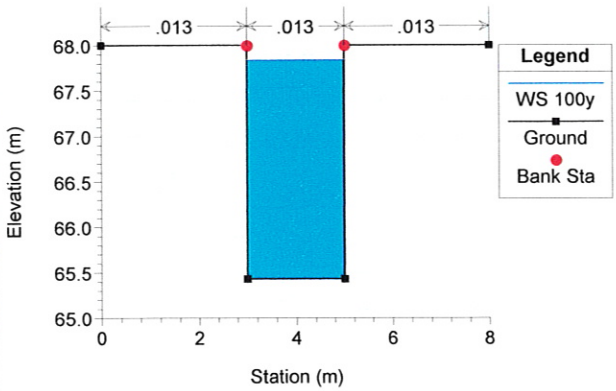
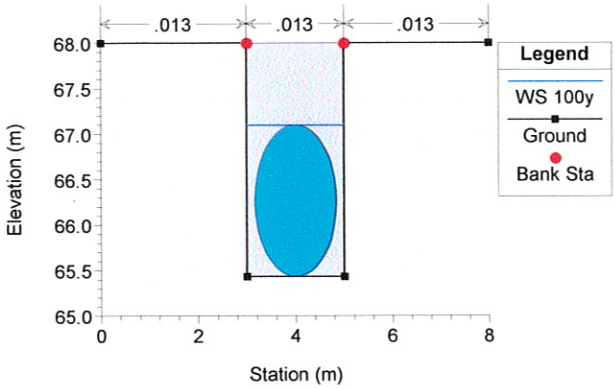
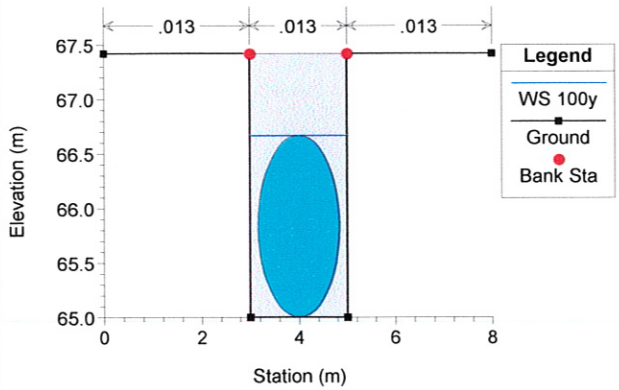
P2E Plan: proposed condition 8/30/2007



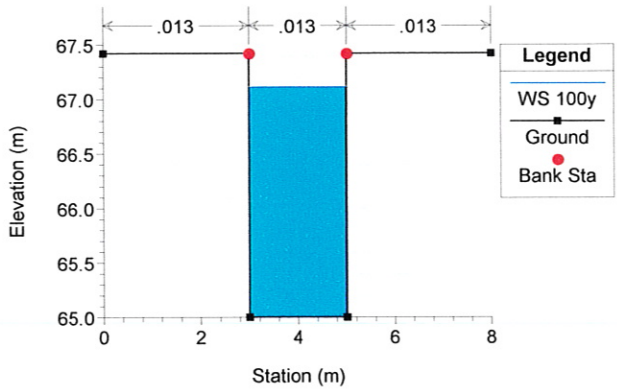
P2E Plan: proposed condition 8/30/2007



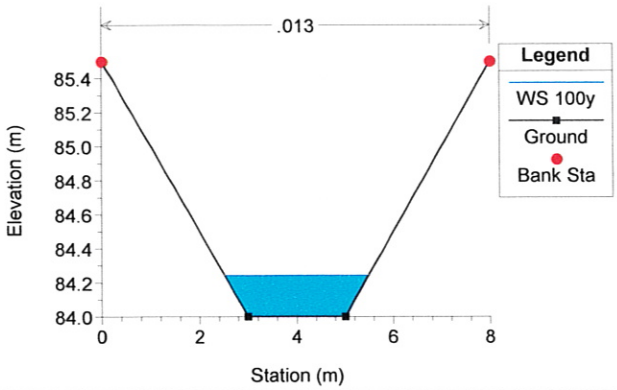
P2E Plan: proposed condition 8/30/2007



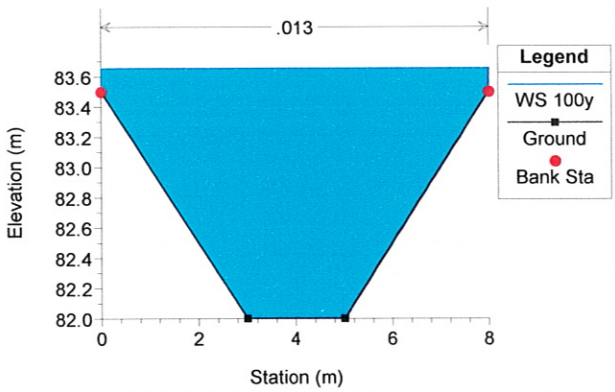
P2E Plan: proposed condition 8/30/2007



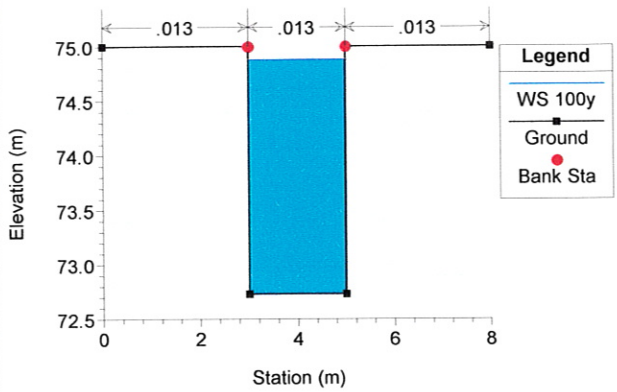
P2E Plan: proposed condition 8/30/2007



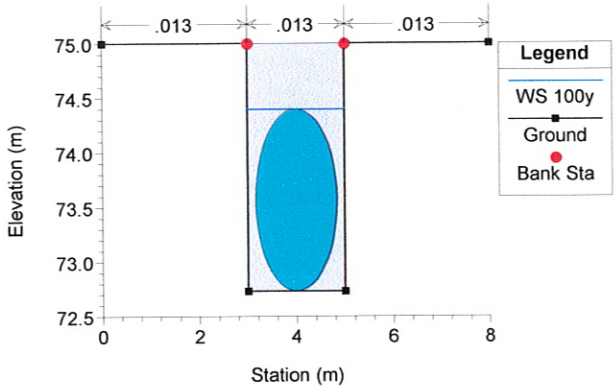
P2E Plan: proposed condition 8/30/2007



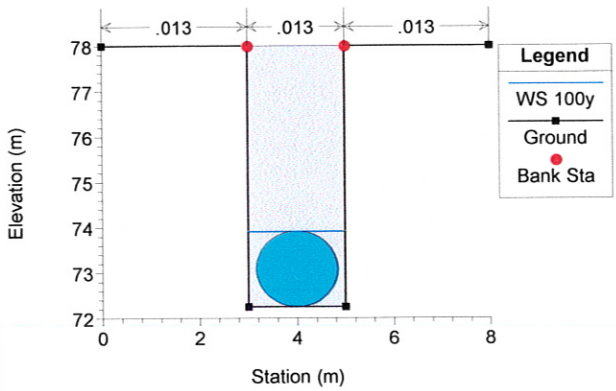
P2E Plan: proposed condition 8/30/2007



P2E Plan: proposed condition 8/30/2007



P2E Plan: proposed condition 8/30/2007



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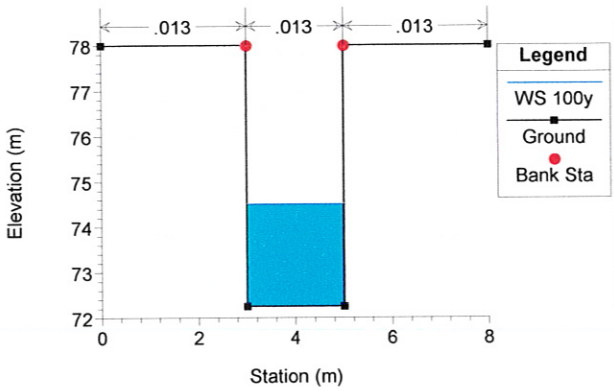
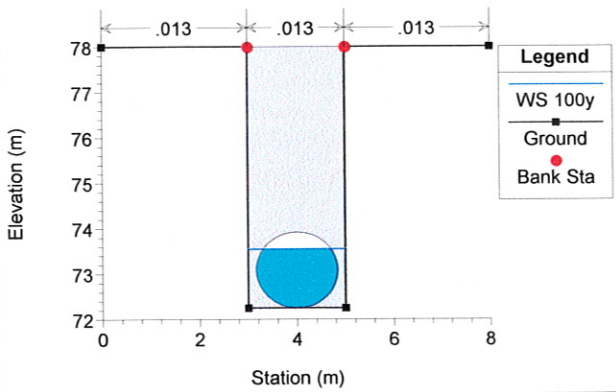
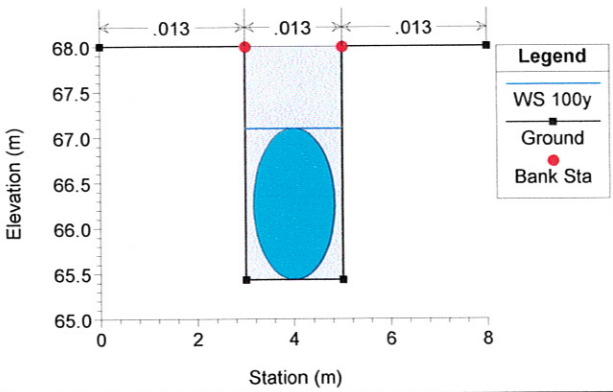
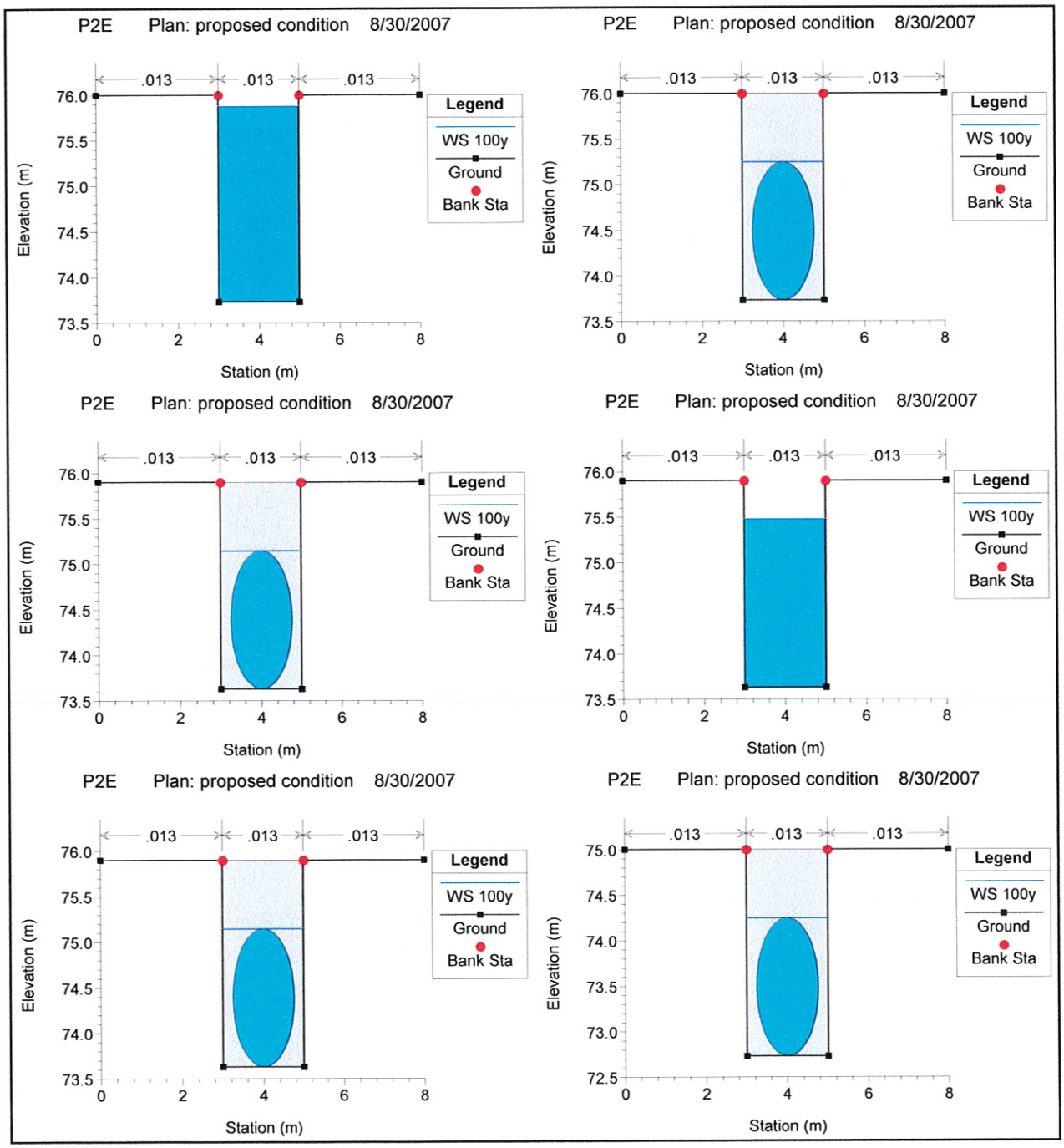


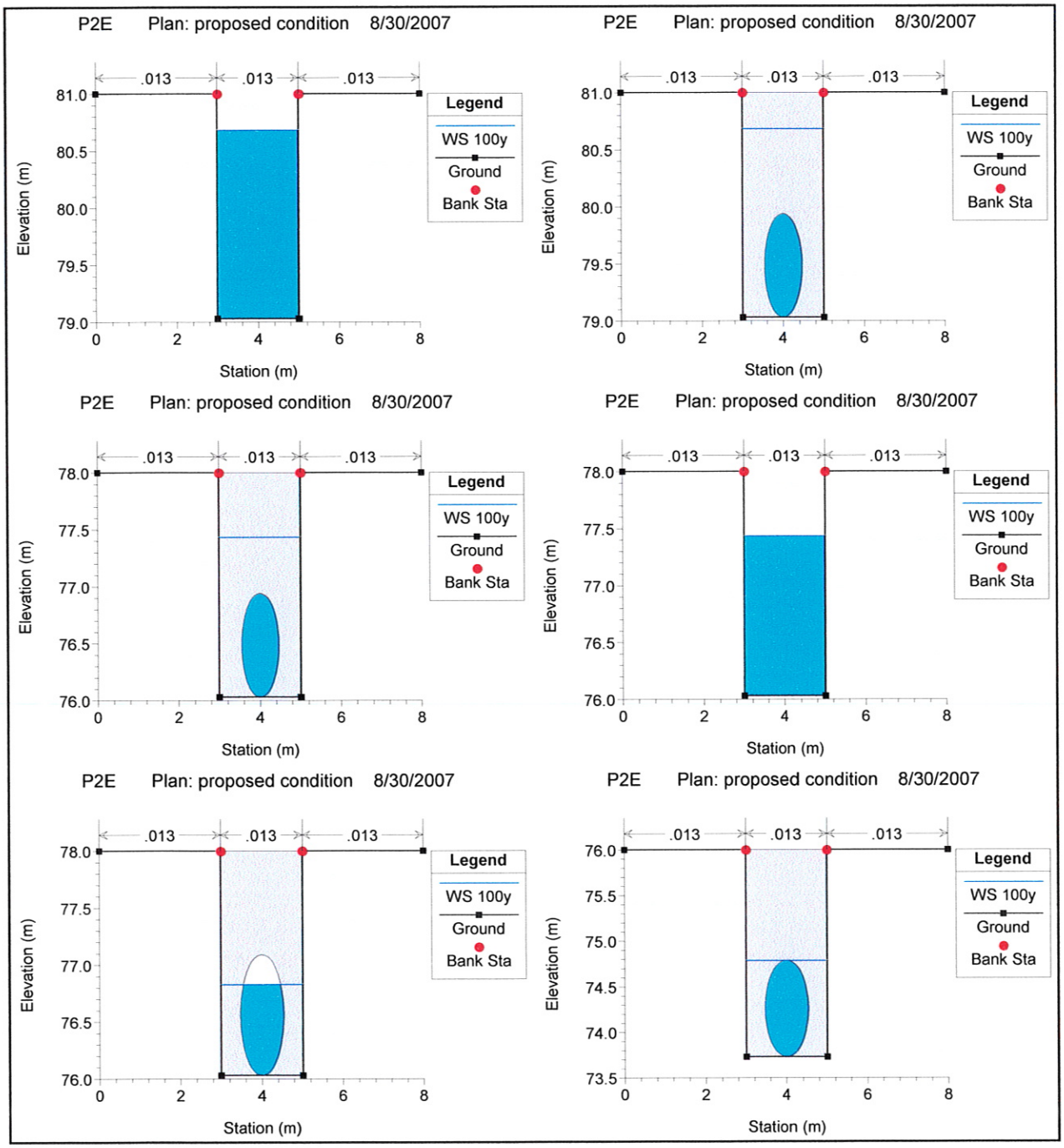
P2E Plan: proposed condition 8/30/2007



P2E Plan: proposed condition 8/30/2007




P2E Plan: proposed condition 8/30/2007
.013
.013
.013
Legend
WS 100y
Ground
Bank Sta
Elevation (m)
Station (m)
76.0
75.5
75.0
74.5
74.0
73.5
72.5
0
2
4
6
8


P2E Plan: proposed condition 8/30/2007
.013
.013
.013
Legend
WS 100y
Ground
Bank Sta
Elevation (m)
Station (m)
81.0
80.5
80.0
79.5
79.0
78.0
77.5
77.0
76.5
76.0
75.5
75.0
74.5
74.0
73.5
0
2
4
6
8

HEC-RAS Version 3.1.1 May 2003
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

```
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
XXXXXXX  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: pipesw/manning-contech
Project File : contech.prj
Run Date and Time: 8/30/2007 2:17:23 PM

Project in SI units

PLAN DATA

Plan Title: proposed condition2
Plan File : p:\414-La Sabana, Vega Baja\hecras\contech.p01

Geometry Title: proposed condition2
Geometry File : p:\414-La Sabana, Vega Baja\hecras\contech.g01

Flow Title : proposed condition2
Flow File : p:\414-La Sabana, Vega Baja\hecras\contech.f01

Plan Summary Information:
Number of: Cross Sections = 42 Mulitple Openings = 0
Culverts = 17 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.003
Critical depth calculaton tolerance = 0.003
Maximum number of interations = 20
Maximum difference tolerance = 0.1
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: proposed condition2
Flow File : p:\414-La Sabana, Vega Baja\hecras\contech.f01

Flow Data (m3/s)

River	Reach	RS	100 year
pipe4	one	19	.6
pipe4	one	18.5	1.2
pipe4	one	18	2.01
pipe5	one	22	14.98
pipe5	one	21	20.09
pipe1	two	5	.7
pipe1	two	4.5	23.95
pipe1	two	3.5	26.36
pipe1	one	2	64.42
pipe1	one	1.5	68.59
pipe2	two	12	7.92
pipe2	two	10	10.28
pipe2	one	7	33.44
pipe3	two	17	.78
pipe3	two	16.5	1.56
pipe3	two	16	2.6
pipe3	one	14	4.61

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
pipe4	one	100 year	Critical	
pipe5	one	100 year	Critical	
pipe1	two	100 year	Critical	
pipe1	one	100 year		Normal S = 0.006
pipe2	two	100 year	Critical	
pipe3	two	100 year	Critical	

GEOMETRY DATA

Geometry Title: proposed condition2
Geometry File : p:\414-La Sabana, Vega Baja\hecras\contech.g01

Reach Connection Table

River	Reach	Upstream Boundary	Downstream Boundary
pipe4	one		B
pipe5	one		C
pipe1	two		A
pipe1	one	A	
pipe2	two		C
pipe2	one	C	A
pipe3	two		B
pipe3	one	B	A

JUNCTION INFORMATION

Name: A
Description:
Energy computation Method

Length across Junction River	Reach	Tributary River	Reach	Length	Angle
pipe1	two	to pipe1	one	0	0
pipe2	one	to pipe1	one	0	0
pipe3	one	to pipe1	one	0	0

Name: B
Description:
Energy computation Method

Length across Junction River	Reach	Tributary River	Reach	Length	Angle
pipe3	two	to pipe3	one	0	0
pipe4	one	to pipe3	one	0	0

Name: C
Description:
Energy computation Method

Length across Junction River	Reach	Tributary River	Reach	Length	Angle
pipe2	two	to pipe2	one	0	0
pipe5	one	to pipe2	one	0	0

CROSS SECTION

RIVER: pipe4
REACH: one RS: 19

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	75	3	75	3	73.34	5	73.34	5	75
8	75								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	3	.013	5	.013

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
3	5	190	190	190	.1	.3

CROSS SECTION OUTPUT Profile #100 year

E.G. Elev (m)	74.30	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.013	
W.S. Elev (m)	74.30	Reach Len. (m)	190.00	190.00	190.00
Crit W.S. (m)	73.55	Flow Area (m2)		1.91	
E.G. Slope (m/m)	0.000043	Area (m2)		1.91	

```
  Q Total (m3/s)            0.60    Flow (m3/s)                        0.60
  Top Width (m)             2.00    Top Width (m)                      2.00
  Vel Total (m/s)           0.31    Avg. Vel. (m/s)                    0.31
  Max Chl Dpth (m)          0.96    Hydr. Depth (m)                    0.96
  Conv. Total (m3/s)        91.2    Conv. (m3/s)                       91.2
  Length Wtd. (m)         190.00    Wetted Per. (m)                    3.91
  Min Ch El (m)            73.34    Shear (N/m2)                       0.21
  Alpha                     1.00    Stream Power (N/m s)               0.07
  Frctn Loss (m)                    Cum Volume (1000 m3)               1.39
  C & E Loss (m)                    Cum SA (1000 m2)                   0.90


CULVERT


RIVER: pipe4
REACH: one                RS: 18.8

INPUT
Description:
Distance from Upstream XS =      .5
Deck/Roadway Width        =     189
Weir Coefficient          =    1.44
Upstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0      75               8      75

Upstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0      75       3      75       3   73.34       5   73.34       5      75
       8      75

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       3    .013       5    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
             3       5             .1       .3

 ownstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0      72               8      72

Downstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0      72       3      72       3   70.34       5   70.34       5      72
       8      72

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       3    .013       5    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
             3       5             .1       .3

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 =     .95
Elevation at which weir flow begins         =      75
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      .6
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
                 .5     189     .013     .013        0                  .6                 1
Upstream   Elevation =  73.34
           Centerline Station =  4
Downstream Elevation =  70.34
           Centerline Station =  4

CULVERT OUTPUT  Profile #100 year  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.60    Culv Full Len (m)         90.87
  # Barrels                    1    Culv Vel US (m/s)         2.12
  Q Barrel (m3/s)           0.60    Culv Vel DS (m/s)         2.12
  E.G. US. (m)             74.30    Culv Inv El Up (m)       73.34
  W.S. US. (m)             74.30    Culv Inv El Dn (m)       70.34
  E.G. DS (m)              71.52    Culv Frctn Ls (m)         2.42
```

W.S. DS (m)	71.52	Culv Exit Loss (m)	0.23
Delta EG (m)	2.78	Culv Entr Loss (m)	0.14
Delta WS (m)	2.78	Q Weir (m3/s)	
E.G. IC (m)	74.32	Weir Sta Lft (m)	
E.G. OC (m)	74.30	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	73.94	Weir Max Depth (m)	
Culv WS Outlet (m)	70.94	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.40	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.50	Min El Weir Flow (m)	75.00

CROSS SECTION

RIVER: pipe4
REACH: one RS: 18.51

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	72	3	72	3	70.34	5	70.34	5	72
8	72								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	3	.013	5	.013

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
3	5	1	1	1	.1	.3

CROSS SECTION OUTPUT Profile #100 year

			Left OB	Channel	Right OB
E.G. Elev (m)	71.52	Element			
Vel Head (m)	0.00	Wt. n-Val.		0.013	
W.S. Elev (m)	71.52	Reach Len. (m)	1.00	1.00	1.00
Crit W.S. (m)		Flow Area (m2)		2.35	
E.G. Slope (m/m)	0.000025	Area (m2)		2.35	
Q Total (m3/s)	0.60	Flow (m3/s)		0.60	
Top Width (m)	2.00	Top Width (m)		2.00	
Vel Total (m/s)	0.26	Avg. Vel. (m/s)		0.26	
Max Chl Dpth (m)	1.18	Hydr. Depth (m)		1.18	
Conv. Total (m3/s)	120.0	Conv. (m3/s)		120.0	
Length Wtd. (m)	1.00	Wetted Per. (m)		4.35	
Min Ch El (m)	70.34	Shear (N/m2)		0.13	
Alpha	1.00	Stream Power (N/m s)		0.03	
Frctn Loss (m)	0.00	Cum Volume (1000 m3)		0.98	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.52	

CROSS SECTION

RIVER: pipe4
REACH: one RS: 18.5

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	72	3	72	3	70.19	5	70.19	5	72
8	72								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	3	.013	5	.013

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
3	5	130	130	130	.1	.3

CROSS SECTION OUTPUT Profile #100 year

			Left OB	Channel	Right OB
E.G. Elev (m)	71.52	Element			
Vel Head (m)	0.01	Wt. n-Val.		0.013	
W.S. Elev (m)	71.51	Reach Len. (m)	130.00	130.00	130.00
Crit W.S. (m)	70.52	Flow Area (m2)		2.64	
E.G. Slope (m/m)	0.000074	Area (m2)		2.64	
Q Total (m3/s)	1.20	Flow (m3/s)		1.20	
Top Width (m)	2.00	Top Width (m)		2.00	
Vel Total (m/s)	0.46	Avg. Vel. (m/s)		0.46	
Max Chl Dpth (m)	1.32	Hydr. Depth (m)		1.32	
Conv. Total (m3/s)	139.2	Conv. (m3/s)		139.2	
Length Wtd. (m)	130.00	Wetted Per. (m)		4.64	
Min Ch El (m)	70.19	Shear (N/m2)		0.41	
Alpha	1.00	Stream Power (N/m s)		0.19	
Frctn Loss (m)		Cum Volume (1000 m3)		0.98	
C & E Loss (m)		Cum SA (1000 m2)		0.52	

CULVERT

RIVER: pipe4
REACH: one RS: 18.3

INPUT
Description:
Distance from Upstream XS = .5
Deck/Roadway Width = 129
Weir Coefficient = 1.44
Upstream Deck/Roadway Coordinates
num= 2

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	72	8	72

Upstream Bridge Cross Section Data
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	72	3	72	3	70.19	5	70.19	5	72
8	72								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	3	.013	5	.013

Bank Sta: Left	Right	Coeff Contr.	Expan.
3	5	.1	.3

Downstream Deck/Roadway Coordinates
num= 2

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	67	8	67

Downstream Bridge Cross Section Data
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	67	3	67	3	65.04	5	65.04	5	67
8	67								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	3	.013	5	.013

Bank Sta: Left	Right	Coeff Contr.	Expan.
3	5	.1	.3

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 = .95
Elevation at which weir flow begins = 72
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	.76	

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
	.5	129	.013	.013	0	.6	1

Upstream Elevation = 70.19
Centerline Station = 4
Downstream Elevation = 65.04
Centerline Station = 4

CULVERT OUTPUT Profile #100 year Culv Group: Culvert #1

Q Culv Group (m3/s)	1.20	Culv Full Len (m)	40.02
# Barrels	1	Culv Vel US (m/s)	2.65
Q Barrel (m3/s)	1.20	Culv Vel DS (m/s)	2.65
E.G. US. (m)	71.52	Culv Inv El Up (m)	70.19
W.S. US. (m)	71.51	Culv Inv El Dn (m)	65.04
E.G. DS (m)	66.97	Culv Frctn Ls (m)	3.99
W.S. DS (m)	66.96	Culv Exit Loss (m)	0.35
Delta EG (m)	4.55	Culv Entr Loss (m)	0.21
Delta WS (m)	4.54	Q Weir (m3/s)	
E.G. IC (m)	71.60	Weir Sta Lft (m)	
E.G. OC (m)	71.52	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	70.95	Weir Max Depth (m)	
Culv WS Outlet (m)	65.80	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.39	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.66	Min El Weir Flow (m)	72.00

ROSS SECTION

RIVER: pipe4
REACH: one RS: 18.1

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	67	3	67	3	65.04	5	65.04	5	67
8	67								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	3	.013	5	.013

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
3	5	1	1	1	.1	.3

CROSS SECTION OUTPUT Profile #100 year

			Left OB	Channel	Right OB
E.G. Elev (m)	66.97	Element			
Vel Head (m)	0.00	Wt. n-Val.		0.013	
W.S. Elev (m)	66.96	Reach Len. (m)	1.00	1.00	1.00
Crit W.S. (m)		Flow Area (m2)		3.85	
E.G. Slope (m/m)	0.000029	Area (m2)		3.85	
Q Total (m3/s)	1.20	Flow (m3/s)		1.20	
Top Width (m)	2.00	Top Width (m)		2.00	
Vel Total (m/s)	0.31	Avg. Vel. (m/s)		0.31	
Max Chl Dpth (m)	1.92	Hydr. Depth (m)		1.92	
Conv. Total (m3/s)	223.9	Conv. (m3/s)		223.9	
Length Wtd. (m)	1.00	Wetted Per. (m)		5.85	
Min Ch El (m)	65.04	Shear (N/m2)		0.19	
Alpha	1.00	Stream Power (N/m s)		0.06	
Frctn Loss (m)	0.00	Cum Volume (1000 m3)		0.56	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.26	

ROSS SECTION

RIVER: pipe4
REACH: one RS: 18

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	67	3	67	3	64.59	5	64.59	5	67
8	67								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	3	.013	5	.013

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
3	5	127	127	127	.1	.3

CROSS SECTION OUTPUT Profile #100 year

			Left OB	Channel	Right OB
E.G. Elev (m)	66.97	Element			
Vel Head (m)	0.01	Wt. n-Val.		0.013	
W.S. Elev (m)	66.96	Reach Len. (m)	127.00	127.00	127.00
Crit W.S. (m)	65.06	Flow Area (m2)		4.74	
E.G. Slope (m/m)	0.000049	Area (m2)		4.74	
Q Total (m3/s)	2.01	Flow (m3/s)		2.01	
Top Width (m)	2.00	Top Width (m)		2.00	
Vel Total (m/s)	0.42	Avg. Vel. (m/s)		0.42	
Max Chl Dpth (m)	2.37	Hydr. Depth (m)		2.37	
Conv. Total (m3/s)	288.2	Conv. (m3/s)		288.2	
Length Wtd. (m)	127.00	Wetted Per. (m)		6.74	
Min Ch El (m)	64.59	Shear (N/m2)		0.34	
Alpha	1.00	Stream Power (N/m s)		0.14	
Frctn Loss (m)		Cum Volume (1000 m3)		0.55	
C & E Loss (m)		Cum SA (1000 m2)		0.25	

CULVERT

RIVER: pipe4
REACH: one RS: 17.8

INPUT
Description:
Distance from Upstream XS = .5
Deck/Roadway Width = 126

```
Weir Coefficient          =    1.44
Upstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0      67               8      67

Upstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0      67       3      67       3   64.59       5   64.59       5      67
       8      67

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       3    .013       5    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
             3       5             .1       .3

Downstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0      67               8      67

Downstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0      67       3      67       3   64.43       5   64.43       5      67
       8      67

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       3    .013       5    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
             3       5             .1       .3

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 =     .95
 levation at which weir flow begins         =      67
 nergy 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    1.22
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
                .5     126     .013     .013        0                   .6                 1
Upstream   Elevation =  64.59
           Centerline Station =  4
Downstream Elevation =  64.43
           Centerline Station =  4

CULVERT OUTPUT  Profile #100 year  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       2.01    Culv Full Len (m)       126.00
  # Barrels                    1    Culv Vel US (m/s)         1.72
  Q Barrel (m3/s)           2.01    Culv Vel DS (m/s)         1.72
  E.G. US. (m)             66.97    Culv Inv El Up (m)       64.59
  W.S. US. (m)             66.96    Culv Inv El Dn (m)       64.43
  E.G. DS (m)              66.43    Culv Frctn Ls (m)         0.31
  W.S. DS (m)              66.42    Culv Exit Loss (m)        0.14
  Delta EG (m)              0.53    Culv Entr Loss (m)        0.09
  Delta WS (m)              0.54    Q Weir (m3/s)
  E.G. IC (m)              65.79    Weir Sta Lft (m)
  E.G. OC (m)              66.97    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)        65.81    Weir Max Depth (m)
  Culv WS Outlet (m)       65.65    Weir Avg Depth (m)
  Culv Nml Depth (m)                Weir Flow Area (m2)
  Culv Crt Depth (m)        0.78    Min El Weir Flow (m)     67.00


CROSS SECTION


RIVER: pipe4
REACH: one                RS: 17.5

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
```

```
      0      67       3      67       3   64.43       5   64.43       5      67
      8      67

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       3    .013       5    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             3       5                 0       0       0             .1       .3

CROSS SECTION OUTPUT  Profile #100 year

  E.G. Elev (m)            66.43    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.01    Wt. n-Val.                         0.013
  W.S. Elev (m)            66.42    Reach Len. (m)            0.00      0.00       0.00
  Crit W.S. (m)                     Flow Area (m2)                      3.98
  E.G. Slope (m/m)      0.000074    Area (m2)                           3.98
  Q Total (m3/s)            2.01    Flow (m3/s)                         2.01
  Top Width (m)             2.00    Top Width (m)                       2.00
  Vel Total (m/s)           0.50    Avg. Vel. (m/s)                     0.50
  Max Chl Dpth (m)          1.99    Hydr. Depth (m)                     1.99
  Conv. Total (m3/s)       233.5    Conv. (m3/s)                       233.5
  Length Wtd. (m)           0.00    Wetted Per. (m)                     5.98
  Min Ch El (m)            64.43    Shear (N/m2)                        0.48
  Alpha                     1.00    Stream Power (N/m s)                0.24
  Frctn Loss (m)            0.00    Cum Volume (1000 m3)
  C & E Loss (m)            0.00    Cum SA (1000 m2)


CROSS SECTION


RIVER: pipe5
REACH: one                RS: 22

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    62.5       1    62.5       1   59.16       9   59.16       9    62.5
      10    62.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       0    .013      10    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0      10                454     454     454             .1       .3

CROSS SECTION OUTPUT  Profile #100 year

  E.G. Elev (m)            61.93    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.02    Wt. n-Val.                         0.013
  W.S. Elev (m)            61.91    Reach Len. (m)          454.00     454.00     454.00
  Crit W.S. (m)            59.87    Flow Area (m2)                     21.97
  E.G. Slope (m/m)      0.000041    Area (m2)                          21.97
  Q Total (m3/s)           14.98    Flow (m3/s)                        14.98
  Top Width (m)             8.00    Top Width (m)                       8.00
  Vel Total (m/s)           0.68    Avg. Vel. (m/s)                     0.68
  Max Chl Dpth (m)          2.75    Hydr. Depth (m)                     2.75
  Conv. Total (m3/s)      2339.0    Conv. (m3/s)                      2339.0
  Length Wtd. (m)         454.00    Wetted Per. (m)                    13.49
  Min Ch El (m)            59.16    Shear (N/m2)                        0.65
  Alpha                     1.00    Stream Power (N/m s)                0.45
  Frctn Loss (m)                    Cum Volume (1000 m3)               17.78
  C & E Loss (m)                    Cum SA (1000 m2)                    5.40


CULVERT


RIVER: pipe5
REACH: one                RS: 21.5

INPUT
Description:
Distance from Upstream XS =      .5
Deck/Roadway Width        =     453
Weir Coefficient          =    1.44
Upstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0    62.5              10    62.5

Upstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    62.5       1    62.5       1   59.16       9   59.16       9    62.5
      10    62.5
```

```
 nning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       0    .013      10    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
             0      10             .1       .3

Downstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0    60.2              10    60.2

Downstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    60.2       1    60.2       1    56.5       9    56.5       9    60.2
      10    60.2

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       0    .013      10    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
             0      10             .1       .3

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 =     .95
Elevation at which weir flow begins         =    62.5
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     Pipe Arch    2.48    3.87
FHWA Chart # 34- 18 inch corner radius; Corrugated metal
FHWA Scale # 1 - 90 Degree headwall
 olution Criteria = Highest U.S. EG
.ulvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                .5     453     .024     .024        0                   .6                 1
Upstream   Elevation =  59.16
           Centerline Station =  5
Downstream Elevation =  56.5
           Centerline Station =  5

CULVERT OUTPUT  Profile #100 year  Culv Group:  Culvert #1

  Q Culv Group (m3/s)      14.98    Culv Full Len (m)       453.00
  # Barrels                    1    Culv Vel US (m/s)         1.97
  Q Barrel (m3/s)          14.98    Culv Vel DS (m/s)         1.97
  E.G. US. (m)             61.93    Culv Inv El Up (m)       59.16
  W.S. US. (m)             61.91    Culv Inv El Dn (m)       56.50
  E.G. DS (m)              60.08    Culv Frctn Ls (m)         1.57
  W.S. DS (m)              60.07    Culv Exit Loss (m)        0.18
  Delta EG (m)              1.84    Culv Entr Loss (m)        0.12
  Delta WS (m)              1.84    Q Weir (m3/s)
  E.G. IC (m)              61.09    Weir Sta Lft (m)
  E.G. OC (m)              61.93    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)        61.64    Weir Max Depth (m)
  Culv WS Outlet (m)       58.98    Weir Avg Depth (m)
  Culv Nml Depth (m)                Weir Flow Area (m2)
  Culv Crt Depth (m)        1.24    Min El Weir Flow (m)     62.50


CROSS SECTION


RIVER: pipe5
REACH: one                RS: 21.1

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    60.2       1    60.2       1    56.5       9    56.5       9    60.2
      10    60.2

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       0    .013      10    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0      10                1       1       1             .1       .3

CROSS SECTION OUTPUT  Profile #100 year
```

E.G. Elev (m)	60.08	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.013	
W.S. Elev (m)	60.07	Reach Len. (m)	1.00	1.00	1.00
Crit W.S. (m)		Flow Area (m2)		28.57	
E.G. Slope (m/m)	0.000020	Area (m2)		28.57	
Q Total (m3/s)	14.98	Flow (m3/s)		14.98	
Top Width (m)	8.00	Top Width (m)		8.00	
Vel Total (m/s)	0.52	Avg. Vel. (m/s)		0.52	
Max Chl Dpth (m)	3.57	Hydr. Depth (m)		3.57	
Conv. Total (m3/s)	3355.3	Conv. (m3/s)		3355.3	
Length Wtd. (m)	1.00	Wetted Per. (m)		15.14	
Min Ch El (m)	56.50	Shear (N/m2)		0.37	
Alpha	1.00	Stream Power (N/m s)		0.19	
Frctn Loss (m)	0.00	Cum Volume (1000 m3)		6.31	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.76	

CROSS SECTION

RIVER: pipe5
REACH: one RS: 21

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	60.2	1	60.2	1	56.5	10	56.5	10	60.2
11	60.2								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	1	.013	10	.013

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1	10	195	195	195	.1	.3

CROSS SECTION OUTPUT Profile #100 year

E.G. Elev (m)	60.08	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.013	
W.S. Elev (m)	60.06	Reach Len. (m)	195.00	195.00	195.00
Crit W.S. (m)	57.29	Flow Area (m2)		32.08	
E.G. Slope (m/m)	0.000027	Area (m2)		32.08	
Q Total (m3/s)	20.09	Flow (m3/s)		20.09	
Top Width (m)	9.00	Top Width (m)		9.00	
Vel Total (m/s)	0.63	Avg. Vel. (m/s)		0.63	
Max Chl Dpth (m)	3.56	Hydr. Depth (m)		3.56	
Conv. Total (m3/s)	3902.5	Conv. (m3/s)		3902.5	
Length Wtd. (m)	195.00	Wetted Per. (m)		16.13	
Min Ch El (m)	56.50	Shear (N/m2)		0.52	
Alpha	1.00	Stream Power (N/m s)		0.32	
Frctn Loss (m)		Cum Volume (1000 m3)		6.28	
C & E Loss (m)		Cum SA (1000 m2)		1.75	

CULVERT

RIVER: pipe5
REACH: one RS: 20.5

INPUT
Description:
Distance from Upstream XS = .5
Deck/Roadway Width = 194
Weir Coefficient = 1.44
Upstream Deck/Roadway Coordinates
num= 2

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	60.2	11	60.2

Upstream Bridge Cross Section Data
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	60.2	1	60.2	1	56.5	10	56.5	10	60.2
11	60.2								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	1	.013	10	.013

Bank Sta: Left	Right	Coeff Contr.	Expan.
1	10	.1	.3

Downstream Deck/Roadway Coordinates
num= 2

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord

```
      0      60              11      60

 Downstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0      60       1      60       1   56.05      10   56.05      10      60
      11      60

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       1    .013      11    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
             1      11             .1       .3

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 =     .95
Elevation at which weir flow begins         =    60.2
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     Pipe Arch    2.48    3.87
FHWA Chart # 34- 18 inch corner radius; Corrugated metal
FHWA Scale # 1 - 90 Degree headwall
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                  .5     194     .024     .024        0                   .6                 1
Number of Barrels =  2
Upstream   Elevation =  56.5
Centerline Stations
    Sta.    Sta.
     3.5     7.5
Downstream Elevation =  56.05
Centerline Stations
    Sta.    Sta.
     3.5     7.5

CULVERT OUTPUT  Profile #100 year  Culv Group:  Culvert #1

  Q Culv Group (m3/s)      20.09    Culv Full Len (m)       194.00
  # Barrels                    2    Culv Vel US (m/s)         1.32
  Q Barrel (m3/s)          10.05    Culv Vel DS (m/s)         1.32
  E.G. US. (m)             60.08    Culv Inv El Up (m)       56.50
  W.S. US. (m)             60.06    Culv Inv El Dn (m)       56.05
  E.G. DS (m)              59.66    Culv Frctn Ls (m)         0.30
  W.S. DS (m)              59.64    Culv Exit Loss (m)        0.07
  Delta EG (m)              0.42    Culv Entr Loss (m)        0.05
  Delta WS (m)              0.42    Q Weir (m3/s)
  E.G. IC (m)              57.98    Weir Sta Lft (m)
  E.G. OC (m)              60.08    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)        58.98    Weir Max Depth (m)
  Culv WS Outlet (m)       58.53    Weir Avg Depth (m)
  Culv Nml Depth (m)                Weir Flow Area (m2)
  Culv Crt Depth (m)        1.00    Min El Weir Flow (m)     60.20


CROSS SECTION


RIVER: pipe5
REACH: one                RS: 20

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0      60       1      60       1   56.05      10   56.05      10      60
      11      60

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       1    .013      11    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             1      11                 0       0       0             .1       .3

CROSS SECTION OUTPUT  Profile #100 year

  E.G. Elev (m)            59.66    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.02    Wt. n-Val.                         0.013
  W.S. Elev (m)            59.64    Reach Len. (m)            0.00      0.00       0.00
  Crit W.S. (m)                     Flow Area (m2)                     32.35
  E.G. Slope (m/m)      0.000026    Area (m2)                          32.35
```

Q Total (m3/s)	20.09	Flow (m3/s)	20.09
Top Width (m)	9.00	Top Width (m)	9.00
Vel Total (m/s)	0.62	Avg. Vel. (m/s)	0.62
Max Chl Dpth (m)	3.59	Hydr. Depth (m)	3.59
Conv. Total (m3/s)	3948.5	Conv. (m3/s)	3948.5
Length Wtd. (m)	0.00	Wetted Per. (m)	16.19
Min Ch El (m)	56.05	Shear (N/m2)	0.51
Alpha	1.00	Stream Power (N/m s)	0.32
Frctn Loss (m)	0.00	Cum Volume (1000 m3)	
C & E Loss (m)	0.00	Cum SA (1000 m2)	

CROSS SECTION

RIVER: pipe1
REACH: two RS: 5

INPUT
Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	77.4	2.13	76.34	3.04	76.34	5.17	77.4

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	0	.013	5.17	.013

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	5.17	160	160	160	.1	.3

CROSS SECTION OUTPUT Profile #100 year

			Left OB	Channel	Right OB
E.G. Elev (m)	76.76	Element			
Vel Head (m)	0.11	Wt. n-Val.		0.013	
W.S. Elev (m)	76.65	Reach Len. (m)	160.00	160.00	160.00
Crit W.S. (m)	76.65	Flow Area (m2)		0.47	
E.G. Slope (m/m)	0.003043	Area (m2)		0.47	
Q Total (m3/s)	0.70	Flow (m3/s)		0.70	
Top Width (m)	2.15	Top Width (m)		2.15	
Vel Total (m/s)	1.48	Avg. Vel. (m/s)		1.48	
Max Chl Dpth (m)	0.31	Hydr. Depth (m)		0.22	
Conv. Total (m3/s)	12.7	Conv. (m3/s)		12.7	
Length Wtd. (m)	160.00	Wetted Per. (m)		2.30	
Min Ch El (m)	76.34	Shear (N/m2)		6.15	
Alpha	1.00	Stream Power (N/m s)		9.09	
Frctn Loss (m)	0.37	Cum Volume (1000 m3)		7.16	
C & E Loss (m)	0.05	Cum SA (1000 m2)		3.11	

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.

CROSS SECTION

RIVER: pipe1
REACH: two RS: 4.5

INPUT
Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	73.23	2.13	72.17	3.04	72.17	5.17	73.23

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	0	.013	5.17	.013

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	5.17	145	145	145	.1	.3

CROSS SECTION OUTPUT Profile #100 year

			Left OB	Channel	Right OB
E.G. Elev (m)	75.13	Element			
Vel Head (m)	1.73	Wt. n-Val.		0.013	
W.S. Elev (m)	73.40	Reach Len. (m)	145.00	145.00	145.00
Crit W.S. (m)	73.90	Flow Area (m2)		4.11	
E.G. Slope (m/m)	0.009558	Area (m2)		4.11	
Q Total (m3/s)	23.95	Flow (m3/s)		23.95	

Top Width (m)	5.17	Top Width (m)	5.17
Vel Total (m/s)	5.83	Avg. Vel. (m/s)	5.83
Max Chl Dpth (m)	1.23	Hydr. Depth (m)	0.79
Conv. Total (m3/s)	245.0	Conv. (m3/s)	245.0
Length Wtd. (m)	145.00	Wetted Per. (m)	6.01
Min Ch El (m)	72.17	Shear (N/m2)	64.03
Alpha	1.00	Stream Power (N/m s)	373.50
Frctn Loss (m)	1.46	Cum Volume (1000 m3)	6.79
C & E Loss (m)	0.16	Cum SA (1000 m2)	2.52

Warning: The cross-section end points had to be extended vertically for the computed water surface.
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: pipe1
REACH: two RS: 4.1

INPUT
Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	69.4	2.13	68.34	3.04	68.34	5.17	69.4

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	0	.013	5.17	.013

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	5.17	1	1	1	.1	.3

CROSS SECTION OUTPUT Profile #100 year

E.G. Elev (m)	72.81	Element	Left OB	Channel	Right OB
Vel Head (m)	3.47	Wt. n-Val.		0.013	
W.S. Elev (m)	69.34	Reach Len. (m)	1.00	1.00	1.00
Crit W.S. (m)	70.07	Flow Area (m2)		2.90	
E.G. Slope (m/m)	0.026227	Area (m2)		2.90	
Q Total (m3/s)	23.95	Flow (m3/s)		23.95	
Top Width (m)	4.92	Top Width (m)		4.92	
Vel Total (m/s)	8.25	Avg. Vel. (m/s)		8.25	
Max Chl Dpth (m)	1.00	Hydr. Depth (m)		0.59	
Conv. Total (m3/s)	147.9	Conv. (m3/s)		147.9	
Length Wtd. (m)	1.00	Wetted Per. (m)		5.38	
Min Ch El (m)	68.34	Shear (N/m2)		138.65	
Alpha	1.00	Stream Power (N/m s)		1144.15	
Frctn Loss (m)	2.16	Cum Volume (1000 m3)		6.28	
C & E Loss (m)	0.17	Cum SA (1000 m2)		1.79	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
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: pipe1
REACH: two RS: 4

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	70	2	70	2	66.36	6	66.36	6	70
8	70								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	2	.013	6	.013

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
2	6	221	221	221	.1	.3

CROSS SECTION OUTPUT Profile #100 year

E.G. Elev (m)	69.91	Element	Left OB	Channel	Right OB
Vel Head (m)	0.16	Wt. n-Val.		0.013	
W.S. Elev (m)	69.75	Reach Len. (m)	221.00	221.00	221.00

Crit W.S. (m)	67.90	Flow Area (m2)	13.56
E.G. Slope (m/m)	0.000388	Area (m2)	13.56
Q Total (m3/s)	23.95	Flow (m3/s)	23.95
Top Width (m)	4.00	Top Width (m)	4.00
Vel Total (m/s)	1.77	Avg. Vel. (m/s)	1.77
Max Chl Dpth (m)	3.39	Hydr. Depth (m)	3.39
Conv. Total (m3/s)	1216.0	Conv. (m3/s)	1216.0
Length Wtd. (m)	221.00	Wetted Per. (m)	10.78
Min Ch El (m)	66.36	Shear (N/m2)	4.79
Alpha	1.00	Stream Power (N/m s)	8.45
Frctn Loss (m)		Cum Volume (1000 m3)	6.28
C & E Loss (m)		Cum SA (1000 m2)	1.78

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

CULVERT

RIVER: pipe1
REACH: two RS: 3.8

INPUT
Description:
Distance from Upstream XS = .5
Deck/Roadway Width = 220
Weir Coefficient = 1.44
Upstream Deck/Roadway Coordinates
num= 2

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	70	8	70

Upstream Bridge Cross Section Data
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	70	2	70	2	66.36	6	66.36	6	70
8	70								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	2	.013	6	.013

Bank Sta: Left	Right	Coeff Contr.	Expan.
2	6	.1	.3

Downstream Deck/Roadway Coordinates
num= 2

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	67	8	67

Downstream Bridge Cross Section Data
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	67	2	67	2	62.5	6	62.5	6	67
8	67								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	2	.013	6	.013

Bank Sta: Left	Right	Coeff Contr.	Expan.
2	6	.1	.3

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 = .95
Elevation at which weir flow begins = 70
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	Pipe Arch	2.285	3.57

FHWA Chart # 34- 18 inch corner radius; Corrugated metal
FHWA Scale # 1 - 90 Degree headwall
Solution Criteria = Highest U.S. EG

Culvert	Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
	.5	220	.024	.024	0	.6	1

›stream Elevation = 66.36
Centerline Station = 4
Downstream Elevation = 62.5
Centerline Station = 4

CULVERT OUTPUT Profile #100 year Culv Group: Culvert #1

Q Culv Group (m3/s)	23.95	Culv Full Len (m)	220.00
# Barrels	1	Culv Vel US (m/s)	3.79

Q Barrel (m3/s)	23.95	Culv Vel DS (m/s)	3.79
E.G. US. (m)	69.91	Culv Inv El Up (m)	66.36
W.S. US. (m)	69.75	Culv Inv El Dn (m)	62.50
E.G. DS (m)	65.81	Culv Frctn Ls (m)	3.11
W.S. DS (m)	65.63	Culv Exit Loss (m)	0.55
Delta EG (m)	4.10	Culv Entr Loss (m)	0.44
Delta WS (m)	4.13	Q Weir (m3/s)	
E.G. IC (m)	69.71	Weir Sta Lft (m)	
E.G. OC (m)	69.91	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	68.65	Weir Max Depth (m)	
Culv WS Outlet (m)	64.78	Weir Avg Depth (m)	
Culv Nml Depth (m)		Weir Flow Area (m2)	
Culv Crt Depth (m)	1.71	Min El Weir Flow (m)	70.00

CROSS SECTION

RIVER: pipe1
REACH: two RS: 3.51

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	67	2	67	2	62.5	6	62.5	6	67
8	67								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	2	.013	6	.013

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
2	6	1	1	1	.1	.3

CROSS SECTION OUTPUT Profile #100 year

E.G. Elev (m)	65.81	Element	Left OB	Channel	Right OB
Vel Head (m)	0.19	Wt. n-Val.		0.013	
W.S. Elev (m)	65.63	Reach Len. (m)	1.00	1.00	1.00
Crit W.S. (m)		Flow Area (m2)		12.51	
E.G. Slope (m/m)	0.000476	Area (m2)		12.51	
Q Total (m3/s)	23.95	Flow (m3/s)		23.95	
Top Width (m)	4.00	Top Width (m)		4.00	
Vel Total (m/s)	1.92	Avg. Vel. (m/s)		1.92	
Max Chl Dpth (m)	3.13	Hydr. Depth (m)		3.13	
Conv. Total (m3/s)	1098.2	Conv. (m3/s)		1098.2	
Length Wtd. (m)	1.00	Wetted Per. (m)		10.25	
Min Ch El (m)	62.50	Shear (N/m2)		5.69	
Alpha	1.00	Stream Power (N/m s)		10.90	
Frctn Loss (m)	0.00	Cum Volume (1000 m3)		3.39	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.90	

CROSS SECTION

RIVER: pipe1
REACH: two RS: 3.5

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	67	2	67	2	62.5	6	62.5	6	67
8	67								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	2	.013	6	.013

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
2	6	224	224	224	.1	.3

CROSS SECTION OUTPUT Profile #100 year

E.G. Elev (m)	65.81	Element	Left OB	Channel	Right OB
Vel Head (m)	0.23	Wt. n-Val.		0.013	
W.S. Elev (m)	65.57	Reach Len. (m)	224.00	224.00	224.00
Crit W.S. (m)	64.14	Flow Area (m2)		12.30	
E.G. Slope (m/m)	0.000601	Area (m2)		12.30	
Q Total (m3/s)	26.36	Flow (m3/s)		26.36	
Top Width (m)	4.00	Top Width (m)		4.00	
Vel Total (m/s)	2.14	Avg. Vel. (m/s)		2.14	
Max Chl Dpth (m)	3.07	Hydr. Depth (m)		3.07	
Conv. Total (m3/s)	1074.9	Conv. (m3/s)		1074.9	
Length Wtd. (m)	224.00	Wetted Per. (m)		10.15	
Min Ch El (m)	62.50	Shear (N/m2)		7.15	

```
  Alpha                      1.00    Stream Power (N/m s)                15.32
  Frctn Loss (m)                     Cum Volume (1000 m3)                 3.38
  C & E Loss (m)                     Cum SA (1000 m2)                     0.90


CULVERT


RIVER: pipe1
REACH: two                RS: 3.3

INPUT
Description:
Distance from Upstream XS =      .5
Deck/Roadway Width        =     223
Weir Coefficient          =    1.44
Upstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0      67              8      67

Upstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0      67       2      67       2    62.5       6    62.5       6      67
       8      67

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       2    .013       6    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
             2       6             .1       .3

Downstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0    59.5              8    59.5

Downstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    59.5       2    59.5       2    54.7       6    54.7       6    59.5
       8    59.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       2    .013       6    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
             2       6             .1       .3

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 =     .95
Elevation at which weir flow begins         =      67
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     Pipe Arch    2.48    3.87
FHWA Chart # 34- 18 inch corner radius; Corrugated metal
FHWA Scale # 1 - 90 Degree headwall
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                 .5     223     .024     .024        0                  .6                 1
Upstream   Elevation =  62.5
           Centerline Station =  4
Downstream Elevation =  54.7
           Centerline Station =  4

CULVERT OUTPUT  Profile #100 year  Culv Group:  Culvert #1

  Q Culv Group (m3/s)      26.36    Culv Full Len (m)        81.69
  # Barrels                    1    Culv Vel US (m/s)         4.40
  Q Barrel (m3/s)          26.36    Culv Vel DS (m/s)         3.47
  E.G. US. (m)             65.81    Culv Inv El Up (m)       62.50
  W.S. US. (m)             65.57    Culv Inv El Dn (m)       54.70
  E.G. DS (m)              59.29    Culv Frctn Ls (m)         5.43
  W.S. DS (m)              59.18    Culv Exit Loss (m)        0.50
  Delta EG (m)              6.52    Culv Entr Loss (m)        0.59
  Delta WS (m)              6.40    Q Weir (m3/s)
  E.G. IC (m)              65.66    Weir Sta Lft (m)
  E.G. OC (m)              65.81    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)        64.23    Weir Max Depth (m)
```

Culv WS Outlet (m)	57.18	Weir Avg Depth (m)	
Culv Nml Depth (m)	1.18	Weir Flow Area (m2)	
Culv Crt Depth (m)	1.73	Min El Weir Flow (m)	67.00

CROSS SECTION

RIVER: pipe1
REACH: two RS: 3

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	59.5	2	59.5	2	54.7	6	54.7	6	59.5
8	59.5								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	2	.013	6	.013

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
2	6	0	0	0	.1	.3

CROSS SECTION OUTPUT Profile #100 year

			Left OB	Channel	Right OB
E.G. Elev (m)	59.29	Element			
Vel Head (m)	0.11	Wt. n-Val.		0.013	
W.S. Elev (m)	59.18	Reach Len. (m)	0.00	0.00	0.00
Crit W.S. (m)		Flow Area (m2)		17.90	
E.G. Slope (m/m)	0.000238	Area (m2)		17.90	
Q Total (m3/s)	26.36	Flow (m3/s)		26.36	
Top Width (m)	4.00	Top Width (m)		4.00	
Vel Total (m/s)	1.47	Avg. Vel. (m/s)		1.47	
Max Chl Dpth (m)	4.48	Hydr. Depth (m)		4.48	
Conv. Total (m3/s)	1708.8	Conv. (m3/s)		1708.8	
Length Wtd. (m)	0.00	Wetted Per. (m)		12.95	
Min Ch El (m)	54.70	Shear (N/m2)		3.23	
Alpha	1.00	Stream Power (N/m s)		4.75	
Frctn Loss (m)	0.00	Cum Volume (1000 m3)			
C & E Loss (m)	0.01	Cum SA (1000 m2)			

CROSS SECTION

RIVER: pipe1
REACH: one RS: 2

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	59.5	1	59.5	1	54.7	13	54.7	13	59.5
14	59.5								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	1	.013	14	.013

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1	14	205	205	205	.1	.3

CROSS SECTION OUTPUT Profile #100 year

			Left OB	Channel	Right OB
E.G. Elev (m)	59.27	Element			
Vel Head (m)	0.07	Wt. n-Val.		0.013	
W.S. Elev (m)	59.20	Reach Len. (m)	205.00	205.00	205.00
Crit W.S. (m)	56.13	Flow Area (m2)		54.03	
E.G. Slope (m/m)	0.000068	Area (m2)		54.03	
Q Total (m3/s)	64.42	Flow (m3/s)		64.42	
Top Width (m)	12.00	Top Width (m)		12.00	
Vel Total (m/s)	1.19	Avg. Vel. (m/s)		1.19	
Max Chl Dpth (m)	4.50	Hydr. Depth (m)		4.50	
Conv. Total (m3/s)	7802.2	Conv. (m3/s)		7802.2	
Length Wtd. (m)	205.00	Wetted Per. (m)		21.00	
Min Ch El (m)	54.70	Shear (N/m2)		1.72	
Alpha	1.00	Stream Power (N/m s)		2.05	
Frctn Loss (m)		Cum Volume (1000 m3)		18.25	
C & E Loss (m)		Cum SA (1000 m2)		6.63	

CULVERT

RIVER: pipe1
REACH: one RS: 1.8

```
INPUT
Description:
  stance from Upstream XS =       .5
 eck/Roadway Width        =     204
Weir Coefficient          =    1.44
Upstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0    59.5              14    59.5

Upstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    59.5       1    59.5       1    54.7      13    54.7      13    59.5
      14    59.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       1    .013      14    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
             1      14             .1       .3

Downstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0    58.1              14    58.1

Downstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    58.1       1    58.1       1   54.15      13   54.15      13    58.1
      14    58.1

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       1    .013      14    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
             1      14             .1       .3

 ostream 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 =     .95
Elevation at which weir flow begins         =    59.5
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     Pipe Arch   3.047    5.03
FHWA Chart # 34- 18 inch corner radius; Corrugated metal
FHWA Scale # 1 - 90 Degree headwall
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                 .5     204     .024     .024        0                   .6                 1
Number of Barrels =  2
Upstream   Elevation =  54.7
Centerline Stations
    Sta.    Sta.
       4      10
Downstream Elevation =  54.15
Centerline Stations
    Sta.    Sta.
       4      10

CULVERT OUTPUT  Profile #100 year  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       64.42    Culv Full Len (m)        204.00
  # Barrels                     2    Culv Vel US (m/s)         2.72
  Q Barrel (m3/s)           32.21    Culv Vel DS (m/s)         2.72
  E.G. US. (m)              59.28    Culv Inv El Up (m)       54.70
  W.S. US. (m)              59.20    Culv Inv El Dn (m)       54.15
  E.G. DS (m)               57.79    Culv Frctn Ls (m)         1.00
  W.S. DS (m)               57.67    Culv Exit Loss (m)        0.26
  Delta EG (m)               1.49    Culv Entr Loss (m)        0.23
  Delta WS (m)               1.53    Q Weir (m3/s)
  E.G. IC (m)               57.51    Weir Sta Lft (m)
  E.G. OC (m)               59.28    Weir Sta Rgt (m)
  Culvert Control          Outlet    Weir Submerg
  Culv WS Inlet (m)         57.75    Weir Max Depth (m)
  Culv WS Outlet (m)        57.20    Weir Avg Depth (m)
  Culv Nml Depth (m)                 Weir Flow Area (m2)
  Culv Crt Depth (m)         1.71    Min El Weir Flow (m)     59.50


CROSS SECTION
```

```
 VER: pipe1
REACH: one                RS: 1.51

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    58.1       1    58.1       1   54.15      13   54.15      13    58.1
      14    58.1

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       1    .013      14    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             1      14                1       1       1              .1       .3

CROSS SECTION OUTPUT  Profile #100 year

  E.G. Elev (m)            57.79    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.12    Wt. n-Val.                         0.013
  W.S. Elev (m)            57.67    Reach Len. (m)            1.00      1.00       1.00
  Crit W.S. (m)                     Flow Area (m2)                     42.23
  E.G. Slope (m/m)      0.000136    Area (m2)                          42.23
  Q Total (m3/s)           64.42    Flow (m3/s)                        64.42
  Top Width (m)            12.00    Top Width (m)                      12.00
  Vel Total (m/s)           1.53    Avg. Vel. (m/s)                     1.53
  Max Chl Dpth (m)          3.52    Hydr. Depth (m)                     3.52
  Conv. Total (m3/s)      5525.3    Conv. (m3/s)                      5525.3
  Length Wtd. (m)           1.00    Wetted Per. (m)                    19.04
  Min Ch El (m)            54.15    Shear (N/m2)                        2.96
  Alpha                     1.00    Stream Power (N/m s)                4.51
  Frctn Loss (m)            0.00    Cum Volume (1000 m3)                8.38
  C & E Loss (m)            0.00    Cum SA (1000 m2)                    4.17


CROSS SECTION


 VER: pipe1
REACH: one                RS: 1.5

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    58.1       1    58.1       1   54.15      13   54.15      13    58.1
      14    58.1

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       1    .013      14    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             1      14                167     167     167              .1       .3

CROSS SECTION OUTPUT  Profile #100 year

  E.G. Elev (m)            57.79    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.14    Wt. n-Val.                         0.013
  W.S. Elev (m)            57.65    Reach Len. (m)          167.00     167.00     167.00
  Crit W.S. (m)            55.64    Flow Area (m2)                     42.00
  E.G. Slope (m/m)      0.000157    Area (m2)                          42.00
  Q Total (m3/s)           68.59    Flow (m3/s)                        68.59
  Top Width (m)            12.00    Top Width (m)                      12.00
  Vel Total (m/s)           1.63    Avg. Vel. (m/s)                     1.63
  Max Chl Dpth (m)          3.50    Hydr. Depth (m)                     3.50
  Conv. Total (m3/s)      5482.5    Conv. (m3/s)                      5482.5
  Length Wtd. (m)         167.00    Wetted Per. (m)                    19.00
  Min Ch El (m)            54.15    Shear (N/m2)                        3.39
  Alpha                     1.00    Stream Power (N/m s)                5.54
  Frctn Loss (m)                    Cum Volume (1000 m3)                8.34
  C & E Loss (m)                    Cum SA (1000 m2)                    4.16


CULVERT


 IVER: pipe1
REACH: one                RS: 1.2

INPUT
Description:
Distance from Upstream XS =       .5
Deck/Roadway Width        =     166
Weir Coefficient          =    1.44
Upstream  Deck/Roadway Coordinates
```

```
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0    58.1              14    58.1

Upstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    58.1       1    58.1       1   54.15      13   54.15      13    58.1
      14    58.1

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       1    .013      14    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
             1      14             .1       .3

Downstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0    57.3              14    57.3

Downstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    57.3       1    57.3       1   53.85      13   53.85      13    57.3
      14    57.3

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       1    .013      14    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
             1      14             .1       .3

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 =     .95
Elevation at which weir flow begins         =    58.1
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     Pipe Arch   3.047    5.03
FHWA Chart # 34- 18 inch corner radius; Corrugated metal
FHWA Scale # 1 - 90 Degree headwall
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                .5     166     .024     .024        0                  .6                 1
Number of Barrels =  2
Upstream   Elevation =  54.15
Centerline Stations
    Sta.    Sta.
       4      10
Downstream Elevation =  53.85
Centerline Stations
    Sta.    Sta.
       4      10

CULVERT OUTPUT  Profile #100 year  Culv Group:  Culvert #1

  Q Culv Group (m3/s)      68.59    Culv Full Len (m)
  # Barrels                    2    Culv Vel US (m/s)         2.94
  Q Barrel (m3/s)          34.30    Culv Vel DS (m/s)         3.88
  E.G. US. (m)             57.79    Culv Inv El Up (m)       54.15
  W.S. US. (m)             57.65    Culv Inv El Dn (m)       53.85
  E.G. DS (m)              56.27    Culv Frctn Ls (m)         0.91
  W.S. DS (m)              55.85    Culv Exit Loss (m)        0.35
  Delta EG (m)              1.52    Culv Entr Loss (m)        0.26
  Delta WS (m)              1.80    Q Weir (m3/s)
  E.G. IC (m)              57.10    Weir Sta Lft (m)
  E.G. OC (m)              57.79    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)        57.08    Weir Max Depth (m)
  Culv WS Outlet (m)       55.85    Weir Avg Depth (m)
  Culv Nml Depth (m)        3.05    Weir Flow Area (m2)
  Culv Crt Depth (m)        1.79    Min El Weir Flow (m)     58.10


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: pipe1
```

REACH: one RS: 1

PUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	57.3	1	57.3	1	53.85	13	53.85	13	57.3
14	57.3								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	1	.013	14	.013

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1	14	1	1	1	.1	.3

CROSS SECTION OUTPUT Profile #100 year

			Left OB	Channel	Right OB
E.G. Elev (m)	56.27	Element			
Vel Head (m)	0.42	Wt. n-Val.		0.013	
W.S. Elev (m)	55.85	Reach Len. (m)	1.00	1.00	1.00
Crit W.S. (m)		Flow Area (m2)		24.00	
E.G. Slope (m/m)	0.000804	Area (m2)		24.00	
Q Total (m3/s)	68.59	Flow (m3/s)		68.59	
Top Width (m)	12.00	Top Width (m)		12.00	
Vel Total (m/s)	2.86	Avg. Vel. (m/s)		2.86	
Max Chl Dpth (m)	2.00	Hydr. Depth (m)		2.00	
Conv. Total (m3/s)	2418.4	Conv. (m3/s)		2418.4	
Length Wtd. (m)	1.00	Wetted Per. (m)		16.00	
Min Ch El (m)	53.85	Shear (N/m2)		11.83	
Alpha	1.00	Stream Power (N/m s)		33.82	
Frctn Loss (m)	0.00	Cum Volume (1000 m3)		2.83	
C & E Loss (m)	0.04	Cum SA (1000 m2)		2.15	

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.

CROSS SECTION

RIVER: pipe1
REACH: one RS: 0.8

INPUT
Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	55.15	1.5	53.65	9.5	53.65	11	55.15

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	0	.013	11	.013

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	11	83	83	83	.1	.3

CROSS SECTION OUTPUT Profile #100 year

			Left OB	Channel	Right OB
E.G. Elev (m)	56.23	Element			
Vel Head (m)	0.79	Wt. n-Val.		0.013	
W.S. Elev (m)	55.44	Reach Len. (m)	83.00	83.00	83.00
Crit W.S. (m)	55.44	Flow Area (m2)		17.39	
E.G. Slope (m/m)	0.001751	Area (m2)		17.39	
Q Total (m3/s)	68.59	Flow (m3/s)		68.59	
Top Width (m)	11.00	Top Width (m)		11.00	
Vel Total (m/s)	3.95	Avg. Vel. (m/s)		3.95	
Max Chl Dpth (m)	1.79	Hydr. Depth (m)		1.58	
Conv. Total (m3/s)	1639.3	Conv. (m3/s)		1639.3	
Length Wtd. (m)	83.00	Wetted Per. (m)		12.81	
Min Ch El (m)	53.65	Shear (N/m2)		23.30	
Alpha	1.00	Stream Power (N/m s)		91.91	
Frctn Loss (m)	0.15	Cum Volume (1000 m3)		2.81	
C & E Loss (m)	0.00	Cum SA (1000 m2)		2.14	

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

CROSS SECTION

RIVER: pipe1
ACH: one RS: 0.5

INPUT
Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	54.75	1.5	53.25	9.5	53.25	11	54.75

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	0	.013	11	.013

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	11	114	114	114	.1	.3

CROSS SECTION OUTPUT Profile #100 year

E.G. Elev (m)	55.98	Element	Left OB	Channel	Right OB
Vel Head (m)	1.28	Wt. n-Val.		0.013	
W.S. Elev (m)	54.70	Reach Len. (m)	114.00	114.00	114.00
Crit W.S. (m)	55.04	Flow Area (m2)		13.69	
E.G. Slope (m/m)	0.003597	Area (m2)		13.69	
Q Total (m3/s)	68.59	Flow (m3/s)		68.59	
Top Width (m)	10.90	Top Width (m)		10.90	
Vel Total (m/s)	5.01	Avg. Vel. (m/s)		5.01	
Max Chl Dpth (m)	1.45	Hydr. Depth (m)		1.26	
Conv. Total (m3/s)	1143.7	Conv. (m3/s)		1143.7	
Length Wtd. (m)	114.00	Wetted Per. (m)		12.10	
Min Ch El (m)	53.25	Shear (N/m2)		39.91	
Alpha	1.00	Stream Power (N/m s)		199.96	
Frctn Loss (m)	0.20	Cum Volume (1000 m3)		1.52	
C & E Loss (m)	0.05	Cum SA (1000 m2)		1.23	

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.

CROSS SECTION

RIVER: pipe1
REACH: one RS: 0.1

INPUT
Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	54.2	1.5	52.7	9.5	52.7	11	54.2

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	0	.013	11	.013

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	11	0	0	0	.1	.3

CROSS SECTION OUTPUT Profile #100 year

E.G. Elev (m)	55.52	Element	Left OB	Channel	Right OB
Vel Head (m)	1.44	Wt. n-Val.		0.013	
W.S. Elev (m)	54.08	Reach Len. (m)			
Crit W.S. (m)	54.49	Flow Area (m2)		12.90	
E.G. Slope (m/m)	0.004282	Area (m2)		12.90	
Q Total (m3/s)	68.59	Flow (m3/s)		68.59	
Top Width (m)	10.75	Top Width (m)		10.75	
Vel Total (m/s)	5.32	Avg. Vel. (m/s)		5.32	
Max Chl Dpth (m)	1.38	Hydr. Depth (m)		1.20	
Conv. Total (m3/s)	1048.2	Conv. (m3/s)		1048.2	
Length Wtd. (m)		Wetted Per. (m)		11.89	
Min Ch El (m)	52.70	Shear (N/m2)		45.56	
Alpha	1.00	Stream Power (N/m s)		242.16	
Frctn Loss (m)	0.45	Cum Volume (1000 m3)			
C & E Loss (m)	0.02	Cum SA (1000 m2)			

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.

CROSS SECTION

RIVER: pipe2
REACH: two RS: 12

INPUT
Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	69.4	1.52	68.64	2.43	68.64	3.95	69.4

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	0	.013	3.95	.013

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	3.95	160	160	160	.1	.3

CROSS SECTION OUTPUT Profile #100 year

E.G. Elev (m)	70.05	Element	Left OB	Channel	Right OB
Vel Head (m)	0.38	Wt. n-Val.		0.013	
W.S. Elev (m)	69.67	Reach Len. (m)	160.00	160.00	160.00
Crit W.S. (m)	69.67	Flow Area (m2)		2.92	
E.G. Slope (m/m)	0.002456	Area (m2)		2.92	
Q Total (m3/s)	7.92	Flow (m3/s)		7.92	
Top Width (m)	3.95	Top Width (m)		3.95	
Vel Total (m/s)	2.72	Avg. Vel. (m/s)		2.72	
Max Chl Dpth (m)	1.03	Hydr. Depth (m)		0.74	
Conv. Total (m3/s)	159.8	Conv. (m3/s)		159.8	
Length Wtd. (m)	160.00	Wetted Per. (m)		4.85	
Min Ch El (m)	68.64	Shear (N/m2)		14.48	
Alpha	1.00	Stream Power (N/m s)		39.33	
Frctn Loss (m)	0.18	Cum Volume (1000 m3)		3.36	
C & E Loss (m)	0.07	Cum SA (1000 m2)		1.73	

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

CROSS SECTION

RIVER: pipe2
REACH: two RS: 11.1

INPUT
Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	62.4	1.52	61.64	2.43	61.64	3.95	62.4

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	0	.013	3.95	.013

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	3.95	1	1	1	.1	.3

CROSS SECTION OUTPUT Profile #100 year

E.G. Elev (m)	68.27	Element	Left OB	Channel	Right OB
Vel Head (m)	6.22	Wt. n-Val.		0.013	
W.S. Elev (m)	62.05	Reach Len. (m)	1.00	1.00	1.00
Crit W.S. (m)	62.67	Flow Area (m2)		0.72	
E.G. Slope (m/m)	0.124271	Area (m2)		0.72	
Q Total (m3/s)	7.92	Flow (m3/s)		7.92	
Top Width (m)	2.56	Top Width (m)		2.56	
Vel Total (m/s)	11.05	Avg. Vel. (m/s)		11.05	
Max Chl Dpth (m)	0.41	Hydr. Depth (m)		0.28	
Conv. Total (m3/s)	22.5	Conv. (m3/s)		22.5	
Length Wtd. (m)	1.00	Wetted Per. (m)		2.76	
Min Ch El (m)	61.64	Shear (N/m2)		316.89	
Alpha	1.00	Stream Power (N/m s)		3500.79	
Frctn Loss (m)	1.19	Cum Volume (1000 m3)		3.07	
C & E Loss (m)	0.58	Cum SA (1000 m2)		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.
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: pipe2
REACH: two RS: 11

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	63	3	63	3	60.58	5	60.58	5	63
8	63								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	3	.013	5	.013

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
3	5	355	355	355	.1	.3

CROSS SECTION OUTPUT Profile #100 year

E.G. Elev (m)	68.04	Element	Left OB	Channel	Right OB
Vel Head (m)	7.13	Wt. n-Val.		0.013	
W.S. Elev (m)	60.91	Reach Len. (m)	355.00	355.00	355.00
Crit W.S. (m)	61.75	Flow Area (m2)		0.67	
E.G. Slope (m/m)	0.149494	Area (m2)		0.67	
Q Total (m3/s)	7.92	Flow (m3/s)		7.92	
Top Width (m)	2.00	Top Width (m)		2.00	
Vel Total (m/s)	11.83	Avg. Vel. (m/s)		11.83	
Max Chl Dpth (m)	0.33	Hydr. Depth (m)		0.33	
Conv. Total (m3/s)	20.5	Conv. (m3/s)		20.5	
Length Wtd. (m)	355.00	Wetted Per. (m)		2.67	
Min Ch El (m)	60.58	Shear (N/m2)		367.71	
Alpha	1.00	Stream Power (N/m s)		4349.57	
Frctn Loss (m)	0.14	Cum Volume (1000 m3)		3.07	
C & E Loss (m)	0.09	Cum SA (1000 m2)		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.

CULVERT

RIVER: pipe2
REACH: two RS: 10.5

INPUT
Description:
Distance from Upstream XS = .5
Deck/Roadway Width = 354
Weir Coefficient = 1.44
Upstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	63		8	63	

Upstream Bridge Cross Section Data
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	63	3	63	3	60.58	5	60.58	5	63
8	63								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	3	.013	5	.013

Bank Sta: Left	Right	Coeff Contr.	Expan.
3	5	.1	.3

Downstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	61.5		8	61.5	

Downstream Bridge Cross Section Data
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	61.5	3	61.5	3	57.37	5	57.37	5	61.5
8	61.5								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	3	.013	5	.013

Bank Sta: Left Right Coeff Contr. Expan.

```
            3       5             .1       .3

 ·stream Embankment side slope              =       0 horiz. to 1.0 vertical
 ownstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins         =      63
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    1.67
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
                .5     354     .013     .013        0                .6                 1
Upstream   Elevation =  60.58
           Centerline Station =  4
Downstream Elevation =  57.37
           Centerline Station =  4

CULVERT OUTPUT  Profile #100 year  Culv Group:  Culvert #1

  Q Culv Group (m3/s)        6.53    Culv Full Len (m)        354.00
  # Barrels                     1    Culv Vel US (m/s)          9.18
  Q Barrel (m3/s)            6.53    Culv Vel DS (m/s)          2.98
  E.G. US. (m)              68.04    Culv Inv El Up (m)        60.58
  W.S. US. (m)              68.04    Culv Inv El Dn (m)        57.37
  E.G. DS (m)               60.88    Culv Frctn Ls (m)          4.14
  W.S. DS (m)               60.81    Culv Exit Loss (m)         0.45
  Delta EG (m)               7.16    Culv Entr Loss (m)         2.57
  Delta WS (m)               7.23    Q Weir (m3/s)
  E.G. IC (m)                        Weir Sta Lft (m)           0.00
  E.G. OC (m)                        Weir Sta Rgt (m)           8.00
  Culvert Control          Outlet    Weir Submerg               0.00
  Culv WS Inlet (m)         61.18    Weir Max Depth (m)         0.24
  Culv WS Outlet (m)        59.04    Weir Avg Depth (m)         0.24
  Culv Nml Depth (m)                 Weir Flow Area (m2)        1.95
  Culv Crt Depth (m)         1.41    Min El Weir Flow (m)      63.00


Note:    During supercritical analysis, the culvert direct step method went to normal depth.  The program
         then assumed normal depth at the outlet.
Note:    During the supercritical calculations a hydraulic jump occurred inside of the culvert.

CROSS SECTION


RIVER: pipe2
REACH: two                RS: 10.1

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    61.5       3    61.5       3   57.37       5   57.37       5    61.5
       8    61.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       3    .013       5    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             3       5                1       1       1             .1       .3

CROSS SECTION OUTPUT  Profile #100 year

  E.G. Elev (m)            60.88    Element                  Left OB    Channel   Right OB
  Vel Head (m)              0.07    Wt. n-Val.                          0.013
  W.S. Elev (m)            60.81    Reach Len. (m)             1.00      1.00       1.00
  Crit W.S. (m)                     Flow Area (m2)                       6.88
  E.G. Slope (m/m)      0.000315    Area (m2)                            6.88
  Q Total (m3/s)            7.92    Flow (m3/s)                          7.92
  Top Width (m)             2.00    Top Width (m)                        2.00
  Vel Total (m/s)           1.15    Avg. Vel. (m/s)                      1.15
  Max Chl Dpth (m)          3.44    Hydr. Depth (m)                      3.44
  Conv. Total (m3/s)       446.5    Conv. (m3/s)                        446.5
  Length Wtd. (m)           1.00    Wetted Per. (m)                      8.88
  Min Ch El (m)            57.37    Shear (N/m2)                         2.39
  Alpha                     1.00    Stream Power (N/m s)                 2.75
  Frctn Loss (m)            0.00    Cum Volume (1000 m3)                 1.73
  C & E Loss (m)            0.01    Cum SA (1000 m2)                     0.50


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: pipe2
REACH: two RS: 10

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	61.5	2	61.5	2	57.12	6	57.12	6	61.5
8	61.5								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	2	.013	6	.013

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
2	6	32	32	32	.1	.3

CROSS SECTION OUTPUT Profile #100 year

			Left OB	Channel	Right OB
E.G. Elev (m)	60.87	Element			
Vel Head (m)	0.02	Wt. n-Val.		0.013	
W.S. Elev (m)	60.84	Reach Len. (m)	32.00	32.00	32.00
Crit W.S. (m)	57.99	Flow Area (m2)		14.88	
E.G. Slope (m/m)	0.000057	Area (m2)		14.88	
Q Total (m3/s)	10.28	Flow (m3/s)		10.28	
Top Width (m)	4.00	Top Width (m)		4.00	
Vel Total (m/s)	0.69	Avg. Vel. (m/s)		0.69	
Max Chl Dpth (m)	3.72	Hydr. Depth (m)		3.72	
Conv. Total (m3/s)	1364.2	Conv. (m3/s)		1364.2	
Length Wtd. (m)	32.00	Wetted Per. (m)		11.44	
Min Ch El (m)	57.12	Shear (N/m2)		0.72	
Alpha	1.00	Stream Power (N/m s)		0.50	
Frctn Loss (m)		Cum Volume (1000 m3)		1.72	
C & E Loss (m)		Cum SA (1000 m2)		0.50	

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

CULVERT

RIVER: pipe2
REACH: two RS: 9.5

INPUT
Description:
Distance from Upstream XS = .5
Deck/Roadway Width = 31
Weir Coefficient = 1.44
Upstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	61.5		8	61.5	

Upstream Bridge Cross Section Data
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	61.5	2	61.5	2	57.12	6	57.12	6	61.5
8	61.5								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	2	.013	6	.013

Bank Sta: Left	Right	Coeff Contr.	Expan.
2	6	.1	.3

Downstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	61		8	61	

Downstream Bridge Cross Section Data
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	61	2	61	2	56.91	6	56.91	6	61
8	61								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	2	.013	6	.013

Bank Sta: Left	Right	Coeff Contr.	Expan.
2	6	.1	.3

```
Upstream Embankment side slope              =       0 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
  ximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins         =    61.5
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    1.67
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
                .5      31     .013     .013        0                .6                 1
Number of Barrels =  2
Upstream   Elevation =  57.12
Centerline Stations
    Sta.    Sta.
    3.09    4.91
Downstream Elevation =  56.91
Centerline Stations
    Sta.    Sta.
    3.09    4.91

CULVERT OUTPUT  Profile #100 year  Culv Group:  Culvert #1

  Q Culv Group (m3/s)      10.28    Culv Full Len (m)        31.00
  # Barrels                    2    Culv Vel US (m/s)         2.35
  Q Barrel (m3/s)           5.14    Culv Vel DS (m/s)         2.35
  E.G. US. (m)             60.87    Culv Inv El Up (m)       57.12
  W.S. US. (m)             60.84    Culv Inv El Dn (m)       56.91
  E.G. DS (m)              60.35    Culv Frctn Ls (m)         0.09
  W.S. DS (m)              60.32    Culv Exit Loss (m)        0.25
  Delta EG (m)              0.51    Culv Entr Loss (m)        0.17
  Delta WS (m)              0.52    Q Weir (m3/s)
  E.G. IC (m)              58.96    Weir Sta Lft (m)
  E.G. OC (m)              60.87    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)        58.79    Weir Max Depth (m)
  Culv WS Outlet (m)       58.58    Weir Avg Depth (m)
  Culv Nml Depth (m)                Weir Flow Area (m2)
  Culv Crt Depth (m)        1.15    Min El Weir Flow (m)     61.50


CROSS SECTION


RIVER: pipe2
REACH: two                RS: 9.1

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0      61       2      61       2   56.91       6   56.91       6      61
       8      61

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       2    .013       6    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             2       6                1       1       1             .1       .3

CROSS SECTION OUTPUT  Profile #100 year

  E.G. Elev (m)            60.35    Element                  Left OB    Channel   Right OB
  Vel Head (m)              0.03    Wt. n-Val.                          0.013
  W.S. Elev (m)            60.32    Reach Len. (m)             1.00      1.00       1.00
  Crit W.S. (m)                     Flow Area (m2)                      13.66
  E.G. Slope (m/m)       0.000070   Area (m2)                           13.66
  Q Total (m3/s)           10.28    Flow (m3/s)                         10.28
  Top Width (m)             4.00    Top Width (m)                        4.00
  Vel Total (m/s)           0.75    Avg. Vel. (m/s)                      0.75
  Max Chl Dpth (m)          3.41    Hydr. Depth (m)                      3.41
  Conv. Total (m3/s)       1226.1   Conv. (m3/s)                       1226.1
  Length Wtd. (m)           1.00    Wetted Per. (m)                     10.83
  Min Ch El (m)            56.91    Shear (N/m2)                         0.87
  Alpha                     1.00    Stream Power (N/m s)                 0.65
  Frctn Loss (m)            0.00    Cum Volume (1000 m3)                 1.27
  C & E Loss (m)            0.00    Cum SA (1000 m2)                     0.37


CROSS SECTION
```

```
RIVER: pipe2
REACH: two                RS: 9

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0      61       2      61       2   56.91       6   56.91       6      61
       8      61

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       2    .013       6    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             2       6               91      91      91              .1       .3

CROSS SECTION OUTPUT  Profile #100 year

  E.G. Elev (m)            60.35    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.03    Wt. n-Val.                         0.013
  W.S. Elev (m)            60.32    Reach Len. (m)           91.00     91.00      91.00
  Crit W.S. (m)            57.78    Flow Area (m2)                     13.66
  E.G. Slope (m/m)      0.000070    Area (m2)                          13.66
  Q Total (m3/s)           10.28    Flow (m3/s)                        10.28
  Top Width (m)             4.00    Top Width (m)                       4.00
  Vel Total (m/s)           0.75    Avg. Vel. (m/s)                     0.75
  Max Chl Dpth (m)          3.41    Hydr. Depth (m)                     3.41
  Conv. Total (m3/s)      1226.1    Conv. (m3/s)                      1226.1
  Length Wtd. (m)          91.00    Wetted Per. (m)                    10.83
  Min Ch El (m)            56.91    Shear (N/m2)                        0.87
  Alpha                     1.00    Stream Power (N/m s)                0.65
  Frctn Loss (m)                    Cum Volume (1000 m3)                1.25
  C & E Loss (m)                    Cum SA (1000 m2)                    0.36


CULVERT


RIVER: pipe2
REACH: two                RS: 8.5

INPUT
Description:
Distance from Upstream XS =      .5
Deck/Roadway Width        =      90
Weir Coefficient          =    1.44
Upstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0      61               8      61

Upstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0      61       2      61       2   56.91       6   56.91       6      61
       8      61

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       2    .013       6    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
             2       6             .1       .3

Downstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0      60               8      60

Downstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0      60       2      60       2   56.17       6   56.17       6      60
       8      60

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       2    .013       6    .013

 Bank Sta: Left   Right    Coeff Contr.   Expan.
             2       6             .1       .3

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 =     .95
Elevation at which weir flow begins         =      61
Energy head used in spillway design         =
Spillway height used in design              =
```

Weir crest shape = Broad Crested

:mber of Culverts = 1

Culvert Name	Shape	Rise	Span
Culvert #1	Circular	1.67	

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
	.5	90	.013	.013	0	.6	1

Number of Barrels = 2
Upstream Elevation = 56.91
Centerline Stations

Sta.	Sta.
3.09	4.91

Downstream Elevation = 56.17
Centerline Stations

Sta.	Sta.
3.09	4.91

CULVERT OUTPUT Profile #100 year Culv Group: Culvert #1

Q Culv Group (m3/s)	10.28	Culv Full Len (m)	90.00
# Barrels	2	Culv Vel US (m/s)	2.35
Q Barrel (m3/s)	5.14	Culv Vel DS (m/s)	2.35
E.G. US. (m)	60.35	Culv Inv El Up (m)	56.91
W.S. US. (m)	60.32	Culv Inv El Dn (m)	56.17
E.G. DS (m)	59.66	Culv Frctn Ls (m)	0.27
W.S. DS (m)	59.64	Culv Exit Loss (m)	0.25
Delta EG (m)	0.69	Culv Entr Loss (m)	0.17
Delta WS (m)	0.69	Q Weir (m3/s)	
E.G. IC (m)	58.75	Weir Sta Lft (m)	
E.G. OC (m)	60.35	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	58.58	Weir Max Depth (m)	
Culv WS Outlet (m)	57.84	Weir Avg Depth (m)	
Culv Nml Depth (m)		Weir Flow Area (m2)	
Culv Crt Depth (m)	1.15	Min El Weir Flow (m)	61.00

ROSS SECTION

RIVER: pipe2
REACH: two RS: 8

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	60	2	60	2	56.17	6	56.17	6	60
8	60								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	2	.013	6	.013

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
2	6	0	0	0	.1	.3

CROSS SECTION OUTPUT Profile #100 year

			Left OB	Channel	Right OB
E.G. Elev (m)	59.66	Element			
Vel Head (m)	0.03	Wt. n-Val.		0.013	
W.S. Elev (m)	59.64	Reach Len. (m)	0.00	0.00	0.00
Crit W.S. (m)		Flow Area (m2)		13.86	
E.G. Slope (m/m)	0.000068	Area (m2)		13.86	
Q Total (m3/s)	10.28	Flow (m3/s)		10.28	
Top Width (m)	4.00	Top Width (m)		4.00	
Vel Total (m/s)	0.74	Avg. Vel. (m/s)		0.74	
Max Chl Dpth (m)	3.47	Hydr. Depth (m)		3.47	
Conv. Total (m3/s)	1249.3	Conv. (m3/s)		1249.3	
Length Wtd. (m)	0.00	Wetted Per. (m)		10.93	
Min Ch El (m)	56.17	Shear (N/m2)		0.84	
Alpha	1.00	Stream Power (N/m s)		0.62	
Frctn Loss (m)	0.00	Cum Volume (1000 m3)			
C & E Loss (m)	0.00	Cum SA (1000 m2)			

ROSS SECTION

RIVER: pipe2
REACH: one RS: 7

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	60	1	60	1	56	12	56	12	60
13	60								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	1	.013	12	.013

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1	12	102	102	102	.1	.3

CROSS SECTION OUTPUT Profile #100 year

E.G. Elev (m)	59.66	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.013	
W.S. Elev (m)	59.63	Reach Len. (m)	102.00	102.00	102.00
Crit W.S. (m)	56.98	Flow Area (m2)		39.90	
E.G. Slope (m/m)	0.000042	Area (m2)		39.90	
Q Total (m3/s)	33.44	Flow (m3/s)		33.44	
Top Width (m)	11.00	Top Width (m)		11.00	
Vel Total (m/s)	0.84	Avg. Vel. (m/s)		0.84	
Max Chl Dpth (m)	3.63	Hydr. Depth (m)		3.63	
Conv. Total (m3/s)	5169.0	Conv. (m3/s)		5169.0	
Length Wtd. (m)	102.00	Wetted Per. (m)		18.25	
Min Ch El (m)	56.00	Shear (N/m2)		0.90	
Alpha	1.00	Stream Power (N/m s)		0.75	
Frctn Loss (m)		Cum Volume (1000 m3)		4.59	
C & E Loss (m)		Cum SA (1000 m2)		1.12	

CULVERT

RIVER: pipe2
REACH: one RS: 6.5

INPUT
Description:
Distance from Upstream XS = .5
Deck/Roadway Width = 101
Weir Coefficient = 1.44
Upstream Deck/Roadway Coordinates
num= 2

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	60	13	60

Upstream Bridge Cross Section Data
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	60	1	60	1	56	12	56	12	60
13	60								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	1	.013	12	.013

Bank Sta: Left	Right	Coeff Contr.	Expan.
1	12	.1	.3

Downstream Deck/Roadway Coordinates
num= 2

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	59.5	13	59.5

Downstream Bridge Cross Section Data
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	59.5	1	59.5	1	54.7	12	54.7	12	59.5
13	59.5								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	1	.013	12	.013

Bank Sta: Left	Right	Coeff Contr.	Expan.
1	12	.1	.3

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 = .95
Elevation at which weir flow begins = 60
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	Pipe Arch	2.8699	4.72

```
FHWA Chart # 34- 18 inch corner radius; Corrugated metal
FHWA Scale # 1 - 90 Degree headwall
  lution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                .5     101     .024     .024        0                .6                 1
Number of Barrels =  2
Upstream   Elevation =  56
Centerline Stations
    Sta.    Sta.
       4       9
Downstream Elevation =  54.7
Centerline Stations
    Sta.    Sta.
       4       9

CULVERT OUTPUT  Profile #100 year  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       33.44    Culv Full Len (m)        101.00
  # Barrels                     2    Culv Vel US (m/s)          1.62
  Q Barrel (m3/s)           16.72    Culv Vel DS (m/s)          1.62
  E.G. US. (m)              59.66    Culv Inv El Up (m)        56.00
  W.S. US. (m)              59.63    Culv Inv El Dn (m)        54.70
  E.G. DS (m)               59.28    Culv Frctn Ls (m)          0.19
  W.S. DS (m)               59.26    Culv Exit Loss (m)         0.11
  Delta EG (m)               0.38    Culv Entr Loss (m)         0.08
  Delta WS (m)               0.37    Q Weir (m3/s)
  E.G. IC (m)               57.85    Weir Sta Lft (m)
  E.G. OC (m)               59.66    Weir Sta Rgt (m)
  Culvert Control          Outlet    Weir Submerg
  Culv WS Inlet (m)         58.87    Weir Max Depth (m)
  Culv WS Outlet (m)        57.57    Weir Avg Depth (m)
  Culv Nml Depth (m)                 Weir Flow Area (m2)
  Culv Crt Depth (m)         1.25    Min El Weir Flow (m)      60.00


CROSS SECTION


RIVER: pipe2
REACH: one                RS: 6

 INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    59.5       1    59.5       1    54.7      12    54.7      12    59.5
      13    59.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       1    .013      12    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             1      12               0       0       1             .1       .3

CROSS SECTION OUTPUT  Profile #100 year

  E.G. Elev (m)             59.28    Element                 Left OB    Channel   Right OB
  Vel Head (m)               0.02    Wt. n-Val.                         0.013
  W.S. Elev (m)             59.26    Reach Len. (m)            0.00      0.00       0.00
  Crit W.S. (m)                      Flow Area (m2)                     50.13
  E.G. Slope (m/m)       0.000022    Area (m2)                          50.13
  Q Total (m3/s)            33.44    Flow (m3/s)                        33.44
  Top Width (m)             11.00    Top Width (m)                      11.00
  Vel Total (m/s)            0.67    Avg. Vel. (m/s)                     0.67
  Max Chl Dpth (m)           4.56    Hydr. Depth (m)                     4.56
  Conv. Total (m3/s)       7087.9    Conv. (m3/s)                      7087.9
  Length Wtd. (m)            0.00    Wetted Per. (m)                    20.11
  Min Ch El (m)             54.70    Shear (N/m2)                        0.54
  Alpha                      1.00    Stream Power (N/m s)                0.36
  Frctn Loss (m)             0.00    Cum Volume (1000 m3)
  C & E Loss (m)             0.00    Cum SA (1000 m2)


CROSS SECTION


RIVER: pipe3
REACH: two                RS: 17

 INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0      78       3      78       3   76.49       5   76.49       5      78
       8      78

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
```

```
      0    .013       3    .013       5    .013

  nk Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            3       5              190     190     190             .1       .3

CROSS SECTION OUTPUT  Profile #100 year

  E.G. Elev (m)            77.44    Element                  Left OB    Channel   Right OB
  Vel Head (m)              0.01    Wt. n-Val.                          0.013
  W.S. Elev (m)            77.43    Reach Len. (m)          190.00     190.00     190.00
  Crit W.S. (m)            76.74    Flow Area (m2)                       1.89
  E.G. Slope (m/m)      0.000075    Area (m2)                            1.89
  Q Total (m3/s)            0.78    Flow (m3/s)                          0.78
  Top Width (m)             2.00    Top Width (m)                        2.00
  Vel Total (m/s)           0.41    Avg. Vel. (m/s)                      0.41
  Max Chl Dpth (m)          0.95    Hydr. Depth (m)                      0.95
  Conv. Total (m3/s)        89.8    Conv. (m3/s)                         89.8
  Length Wtd. (m)         190.00    Wetted Per. (m)                      3.89
  Min Ch El (m)            76.49    Shear (N/m2)                         0.36
  Alpha                     1.00    Stream Power (N/m s)                 0.15
  Frctn Loss (m)                    Cum Volume (1000 m3)                 1.59
  C & E Loss (m)                    Cum SA (1000 m2)                     1.17


CULVERT


RIVER: pipe3
REACH: two                RS: 16.8

INPUT
Description:
Distance from Upstream XS =       .5
Deck/Roadway Width        =     189
Weir Coefficient          =    1.44
Upstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0      78               8      78

 ostream Bridge Cross Section Data
 .ation Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0      78       3      78       3   76.49       5   76.49       5      78
       8      78

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       3    .013       5    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
            3       5             .1       .3

Downstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0      75               8      75

Downstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0      75       3      75       3   73.34       5   73.34       5      75
       8      75

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       3    .013       5    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
            3       5             .1       .3

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 =     .95
Elevation at which weir flow begins         =      78
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

 'umber of Culverts =  1

 Culvert Name     Shape      Rise    Span
 Culvert #1      Circular     .76
 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
                  .5     189     .013     .013        0                  .6                 1
 Upstream   Elevation =  76.49
```

Centerline Station = 4
Downstream Elevation = 73.34
Centerline Station = 4

CULVERT OUTPUT Profile #100 year Culv Group: Culvert #1

Q Culv Group (m3/s)	0.78	Culv Full Len (m)	40.53
# Barrels	1	Culv Vel US (m/s)	2.24
Q Barrel (m3/s)	0.78	Culv Vel DS (m/s)	1.72
E.G. US. (m)	77.44	Culv Inv El Up (m)	76.49
W.S. US. (m)	77.43	Culv Inv El Dn (m)	73.34
E.G. DS (m)	74.59	Culv Frctn Ls (m)	2.55
W.S. DS (m)	74.59	Culv Exit Loss (m)	0.15
Delta EG (m)	2.85	Culv Entr Loss (m)	0.15
Delta WS (m)	2.85	Q Weir (m3/s)	
E.G. IC (m)	77.38	Weir Sta Lft (m)	
E.G. OC (m)	77.44	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	77.04	Weir Max Depth (m)	
Culv WS Outlet (m)	74.10	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.39	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.55	Min El Weir Flow (m)	78.00

CROSS SECTION

RIVER: pipe3
REACH: two RS: 16.51

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	75	3	75	3	73.34	5	73.34	5	75
8	75								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	3	.013	5	.013

Bnk Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
3	5	1	1	1	.1	.3

CROSS SECTION OUTPUT Profile #100 year

E.G. Elev (m)	74.59	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.013	
W.S. Elev (m)	74.59	Reach Len. (m)	1.00	1.00	1.00
Crit W.S. (m)		Flow Area (m2)		2.50	
E.G. Slope (m/m)	0.000036	Area (m2)		2.50	
Q Total (m3/s)	0.78	Flow (m3/s)		0.78	
Top Width (m)	2.00	Top Width (m)		2.00	
Vel Total (m/s)	0.31	Avg. Vel. (m/s)		0.31	
Max Chl Dpth (m)	1.25	Hydr. Depth (m)		1.25	
Conv. Total (m3/s)	129.9	Conv. (m3/s)		129.9	
Length Wtd. (m)	1.00	Wetted Per. (m)		4.50	
Min Ch El (m)	73.34	Shear (N/m2)		0.20	
Alpha	1.00	Stream Power (N/m s)		0.06	
Frctn Loss (m)	0.00	Cum Volume (1000 m3)		1.17	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.79	

CROSS SECTION

RIVER: pipe3
REACH: two RS: 16.5

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	75	3	75	3	73.34	5	73.34	5	75
8	75								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	3	.013	5	.013

Bnk Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
3	5	243	243	243	.1	.3

CROSS SECTION OUTPUT Profile #100 year

E.G. Elev (m)	74.59	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.013	
W.S. Elev (m)	74.57	Reach Len. (m)	243.00	243.00	243.00
Crit W.S. (m)	73.73	Flow Area (m2)		2.47	

```
  E.G. Slope (m/m)       0.000149    Area (m2)                          2.47
  Q Total (m3/s)            1.56     Flow (m3/s)                        1.56
  Top Width (m)             2.00     Top Width (m)                      2.00
  Vel Total (m/s)           0.63     Avg. Vel. (m/s)                    0.63
  Max Chl Dpth (m)          1.23     Hydr. Depth (m)                    1.23
  Conv. Total (m3/s)       127.6     Conv. (m3/s)                      127.6
  Length Wtd. (m)         243.00     Wetted Per. (m)                    4.47
  Min Ch El (m)            73.34     Shear (N/m2)                       0.81
  Alpha                     1.00     Stream Power (N/m s)               0.51
  Frctn Loss (m)                     Cum Volume (1000 m3)               1.17
  C & E Loss (m)                     Cum SA (1000 m2)                   0.79


CULVERT


RIVER: pipe3
REACH: two                RS: 16.2

INPUT
Description:
Distance from Upstream XS =      .5
Deck/Roadway Width        =     242
Weir Coefficient          =    1.44
Upstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0      75               8      75

Upstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0      75       3      75       3   73.34       5   73.34       5      75
       8      75                                       .

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       3    .013       5    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
             3       5             .1       .3

Downstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0    72.5               8    72.5

Downstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    72.5       3    72.5       3   70.69       5   70.69       5    72.5
       8    72.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       3    .013       5    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
             3       5             .1       .3

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 =     .95
Elevation at which weir flow begins         =      75
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     .91
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
                 .5     242     .013     .013        0                   .6                1
Upstream   Elevation =  73.34
           Centerline Station =  4
Downstream Elevation =  70.69
           Centerline Station =  4

CULVERT OUTPUT  Profile #100 year  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       1.56    Culv Full Len (m)       242.00
  # Barrels                    1    Culv Vel US (m/s)         2.40
  Q Barrel (m3/s)           1.56    Culv Vel DS (m/s)         2.40
  E.G. US. (m)             74.59    Culv Inv El Up (m)       73.34
  W.S. US. (m)             74.57    Culv Inv El Dn (m)       70.69
```

E.G. DS (m)	72.44	Culv Frctn Ls (m)	1.82
W.S. DS (m)	72.43	Culv Exit Loss (m)	0.28
Delta EG (m)	2.15	Culv Entr Loss (m)	0.18
Delta WS (m)	2.14	Q Weir (m3/s)	
E.G. IC (m)	74.70	Weir Sta Lft (m)	
E.G. OC (m)	74.59	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	74.25	Weir Max Depth (m)	
Culv WS Outlet (m)	71.60	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.62	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.73	Min El Weir Flow (m)	75.00

CROSS SECTION

RIVER: pipe3
REACH: two RS: 16.1

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	72.5	3	72.5	3	70.69	5	70.69	5	72.5
8	72.5								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	3	.013	5	.013

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
3	5	1	1	1	.1	.3

CROSS SECTION OUTPUT Profile #100 year

E.G. Elev (m)	72.44	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.013	
W.S. Elev (m)	72.43	Reach Len. (m)	1.00	1.00	1.00
Crit W.S. (m)		Flow Area (m2)		3.48	
E.G. Slope (m/m)	0.000062	Area (m2)		3.48	
Q Total (m3/s)	1.56	Flow (m3/s)		1.56	
Top Width (m)	2.00	Top Width (m)		2.00	
Vel Total (m/s)	0.45	Avg. Vel. (m/s)		0.45	
Max Chl Dpth (m)	1.74	Hydr. Depth (m)		1.74	
Conv. Total (m3/s)	198.0	Conv. (m3/s)		198.0	
Length Wtd. (m)	1.00	Wetted Per. (m)		5.48	
Min Ch El (m)	70.69	Shear (N/m2)		0.39	
Alpha	1.00	Stream Power (N/m s)		0.17	
Frctn Loss (m)	0.00	Cum Volume (1000 m3)		0.44	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.31	

CROSS SECTION

RIVER: pipe3
REACH: two RS: 16

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	72.5	3	72.5	3	70.69	5	70.69	5	72.5
8	72.5								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	3	.013	5	.013

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
3	5	152	152	152	.1	.3

CROSS SECTION OUTPUT Profile #100 year

E.G. Elev (m)	72.44	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.013	
W.S. Elev (m)	72.41	Reach Len. (m)	152.00	152.00	152.00
Crit W.S. (m)	71.24	Flow Area (m2)		3.44	
E.G. Slope (m/m)	0.000178	Area (m2)		3.44	
Q Total (m3/s)	2.60	Flow (m3/s)		2.60	
Top Width (m)	2.00	Top Width (m)		2.00	
Vel Total (m/s)	0.76	Avg. Vel. (m/s)		0.76	
Max Chl Dpth (m)	1.72	Hydr. Depth (m)		1.72	
Conv. Total (m3/s)	195.0	Conv. (m3/s)		195.0	
Length Wtd. (m)	152.00	Wetted Per. (m)		5.44	
Min Ch El (m)	70.69	Shear (N/m2)		1.10	
Alpha	1.00	Stream Power (N/m s)		0.83	
Frctn Loss (m)		Cum Volume (1000 m3)		0.44	
C & E Loss (m)		Cum SA (1000 m2)		0.30	

```
CULVERT

RIVER: pipe3
REACH: two                    RS: 15.5

INPUT
Description:
Distance from Upstream XS =       .5
Deck/Roadway Width        =      151
Weir Coefficient          =     1.44
Upstream  Deck/Roadway Coordinates
    num=        2
     Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord
       0    72.5                8    72.5

Upstream Bridge Cross Section Data
Station Elevation Data    num=        6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    72.5       3    72.5       3   70.69       5   70.69       5    72.5
       8    72.5

Manning's n Values        num=        3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       3    .013       5    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
             3       5             .1       .3

Downstream  Deck/Roadway Coordinates
    num=        2
     Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord
       0      67                8      67

Downstream Bridge Cross Section Data
Station Elevation Data    num=        6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0      67       3      67       3   65.19       5   65.19       5      67
       8      67

Manning's n Values        num=        3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       3    .013       5    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
             3       5             .1       .3

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 =     .95
Elevation at which weir flow begins         =    72.5
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   1.066
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
                .5     151     .013     .013        0                  .6                 1
Upstream   Elevation =  70.69
           Centerline Station =  4
Downstream Elevation =  65.19
           Centerline Station =  4

CULVERT OUTPUT  Profile #100 year  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       2.60    Culv Full Len (m)         3.96
  # Barrels                    1    Culv Vel US (m/s)         2.91
  Q Barrel (m3/s)           2.60    Culv Vel DS (m/s)         2.91
  E.G. US. (m)             72.44    Culv Inv El Up (m)       70.69
  W.S. US. (m)             72.41    Culv Inv El Dn (m)       65.19
  E.G. DS (m)              66.43    Culv Frctn Ls (m)         5.39
  W.S. DS (m)              66.37    Culv Exit Loss (m)        0.37
  Delta EG (m)              6.01    Culv Entr Loss (m)        0.26
  Delta WS (m)              6.04    Q Weir (m3/s)
  E.G. IC (m)              72.49    Weir Sta Lft (m)
  E.G. OC (m)              72.44    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)        71.76    Weir Max Depth (m)
  Culv WS Outlet (m)       66.26    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.52    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.90    Min El Weir Flow (m)     72.50
```