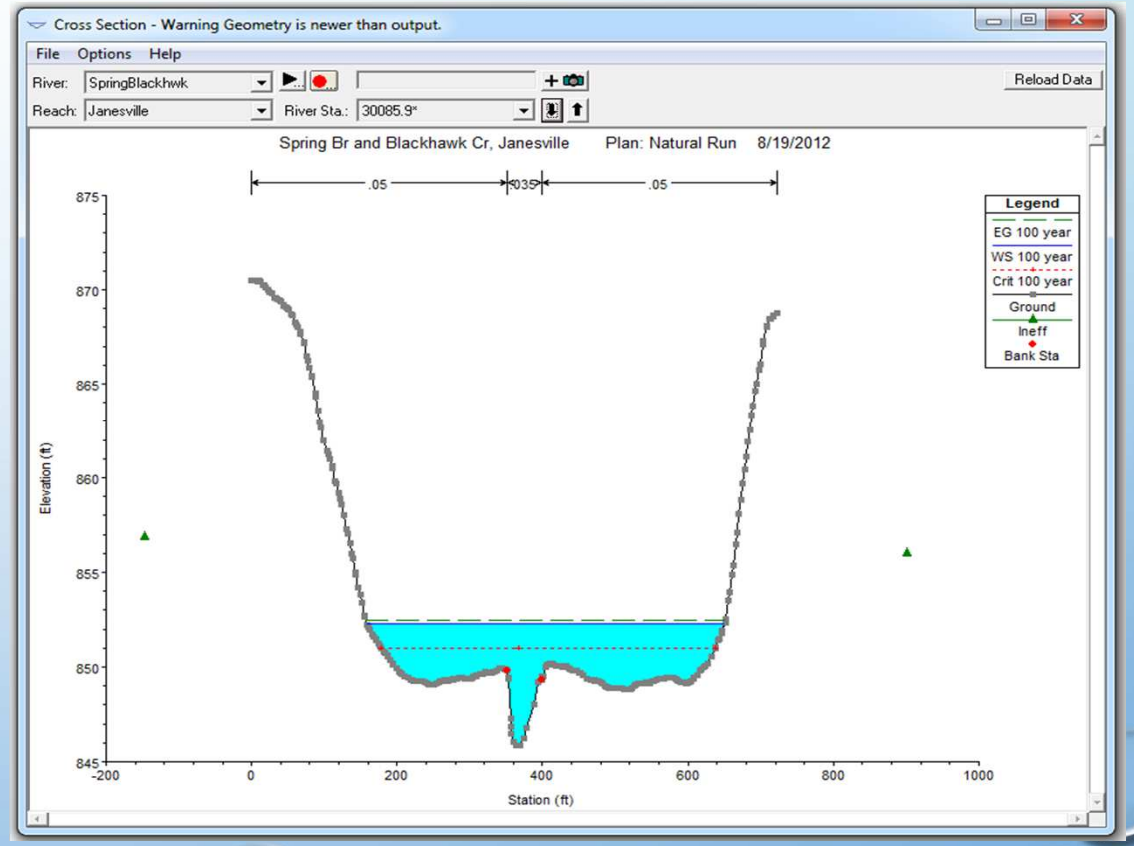




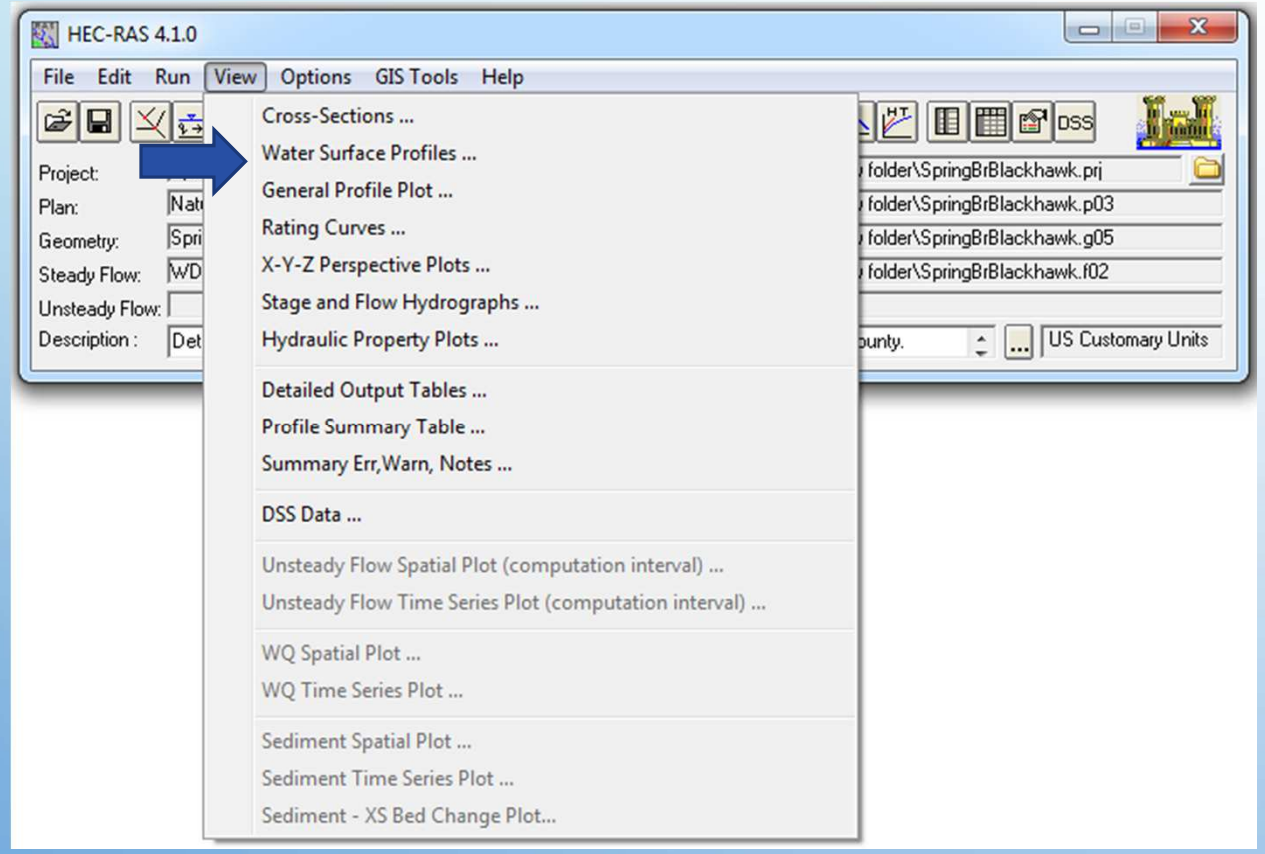
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Janesville	39542 AO	10 year	732.00	869.05	873.86		874.01	0.001524	3.10	271.75	153.87	0.31
Janesville	39542 AO	50 year	1183.00	869.05	874.71		874.91	0.001591	3.71	422.99	200.06	0.33
Janesville	39542 AO	100 year	1393.00	869.05	875.00		875.22	0.001656	3.97	483.40	209.79	0.34
Janesville	39135	10 year	732.00	867.66	873.77	870.07	873.80	0.000158	1.21	695.55	201.80	0.10
Janesville	39135	50 year	1183.00	867.66	874.59	870.57	874.63	0.000228	1.60	865.07	213.83	0.13
Janesville	39135	100 year	1393.00	867.66	874.86	870.78	874.91	0.000270	1.80	927.25	244.71	0.14
Janesville	39060 Milton-Shopiere		Bridge									
Janesville	38985 AN	10 year	732.00	867.28	872.29	870.10	872.35	0.000632	2.48	504.60	290.24	0.21
Janesville	38985 AN	50 year	1183.00	867.28	873.40	870.78	873.48	0.000638	2.90	704.85	300.63	0.22
Janesville	38985 AN	100 year	1393.00	867.28	873.78	870.97	873.88	0.000668	3.11	776.22	317.11	0.23
Janesville	38715.5*	10 year	732.00	867.05	871.97		872.09	0.001374	2.83	261.05	92.44	0.29
Janesville	38715.5*	50 year	1183.00	867.05	873.06		873.22	0.001243	3.28	390.97	146.79	0.29
Janesville	38715.5*	100 year	1393.00	867.05	873.42		873.61	0.001259	3.50	446.22	154.84	0.30
Janesville	38446 AM	10 year	732.00	866.82	871.41		871.59	0.002600	3.45	212.28	85.81	0.39
Janesville	38446 AM	50 year	1183.00	866.82	872.58		872.78	0.002188	3.65	324.38	105.91	0.37
Janesville	38446 AM	100 year	1393.00	866.82	872.93		873.16	0.002241	3.83	363.34	112.05	0.38
Janesville	38113.5*	10 year	732.00	865.93	870.56		870.74	0.002542	3.41	214.89	87.05	0.38
Janesville	38113.5*	50 year	1183.00	865.93	871.95		872.12	0.001755	3.35	352.92	110.88	0.33
Janesville	38113.5*	100 year	1393.00	865.93	872.29		872.48	0.001822	3.56	391.08	115.84	0.34
Janesville	37781 AL	10 year	732.00	865.04	869.78		869.94	0.002242	3.24	225.70	89.54	0.36
Janesville	37781 AL	50 year	1183.00	865.04	871.53		871.66	0.001072	2.94	413.26	129.37	0.27
Janesville	37781 AL	100 year	1393.00	865.04	871.84		871.99	0.001161	3.19	454.02	135.47	0.28
Janesville	36959 AK	10 year	732.00	862.92	869.07		869.13	0.000521	1.82	402.11	126.65	0.18
Janesville	36959 AK	50 year	1183.00	862.92	871.21		871.25	0.000257	1.67	722.29	175.09	0.14
Janesville	36959 AK	100 year	1393.00	862.92	871.48		871.53	0.000296	1.86	769.88	179.94	0.15
Janesville	36461	10 year	732.00	861.54	868.93	864.35	868.97	0.000198	1.69	437.12	307.41	0.12
Janesville	36461	50 year	1183.00	861.54	871.16	865.01	871.18	0.000077	1.31	1552.70	382.94	0.08
Janesville	36461	100 year	1393.00	861.54	871.42	865.26	871.44	0.000094	1.47	1634.55	391.27	0.09

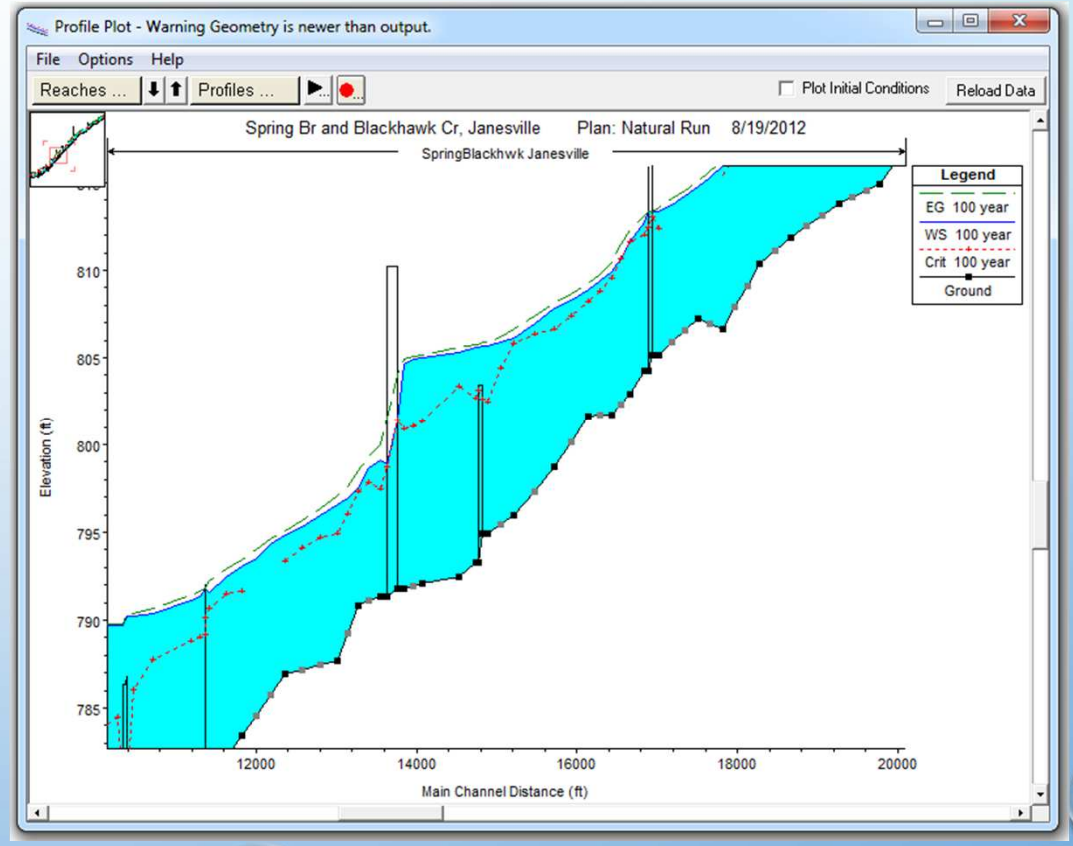
REVIEWING OUTPUT DATA
CROSS SECTIONS



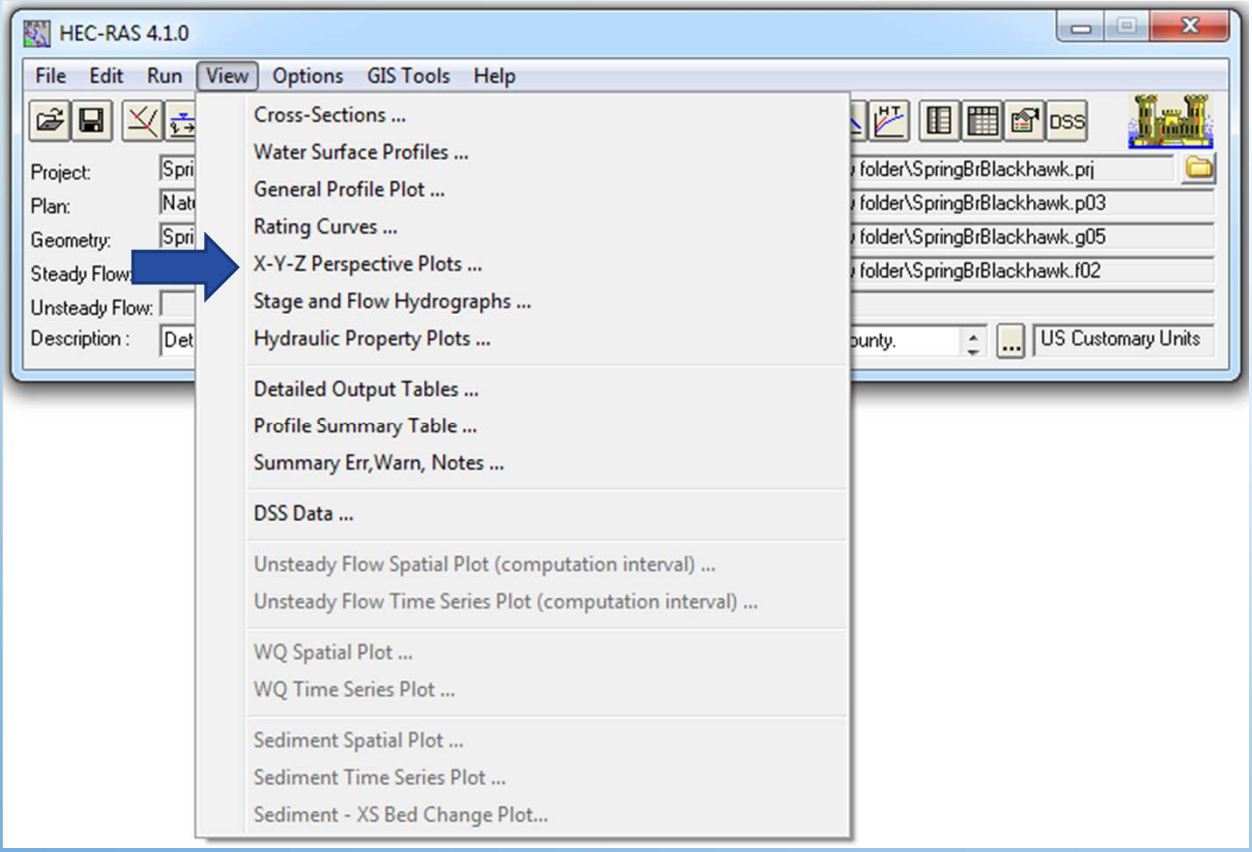


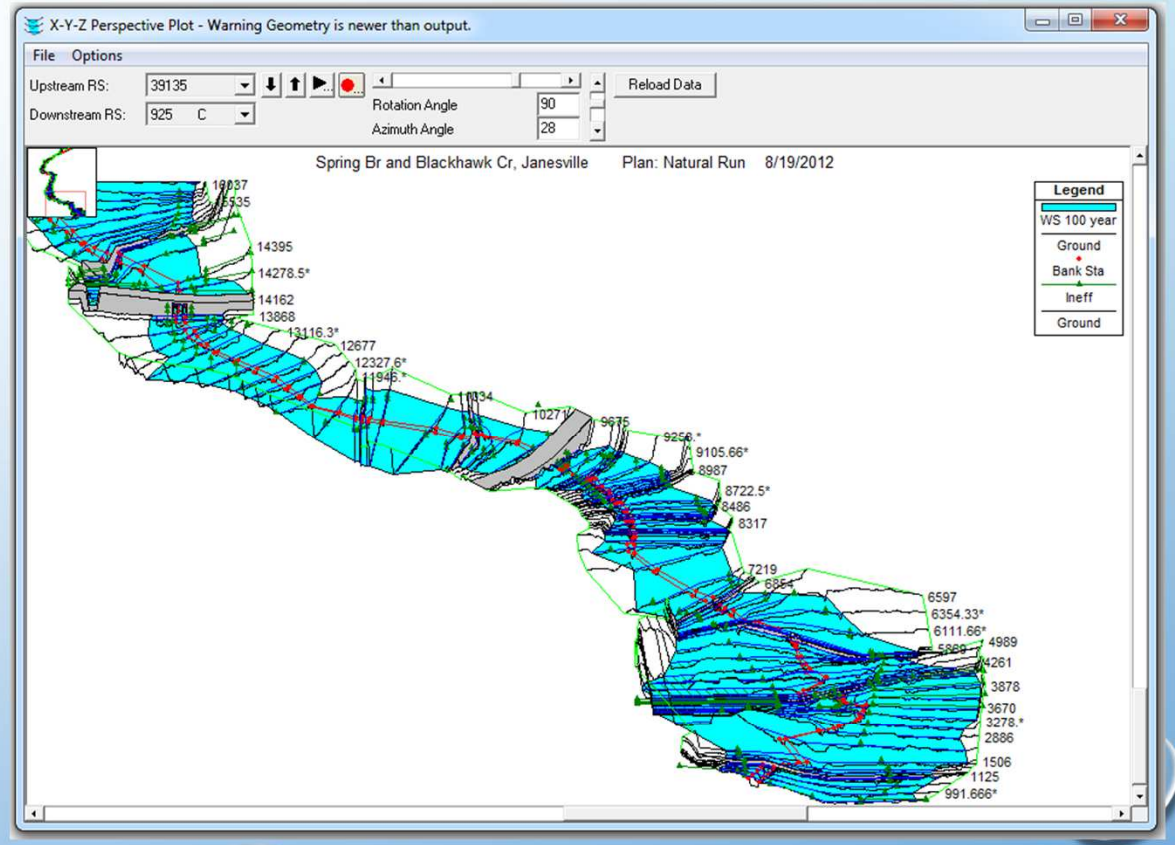
REVIEWING OUTPUT DATA
WATER SURFACE PROFILE



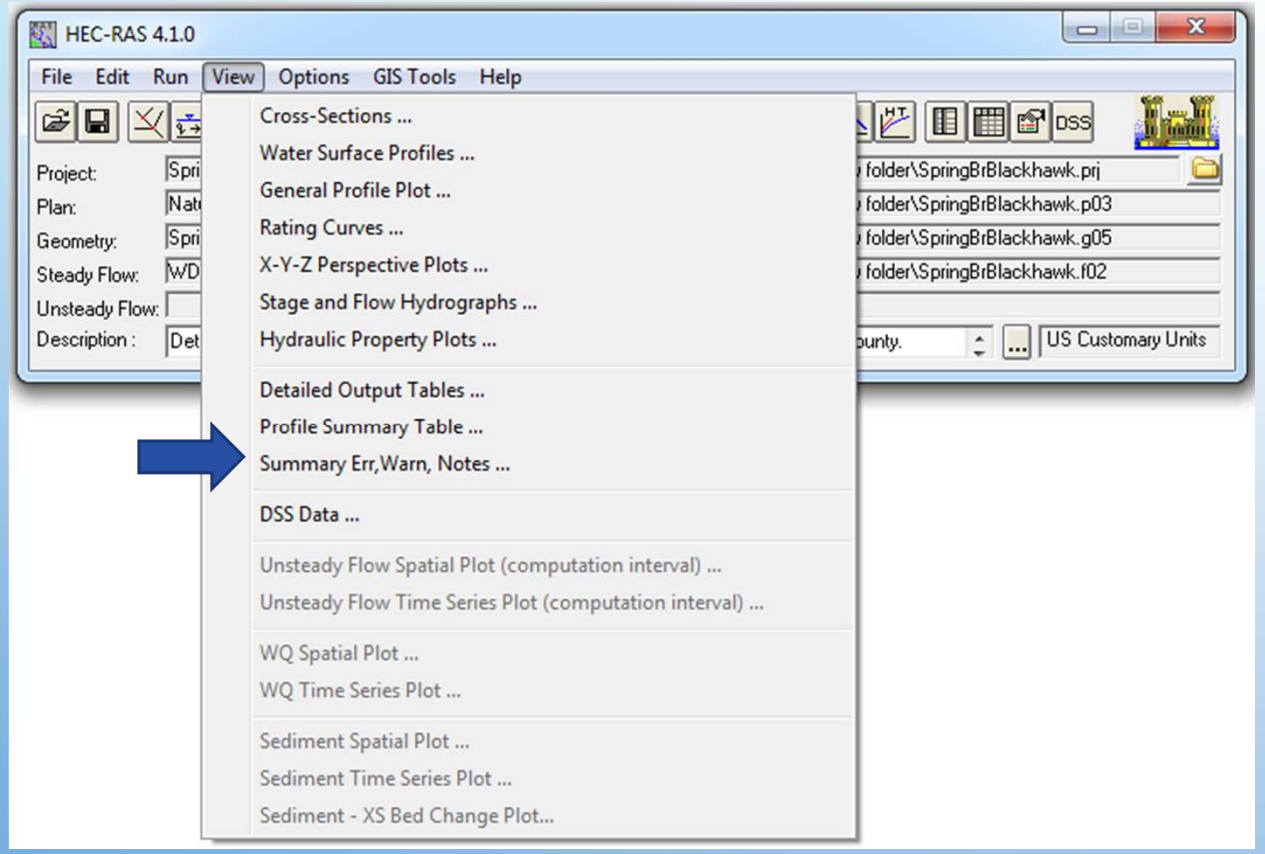


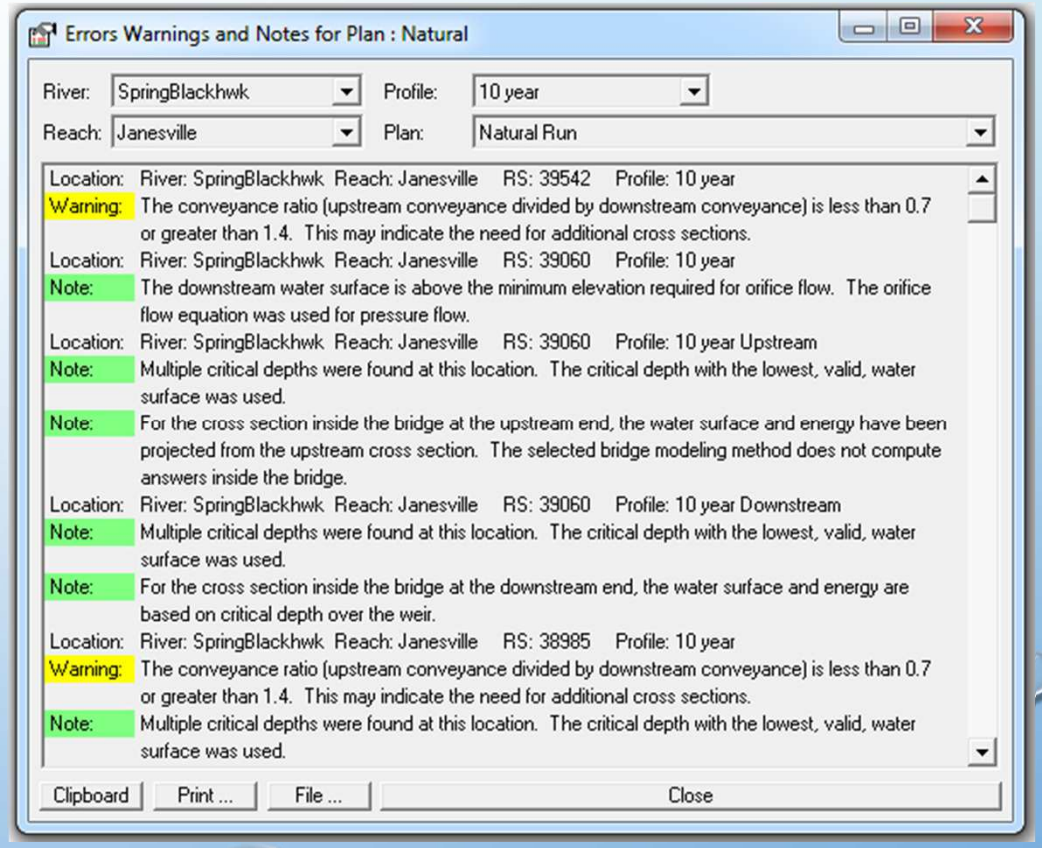
REVIEWING OUTPUT DATA
X-Y-Z PERSPECTIVE PLOT



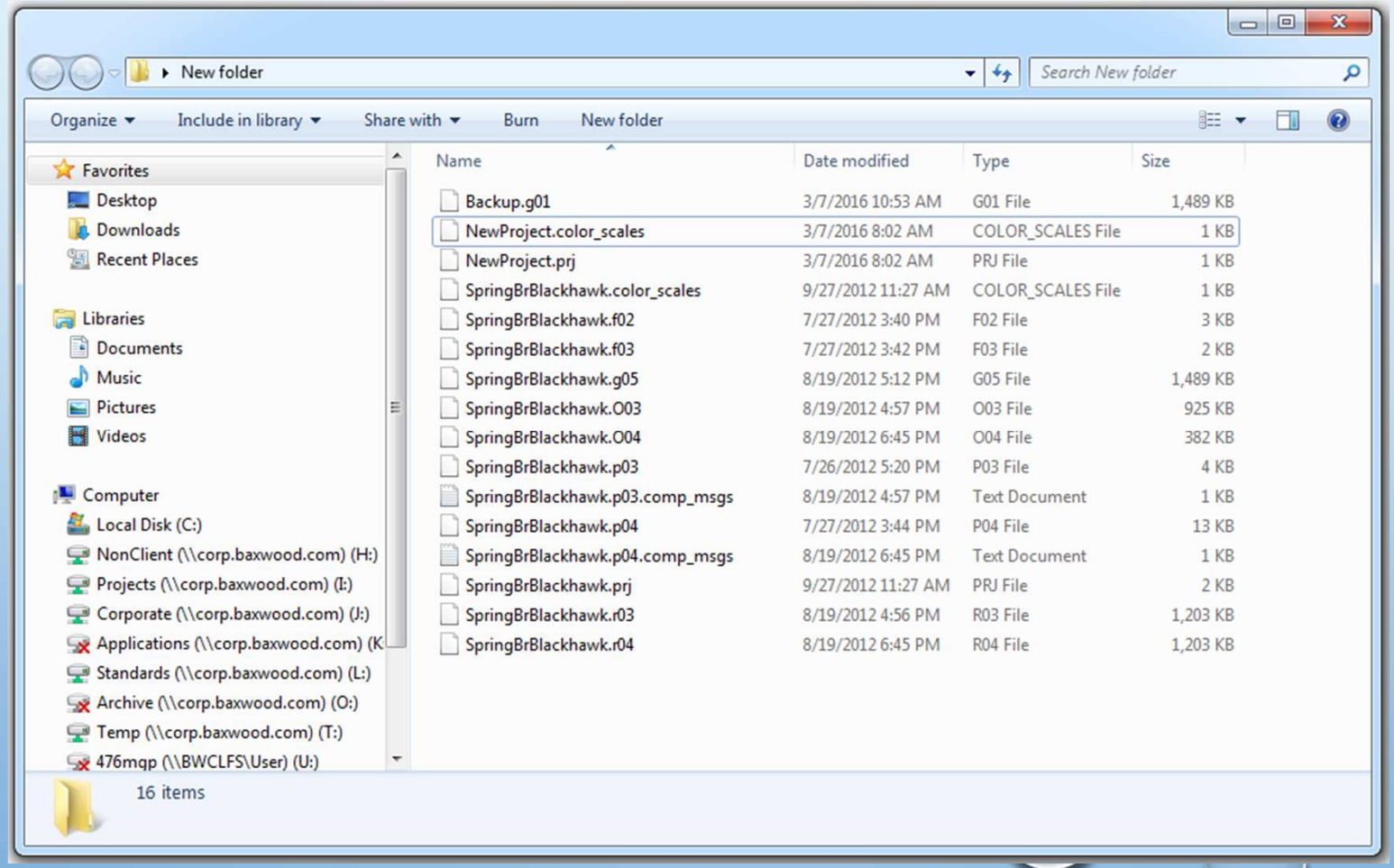


REVIEWING OUTPUT DATA
SUMMARY OF ERRORS, WARNINGS, & NOTES





FILE STRUCTURE



CONTACT INFORMATION

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