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Narrative

As discussed with ODOT, prior to the Preferred Alternative Verification Review (PAVR), culverts located under high fill[1] are to be increased in size. The increased size is the design size plus two additional sizes. This will allow a liner with a field paved invert to be inserted into it at a later date. Since a liner will be installed at the high fill locations, traffic on the roadway above the culvert can be maintained with minimal interruption when a new culvert is installed.

Currently there are no oversized storm sewers in this section of the project.

On June 23, 2005, the County Engineer requested that a copy of the LD-33 form be submitted to him at the Stage 1 Review. Therefore the LD-33 form has not yet been approved by the County Engineer. A copy of the form and calculations is attached in the Appendix.

For this Phase of the project the BMP's used are:
Exfiltration trenches and vegetative ditches as described in L&D Volume 2, section 1118. The BMP ditch calculations show required widths.

The SR 335 bridge over the Little Scioto River falls within FEMA flood zone A.

Hydraulic analysis for inlet spacing, storm sewers, culverts and ditches were done using ODOT CDSS Version 1.0.0.3.

The Report is organized as follows:

Appendix A contains all the LD-35 Drainage Criteria submitted to ODOT in July 2005

Appendix B contains all the Inlet Spacing Calculations

Appendix C contains the Storm Sewer Calculations

Appendix D contains Culverts Analysis

Appendix E contains Ditch Calculations

Appendix F contains the BMP Exfiltration Trench calculations and Ditch BMP calculations

Appendix G contains LD-33 Form

[1] (high is fill greater than or equal to 30')

APPENDIX A

LD-35, Drainage Criteria

Form LD-35
Revised April 2005

GENERAL PROJECT INFORMATION

County	Route	Section
Scioto	SR 823 (Attach Typical Section)	0.00

AFFECTED ROADWAYS:	Route	Average Daily Traffic	Rural / Urban
INTERSTATE OR OTHER L/A FACILITIES	SCI 823	21,200 (2008)	Rural
ARTERIALS AND COLLECTORS	U.S. 52, U.S. 23, S.R. 140		
LOCALS	Shumway-Hollow Rd Stout Hollow Road		
CLEAR ZONE	30'		

All Units are English: Yes

PIPE POLICY:

The Pipe Policy of ODOT will be used for this project. (See Section 1002 for additional information)

If a policy other than ODOT's is being used, the following material types are permitted:

(Please attach a copy of the written pipe policy. In lieu of a written policy, documentation of locally funded construction practices may be provided)

PROJECT SPECIFIC INFORMATION AFFECTING DRAINAGE:

Section A. Roadway Culverts (Type A Conduits)

1. DESIGN STORM FREQUENCY (1004.2):

   a. Mainline 50 Year

   b. Crossroads 25 Year

2. BANKFULL DESIGN (Yes) No (Circle yes if at least one culvert has bankfull design) *attach a list of culverts with bankfull designs*

3. FLOOD PLAIN CULVERT(S) NEEDED? (Yes) No (Circle yes if at least one culvert has flood plain culverts) *attach a list of culverts with flood plain culverts*

4. DURABILITY SERVICE LIFE 75 Year *attach a list of culverts with their durability service life if multiple culverts have different frequencies.*

5. ABRASIVE SITE? Yes (No) (Circle yes if at least one culvert has an abrasive site) *attach a list of culverts with their abrasive site assumptions if multiple culverts are different*

6. MAXIMUM ALLOWABLE HEADWATER FOR DESIGN STORM (1006.2):

   a. 2' below eop if drainage area >1000acres, 1' below eop if drainage area < 1000acres.

   b. 2' above crown in flat terrain, 4' above crown in a ravine.

   c.

7. METHOD USED TO ESTIMATE DESIGN DISCHARGE (Q) (1003):

   a. U.S.G.S. Rural Equations for areas ≥6acres.

   b. Rational Method for areas < 6 acres.

8. SCALE OF TOPOGRAPHIC MAPPING USED TO DELINEATE DRAINAGE AREAS (1101.1):

   a. 24,000:1

   b.

   c.

9. MANNING'S "n" USED FOR (1105.5.5):

   a. Smooth pipe 0.012

   b. Corrugated pipe:

2-$^{2}/_{3}$" x $^{1}/_{2}$":	Full flow	0.025
3" x 1":	Full flow	0.025
6" x 2":	Full flow	0.025

Section A. Roadway Culverts - Continued

10. ENTRANCE LOSS COEFFICIENT (k_e) (1105.5.6, table 1105-1):

    a. Corrugated pipe: HW-4 Headwall 0.9 Full Headwall 0.25

    b. Smooth Concrete pipe HW-4 Headwall 0.2 Full Headwall 0.25

    d. Box Shape Full Headwall 0.2

11. MINIMUM COVER (top of pipe to subgrade) FOR (1008):

    a. Rigid pipe ODOT L&D Vol. 2 Sec. 1008.2.2

    b. Flexible pipe ODOT L&D Vol. 2 Sec. 1008.1.4

12. MAXIMUM COVER FOR (1008):

    a. Rigid pipe ODOT L&D Vol. 2 Sec. 1008.1.4

    b. Flexible pipe ODOT L&D Vol. 2 Sec. 1008.1.4

13. MAXIMUM ALLOWABLE CULVERT OUTLET VELOCITY (1002.2.2) :

    a. Bare earth channel 2fps

    b. Rock channel protection 6-20fps

    c. Use Energy Dissapators for velocities in excess of 20 f.p.s.

14. HEADWALL TYPE (1106.2):

    a. Hw-1.1

    b. HW-2.1 or HW-2.2

15. CONTACT WILL BE MADE WITH COUNTY ENGINEER TO ESTABLISH:

    a. Floodplain Issues

    b. Farm tiles

16. MINIMUM PIPE SIZE (1002.3.1, Figure 1002-1) :

    a. Freeway or limited access facility 15"

    b. Other highways 12"

Section B. Storm Sewers (Type B & C Conduits)

1. DESIGN FREQUENCY (Just Full) 10 YEAR (1104.4.1)

2. HYDRAULIC GRADIENT SHALL NOT EXCEED (1104.4.2):

   a. 12 inches below edge of pavement for 25 year frequency storm.

   b. Pavement catch basin grate or lip of inlet for 25 year frequency storm.

   c. A point in a depressed pavement sag that would result in an impassible highway for a 25 year frequency storm.

   d. Other: See ODOT L&D Vol. 2 Sec. 1104.4.2

   e. The above is based on:

      i. A pipe roughness "n" = 0.015 for pipe sizes 60" and under and 0.013 for larger sizes.

      ii. _____

3. METHOD USED TO ESTIMATE DESIGN DISCHARGE (Q) (1003):
   a. Rational Method for areas under 6acres.

   b. U.S.G.S. Rural Equations – Report 89-4126 for areas 6acres or greater.

4. COEFFICIENT OF RUNOFF "C" FOR (1101.2.3):

   a. Pavement and paved shoulders 0.9

   b. Berms and slopes (4:1 and flatter) 0.5

   c. Berms and slopes (steeper than 4:1) 0.7

   d. Contributing areas:

      Residential 0.3-0.5 Woods 0.3-0.4 Cultivated 0.3-0.6

5. METHOD USED TO DETERMINE TIME TO FIRST CATCH BASIN OR PAVEMENT INLET (1101.2):

   a. Overland flow plus time in ditch.

   b.

6. MINIMUM TIME TO (1104.4.4):

   a. Ditch catch basin 15 minutes
   b. Pavement inlet or catch basin 10 minutes

Section B. Storm Sewers (Type B & C Conduits) - Continued

7. MINIMUM COVER OVER SEWERS (1104.2.1):

   a. Rigid pipe:

      i. Type B conduit (under pavement or paved shoulder) 9" from top of pipe to bottom of the subgrade

      ii. Type C conduit (beyond pavement or paved shoulder) 18"

   b. Flexible pipe:

      i. Type B conduit (under pavement or paved shoulder) 12"-24" from top of pipe to bottom of the subgrade

      ii. Type C conduit (beyond pavement or paved shoulder) 18"

8. DESIRABLE MINIMUM VELOCITY FOR DESIGN FLOW 3 f.p.s (1104.2.1).

9. MAXIMUM LENGTH BETWEEN MANHOLES OR SUITABLE CLEANOUT POINTS (1104.2.2) :

   a. Under 36"diameter 300'

   b. 36" - 60" diameter 500'

   c. Over 60" diameter 750' to 1000'

10. MINIMUM PIPE SIZE UNDER PAVEMENT (1104.4.6):

   a. Freeway or limited access facility 15"

   b. Other highways 12"

11. PROCEDURE TO FOLLOW WHEN EXISTING PRIVATE DRAINS ARE CUT BY PROPOSED SEWERS OR DITCHES: See Section 1104.2.1 ODOT L&D Vol. 2

Section C. Roadway Ditches

1. METHOD USED TO ESTIMATE DESIGN DISCHARGE (Q) (1003):

   a. Rational Method with minimum Tc for areas under 6 acres.

   b. U.S.G.S. Rural Equations fir areas ≥6 acres.

2. DESIGN FREQUENCY TO DETERMINE (1102.3.1 or 1102.4):

   ADT >2000:

   a. Depth of flow determination ___10___ year

   b. Shear Stress determination (for protection and width of protection) ___5___ year

   ADT <2000:

   c. Depth of flow determination ___5___ year

   d. Shear Stress determination (for protection and width of protection) ___5___ year

3. METHOD USED TO DETERMINE TIME OF FLOW TO DITCH (1101.2):

   ___Overland Flow_____

   _____

3. ALLOWABLE SHEAR STRESS FOR DITCH LINING (1102.3):

   Permanent Ditch Protection:

   a. Seed lining ___0.40___ psf.

   b. Sod or other temporary ditch protection ___1.0___ psf.

   c. Turf Reinforcing Mat (SS836), Type 1 ___2.00___ psf.

   d. Turf Reinforcing Mat (SS836), Type 2 ___3.00___ psf.

   e. Turf Reinforcing Mat (SS836), Type 3 ___5.00___ psf.

   f. RCP, Type B___6___psf.

   g. RCP, Type C___4___ psf.

   h. RCP, Type D___2___ psf.

   Temporary Ditch Protection (Item 670):

   a. Mat, Type A ___1.25___ psf.

   b. Mat, Type B ___1.50___ psf.

   c. Mat, Type C ___2.0___ psf.

   d. Mat, Type E ___2.25___ psf.

   e. Mat, Type F ___0.45___ psf.

f. Mat, Type G 1.75 psf.

4. MANNING'S "n" USED FOR (1102.3):

a. Seed lining 0.03

b. Sod, jute, or other temporary linings 0.04

c. Turf reinforcing mats 0.04

d. Tied Concrete Block Matting 0.021

e. Rock channel protection 0.04-0.06

5. DITCH CONFIGURATION (1102.2):

a. Cut section for roadway, with 18-3/4 inch minimum depth

b. Fill Section for toe of embankment, with 18 inch minimum depth

Section C. Roadway Ditches - Continued

7. TYPE OF DITCH CATCH BASIN (1102.3.4):
   a. 2-2A, 2-2B, 2-3, 2-4, CB-4, CB-5, CB-8, CB-4A, CB-5A, CB-8A, CB-7

8. MINIMUM LONGITUDINAL SLOPE OF DITCHES IN CUT SECTIONS (1102.1):

   a. 0.5% desirable minimum

   b. 0.25% absolute minimum

9. METHOD USED TO LOCATE EXISTING FARM TILE CROSSED BY HIGHWAYS?

   a. Contact with County Engineer

   b.

   c.

   d.

10. MINIMUM WIDTH OF DITCH LININGS (1102.3.1) :

   a. Sod 7.5 ft.

   b. Temporary linings 7.5 ft.

   c. Turf reinforcing mats 7.5 ft.

11. DESIGN FREQUENCY DEPTH SHALL NOT EXCEED (1102.3.1):

   a. 1' below eop for design discharge.

   b. Toe of slope ditch not to overtop ditch bank for design year.

   c.

Section D. Median Ditches

1. DITCH CONFIGURATIONS (1102.3):

   a. Depressed 60' Median

   b. Type of barrier Type A1

2. WIDTH BETWEEN PAVEMENT EDGES Varies 14'5-3/4" to 60' ft.

3. ALLOWABLE SHEAR STRESS FOR DITCH LINING (1102.3):

   Permanent Ditch Protection:

   a. Seed lining 0.40 psf.

   i. Sod or other temporary ditch protection 1.0 psf.

   j. Turf Reinforcing Mat (SS836), Type 1 2.00 psf.

   k. Turf Reinforcing Mat (SS836), Type 2 3.00 psf.

   l. Turf Reinforcing Mat (SS836), Type 3 5.00 psf.

   m. RCP, Type B 6 psf.

   n. RCP, Type C 4 psf.

   o. RCP, Type D 2 psf.

   Temporary Ditch Protection (Item 670):

   g. Mat, Type A 1.25 psf.

   h. Mat, Type B 1.50 psf.

   i. Mat, Type C 2.0 psf.

   j. Mat, Type E 2.25 psf.

   k. Mat, Type F 0.45 psf.

   l. Mat, Type G 1.75 psf.

4. METHOD USED TO ESTIMATE DESIGN DISCHARGE (Q) (1101.2):

   a. Rational Method for areas < 6 acres.

   b. U.S.G.S. Rural Equations for areas ≥6 acres.

5. CATCH BASIN SPACING WILL BE DETERMINED BY HYDRAULIC ANALYSIS USING (1102.3.4):

   a. 5 year frequency and "n" = 0.04 for velocity

   b. 10 year frequency and "n" = 0.04 for depth

   c. Controls:

i. Design frequency depth shall not exceed:

(1) 1' below eop design discharge.

(2)

d. Catch basin spacing, depressed median, fill section:

	Median Width	84'	60'	40'
i.	Desirable maximum	1250'	1000'	800'
ii.	Absolute maximum	1500'	1250'	1000'

5. TYPE OF MEDIAN CATCH BASIN OR INLET (1102.3.4):

a. CB- 4, Inlet No. 3, Single Slope Barrier A1, Inlet No. 3, Single Slope Barrier Type C1.

7. MINIMUM LONGITUDINAL SLOPE OF DEPRESSED EARTH MEDIAN:

0.5% preferred minimum, 0.25% absolute mninum.

Section E. Drainage for Curbed Pavements

1. CONTROLS FOR THE DETERMINATION OF INLET OR CATCH BASIN SPACING (1103):

   a. Design storm frequency ___10___ year

   b. Check storm frequency___50___ year (for underpasses or depressed roadways where the storm sewer is the only outlet)

   c. METHOD USED TO DETERMINE TIME TO FIRST CATCH BASIN OR PAVEMENT INLET:

      i. Overland Flow

      ii. 10 minute minimum.

   d. Maximum spread of flow into traveled lane ___0_____ ft. (table 1103-1)

      Outside lane width greater than 12 feet ___4___ ft.

      Total allowable spread on pavement ___4___ ft.

   e. Maximum depth of flow at curb ____5____ in .

   f. Manning's "n" for:

      i. Reinforced concrete pavement ___.015_____

      ii. Asphaltic concrete pavement ____.015_____

      iii. Paved shoulders ___.015_____

2. TYPE OF INLET OR CATCH BASIN PROPOSED FOR (1103):

   a. Continuous grades ___CB-3, CB-3A, CB-6, Inlet No.4 Type A, B, A1 and B1_____

   b. Sags _CB-3, CB-6, Inlet No.4 Type A, B, A1 and B1_____

4. INLET LIP OF CURB OPENING INLET WILL BE DEPRESSED _____ INCHES BELOW NORMAL GUTTER.

   a. A local depression of ___1/2___ inches will be used to determine spacing of combination grate and curb opening catch basins for a curb pavement section.

   b. A local depression of ___0____ inches will be used to determine spacing of combination grate and curb opening catch basins for a combination curb and gutter section.

Section F. Post Construction Storm Water Management

1. THRESHOLD LIMITS (1115):

   c. Impervious surface width drained in one direction 30 ft.

   d. Project is located within an MS4 area. Yes (No) (Circle answer)

   e. More than 80% of the drained area is discharged through a storm sewer.

      Yes (No) (Circle answer)

   f. Storm water outfall is into a TMDL Regulated Stream.

      Yes (No) (Circle answer)

APPENDIX B

Inlet Spacing Calculations

INLET SPACING DESIGN

PID : 77366 **Date :** 06/04/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : REACH # 1, FROM 58+85.96 & 61+00 TO 59+95.45; CB-3, SR823, 31.5' LT **Designer :** DL

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 12.00 **Allowable Depth (ft.)** 0.48

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
58+85	Begin																		
59+95	CB-3	109.49	0.00	0.00	0.00	0.00	0.00	0.0001	0.0400	0.0160	12.00	0.1670	0.00	******	******	0.29	0.272	6.80	Sag
61+00	Begin																		
59+95	CB-3	104.55	0.00	0.00	0.00	0.00	0.00	0.0001	0.0400	0.0160	12.00	0.1670	0.00	******	******	0.28	0.268	6.71	Sag

INLET SPACING DESIGN

PID : 77366 **Date :** 06/04/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 1, FROM 63+08.83 TO 61+00; CB-3A, SR823, 31.5' LT **Designer :** DL

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 12.00 **Allowable Depth (ft.)** 0.48

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
63+08	Begin																	
61+00	CB-3A	208.83	0.00	0.00	0.00	0.00	0.00	0.0036	0.0160	0.0160	12.00	0.1670	0.00	0.44	0.14	0.58	0.128	7.99

INLET SPACING DESIGN

PID : 77366 **Date :** 06/04/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 2, FROM 112+26.36 TO 118+00; CB-3A, SR823, 43.5' LT **Designer :** DL

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 12.00 **Allowable Depth (ft.)** 0.48

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
112+26	Begin																	
118+00	CB-3A	573.64	0.00	0.00	0.00	0.00	0.00	0.0410	0.0400	0.0160	12.00	0.1670	0.00	1.69	0.61	2.30	0.191	4.79

INLET SPACING DESIGN

PID : 77366 **Date :** 06/04/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 2, FROM 121+02.61 TO 126+00; CB-3A, SR823, 43.5' LT **Designer :** DL

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 12.00 **Allowable Depth (ft.)** 0.48

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
121+02	Begin																	
126+00	CB-3A	497.39	0.00	0.00	0.00	0.00	0.00	0.0223	0.0400	0.0160	12.00	0.1670	0.00	1.48	0.52	2.00	0.204	5.09

INLET SPACING DESIGN

PID : 77366 **Date :** 05/16/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :RH#2, FROM 112+00-120+00-128+50-129+50-140+00 TO 130+15.93; I3D, SR823, 41.7' RT **Designer :** DL

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 12.00 **Allowable Depth (ft.)** 0.48

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
110+00	Begin																		
112+00	I-3D	200.00	0.00	0.00	0.00	0.00	0.00	0.0410	0.0400	0.0160	12.00	0.0670	0.00	0.70	0.13	0.83	0.131	3.27	
120+00	I-3D	800.00	0.00	0.00	0.00	0.00	0.00	0.0410	0.0400	0.0160	12.00	0.0670	0.00	1.71	1.64	3.34	0.220	5.51	
128+50	I-3D	850.00	0.00	0.00	0.00	0.00	0.00	0.0089	0.0400	0.0297	12.00	0.0670	0.00	3.01	2.03	5.04	0.342	8.55	
129+50	I-3D	100.00	0.00	0.00	0.00	0.00	0.00	0.0035	0.0400	0.0360	12.00	0.0670	0.00	2.14	0.33	2.47	0.312	7.80	
130+15	I-3D	65.93	0.00	0.00	0.00	0.00	0.00	0.0010	0.0400	0.0360	12.00	0.0670	0.00	******	******	0.61	0.234	5.84	Sag
140+00	Begin																		
130+15	I-3D	984.07	0.00	0.00	0.00	0.00	0.00	0.0010	0.0400	0.0360	12.00	0.0670	0.00	******	******	4.16	0.480	11.99	Sag

INLET SPACING DESIGN

PID : 77366 **Date :** 05/23/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 16+76.64 TO 13+60; SR140, RHS **Designer :** DL

Rainfall Area: D **Storm Frequency (yr.) :** 5 **Total Allow. Spread (ft.) :** 4.00 **Allowable Depth (ft.)** 0.24

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
16+76	Begin																	
13+60	CB-3	316.64	0.00	0.00	0.00	0.00	0.00	0.0312	0.0833	0.0200	2.00	0.0417	0.00	0.63	0.00	0.63	0.163	1.96

INLET SPACING DESIGN

PID : 77366 **Date :** 12/10/2006 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : REACH # 1, 47+50.94 (US52 RAMP B) TO 96+13.74 (HP), SR 823, LHS **Designer :** RN

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 0.00 **Allowable Depth (ft.)** 0.24

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
47+50	Begin																		
52+00	I-3B	450.00	0.00	0.00	0.00	0.00	0.00	0.0087	0.0400	0.0000	6.00	0.0600	0.00	1.20	0.16	1.36	0.210	5.26	
56+00	I-3B	400.00	0.00	0.00	0.00	0.00	0.00	0.0050	0.0400	0.0000	6.00	0.0600	0.00	0.86	0.00	0.86	0.196	4.90	
59+00	I-3B	300.00	0.00	0.00	0.00	0.00	0.00	0.0033	0.0400	0.0000	6.00	0.0600	0.00	0.25	0.00	0.25	0.134	3.35	
59+95	I-3B	95.00	0.00	0.00	0.00	0.00	0.00	0.0010	0.0400	0.0000	6.00	0.0600	0.00	******	******	0.09	0.114	2.85	Sag
96+13	Begin																		
86+00	I-3B	1013.00	0.00	0.00	0.00	0.00	0.00	0.0401	0.0400	0.0000	6.00	0.0600	0.00	0.70	0.15	0.85	0.132	3.31	
76+00	I-3B	1000.00	0.00	0.00	0.00	0.00	0.00	0.0500	0.0400	0.0000	6.00	0.0600	0.00	0.75	0.24	0.99	0.134	3.36	
71+00	I-3B	500.00	0.00	0.00	0.00	0.00	0.00	0.0380	0.0400	0.0000	6.00	0.0600	0.00	0.59	0.07	0.66	0.122	3.04	
66+00	I-3B	500.00	0.00	0.00	0.00	0.00	0.00	0.0208	0.0400	0.0000	6.00	0.0600	0.00	0.49	0.00	0.49	0.122	3.05	
63+50	I-3B	250.00	0.00	0.00	0.00	0.00	0.00	0.0122	0.0400	0.0000	6.00	0.0600	0.00	0.21	0.00	0.21	0.098	2.45	
61+00	I-3B	250.00	0.00	0.00	0.00	0.00	0.00	0.0036	0.0400	0.0000	6.00	0.0600	0.00	0.21	0.00	0.21	0.123	3.08	
59+95	I-3B	105.00	0.00	0.00	0.00	0.00	0.00	0.0010	0.0400	0.0000	6.00	0.0600	0.00	******	******	0.09	0.114	2.85	End

SUMP DATA

Total Flow (cfs) : 0.18 **Ponded Depth (ft.) :** 0.000 **Spread on Pavement (ft.) :** 0.00

INLET SPACING DESIGN

PID : 77366 **Date :** 12/10/2006 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : REACH # 1, 44+14.11 (US52 RAMP A) TO 96+13.74 (HP), SR 823, RHS **Designer :** RN

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 0.00 **Allowable Depth (ft.)** 0.24

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
44+14	Begin																		
52+00	I-3B	786.00	0.00	0.00	0.00	0.00	0.00	0.0051	0.0400	0.0000	4.00	0.1670	0.00	0.48	0.00	0.48	0.157	3.93	
56+00	I-3B	400.00	0.00	0.00	0.00	0.00	0.00	0.0050	0.0400	0.0000	6.00	0.0600	0.00	0.31	0.00	0.31	0.134	3.35	
59+00	I-3B	300.00	0.00	0.00	0.00	0.00	0.00	0.0033	0.0400	0.0000	6.00	0.1670	0.00	0.25	0.00	0.25	0.134	3.35	
59+95	I-3B	95.00	0.00	0.00	0.00	0.00	0.00	0.0010	0.0400	0.0000	6.00	0.1670	0.00	******	******	0.09	0.114	2.85	Sag
96+13	Begin																		
86+00	I-3B	1013.00	0.00	0.00	0.00	0.00	0.00	0.0401	0.0400	0.0000	6.00	0.1670	0.00	0.85	0.00	0.85	0.132	3.31	
76+00	I-3B	1000.00	0.00	0.00	0.00	0.00	0.00	0.0500	0.0400	0.0000	6.00	0.1670	0.00	0.84	0.00	0.84	0.126	3.16	
71+00	I-3B	500.00	0.00	0.00	0.00	0.00	0.00	0.0380	0.0400	0.0000	6.00	0.1670	0.00	0.42	0.00	0.42	0.103	2.57	
66+00	I-3B	500.00	0.00	0.00	0.00	0.00	0.00	0.0208	0.0400	0.0000	6.00	0.1670	0.00	0.42	0.00	0.42	0.115	2.87	
63+50	I-3B	250.00	0.00	0.00	0.00	0.00	0.00	0.0122	0.0400	0.0000	6.00	0.1670	0.00	0.21	0.00	0.21	0.098	2.45	
61+00	I-3B	250.00	0.00	0.00	0.00	0.00	0.00	0.0036	0.0400	0.0000	6.00	0.1670	0.00	0.21	0.00	0.21	0.123	3.08	
59+95	I-3B	105.00	0.00	0.00	0.00	0.00	0.00	0.0010	0.0400	0.0000	6.00	0.1670	0.00	******	******	0.09	0.114	2.85	End

SUMP DATA

Total Flow (cfs) : 0.18 **Ponded Depth (ft.) :** 0.000 **Spread on Pavement (ft.) :** 0.00

INLET SPACING DESIGN

PID : 77366 **Date :** 12/24/2006 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : REACH # 2, 96+13.74(HP) TO 130+15.93(LP) TO 167+27.78(HP), SR823, LHS **Designer :** RN

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 0.00 **Allowable Depth (ft.)** 0.24

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
96+13	Begin																		
106+00	I-3B	987.00	0.00	0.00	0.00	0.00	0.00	0.0390	0.0400	0.0000	6.00	0.0600	0.00	0.69	0.14	0.83	0.132	3.30	
112+00	I-3B	600.00	0.00	0.00	0.00	0.00	0.00	0.0410	0.0400	0.0000	6.00	0.0600	0.00	0.57	0.07	0.64	0.118	2.96	
120+00	I-3B	800.00	0.00	0.00	0.00	0.00	0.00	0.0410	0.0400	0.0000	6.00	0.0600	0.00	0.63	0.11	0.74	0.125	3.13	
126+00	I-3B	600.00	0.00	0.00	0.00	0.00	0.00	0.0223	0.0400	0.0000	6.00	0.0600	0.00	0.59	0.02	0.61	0.130	3.26	
128+50	I-3B	250.00	0.00	0.00	0.00	0.00	0.00	0.0089	0.0400	0.0000	6.00	0.0600	0.00	0.64	0.00	0.64	0.158	3.95	
129+50	I-3C	100.00	0.00	0.00	0.00	0.00	0.00	0.0035	0.0400	0.0000	6.00	0.0600	0.00	0.35	0.00	0.35	0.150	3.75	
130+16	I-3C	66.00	0.00	0.00	0.00	0.00	0.00	0.0030	0.0400	0.0000	6.00	0.0600	0.00	******	******	0.23	0.132	3.30	Sag
131+64	Begin																		
130+16	I-3C	148.00	0.00	0.00	0.00	0.00	0.00	0.0030	0.0400	0.0000	6.00	0.0600	0.00	******	******	1.10	0.237	5.93	End

SUMP DATA

Total Flow (cfs) : 1.33 **Ponded Depth (ft.) :** 0.123 **Spread on Pavement (ft.) :** 2.46

INLET SPACING DESIGN

PID : 77366 **Date :** 12/24/2006 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : REACH # 2, 96+13.74(HP) TO 130+15.93(LP) TO 167+27.78(HP), SR823, RHS **Designer :** RN

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 0.00 **Allowable Depth (ft.)** 0.24

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
96+13	Begin																		
106+00	I-3B	987.00	0.00	0.00	0.00	0.00	0.00	0.0390	0.0400	0.0000	6.00	0.1670	0.00	0.83	0.00	0.83	0.132	3.30	
112+00	I-3B	600.00	0.00	0.00	0.00	0.00	0.00	0.0410	0.0400	0.0000	6.00	0.1670	0.00	0.50	0.00	0.50	0.108	2.70	
120+00	I-3B	800.00	0.00	0.00	0.00	0.00	0.00	0.0410	0.0400	0.0000	6.00	0.1670	0.00	0.67	0.00	0.67	0.121	3.01	
126+00	I-3B	600.00	0.00	0.00	0.00	0.00	0.00	0.0223	0.0400	0.0000	6.00	0.1670	0.00	0.50	0.00	0.50	0.121	3.03	
128+50	I-3B	250.00	0.00	0.00	0.00	0.00	0.00	0.0089	0.0400	0.0000	6.00	0.1670	0.00	0.21	0.00	0.21	0.104	2.60	
129+50	I-3C	100.00	0.00	0.00	0.00	0.00	0.00	0.0035	0.0400	0.0000	6.00	0.1670	0.00	0.07	0.00	0.07	0.082	2.05	
130+16	I-3C	66.00	0.00	0.00	0.00	0.00	0.00	0.0030	0.0400	0.0000	6.00	0.1670	0.00	******	******	0.04	0.068	1.71	Sag
131+64	Begin																		
130+16	I-3C	148.00	0.00	0.00	0.00	0.00	0.00	0.0030	0.0400	0.0000	6.00	0.1670	0.00	******	******	0.21	0.128	3.20	End

SUMP DATA

Total Flow (cfs) : 0.25 **Ponded Depth (ft.) :** 0.041 **Spread on Pavement (ft.) :** 0.60

INLET SPACING DESIGN

PID : 77366 **Date :** 12/28/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 2, 96+13.37(HP) TO 130+15.93(LP) TO 167+27.78(HP), SR823, LHS **Designer :** MDC

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 0.00 **Allowable Depth (ft.)** 0.22

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
167+27	Begin																		
161+00	I-3C	627.00	0.00	0.00	0.00	0.00	0.00	0.0246	0.0400	0.0000	6.00	0.0600	0.00	1.51	0.87	2.38	0.213	5.33	
155+00	I-3C	600.00	0.00	0.00	0.00	0.00	0.00	0.0480	0.0400	0.0000	6.00	0.0600	0.00	1.58	1.57	3.15	0.209	5.23	
150+00	I-3C	500.00	0.00	0.00	0.00	0.00	0.00	0.0500	0.0400	0.0000	6.00	0.0600	0.00	1.66	1.81	3.46	0.215	5.38	
146+00	I-3C	400.00	0.00	0.00	0.00	0.00	0.00	0.0500	0.0400	0.0000	6.00	0.0600	0.00	1.61	1.70	3.32	0.212	5.29	
142+00	I-3C	400.00	0.00	0.00	0.00	0.00	0.00	0.0500	0.0400	0.0000	6.00	0.0600	0.00	1.58	1.63	3.21	0.209	5.23	
141+50	I-3C	50.00	0.00	0.00	0.00	0.00	0.00	0.0500	0.0400	0.0000	6.00	0.0600	0.00	1.11	0.71	1.82	0.169	4.22	
141+00	I-3C	50.00	0.00	0.00	0.00	0.00	0.00	0.0500	0.0400	0.0000	6.00	0.0600	0.00	******	******	0.90	0.130	3.24	End

INLET SPACING DESIGN

PID : 77366 **Date :** 12/28/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 2, 96+13.37(HP) TO 130+15.93(LP) TO 167+27.78(HP), SR823, RHS **Designer :** MDC

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 0.00 **Allowable Depth (ft.)** 0.22

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
167+27	Begin																		
161+00	I-3C	627.00	0.00	0.00	0.00	0.00	0.00	0.0246	0.0400	0.0000	4.00	0.1670	0.00	0.41	0.00	0.41	0.111	2.76	
155+00	I-3C	600.00	0.00	0.00	0.00	0.00	0.00	0.0480	0.0400	0.0000	4.00	0.1670	0.00	0.39	0.00	0.39	0.096	2.39	
150+00	I-3C	500.00	0.00	0.00	0.00	0.00	0.00	0.0500	0.0400	0.0000	4.00	0.1670	0.00	0.31	0.00	0.31	0.087	2.16	
146+00	I-3C	400.00	0.00	0.00	0.00	0.00	0.00	0.0500	0.0400	0.0000	4.00	0.1670	0.00	0.24	0.00	0.24	0.079	1.98	
142+00	I-3C	400.00	0.00	0.00	0.00	0.00	0.00	0.0500	0.0400	0.0000	4.00	0.1670	0.00	0.24	0.00	0.24	0.079	1.98	
141+50	I-3C	50.00	0.00	0.00	0.00	0.00	0.00	0.0500	0.0400	0.0000	4.00	0.1670	0.00	0.03	0.00	0.03	0.037	0.92	
141+00	I-3C	50.00	0.00	0.00	0.00	0.00	0.00	0.0500	0.0400	0.0000	4.00	0.1670	0.00	******	******	0.03	0.037	0.92	End

INLET SPACING DESIGN

PID : 77366 **Date :** 12/10/2006 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : REACH # 3, 167+27.78(HP) TO 186+32.39 TO 253+03.70(HP), SR823, LHS **Designer :** RN

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 0.00 **Allowable Depth (ft.)** 0.38

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
167+27	Begin																		
177+00	I-3C	973.00	0.00	0.00	0.00	0.00	0.00	0.0380	0.0400	0.0000	6.00	0.1670	0.00	0.87	0.00	0.87	0.135	3.37	
180+00	I-3C	300.00	0.00	0.00	0.00	0.00	0.00	0.0345	0.0400	0.0000	6.00	0.1670	0.00	0.34	0.00	0.34	0.097	2.41	
183+00	I-3C	300.00	0.00	0.00	0.00	0.00	0.00	0.0182	0.0400	0.0000	6.00	0.1670	0.00	0.33	0.00	0.33	0.108	2.69	
185+00	I-3C	200.00	0.00	0.00	0.00	0.00	0.00	0.0072	0.0400	0.0000	6.00	0.1670	0.00	0.21	0.00	0.21	0.108	2.70	
186+32	I-3B	132.00	0.00	0.00	0.00	0.00	0.00	0.0010	0.0400	0.0000	6.00	0.1670	0.00	******	******	0.13	0.131	3.27	Sag
253+03	Begin																		
243+00	I-3B	1003.00	0.00	0.00	0.00	0.00	0.00	0.0310	0.0400	0.0000	9.50	0.1670	0.00	1.13	0.10	1.23	0.160	3.99	
235+00	I-3B	800.00	0.00	0.00	0.00	0.00	0.00	0.0310	0.0400	0.0000	9.50	0.1670	0.00	1.04	0.04	1.08	0.152	3.80	
229+00	I-3B	600.00	0.00	0.00	0.00	0.00	0.00	0.0310	0.0400	0.0000	9.50	0.1670	0.00	0.78	0.00	0.78	0.135	3.36	
224+00	I-3B	500.00	0.00	0.00	0.00	0.00	0.00	0.0310	0.0400	0.0000	9.50	0.1670	0.00	0.61	0.00	0.61	0.123	3.07	
219+00	I-3B	500.00	0.00	0.00	0.00	0.00	0.00	0.0310	0.0400	0.0000	9.50	0.1670	0.00	0.61	0.00	0.61	0.123	3.07	
214+00	I-3B	500.00	0.00	0.00	0.00	0.00	0.00	0.0310	0.0400	0.0000	9.50	0.1670	0.00	0.61	0.00	0.61	0.123	3.07	
209+00	I-3B	500.00	0.00	0.00	0.00	0.00	0.00	0.0310	0.0400	0.0000	9.50	0.1670	0.00	0.61	0.00	0.61	0.123	3.07	
204+00	I-3B	500.00	0.00	0.00	0.00	0.00	0.00	0.0310	0.0400	0.0000	9.50	0.1670	0.00	0.61	0.00	0.61	0.123	3.07	
199+00	I-3B	500.00	0.00	0.00	0.00	0.00	0.00	0.0310	0.0400	0.0000	9.50	0.1670	0.00	0.61	0.00	0.61	0.123	3.07	

INLET SPACING DESIGN

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
189+00	I-3B	1000.00	0.00	0.00	0.00	0.00	0.00	0.0146	0.0400	0.0000	9.50	0.1670	0.00	1.23	0.00	1.23	0.184	4.59	
187+00	I-3B	200.00	0.00	0.00	0.00	0.00	0.00	0.0037	0.0400	0.0000	9.50	0.1670	0.00	0.25	0.00	0.25	0.131	3.28	
186+32	I-3B	68.00	0.00	0.00	0.00	0.00	0.00	0.0010	0.0400	0.0000	6.00	0.1670	0.00	******	******	0.08	0.110	2.75	End

SUMP DATA

Total Flow (cfs) : 0.21 **Ponded Depth (ft.) :** 0.000 **Spread on Pavement (ft.) :** 0.00

INLET SPACING DESIGN

PID : 77366 **Date :** 12/10/2006 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 3, 167+27.78(HP) TO 186+32.39 TO 253+03.70(HP), SR823, RHS **Designer :** RN

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 0.00 **Allowable Depth (ft.)** 0.38

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
167+27	Begin																		
177+00	I-3C	973.00	0.00	0.00	0.00	0.00	0.00	0.0380	0.0600	0.0000	9.50	0.0600	0.00	2.19	1.59	3.78	0.272	4.54	
180+00	I-3C	300.00	0.00	0.00	0.00	0.00	0.00	0.0345	0.0600	0.0000	9.50	0.0600	0.00	1.96	1.14	3.10	0.258	4.29	
183+00	I-3C	300.00	0.00	0.00	0.00	0.00	0.00	0.0182	0.0560	0.0000	9.50	0.0600	0.00	1.89	0.68	2.56	0.263	4.70	
185+00	I-3C	200.00	0.00	0.00	0.00	0.00	0.00	0.0072	0.0400	0.0000	9.50	0.0600	0.00	1.34	0.18	1.53	0.228	5.69	
186+32	I-3C	132.00	0.00	0.00	0.00	0.00	0.00	0.0010	0.0400	0.0000	9.50	0.0600	0.00	******	******	0.72	0.249	6.22	Sag
253+03	Begin																		
243+00	I-3B	1003.00	0.00	0.00	0.00	0.00	0.00	0.0310	0.0400	0.0000	9.50	0.0600	0.00	1.08	0.44	1.52	0.173	4.32	
235+00	I-3B	800.00	0.00	0.00	0.00	0.00	0.00	0.0310	0.0400	0.0000	9.50	0.0600	0.00	1.86	1.70	3.56	0.238	5.94	
229+00	I-3B	600.00	0.00	0.00	0.00	0.00	0.00	0.0310	0.0400	0.0000	9.50	0.0600	0.00	2.01	2.03	4.04	0.249	6.23	
224+00	I-3B	500.00	0.00	0.00	0.00	0.00	0.00	0.0310	0.0400	0.0000	9.50	0.0600	0.00	1.99	1.98	3.98	0.248	6.19	
219+00	I-3B	500.00	0.00	0.00	0.00	0.00	0.00	0.0310	0.0400	0.0000	9.50	0.0600	0.00	1.98	1.95	3.93	0.247	6.17	
214+00	I-3B	500.00	0.00	0.00	0.00	0.00	0.00	0.0310	0.0400	0.0000	9.50	0.0600	0.00	1.97	1.93	3.90	0.246	6.15	
209+00	I-3B	500.00	0.00	0.00	0.00	0.00	0.00	0.0310	0.0400	0.0000	9.50	0.0600	0.00	1.96	1.92	3.88	0.246	6.14	
204+00	I-3B	500.00	0.00	0.00	0.00	0.00	0.00	0.0310	0.0400	0.0000	9.50	0.0600	0.00	1.96	1.91	3.87	0.245	6.13	
199+00	I-3B	500.00	0.00	0.00	0.00	0.00	0.00	0.0310	0.0400	0.0000	9.50	0.0600	0.00	1.55	1.11	2.66	0.213	5.33	

INLET SPACING DESIGN

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
189+00	I-3B	1000.00	0.00	0.00	0.00	0.00	0.00	0.0146	0.0400	0.0000	9.50	0.0600	0.00	1.64	0.70	2.34	0.234	5.84	
187+00	I-3B	200.00	0.00	0.00	0.00	0.00	0.00	0.0037	0.0400	0.0000	9.50	0.0600	0.00	0.95	0.00	0.95	0.216	5.39	
186+32	I-3B	68.00	0.00	0.00	0.00	0.00	0.00	0.0010	0.0400	0.0000	9.50	0.0600	0.00	******	******	0.08	0.110	2.75	End

SUMP DATA

Total Flow (cfs) : 0.81 **Ponded Depth (ft.) :** 0.027 **Spread on Pavement (ft.) :** 2.82

INLET SPACING DESIGN

PID : 77366 **Date :** 12/30/2006 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 4, 253+03.70(HP) TO 350+59.68(LP) TO 425+25(HP), SR823, LHS **Designer :** RN

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 0.00 **Allowable Depth (ft.)** 0.38

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
253+03	Begin																		
263+00	I-3C	997.00	0.00	0.00	0.00	0.00	0.00	0.0230	0.0440	0.0000	9.50	0.0600	0.00	1.47	0.66	2.13	0.215	4.88	
273+00	I-3C	1000.00	0.00	0.00	0.00	0.00	0.00	0.0230	0.0440	0.0000	9.50	0.0600	0.00	2.49	2.34	4.83	0.292	6.64	
283+00	I-3C	1000.00	0.00	0.00	0.00	0.00	0.00	0.0230	0.0440	0.0000	9.50	0.0600	0.00	3.00	3.51	6.51	0.327	7.42	
293+00	I-3B	1000.00	0.00	0.00	0.00	0.00	0.00	0.0230	0.0400	0.0000	9.50	0.0600	0.00	2.88	3.65	6.53	0.316	7.89	
303+00	I-3B	1000.00	0.00	0.00	0.00	0.00	0.00	0.0230	0.0400	0.0000	9.50	0.0600	0.00	2.41	2.47	4.88	0.283	7.07	
313+00	I-3B	1000.00	0.00	0.00	0.00	0.00	0.00	0.0181	0.0400	0.0000	9.50	0.0600	0.00	2.13	1.57	3.70	0.267	6.67	
323+00	I-3B	1000.00	0.00	0.00	0.00	0.00	0.00	0.0181	0.0400	0.0000	9.50	0.1670	0.00	2.04	0.77	2.80	0.240	6.01	
333+00	I-3B	1000.00	0.00	0.00	0.00	0.00	0.00	0.0325	0.0400	0.0000	9.50	0.1670	0.00	1.51	0.49	2.00	0.190	4.74	
340+00	I-3B	700.00	0.00	0.00	0.00	0.00	0.00	0.0470	0.0400	0.0000	9.50	0.1670	0.00	1.13	0.22	1.36	0.153	3.83	
346+00	I-3B	600.00	0.00	0.00	0.00	0.00	0.00	0.0237	0.0400	0.0000	9.50	0.1670	0.00	0.96	0.00	0.96	0.153	3.83	
349+00	I-3B	300.00	0.00	0.00	0.00	0.00	0.00	0.0082	0.0400	0.0000	9.50	0.1670	0.00	0.37	0.00	0.37	0.130	3.26	
350+00	I-3B	100.00	0.00	0.00	0.00	0.00	0.00	0.0031	0.0400	0.0000	9.50	0.1670	0.00	0.12	0.00	0.12	0.103	2.57	
350+60	I-3B	60.00	0.00	0.00	0.00	0.00	0.00	0.0030	0.0400	0.0000	9.50	0.1670	0.00	******	******	0.07	0.086	2.14	Sag
355+00	Begin																		
351+50	I-3B	350.00	0.00	0.00	0.00	0.00	0.00	0.0047	0.0400	0.0000	9.50	0.1670	0.00	0.43	0.00	0.43	0.153	3.83	

INLET SPACING DESIGN

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
350+60	I-3B	90.00	0.00	0.00	0.00	0.00	0.00	0.0030	0.0400	0.0000	9.50	0.1670	0.00	******	******	0.11	0.100	2.50	End

SUMP DATA

Total Flow (cfs) : 0.18

Ponded Depth (ft.) : 0.000

Spread on Pavement (ft.) : 0.00

INLET SPACING DESIGN

PID : 77366 **Date :** 12/30/2006 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 4, 253+03.70(HP) TO 350+59.68(LP) TO 425+25(HP), SR823, RHS **Designer :** RN

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 0.00 **Allowable Depth (ft.)** 0.38

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
253+03	Begin																		
263+00	I-3C	997.00	0.00	0.00	0.00	0.00	0.00	0.0230	0.0400	0.0000	7.00	0.1670	0.00	1.16	0.05	1.21	0.168	4.19	
273+00	I-3C	1000.00	0.00	0.00	0.00	0.00	0.00	0.0230	0.0400	0.0000	7.00	0.1670	0.00	1.02	0.00	1.02	0.157	3.94	
283+00	I-3C	1000.00	0.00	0.00	0.00	0.00	0.00	0.0230	0.0400	0.0000	7.00	0.1670	0.00	0.97	0.00	0.97	0.154	3.86	
293+00	I-3B	1000.00	0.00	0.00	0.00	0.00	0.00	0.0230	0.0400	0.0000	9.50	0.1670	0.00	1.08	0.01	1.09	0.161	4.03	
303+00	I-3B	1000.00	0.00	0.00	0.00	0.00	0.00	0.0218	0.0400	0.0000	9.50	0.1670	0.00	1.18	0.06	1.24	0.171	4.27	
313+00	I-3B	1000.00	0.00	0.00	0.00	0.00	0.00	0.0181	0.0400	0.0000	9.50	0.1670	0.00	1.24	0.05	1.29	0.179	4.49	
323+00	I-3B	1000.00	0.00	0.00	0.00	0.00	0.00	0.0181	0.0400	0.0000	9.50	0.0600	0.00	2.03	1.42	3.45	0.260	6.49	
333+00	I-3B	1000.00	0.00	0.00	0.00	0.00	0.00	0.0325	0.0400	0.0000	9.50	0.0600	0.00	2.36	2.96	5.32	0.274	6.84	
340+00	I-3B	700.00	0.00	0.00	0.00	0.00	0.00	0.0470	0.0400	0.0000	9.50	0.0600	0.00	2.26	3.43	5.69	0.262	6.55	
346+00	I-3B	600.00	0.00	0.00	0.00	0.00	0.00	0.0237	0.0400	0.0000	9.50	0.0600	0.00	2.65	3.11	5.77	0.299	7.49	
349+00	I-3B	300.00	0.00	0.00	0.00	0.00	0.00	0.0082	0.0400	0.0000	9.50	0.0600	0.00	2.73	1.55	4.27	0.327	8.16	
350+00	I-3B	100.00	0.00	0.00	0.00	0.00	0.00	0.0031	0.0400	0.0000	9.50	0.0600	0.00	1.78	0.16	1.94	0.291	7.28	
350+60	I-3B	60.00	0.00	0.00	0.00	0.00	0.00	0.0030	0.0400	0.0000	9.50	0.0600	0.00	******	******	0.39	0.160	4.01	Sag
355+00	Begin																		
351+50	I-3B	350.00	0.00	0.00	0.00	0.00	0.00	0.0047	0.0400	0.0000	9.50	0.0600	0.00	2.85	1.08	3.93	0.351	8.78	

INLET SPACING DESIGN

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
350+60	I-3B	90.00	0.00	0.00	0.00	0.00	0.00	0.0030	0.0400	0.0000	9.50	0.0600	0.00	******	******	1.44	0.262	6.55	End

SUMP DATA

Total Flow (cfs) : 1.82 **Ponded Depth (ft.) :** 0.108 **Spread on Pavement (ft.) :** 3.79

INLET SPACING DESIGN

PID : 77366 **Date :** 06/14/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 1, 37+40 (US52 RAMP A) TO 42+30 (HP), US 52 RAMP A, RHS **Designer :** MDC

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 0.00 **Allowable Depth (ft.)** 0.24

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
42+30	Begin																	
37+40	I-3D	490.00	0.00	0.00	0.00	0.00	0.00	0.0460	0.0560	0.0000	8.00	0.1300	0.00	1.21	0.21	1.42	0.177	3.17

INLET SPACING DESIGN

PID : 77366 **Date :** 06/14/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 1, 29+40 (US52 RAMP B) TO 44+60 (HP), US 52 RAMP B, LHS **Designer :** MDC

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 0.00 **Allowable Depth (ft.)** 0.24

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
44+60	Begin																	
29+40	I-3D	1520.00	0.00	0.00	0.00	0.00	0.00	0.0320	0.0400	0.0000	6.00	0.1300	0.00	0.91	0.07	0.98	0.146	3.64

INLET SPACING DESIGN

PID : 77366 **Date :** 06/14/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 1, 32+40 (US52 RAMP B) TO 43+40 (HP), US 52 RAMP B, RHS **Designer :** MDC

Rainfall Area: D **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 0.00 **Allowable Depth (ft.)** 0.24

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
43+40	Begin																	
32+40	I-3D	1100.00	0.00	0.00	0.00	0.00	0.00	0.0320	0.0430	0.0000	6.00	0.1300	0.00	1.89	1.12	3.01	0.228	5.30

STORM SEWER SYSTEM

PID : 77366 **Date :** 02/01/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 56+00.00 SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	56+00	0.21	0.19	10.00	5.39	6.65	1.0	1.2	15	40.5	0.0100	583.58	3.46	6.03	0.0005	584.04	588.28	4.24	3.45	I 3B
begin		56+00	0.21	0.19									583.18				584.02	586.43			0.015

APPENDIX C

Storm Sewer Calculations

STORM SEWER SYSTEM

PID : 77366 **Date :** 05/30/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :RH#1; FROM 59+00 & 61+00 TO 59+95.45 (I3-B); FROM 61+00 TO 59+95.45, CB-3A, CB-3, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	59+00	0.10	0.09	10.00	5.39	6.60	0.5	0.6	15	95.5	0.0226	582.13	3.76	9.06	0.0001	582.36	586.83	4.47	3.45	I 3B
begin		59+95	0.10	0.09									579.97				580.75	586.67			0.015
0	1	61+00	0.09	0.08	10.00	5.39	6.55	0.4	0.5	15	104.6	0.0104	581.06	2.71	6.15	0.0001	581.31	586.86	5.55	4.55	I 3B
begin		59+95	0.19	0.17									579.97				580.73	586.67			0.015
1	2	59+95	0.07	0.06	10.64	5.27	6.52	1.2	1.5	15	28.8	0.0100	579.97	3.66	6.02	0.0007	580.57	586.67	6.10	5.45	I 3B
		59+95	0.26	0.23									579.68				580.55	586.14			0.015
0	2	61+00	0.12	0.11	10.00	5.39	6.51	0.6	0.7	15	104.6	0.0253	582.33	4.09	9.58	0.0002	582.57	586.33	3.76	2.75	CB 3A
begin		59+95	0.38	0.34									579.68				580.54	586.14			0.015
2	3	59+95	0.12	0.11	10.77	5.25	6.51	2.4	2.9	15	15.8	0.0100	579.68	4.37	6.02	0.0027	580.54	586.14	5.60	5.21	CB 3
final		59+95	0.50	0.45									579.52				580.49	582.77			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 02/28/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 63+50.00 SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	JUNCTION To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	RAINFALL INTENSITY (25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	DISCHARGE (cfs.) (25 yrs.)	PIPE DIAM. (in.)	PIPE LENGTH (ft.)	PIPE SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	63+50	0.09	0.08	10.00	5.39	6.64	0.4	0.5	15	42.1	0.0100	583.03	2.67	6.02	0.0001	583.38	588.83	5.45	4.55	I 3B
begin		63+50	0.09	0.08									582.61				583.37	585.86			0.015
1	2	63+50	0.00	0.00	10.26	5.34	6.60	0.4	0.5	15	87.2	0.3333	582.61	9.06	34.77	0.0001	582.72	858.86	276.14	275.00	MH 3
		63+50	0.09	0.08									553.55				554.31	556.80			0.015
2	3	63+50	0.00	0.00	10.42	5.31	6.59	0.4	0.5	15	11.4	0.0100	553.55	2.67	6.02	0.0001	554.20	556.80	2.60	2.00	MH 3
final		63+50	0.09	0.08									553.43				554.20	556.68			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 02/28/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 66+00.00 SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	66+00	0.17	0.15	10.00	5.39	6.64	0.8	1.0	15	47.7	0.0100	587.15	3.27	6.02	0.0003	587.51	592.95	5.44	4.55	I 3B
begin		66+00	0.17	0.15				-					586.67				587.50	589.92			0.015
1	2	66+00	0.00	0.00	10.24	5.35	6.61	0.8	1.0	15	81.9	0.2500	586.67	10.21	30.11	0.0003	586.84	589.92	3.09	2.00	MH 3
		66+00	0.17	0.15									566.20				567.02	569.45			0.015
2	3	66+00	0.00	0.00	10.38	5.32	6.59	0.8	1.0	15	22.6	0.0100	566.20	3.26	6.01	0.0003	566.80	569.45	2.64	2.00	MH 3
final		66+00	0.17	0.15									565.97				566.79	569.22			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 02/28/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 71+00.00 SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	71+00		0.17	0.15	10.00	5.39	6.65	0.8	1.0	15	97.8	0.0924	601.84	7.17	18.31	0.0003	602.05	607.64	5.59	4.55	I 3B
begin		71+00		0.17	0.15									592.80				593.63	596.05			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 05/16/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : STA. 76+00.00 SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	76+00	0.34	0.31	10.00	5.39	6.65	1.7	2.1	15	57.7	0.0180	625.83	4.91	8.07	0.0014	626.28	630.53	4.25	3.45	I 3B
begin		76+00	0.34	0.31									624.79				625.70	628.04			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 01/31/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 86+00+00 SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	86+00		0.35	0.32	10.00	5.39	6.65	1.7	2.1	15	52.1	0.0100	674.60	3.99	6.02	0.0014	675.13	679.30	4.17	3.45	I 3B
begin		86+00		0.35	0.32									674.08				674.99	677.33			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 06/05/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :104+50 TO 105+00 TO 106+00 (MH3); 106+00 (I3B) TO 106+00 (MH3) SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	2	106+00	0.34	0.31	10.00	5.39	5.68	1.6	1.7	15	63.8	0.1169	674.58	9.53	20.59	0.0010	674.83	680.38	5.55	4.55	I 3B
begin		106+00	0.34	0.31									667.12				668.35	673.87			0.015
0	1	104+50	2.58	1.94	15.00	4.60	5.71	8.9	11.1	15	50.0	0.0540	675.65	11.43	13.99	0.0390	676.54	679.65	3.11	2.75	CB 8
begin		105+00	2.92	2.24									672.95				674.18	677.95			0.015
1	2	105+00	0.10	0.07	15.07	4.59	5.68	9.2	11.4	15	100.0	0.0583	672.95	11.86	14.54	0.0416	673.83	677.95	4.12	3.75	CB 8
		106+00	3.02	2.32									667.12				668.35	673.87			0.015
2	3	106+00	0.00	0.00	15.21	4.58	5.68	10.6	13.2	15	6.8	0.0560	667.12	11.99	14.25	0.0553	668.35	673.87	5.52	5.50	MH 3
		106+00	3.02	2.32									666.74				667.98	670.39			0.015
3	4	106+00	0.00	0.00	15.22	4.57	5.66	10.6	13.1	15	234.6	0.4000	666.74	25.19	38.09	0.0548	667.27	670.39	3.12	2.40	MH 3
		106+00	3.02	2.32									572.90				574.14	576.23			0.015
4	5	106+00	0.00	0.00	15.38	4.55	5.65	10.6	13.1	15	12.6	0.0560	572.90	11.99	14.25	0.0547	574.12	576.23	2.11	2.08	MH 3
final		106+00	3.02	2.32									572.19				573.43	575.72			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 02/07/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :FROM STA. 112+00 (I3B1) TO STA. 112+00 (I3D), SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	112+00	0.21	0.19	10.00	5.39	6.66	1.0	1.2	15	39.0	0.0100	650.03	3.46	6.02	0.0005	650.50	655.83	5.33	4.55	I 3B
begin		112+00	0.21	0.19									649.64				650.48	652.89			0.015
1	2	112+00	0.17	0.15	10.19	5.36	6.64	1.8	2.2	15	13.5	0.0100	649.64	4.08	6.02	0.0016	650.45	655.23	4.78	4.34	I 3D
		112+00	0.38	0.34									649.51				650.43	652.76			0.015
2	3	112+00	0.00	0.00	10.24	5.35	6.59	1.8	2.2	15	228.8	0.4000	649.51	15.12	38.09	0.0016	649.72	652.76	3.04	2.00	MH 3
		112+00	0.38	0.34									557.99				558.91	561.24			0.015
3	4	112+00	0.00	0.00	10.50	5.30	6.57	1.8	2.2	15	16.2	0.0100	557.99	4.06	6.02	0.0016	558.78	561.24	2.46	2.00	MH 3
final		112+00	0.38	0.34									557.83				558.75	561.08			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 05/31/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 118+00.00 SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	PIPE LENGTH (ft.)	PIPE SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	118+00	0.47	0.43	10.00	5.39	6.69	2.3	2.9	15	8.2	0.0100	626.42	4.33	6.02	0.0026	627.32	630.42	3.10	2.75	CB 3A
begin		118+00	0.47	0.43									626.34				627.30	529.59			0.015
1	2	118+00	0.00	0.00	10.03	5.39	6.65	2.3	2.8	15	175.4	0.4000	626.34	16.28	38.09	0.0026	626.58	629.59	3.01	2.00	MH 3
		118+00	0.47	0.43									556.18				557.14	559.43			0.015
2	3	118+00	0.00	0.00	10.21	5.35	6.63	2.3	2.8	15	18.1	0.0100	556.18	4.33	6.02	0.0026	557.01	559.43	2.42	2.00	MH 3
final		118+00	0.47	0.43									556.00				556.96	559.25			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 05/09/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :FROM 120+00 TO 120+00 (CB) SR823 TO 15+50 PERS; FROM 119+00 TO 120+00 (CB) SR823 **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	PIPE LENGTH (ft.)	PIPE SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	120+00	0.66	0.59	10.00	5.39	6.63	3.2	3.9	15	44.5	0.0270	618.43	6.81	9.89	0.0049	619.00	622.43	3.43	2.75	I 3D
begin		120+00	0.66	0.59									617.23				618.33	623.03			0.015
1	2	120+00	0.28	0.25	10.11	5.37	6.63	4.5	5.6	15	52.6	0.0100	617.23	5.07	6.02	0.0100	618.33	623.03	4.70	4.55	I 3B
		120+00	0.94	0.84									616.71				617.81	619.96			0.015
2	4	120+00	0.00	0.00	10.28	5.34	6.60	4.5	5.6	15	165.4	0.4000	616.71	19.78	38.09	0.0099	617.04	619.96	2.91	2.00	MH 3
		120+00	0.94	0.84									550.55				551.65	553.57			0.015
3	4	119+00	4.93	3.57	15.00	4.60	5.68	16.4	20.3	24	104.6	0.0120	548.00	7.53	23.10	0.0107	549.67	552.00	2.33	2.00	CB 2-3
begin		120+00	5.87	4.41									546.75				548.55	553.57			0.015
4	5	120+00	0.26	0.18	15.23	4.57	5.66	21.0	26.0	24	75.8	0.0200	546.75	9.70	29.82	0.0175	548.45	553.57	5.12	4.83	CB 2-3
final		15+50	6.13	4.59									545.23				547.12	549.23			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 05/31/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 126+00.00 SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	126+00	0.21	0.19	10.00	5.39	6.64	1.0	1.2	15	40.8	0.0100	595.91	3.46	6.02	0.0005	596.46	601.71	5.25	4.55	I 3B
begin		126+00	0.21	0.19									595.50				596.44	598.75			0.015
1	2	126+00	0.41	0.37	10.20	5.36	6.64	3.0	3.7	15	12.7	0.0100	595.50	4.63	6.02	0.0043	596.44	600.91	4.47	4.16	CB 3A
		126+00	0.62	0.55									595.38				596.39	598.63			0.015
2	3	126+00	0.00	0.00	10.24	5.35	6.61	3.0	3.7	15	125.2	0.3333	595.38	16.42	34.77	0.0043	595.66	598.63	2.97	2.00	MH 3
		126+00	0.62	0.55									553.64				554.65	556.89			0.015
3	4	126+00	0.00	0.00	10.37	5.32	6.60	3.0	3.7	15	18.6	0.0100	553.64	4.62	6.02	0.0043	554.55	556.89	2.35	2.00	MH 3
final		126+00	0.62	0.55									553.46				554.47	556.71			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 04/06/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 2; FROM 128+50 TO 129+50 TO 130+15.93 (LP) (I3C1) TO 130+15.93 (I3D) **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	PIPE LENGTH (ft.)	PIPE SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
1	2	128+50	0.17	0.15	10.00	5.39	6.59	0.8	1.0	15	100.0	0.0112	593.12	3.41	6.37	0.0003	593.47	597.82	4.35	3.45	I 3B
begin		129+50	0.17	0.15									592.00				592.82	597.20			0.015
2	3	129+50	0.09	0.08	10.49	5.30	6.52	1.2	1.5	15	65.9	0.0109	592.00	3.78	6.29	0.0007	592.44	597.20	4.76	3.95	I 3C
		130+15	0.26	0.23									591.28				592.15	597.08			0.015
3	4	130+15	0.20	0.18	10.78	5.25	6.48	2.2	2.7	15	40.7	0.0100	591.28	4.26	6.02	0.0022	591.93	597.08	5.15	4.55	I 3C
		130+15	0.45	0.41									590.87				591.84	597.57			0.015
4	5	130+15	0.25	0.23	10.94	5.22	6.48	3.3	4.1	15	15.0	0.0100	590.87	4.76	6.02	0.0054	591.84	597.57	5.73	5.45	CB 3
		130+15	0.71	0.64									590.72				591.76	593.97			0.015
5	6	130+15	0.00	0.00	10.99	5.21	6.46	3.3	4.1	15	116.4	0.4000	590.72	18.16	38.09	0.0054	591.01	593.97	2.96	2.00	MH 3
		130+15	0.71	0.64									544.16				545.19	547.41			0.015
6	7	130+15	0.00	0.00	11.10	5.20	6.44	3.3	4.1	15	16.1	0.0100	544.16	4.75	6.02	0.0054	545.12	547.41	2.29	2.00	MH 3
final		130+15	0.71	0.64									543.99				545.03	547.24			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 04/06/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : REACH # 2; FROM 128+50 TO 129+50 TO 130+15.93 (LP); SR823, 41.75' RT **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	128+50	0.70	0.63	10.00	5.39	6.62	3.4	4.2	15	100.0	0.0100	592.64	4.79	6.02	0.0056	593.45	596.89	3.44	3.00	I 3D
begin		129+50	0.70	0.63									591.64				592.68	596.12			0.015
1	2	129+50	0.09	0.08	10.35	5.33	6.56	3.8	4.7	15	65.9	0.0100	591.64	4.90	6.03	0.0069	592.53	596.12	3.59	3.23	I 3D
		130+15	0.79	0.71									590.98				592.07	596.00			0.015
2	3	130+15	0.92	0.83	10.57	5.29	6.56	8.1	10.1	18	12.1	0.0140	590.73	6.70	11.61	0.0122	592.07	596.00	3.93	3.77	I 3D
		130+15	1.71	1.54									590.56				591.92	594.06			0.015
3	4	130+15	0.00	0.00	10.60	5.28	6.55	8.1	10.1	18	98.5	0.4000	590.56	23.04	61.94	0.0122	590.98	594.06	3.08	2.00	MH 3
		130+15	1.71	1.54									551.16				552.52	554.66			0.015
4	5	130+15	0.00	0.00	10.67	5.27	6.54	8.1	10.0	18	21.5	0.0140	551.16	6.69	11.59	0.0121	552.48	554.66	2.18	2.00	MH 3
final		130+15	1.71	1.54									550.86				552.22	554.36			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 12/28/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :FROM 141+50 TO 141+00; 139+50(CB) TO 141+00(CB) TO 141+00; SR 823, RHS **Designer :** MDC

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	139+50	1.66	1.17	15.00	4.60	5.65	5.4	6.6	18	150.0	0.0120	611.55	5.75	10.73	0.0053	612.44	615.55	3.11	2.50	CB 8
begin		141+00	1.66	1.17									609.75				611.00	623.05			0.015
1	2	141+00	0.97	0.68	15.43	4.55	5.62	8.4	10.4	18	63.7	0.0207	609.75	7.87	14.08	0.0131	610.76	623.05	12.29	11.80	CB 8
		141+00	2.63	1.85									608.43				609.80	627.93			0.015
0	2	141+50	0.04	0.04	10.00	5.39	6.65	0.2	0.3	15	50.0	0.0500	625.73	3.79	13.47	0.0000	625.85	630.43	4.58	3.45	I 3C
begin		141+00	2.67	1.89									623.23				623.95	628.08			0.015
2	3	141+00	0.04	0.04	15.57	4.53	5.57	8.7	10.8	24	113.9	0.0100	607.93	6.07	21.14	0.0030	608.99	627.93	18.94	18.00	I 3C
final		141+00	2.72	1.93									606.79				608.38	610.79			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 02/07/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :FROM STA. 142+00 (55.7' LT) TO STA. 142+00, SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	142+00	11.48	8.14	15.00	4.60	5.71	37.5	46.5	30	52.8	0.0500	628.05	15.96	85.51	0.0171	629.43	632.55	3.13	2.00	HW Half He
begin		142+00	11.48	8.14									625.41				627.79	632.93			0.015
1	2	142+00	0.36	0.33	15.06	4.60	5.70	38.9	48.2	30	70.8	0.0500	625.41	16.11	85.51	0.0184	626.82	632.93	6.11	5.02	I 3C
final		142+00	11.84	8.47									621.87				624.26	626.38			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 02/07/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 146+00.00 SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	146+00	0.36	0.32	10.00	5.39	6.64	1.7	2.2	15	58.0	0.0100	647.63	4.04	6.02	0.0015	648.17	652.93	4.76	4.05	I 3C
begin		146+00	0.36	0.32									647.05				647.97	650.30			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 02/07/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : STA. 150+00.00 SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	150+00	0.45	0.41	10.00	5.39	6.65	2.2	2.7	15	58.0	0.0100	667.63	4.29	6.02	0.0023	668.24	672.93	4.69	4.05	I 3C
begin		150+00	0.45	0.41									667.05				668.00	670.30			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 02/07/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 155+00.00 SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	155+00		0.55	0.50	10.00	5.39	6.65	2.7	3.3	15	58.0	0.0100	692.58	4.51	6.03	0.0035	693.27	697.88	4.61	4.05	I 3C
begin		155+00		0.55	0.50									692.00				692.99	695.25			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 02/07/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 161+00.00 SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	JUNCTION To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	RAINFALL INTENSITY (25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	DISCHARGE (cfs.) (25 yrs.)	PIPE DIAM. (in.)	PIPE LENGTH (ft.)	PIPE SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	161+00	0.58	0.52	10.00	5.39	6.65	2.8	3.4	15	58.0	0.0100	714.37	4.56	6.02	0.0038	715.08	719.67	4.59	4.05	I 3C
begin		161+00	0.58	0.52									713.79				714.79	717.04			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 03/01/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 177+00.00 SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	177+00	0.96	0.86	10.00	5.39	6.65	4.7	5.7	15	63.6	0.0110	702.31	5.31	6.32	0.0105	703.39	708.11	4.72	4.55	I 3C
begin		177+00	0.96	0.86									701.61				702.72	704.86			0.015
1	2	177+00	0.00	0.00	10.20	5.35	6.64	4.6	5.7	15	53.9	0.3333	701.61	18.71	34.77	0.0105	701.97	704.86	2.89	2.00	MH 3
		177+00	0.96	0.86									683.65				684.75	686.90			0.015
2	3	177+00	0.00	0.00	10.25	5.35	6.63	4.6	5.7	15	18.0	0.0110	683.65	5.30	6.32	0.0105	684.74	686.90	2.15	2.00	MH 3
final		177+00	0.96	0.86									683.45				684.56	686.70			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 03/01/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 180+00.00 SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / Σ AREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	180+00	0.38	0.34	10.00	5.39	6.64	1.8	2.3	15	65.0	0.0100	690.63	4.09	6.02	0.0016	691.18	696.43	5.25	4.55	I 3C
begin		180+00	0.38	0.34									689.98				690.91	693.23			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 03/01/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 183+00.00 SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / Σ AREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	183+00	0.36	0.32	10.00	5.39	6.63	1.7	2.1	15	67.3	0.0100	682.97	4.04	6.02	0.0015	683.51	688.77	5.26	4.55	I 3C
begin		183+00	0.36	0.32									682.30				683.21	685.55			0.015
1	2	183+00	0.00	0.00	10.28	5.34	6.60	1.7	2.1	15	148.9	0.4000	682.30	15.00	38.09	0.0015	682.51	685.55	3.04	2.00	MH 3
		183+00	0.36	0.32									622.74				623.65	625.99			0.015
2	3	183+00	0.00	0.00	10.44	5.31	6.58	1.7	2.1	15	17.0	0.0100	622.74	4.02	6.02	0.0014	623.51	625.99	2.48	2.00	MH 3
final		183+00	0.36	0.32									622.57				623.48	625.82			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 04/06/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :REACH # 3; FROM 185+00 TO 186+32.39; 187+00 TO 186+32.39 (LP); RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	185+00	0.22	0.20	10.00	5.39	6.56	1.1	1.3	15	132.4	0.0100	680.78	3.52	6.04	0.0005	681.19	686.58	5.39	4.55	I 3C
begin		186+32	0.22	0.20									679.45				680.30	686.15			0.015
0	1	187+00	0.10	0.09	10.00	5.39	6.62	0.5	0.6	15	67.6	0.0151	680.47	3.26	7.40	0.0001	680.72	686.27	5.55	4.55	I 3B
begin		186+32	0.32	0.29									679.45				680.23	686.15			0.015
1	2	186+32	0.17	0.15	10.63	5.28	6.51	2.3	2.9	15	100.5	0.0600	679.45	8.34	14.75	0.0026	679.84	686.15	6.31	5.45	I 3B
final		186+32	0.49	0.44									673.42				674.39	676.67			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 04/13/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : STA. 189+00.00 SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	JUNCTION To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	RAINFALL INTENSITY (25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	DISCHARGE (cfs.) (25 yrs.)	PIPE DIAM. (in.)	PIPE LENGTH (ft.)	PIPE SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	189+00	0.51	0.46	10.00	5.39	6.65	2.5	3.0	15	56.0	0.0100	683.40	4.41	6.02	0.0029	684.05	688.10	4.05	3.45	I 3B
begin		189+00	0.51	0.46									682.84				683.82	686.09			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 02/01/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : STA. 199+00.00 SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	JUNCTION To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	RAINFALL INTENSITY (25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	DISCHARGE (cfs.) (25 yrs.)	PIPE DIAM. (in.)	PIPE LENGTH (ft.)	PIPE SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	199+00	0.28	0.25	10.00	5.39	6.64	1.4	1.7	15	56.0	0.0100	711.94	3.76	6.02	0.0009	712.41	716.64	4.23	3.45	I 3B
begin		199+00	0.28	0.25									711.38				712.26	714.63			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 02/01/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 204+00.00 SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	JUNCTION To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	RAINFALL INTENSITY (25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	DISCHARGE (cfs.) (25 yrs.)	PIPE DIAM. (in.)	PIPE LENGTH (ft.)	PIPE SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	204+00	0.53	0.48	10.00	5.39	6.65	2.6	3.2	15	61.5	0.0100	727.44	4.46	6.03	0.0032	728.11	732.14	4.03	3.45	I 3B
begin		204+00	0.53	0.48									726.82				727.81	730.07			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 03/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 209+00.00 SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	209+00	0.53	0.48	10.00	5.39	6.65	2.6	3.2	15	57.1	0.0100	741.84	4.46	6.02	0.0032	742.51	747.64	5.13	4.55	I 3B
begin		209+00	0.53	0.48									741.27				742.25	744.52			0.015
1	2	209+00	0.00	0.00	10.21	5.35	6.62	2.5	3.1	15	124.4	0.5000	741.27	18.17	42.58	0.0032	741.51	744.52	3.01	2.00	MH 3
		209+00	0.53	0.48									679.07				680.05	682.32			0.015
2	3	209+00	0.00	0.00	10.33	5.33	6.61	2.5	3.1	15	16.8	0.0100	679.07	4.44	6.02	0.0031	679.94	682.32	2.38	2.00	MH 3
final		209+00	0.53	0.48									678.90				679.88	682.15			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 02/01/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 214+00.00 SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	PIPE LENGTH (ft.)	PIPE SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	214+00	0.53	0.48	10.00	5.39	6.65	2.6	3.2	15	61.5	0.0100	758.44	4.46	6.02	0.0032	759.11	763.14	4.03	3.45	I 3B
begin		214+00	0.53	0.48									757.83				758.81	761.08			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 02/01/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 219+00.00 SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	219+00	0.53	0.48	10.00	5.39	6.65	2.6	3.2	15	61.5	0.0100	773.94	4.46	6.02	0.0032	774.61	778.64	4.03	3.45	I 3B
begin		219+00	0.53	0.48									773.33				774.31	776.58			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 02/01/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 224+00.00 SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	224+00	0.53	0.48	10.00	5.39	6.65	2.6	3.2	15	61.5	0.0100	789.44	4.46	6.02	0.0032	790.11	794.14	4.03	3.45	I 3B
begin		224+00	0.53	0.48									788.83				789.81	792.08			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 04/13/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 229+00.00, SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	229+00	0.63	0.57	10.00	5.39	6.64	3.1	3.8	15	68.8	0.0100	803.84	4.67	6.02	0.0046	804.59	809.64	5.05	4.55	I 3B
begin		229+00	0.63	0.57									803.15				804.17	806.40			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 03/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 235+00.00 SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	235+00	0.85	0.76	10.00	5.39	6.65	4.1	5.1	15	66.3	0.0100	822.44	4.99	6.02	0.0081	823.40	828.24	4.84	4.55	I 3B
begin		235+00	0.85	0.76									821.78				822.86	825.03			0.015
1	2	235+00	0.00	0.00	10.22	5.35	6.57	4.1	5.0	15	304.4	0.2000	821.78	14.99	26.93	0.0080	822.16	825.03	2.87	2.00	MH 3
		235+00	0.85	0.76									760.90				761.98	764.15			0.015
2	3	235+00	0.00	0.00	10.56	5.29	6.56	4.0	5.0	15	15.2	0.0100	760.90	4.96	6.02	0.0079	761.94	764.15	2.20	2.00	MH 3
final		235+00	0.85	0.76									760.75				761.82	764.00			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 03/05/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 243+00.00 SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	243+00	0.57	0.51	10.00	5.39	6.64	2.7	3.4	15	66.0	0.0100	847.24	4.54	6.02	0.0036	847.94	853.04	5.10	4.55	I 3B
begin		243+00	0.57	0.51									846.58				847.58	649.83			0.015
1	2	243+00	0.00	0.00	10.24	5.35	6.55	2.7	3.3	15	329.5	0.2000	846.58	13.33	26.93	0.0035	846.89	849.83	2.94	2.00	MH 3
		243+00	0.57	0.51									780.68				781.67	783.93			0.015
2	3	243+00	0.00	0.00	10.65	5.27	6.53	2.7	3.3	15	20.5	0.0100	780.68	4.52	6.02	0.0035	781.54	783.93	2.39	2.00	MH 3
final		243+00	0.57	0.51									780.48				781.47	783.73			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 02/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 263+00.00 SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	263+00	0.69	0.62	10.00	5.39	6.65	3.3	4.1	15	61.5	0.0100	850.32	4.76	6.02	0.0054	851.12	855.62	4.50	4.05	I 3C
begin		263+00	0.69	0.62									849.71				850.74	852.96			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 03/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 273+00.00 SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	273+00	1.06	0.95	10.00	5.39	6.66	5.1	6.4	15	61.7	0.0130	826.82	5.80	6.88	0.0129	827.94	832.62	4.68	4.55	I 3C
begin		273+00	1.06	0.95									826.02				827.15	829.27			0.015
1	2	273+00	0.00	0.00	10.18	5.36	6.64	5.1	6.3	15	104.7	0.3333	826.02	19.22	34.77	0.0128	826.39	829.27	2.87	2.00	MH 3
		273+00	1.06	0.95									791.13				792.27	794.38			0.015
2	3	273+00	0.00	0.00	10.27	5.34	6.63	5.1	6.3	15	16.1	0.0130	791.13	5.79	6.88	0.0127	792.26	794.38	2.12	2.00	MH 3
final		273+00	1.06	0.95									790.92				792.05	794.17			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 02/05/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 283+00.00 SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	283+00		1.06	0.95	10.00	5.39	6.66	5.1	6.3	15	61.7	0.0120	804.32	5.61	6.61	0.0128	805.51	809.62	4.11	4.05	I 3C
begin		283+00		1.06	0.95									803.58				804.71	806.83			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 06/05/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :FROM STA. 283+50 TO STA. 284+00 TO STA. 284+50, SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
1	2	283+50	13.77	9.78	15.00	4.60	5.71	45.0	55.8	30	50.0	0.0420	800.05	15.63	78.37	0.0246	801.69	804.05	2.36	1.50	CB 8A
begin		284+00	13.77	9.78									797.95				800.38	802.95			0.015
2	3	284+00	0.07	0.05	15.05	4.60	5.70	45.2	56.1	30	50.0	0.0486	797.95	16.54	84.30	0.0248	799.51	802.95	3.44	2.50	CB 8A
		284+50	13.84	9.83									795.52				797.95	802.27			0.015
3	4	284+50	0.00	0.00	15.10	4.59	5.70	45.1	56.0	30	4.3	0.0400	795.52	15.34	76.48	0.0248	797.89	802.27	4.38	4.25	MH 3
		284+50	13.84	9.83									795.35				797.78	797.85			0.015
4	5	284+50	0.00	0.00	15.11	4.59	5.68	45.1	55.8	30	242.4	0.3333	795.35	33.53	220.78	0.0246	796.24	797.96	1.72	0.11	MH 3
		284+50	13.84	9.83									714.55				716.98	719.05			0.015
5	6	284+50	0.00	0.00	15.23	4.57	5.68	45.0	55.8	30	17.1	0.0400	714.55	15.33	76.48	0.0246	716.72	719.05	2.33	2.00	MH 3
final		284+50	13.84	9.83									713.86				716.29	718.36			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 04/13/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 293+00.00 SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	293+00	0.85	0.76	10.00	5.39	6.65	4.1	5.1	15	64.1	0.0100	780.84	4.99	6.02	0.0082	781.80	786.64	4.84	4.55	I 3B
begin		293+00	0.85	0.76									780.20				781.28	783.45			0.015
1	2	293+00	0.00	0.00	10.21	5.35	6.60	4.1	5.0	15	182.5	0.1667	780.20	14.11	24.59	0.0081	780.60	783.45	2.85	2.00	MH 3
		293+00	0.85	0.76									749.78				750.86	753.03			0.015
2	3	293+00	0.00	0.00	10.43	5.31	6.58	4.1	5.0	15	29.5	0.0100	749.78	4.97	6.02	0.0080	750.80	753.03	2.23	2.00	MH 3
final		293+00	0.85	0.76									749.49				750.57	752.74			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 03/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 303+00.00 SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	303+00	0.51	0.46	10.00	5.39	6.64	2.5	3.0	15	64.1	0.0100	757.90	4.41	6.02	0.0029	758.55	763.70	5.15	4.55	I 3B
begin		303+00	0.51	0.46									757.26				758.24	760.51			0.015
1	2	303+00	0.00	0.00	10.24	5.35	6.58	2.4	3.0	15	214.0	0.1667	757.26	12.15	24.59	0.0029	757.57	760.51	2.94	2.00	MH 3
		303+00	0.51	0.46									721.59				722.56	724.84			0.015
2	3	303+00	0.00	0.00	10.54	5.29	6.57	2.4	3.0	15	9.9	0.0100	721.59	4.39	6.02	0.0029	722.49	724.84	2.35	2.00	MH 3
final		303+00	0.51	0.46									721.49				722.46	722.74			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 03/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 313+00.00 SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	313+00	0.51	0.46	10.00	5.39	6.65	2.5	3.0	15	59.8	0.0100	739.25	4.41	6.02	0.0029	739.90	745.05	5.15	4.55	I 3B
begin		313+00	0.51	0.46									738.65				739.63	741.90			0.015
1	2	313+00	0.00	0.00	10.23	5.35	6.59	2.4	3.0	15	196.1	0.2500	738.65	13.97	30.11	0.0029	738.93	741.90	2.97	2.00	MH 3
		313+00	0.51	0.46									689.63				690.60	692.88			0.015
2	3	313+00	0.00	0.00	10.46	5.31	6.58	2.4	3.0	15	14.1	0.0100	689.63	4.39	6.02	0.0029	690.50	692.88	2.38	2.00	MH 3
final		313+00	0.51	0.46									689.48				690.46	692.73			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 03/05/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 323+00.00 SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	323+00	0.95	0.86	10.00	5.39	6.66	4.6	5.7	15	57.6	0.0110	721.15	5.30	6.32	0.0104	722.22	726.95	4.73	4.55	I 3B
begin		323+00	0.95	0.86									720.52				721.62	723.77			0.015
1	2	323+00	0.00	0.00	10.18	5.36	6.63	4.6	5.7	15	139.0	0.5000	720.52	21.56	42.58	0.0103	720.84	723.77	2.93	2.00	MH 3
		323+00	0.95	0.86									651.02				652.13	654.27			0.015
2	3	323+00	0.00	0.00	10.29	5.34	6.62	4.6	5.7	15	16.8	0.0110	651.02	5.30	6.32	0.0103	652.12	654.27	2.15	2.00	MH 3
final		323+00	0.95	0.86									650.84				651.94	654.09			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 02/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : STA. 333+00.00 SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	333+00		1.06	0.95	10.00	5.39	6.66	5.1	6.3	15	61.2	0.0130	701.26	5.78	6.87	0.0128	702.38	705.96	3.58	3.45	I 3B
begin		333+00		1.06	0.95									700.47				701.60	703.72			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 02/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 340+00.00 SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	PIPE LENGTH (ft.)	PIPE SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	340+00	0.74	0.67	10.00	5.39	6.65	3.6	4.4	15	61.0	0.0100	671.25	4.84	6.02	0.0063	672.09	675.95	3.86	3.45	I 3B
begin		340+00	0.74	0.67									670.64				671.69	673.89			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 03/05/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 346+00.00 SR 823, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	346+00	0.63	0.57	10.00	5.39	6.65	3.1	3.8	15	57.5	0.0100	647.18	4.67	6.02	0.0046	647.94	652.98	5.04	4.55	I 3B
begin		346+00	0.63	0.57									646.61				647.62	649.86			0.015
1	2	346+00	0.00	0.00	10.21	5.35	6.62	3.1	3.8	15	153.1	0.5000	646.61	19.11	42.58	0.0045	646.87	649.86	2.99	2.00	MH 3
		346+00	0.63	0.57									570.06				571.08	573.31			0.015
2	3	346+00	0.00	0.00	10.34	5.33	6.61	3.0	3.8	15	16.5	0.0100	570.06	4.66	6.02	0.0045	570.99	573.31	2.32	2.00	MH 3
final		346+00	0.63	0.57									569.90				570.91	573.15			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 02/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 349+00.00 SR 823, LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	349+00	0.32	0.28	10.00	5.39	6.64	1.5	1.9	15	61.0	0.0100	643.48	3.89	6.02	0.0011	643.98	648.18	4.20	3.45	I 3B
begin		349+00	0.32	0.28									642.87				643.77	646.12			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 04/06/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : REACH # 4; FROM 350+00 TO 350+59.68 (LP); FROM 351+50 TO 350+59.68 (LP); LHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	350+00	0.11	0.09	10.00	5.39	6.63	0.5	0.6	15	59.7	0.0149	642.92	3.26	7.35	0.0001	643.18	647.62	4.44	3.45	I 3B
begin		350+59	0.11	0.09									642.03				642.81	647.53			0.015
0	1	351+50	0.37	0.33	10.00	5.39	6.62	1.8	2.2	15	90.3	0.0112	643.04	4.22	6.37	0.0015	643.57	647.74	4.17	3.45	I 3B
begin		350+59	0.47	0.43									642.03				642.95	647.53			0.015
1	2	350+59	0.16	0.14	10.36	5.33	6.57	3.0	3.7	15	62.6	0.0100	642.03	4.65	6.02	0.0045	642.78	647.53	4.75	4.25	I 3B
final		350+59	0.63	0.57									641.40				642.42	644.65			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 05/29/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 37+25.00 TO 29+61.40 US52 RAMP A, RHS **Designer :** MDC

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From	To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	37+25		0.29	0.26	10.00	5.39	6.69	1.4	1.8	15	3.5	0.0100	571.96	3.80	6.02	0.0010	572.82	575.96	3.14	2.75	CB 3
begin		37+25		0.29	0.26									571.92				572.81	574.17			0.015
1	2	37+25		0.00	0.00	10.02	5.39	6.69	1.4	1.8	15	37.6	0.5000	571.92	15.21	42.58	0.0010	572.10	574.17	2.07	1.00	MH 3
		37+25		0.29	0.26									553.12				554.01	557.25			0.015
2	3	37+25		0.28	0.15	10.06	5.38	6.53	2.2	2.7	15	175.0	0.0093	553.12	4.18	5.80	0.0023	553.75	557.25	3.50	2.88	CB 2-2B
		35+50		0.57	0.41									551.50				552.45	554.50			0.015
3	4	35+50		0.51	0.31	10.75	5.26	6.38	3.8	4.6	15	200.0	0.0100	551.50	4.91	6.02	0.0068	552.37	554.50	2.13	1.75	CB 2-2B
		33+50		1.08	0.72									549.50				550.56	552.50			0.015
4	5	33+50		0.58	0.34	11.43	5.14	6.30	5.5	6.7	15	200.0	0.0350	549.50	8.62	11.27	0.0143	550.23	552.50	2.27	1.75	CB 2-2B
		31+50		1.66	1.06									542.50				543.64	549.00			0.015
0	5	31+50		0.42	0.27	10.00	5.39	6.65	1.4	1.8	15	52.0	0.0115	543.10	4.03	6.47	0.0010	543.57	546.10	2.53	1.75	CB 2-2B
begin		31+50		2.08	1.33									542.50				543.39	549.00			0.015
5	6	31+50		0.49	0.27	11.82	5.07	6.21	8.1	9.9	24	188.6	0.0139	541.75	6.70	24.86	0.0026	542.67	549.00	6.33	5.25	CB 2-3
final		29+61		2.57	1.60									539.13				540.69	546.71			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 12/18/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 22+84 TO 24+50 US52 RAMP B, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	22+84	0.86	0.77	10.00	5.39	5.98	4.2	4.6	15	63.0	0.0357	537.25	8.12	11.38	0.0068	537.83	542.75	4.92	4.25	CB
begin		22+94	0.86	0.77									535.00				536.21	537.90			0.015
1	2	22+94	0.72	0.65	13.00	4.89	5.98	7.0	8.5	18	154.4	0.0078	534.75	5.11	8.63	0.0087	536.21	537.90	1.69	1.65	CB 2-3
		24+50	1.58	1.42									533.55				534.86	537.10			0.015
2	3	24+50	0.93	0.84	13.50	4.81	5.93	10.9	13.4	24	82.5	0.0067	533.05	5.47	17.21	0.0047	534.54	537.10	2.56	2.05	CB 2-3
final		24+50	2.51	2.26									532.50				534.16	535.00			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 05/29/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 29+25.00, US52 RAMP B, LHS **Designer :** MDC

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From To	ΔAREA ΣAREA (acres)	ΔCA ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	29+25	0.20	0.18	10.00	5.39	6.69	1.0	1.2	15	3.5	0.0100	550.03	3.42	6.02	0.0005	550.84	554.03	3.19	2.75	CB 3
begin		29+25	0.20	0.18									550.00				550.84	552.25			0.015
1	2	29+25	0.00	0.00	10.02	5.39	6.68	1.0	1.2	15	38.0	0.5000	550.00	13.58	42.58	0.0005	550.14	552.25	2.10	1.00	MH 3
		29+25	0.20	0.18									531.00				531.84	533.25			0.015
2	3	29+25	0.00	0.00	10.06	5.38	6.67	1.0	1.2	15	16.5	0.0100	531.00	3.41	6.02	0.0005	531.68	533.25	1.57	1.00	MH 3
final		29+25	0.20	0.18									530.83				531.67	533.08			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 05/29/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 34+70 TO 29+00 US52 RAMP B, RHS **Designer :** MDC

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	34+70	1.00	0.88	10.00	5.39	6.54	4.7	5.8	15	245.0	0.0128	541.00	5.66	6.81	0.0105	541.93	544.50	2.57	2.25	CB 2-2B
begin		32+25	1.00	0.88									537.87				538.98	541.45			0.015
0	1	32+25	0.62	0.56	10.00	5.39	6.69	3.0	3.7	15	56.0	0.3768 *	558.97	17.25	36.97	0.0044	559.25	562.97	3.72	2.75	CB 3
begin		32+25	1.62	1.44									537.87				538.89	541.45			0.015
1	2	32+25	0.35	0.25	10.72	5.26	6.43	8.9	10.8	24	175.0	0.0095	537.12	5.97	20.54	0.0030	538.20	541.45	3.25	2.33	CB 2-3
		30+50	1.97	1.68									535.46				537.05	538.70			0.015
2	3	30+50	0.53	0.37	11.21	5.18	6.32	10.6	13.0	24	150.0	0.0242	535.46	8.83	32.81	0.0044	536.37	538.70	2.33	1.24	CB 2-3
		29+00	2.50	2.05									531.83				533.51	535.90			0.015
3	4	29+00	4.00	3.40	11.49	5.13	6.32	28.0	34.5	36	125.5	0.0099	531.83	8.07	61.81	0.0035	533.51	535.90	2.39	1.07	CB 2-4
final		29+00	6.50	5.45									530.59				533.04	535.90			0.015

* SLOPE FROM CB TO CB (THE BEND IS NOT MODELED)

STORM SEWER SYSTEM

PID : 77366 **Date :** 06/04/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :44+50 TO 43+10.93; US52 RAMP B, TO 21+65; CR503 **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	44+50	0.13	0.09	15.00	4.60	5.65	0.4	0.5	15	68.4	0.0110	586.15	2.77	6.31	0.0001	586.40	590.15	3.75	2.75	CB 8
begin		44+50	0.13	0.09									585.40				586.16	589.45			0.015
1	2	44+50	0.27	0.22	15.41	4.55	5.57	1.4	1.7	15	137.7	0.0150	585.40	4.39	7.38	0.0009	585.83	589.45	3.62	2.80	CB 8
		43+10	0.40	0.31									583.33				584.22	587.35			0.015
2	3	43+10	0.04	0.03	15.93	4.48	5.56	1.5	1.9	15	57.8	0.5000	583.33	15.63	42.58	0.0012	583.52	587.35	3.83	2.77	CB 8
		42+53	0.43	0.34									554.41				555.31	557.66			0.015
3	4	42+53	0.00	0.00	16.00	4.47	5.51	1.5	1.9	15	63.2	0.0100	554.41	3.89	6.02	0.0011	554.91	557.66	2.75	2.00	MH 3
		24+00	0.43	0.34									553.78				554.68	557.90			0.015
4	5	24+00	0.13	0.09	16.27	4.44	5.51	1.9	2.4	15	6.0	0.0100	553.78	4.13	6.02	0.0018	554.67	557.90	3.23	2.87	CB 2-3
		24+00	0.56	0.43									553.72				554.65	559.04			0.015
0	7	26+50	4.12	2.15	10.00	5.39	6.63	11.6	14.2	24	123.0	0.0100	554.25	6.49	21.09	0.0053	555.51	557.25	1.74	1.00	CB 2-3
begin		25+27	4.68	2.58									553.02				554.70	558.10			0.015
7	8	25+27	0.18	0.12	10.32	5.33	6.62	12.1	15.0	24	7.8	0.0090	553.02	6.30	19.98	0.0058	554.69	558.10	3.41	3.08	CB 2-3
		25+27	4.86	2.70									552.95				554.65	558.88			0.015
8	5	25+27	0.01	0.01	10.34	5.33	6.55	12.1	14.9	24	127.0	0.0094	552.95	6.42	20.50	0.0058	554.28	558.88	4.60	3.93	CB 3A
		24+00	4.87	2.71									551.75				553.45	559.04			0.015

STORM SEWER SYSTEM

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
5	9	24+00	0.07	0.06	16.29	4.44	5.41	12.3	15.0	24	235.0	0.0075	551.75	5.88	18.25	0.0058	553.21	559.04	5.83	5.29	I 3D
		21+65	4.94	2.77									549.99				551.69	560.03			0.015
9	10	21+65	0.11	0.10	16.96	4.36	5.40	12.5	15.5	24	23.0	0.0096	549.99	6.49	20.63	0.0062	551.62	560.03	8.41	8.04	CB 3
final		21+65	5.05	2.87									549.77				551.48	553.77			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 05/30/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 47+00; US52 RAMP B, RHS **Designer :** DL

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	47+00	0.08	0.07	10.00	5.39	6.63	0.4	0.5	15	46.2	0.0100	590.56	2.62	6.03	0.0001	590.86	594.40	3.54	2.59	CB 2-3
begin		47+00	0.08	0.07									590.10				590.86	593.35			0.015

STORM SEWER SYSTEM

PID : 77366 **Date :** 06/19/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 8+50 to 11+36.71, SR 140, RHS **Designer :** MDC

Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 1.00

JUNCTION From	To	STATION From / To	ΔAREA / ΣAREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	11+37	80.23	36.10	15.00	4.60		5.71	166.2 206.2	60	38.0	0.0076	551.62	13.47	265.14	0.0053	556.08	557.62	1.54	1.00	HW Half He
begin		11+00	80.23	36.10									551.33				555.88	557.69			0.012
1	2	11+00	0.00	0.00	15.05	4.60		5.68	166.0 204.9	60	168.0	0.0075	551.33	13.38	262.84	0.0053	555.49	557.69	2.20	1.36	MH 3
		9+30	80.23	36.10									550.07				554.61	556.41			0.012
2	3	9+30	0.00	0.00	15.26	4.57		5.67	165.0 204.5	60	77.0	0.0429	550.07	25.58	628.32	0.0052	552.17	556.41	4.24	1.34	MH 3
		8+50	80.23	36.10									546.77				551.77	553.09			0.012
0	3	8+50	101.5	45.68	15.00	4.60		5.67	210.3 258.8	60	100.0	0.0053	547.30	11.91	220.96	0.0084	552.61	554.30	1.69	2.00	HW Half He
begin		8+50	181.73	81.78									546.77				551.77	553.09			0.012
3	4	8+50	0.00	0.00	15.31	4.56		5.67	373.2 463.3	66	14.0	0.0114	546.27	18.64	418.35	0.0162	551.77	553.09	1.32	1.32	MH 3
final		8+50	181.73	81.78									546.11				551.52	553.68			0.012

STORM SEWER SYSTEM

PID : 77366 **Date :** 05/24/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :STA. 13+60.00, SR 140, RHS **Designer :** DL

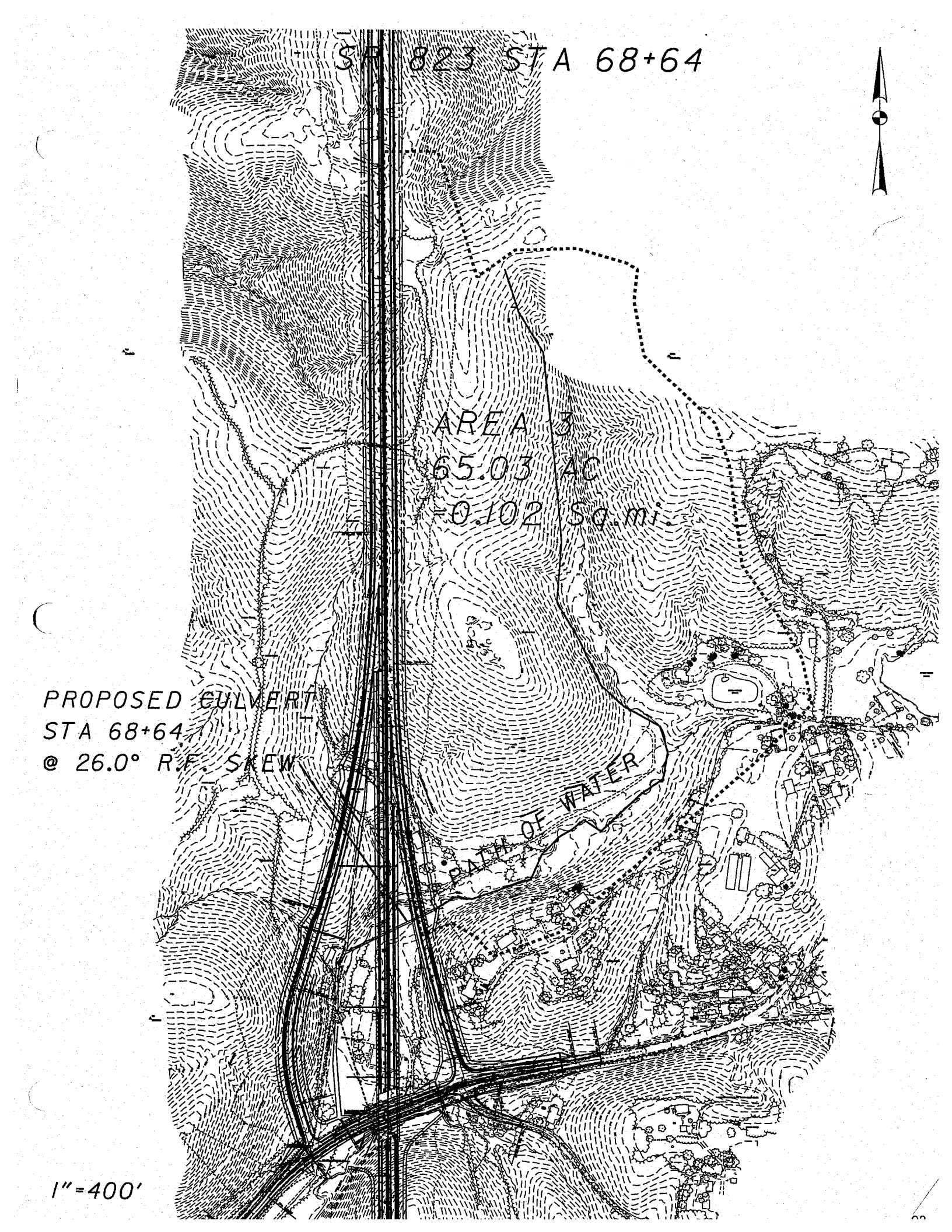
Rainfall Area: D **Just Full Capacity Frequency (yrs.) :** 10 **Hydraulic Gradient Frequency (yrs.) :** 25

Minimum Pipe Size : 15.00 **Tailwater Elevation (ft.):** 0.00

JUNCTION From	To	STATION From / To	ΔAREA / Σ AREA (acres)	ΔCA / ΣCA	BEGIN TIME (min.)	RAINFALL INTENSITY (10 yrs.)	(25 yrs.)	DISCHARGE (cfs.) (10 yrs.)	(25 yrs.)	PIPE DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	F/L PIPE IN / OUT (ft.)	MEAN VEL (fps.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE MANNING'S 'n'
0	1	13+60	0.13	0.12	10.00	5.39	6.69	0.6	0.8	15	5.8	0.0100	560.18	3.01	6.02	0.0002	560.92	564.18	3.26	2.75	CB 3
begin		13+60	0.13	0.12									560.12				560.92	563.37			0.015
1	2	13+60	0.00	0.00	10.03	5.39	6.69	0.6	0.8	15	8.4	0.5000	560.12	11.83	42.58	0.0002	560.24	563.37	3.13	2.00	MH 3
		13+60	0.13	0.12									555.92				556.72	559.17			0.015
2	3	13+60	0.00	0.00	10.04	5.38	6.68	0.6	0.8	15	7.1	0.0100	555.92	3.03	6.02	0.0002	556.65	559.17	2.52	2.00	MH 3
final		13+60	0.13	0.12									555.85				556.65	559.10			0.015

APPENDIX D

Culvert Analysis


SR 823 STA 68+64
AREA 3
65.03 AC
=0.102 Sq.mi.
PROPOSED CULVERT
STA 68+64
@ 26.0° R.F. SKEW
PATH OF WATER
1"=400'

SR823 STA. 68+64.00
TECHNIQUES FOR ESTIMATING FLOOD-PEAK
DISCHARGES OF RURAL, UNREGULATED STREAMS IN OHIO AREA A
U.S. GEOLOGICAL SURVEY Water Resources Investigations Report 89-4126

Values	Units	Definitions
2832542.00	SQ. FT.	
0.102	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
1378.00	FT.	**TOTAL CHANNEL LENGTH**
137.80	FT.	L_{10} = 10% of the Distance along channel
585	FT.	$Elev_{10}$ = Elevation at point L_{10}
1171.30	FT.	L_{85} = 85% of the Distance along channel
754	FT.	$Elev_{85}$ = Elevation at point L_{85}
1033.50	FT.	**Length** = $L_{85} - L_{10}$
862.37	FT./MI.	**SLOPE** = $(Elev_{10}-Elev_{85})$/Length
	CFS	$Q_{\#}$ = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	30.01	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	64.86	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	94.32	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	135.16	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	169.33	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	203.52	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

Worksheet for SR 823 STA 68+64

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.03400	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	10.00	ft
Discharge	169.30	ft^3/s

Results

Normal Depth	1.62	ft
Flow Area	21.40	ft^2
Wetted Perimeter	17.23	ft
Top Width	16.47	ft
Critical Depth	1.82	ft
Critical Slope	0.02203	ft/ft
Velocity	7.91	ft/s
Velocity Head	0.97	ft
Specific Energy	2.59	ft
Froude Number	1.22	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.62	ft
Critical Depth	1.82	ft
Channel Slope	0.03400	ft/ft
Critical Slope	0.02203	ft/ft

UNIVERSAL CULVERT DESIGN

PID : 77356 **Date :** 01/17/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 3, Sta. 68+64 **Designer :** hjs

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 576.67 **Outlet Invert Elevation (ft.) :** 566.58 **Tailwater Elevation (ft.) :** 568.16 **Overflow Elevation (ft.) :** 593.41

Allowable Headwater Elevation (ft.) : 591.41 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 326.00 **Culvert Slope (ft./ft.) :** 0.0310 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 169.33 @ 50 yrs. **Flood Discharge (cfs) :** 203.52 @ 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall							**Entrance Loss (Ke) :** 0.20			
169.33	1	60 in.	582.48	N/A	1 - C	22.88	2.01	3.73	0.0120	INLET	0.00	D	0.00
169.33	1	54 in.	583.32	574.89	2 - E	22.97	2.12	3.79	0.0120	INLET	0.00	D - 1	0.00
169.33	1	48 in.	585.07	577.66	2 - E	22.93	2.28	3.72	0.0120	INLET	0.00	D - 2	0.00
169.33	1	66 in.	582.06	N/A	1 - C	22.74	1.93	3.64	0.0120	INLET	0.00	D + 1	0.00
203.52	1	60 in.	583.49	574.80	2 - E	24.03	2.23	4.07	0.0120	INLET	0.00	F	0.00
203.52	1	54 in.	584.87	576.87	2 - E	24.05	2.36	4.06	0.0120	INLET	0.00	F - 1	0.00
203.52	1	48 in.	587.52	580.94	2 - E	23.86	2.57	3.86	0.0120	INLET	0.00	F - 2	0.00
203.52	1	66 in.	582.80	N/A	1 - C	23.92	2.13	3.99	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall							**Entrance Loss (Ke) :** 0.90			
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
169.33	1	60 in.	583.46	577.50	2 - E	13.96	2.96	3.73	0.0232	INLET	0.00	D	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
169.33	1	54 in.	585.16	581.79	2 - E	13.69	3.27	3.79	0.0233	INLET	0.00	D - 1	0.00
169.33	1	48 in.	588.14	590.52	2 - F	13.89	4.00	3.72	0.0235	OUTLET**	0.00	D - 2	0.00
169.33	1	66 in.	582.57	N/A	1 - C	14.06	2.78	3.64	0.0231	INLET	0.00	D + 1	0.00
203.52	1	60 in.	585.16	580.59	2 - E	14.50	3.36	4.07	0.0232	INLET	0.00	F	0.00
203.52	1	54 in.	587.67	586.84	2 - E	13.73	3.96	4.06	0.0233	INLET	0.00	F - 1	0.00
180.92	1	48 in.	591.68	599.51	2 - F	14.72	4.00	3.78	0.0235	OUTLET**	22.60	F - 2	0.00
203.52	1	66 in.	583.71	577.25	2 - E	14.70	3.11	3.99	0.0231	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
169.33	1	60 in.	583.46	579.09	2 - E	12.35	3.29	3.73	0.0271	INLET	0.00	D	0.00
169.33	1	54 in.	585.16	584.67	2 - E	11.79	3.81	3.79	0.0273	INLET	0.00	D - 1	0.00
160.73	1	48 in.	588.14	595.96	2 - F	13.31	4.00	3.67	0.0275	OUTLET**	8.60	D - 2	0.00
169.33	1	66 in.	582.57	N/A	1 - C	12.53	3.05	3.64	0.0269	INLET	0.00	D + 1	0.00
203.52	1	60 in.	585.16	582.89	2 - E	12.71	3.80	4.07	0.0271	INLET	0.00	F	0.00
203.52	1	54 in.	587.67	591.00	2 - F	13.48	4.50	4.06	0.0273	OUTLET**	0.00	F - 1	0.00
160.72	1	48 in.	591.68	607.37	2 - F	13.31	4.00	3.67	0.0275	OUTLET**	42.80	F - 2	0.00
203.52	1	66 in.	583.71	578.59	2 - E	13.05	3.43	3.99	0.0269	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
169.33	1	66 in.	582.57	N/A	1 - C	10.69	3.48	3.64	0.0330	INLET	0.00	D	0.00
169.33	1	60 in.	583.46	583.72	2 - F	10.78	3.87	3.73	0.0332	OUTLET*	0.00	D - 1	0.00
169.33	1	72 in.	582.10	N/A	1 - C	10.82	3.25	3.54	0.0327	INLET	0.00	D + 1	0.00
203.52	1	66 in.	583.71	581.16	2 - E	11.04	3.98	3.99	0.0330	INLET	0.00	F	0.00
203.52	1	60 in.	585.16	587.19	2 - F	11.90	5.00	4.07	0.0332	OUTLET**	0.00	F - 1	0.00
203.52	1	72 in.	582.92	N/A	1 - C	11.29	3.65	3.90	0.0327	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
169.33	1	60 in.	583.46	578.62	2 - E	12.77	3.20	3.73	0.0260	INLET	0.00	D	0.00
169.33	1	66 in.	582.57	N/A	1 - C	12.85	2.99	3.64	0.0260	INLET	0.00	D + 1	0.00
203.52	1	60 in.	585.16	582.20	2 - E	13.18	3.67	4.07	0.0260	INLET	0.00	F	0.00
203.52	1	66 in.	583.71	578.25	2 - E	13.41	3.35	3.99	0.0260	INLET	0.00	F + 1	0.00

DESIGN = 60" USE F2" (FOR FUTURE LINING)

CULVERT ANALYSIS

PID : 77356 **Date :** 01/17/2007 **Project :** SR 823, Portsmouth Bypass **Location :** Portsmouth, Ohio

Description : Drainage 3, Sta. 68+64 **Designer :** HJS

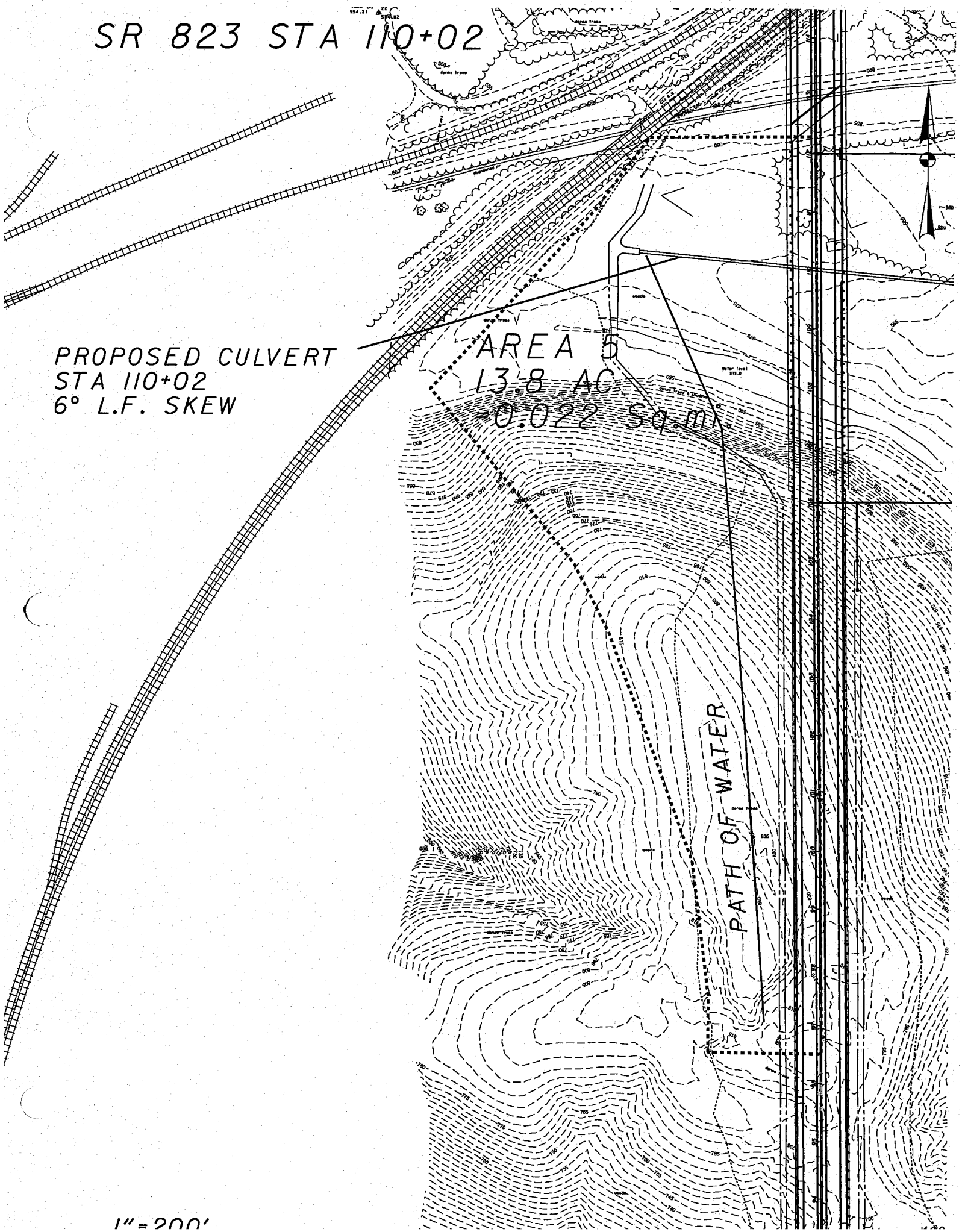
HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Pipe Number : 1 **Use HW :** 0 **Inlet Invert Elevation (ft.) :** 576.67 **Outlet Invert Elevation (ft.) :** 566.58
Pipe Quantity : 1

Culvert Type : Circular Corrugated
Corrugation Type : Corrugated Metal Pipe (6 x 2 in. corrugations) **Pipe Length (ft.) :** 326.00 **Culvert Slope (ft./ft.) :** 0.0310
Pipe Size : 72 in.
Design Manning 'n' : (default)

Entrance Type : Half Headwall **Loss Coef. Ke :** 0.9000

FLOW (cfs.)	HEAD LOSS (ft.)	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	BURIED DEPTH (ft.)	TAILWATER ELEVATION (ft.)
169.30	10.75	582.10	N/A	1 - C	10.82	3.25	3.54	0.0327	INLET	0.00	566.58
203.50	11.39	582.92	N/A	1 - C	11.29	3.65	3.90	0.0327	INLET	0.00	566.58


SR 823 STA 110+02
PROPOSED CULVERT
STA 110+02
6° L.F. SKEW
AREA 5
13.8 AC
0.022 Sq.mi.
PATH OF WATER
1" = 200'

SR 823 STA 110+02.00
TECHNIQUES FOR ESTIMATING FLOOD-PEAK
DISCHARGES OF RURAL, UNREGULATED STREAMS IN OHIO AREA A
U.S. GEOLOGICAL SURVEY Water Resources Investigations Report 89-4126

Values	Units	Definitions
600977.70	SQ. FT.	
0.022	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
1350.00	FT.	**TOTAL CHANNEL LENGTH**
135.00	FT.	L_{10} = 10% of the Distance along channel
580	FT.	$Elev_{10}$ = Elevation at point L_{10}
1147.50	FT.	L_{85} = 85% of the Distance along channel
842	FT.	$Elev_{85}$ = Elevation at point L_{85}
1012.50	FT.	**Length** = $L_{85} - L_{10}$
1366.28	FT./MI.	**SLOPE** = $(Elev_{10}-Elev_{85})/Length$
	CFS	$Q_{\#}$ = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	9.66	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	21.79	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	32.28	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	46.98	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	59.46	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	71.87	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

Worksheet for SR 823 STA 110+02

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.02890	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	5.00	ft
Discharge	59.50	ft^3/s

Results

Normal Depth	1.31	ft
Flow Area	9.97	ft^2
Wetted Perimeter	10.85	ft
Top Width	10.24	ft
Critical Depth	1.36	ft
Critical Slope	0.02521	ft/ft
Velocity	5.97	ft/s
Velocity Head	0.55	ft
Specific Energy	1.86	ft
Froude Number	1.07	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.31	ft
Critical Depth	1.36	ft
Channel Slope	0.02890	ft/ft
Critical Slope	0.02521	ft/ft

UNIVERSAL CULVERT DESIGN

PID : 77366 **Date :** 03/16/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 5, Sta. 110+02 Maximum Q through this culvert **Designer :** mdc

HEADWATER CONTROL CODES:

INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 559.81 **Outlet Invert Elevation (ft.) :** 556.62 **Tailwater Elevation (ft.) :** 557.93 **Overflow Elevation (ft.) :** 664.00

Allowable Headwater Elevation (ft.) : 661.70 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 638.00 **Culvert Slope (ft./ft.) :** 0.0050 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 59.50 @ 50 yrs. **Flood Discharge (cfs) :** 71.90 @ 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.20		
59.50	1	42 in.	563.44	N/A	1 - C	8.84	2.31	2.42	0.0120	INLET	0.00	D	0.00
59.50	1	36 in.	564.10	564.99	2 - F	9.48	3.00	2.49	0.0120	OUTLET**	0.00	D - 1	0.00
59.50	1	33 in.	564.83	567.95	2 - F	10.55	2.75	2.48	0.0120	OUTLET**	0.00	D - 2	0.00
59.50	1	48 in.	563.18	N/A	1 - C	8.93	2.09	2.32	0.0120	INLET	0.00	D + 1	0.00
71.90	1	42 in.	563.99	564.03	2 - F	9.18	2.68	2.66	0.0120	OUTLET*	0.00	F	0.00
71.90	1	36 in.	565.10	567.67	2 - F	10.78	3.00	2.68	0.0120	OUTLET**	0.00	F - 1	0.00
71.90	1	33 in.	566.25	572.02	2 - F	12.35	2.75	2.61	0.0120	OUTLET**	0.00	F - 2	0.00
71.90	1	48 in.	563.59	N/A	1 - C	9.34	2.36	2.56	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.90		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
59.50	1	48 in.	563.35	564.03	1 - A	7.86	3.55	2.32	0.0235	OUTLET*	0.00	D	0.00

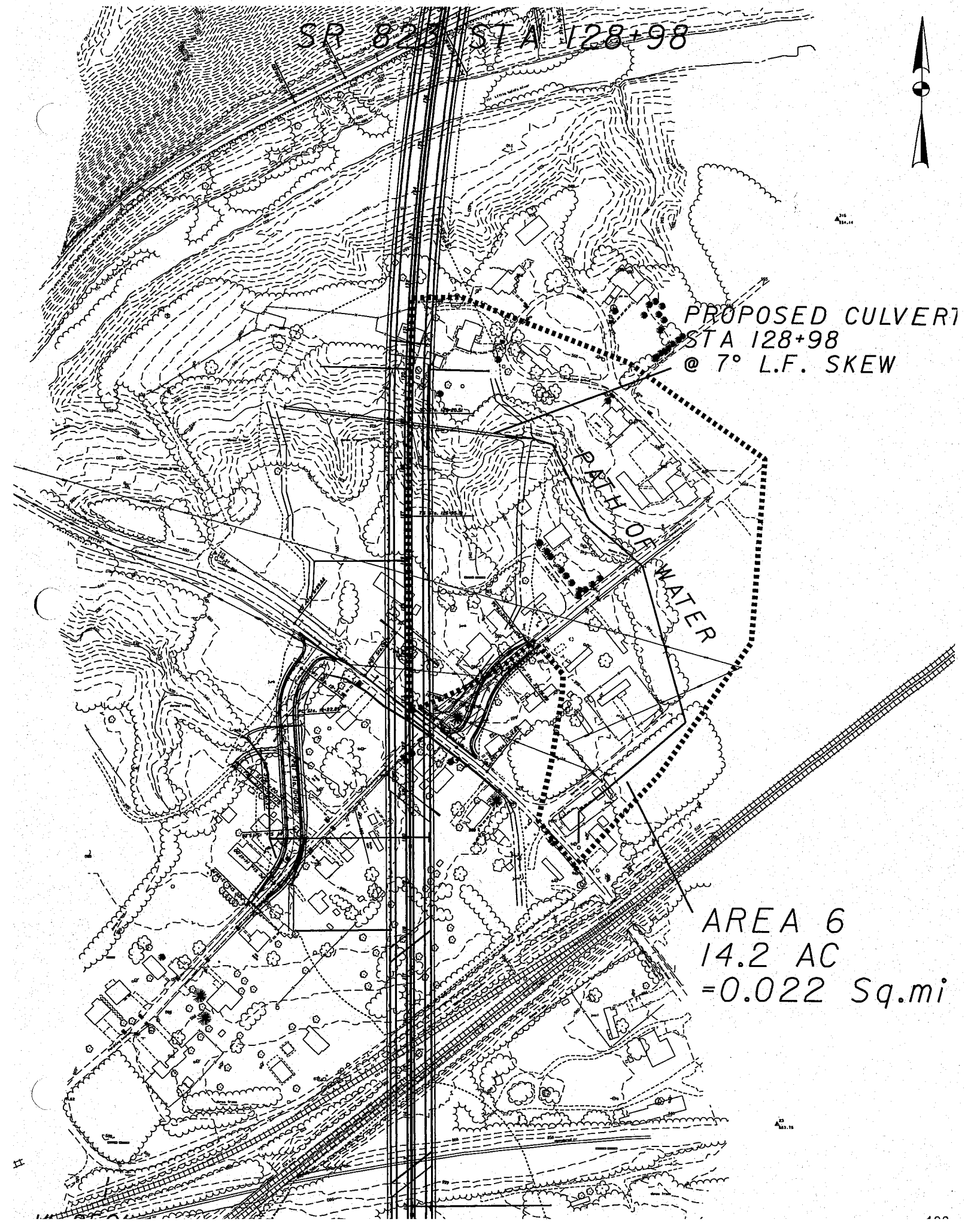
UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
59.50	1	42 in.	563.86	568.08	2 - F	8.39	3.50	2.42	0.0237	OUTLET**	0.00	D - 1	0.00
59.50	1	36 in.	565.23	578.81	2 - F	9.48	3.00	2.49	0.0241	OUTLET**	0.00	D - 2	0.00
59.50	1	54 in.	563.12	563.59	1 - A	7.52	2.95	2.24	0.0233	OUTLET*	0.00	D + 1	0.00
71.90	1	48 in.	563.89	566.06	2 - F	8.45	4.00	2.56	0.0235	OUTLET**	0.00	F	0.00
71.90	1	42 in.	564.76	572.11	2 - F	9.18	3.50	2.66	0.0237	OUTLET**	0.00	F - 1	0.00
71.90	1	36 in.	566.87	587.85	2 - F	10.78	3.00	2.68	0.0241	OUTLET**	0.00	F - 2	0.00
71.90	1	54 in.	563.52	564.10	1 - A	8.03	3.42	2.47	0.0233	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
59.50	1	48 in.	563.35	565.31	2 - F	7.86	4.00	2.32	0.0275	OUTLET**	0.00	D	0.00
59.50	1	42 in.	563.86	570.85	2 - F	8.39	3.50	2.42	0.0278	OUTLET**	0.00	D - 1	0.00
59.50	1	36 in.	565.23	585.05	2 - F	9.48	3.00	2.49	0.0281	OUTLET**	0.00	D - 2	0.00
59.50	1	54 in.	563.12	563.76	1 - A	7.52	3.33	2.24	0.0273	OUTLET*	0.00	D + 1	0.00
71.90	1	48 in.	563.89	567.98	2 - F	8.45	4.00	2.56	0.0275	OUTLET**	0.00	F	0.00
71.90	1	42 in.	564.76	576.16	2 - F	9.18	3.50	2.66	0.0278	OUTLET**	0.00	F - 1	0.00
71.90	1	36 in.	566.87	596.96	2 - F	10.78	3.00	2.68	0.0281	OUTLET**	0.00	F - 2	0.00
71.90	1	54 in.	563.52	564.43	1 - A	8.03	4.11	2.47	0.0273	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
59.50	1	60 in.	562.98	563.73	1 - A	7.29	3.46	2.17	0.0332	OUTLET*	0.00	D	0.00
59.50	1	66 in.	562.85	563.49	1 - A	7.10	3.19	2.11	0.0330	OUTLET*	0.00	D + 1	0.00
71.90	1	60 in.	563.34	564.32	1 - A	7.74	4.09	2.39	0.0332	OUTLET*	0.00	F	0.00
71.90	1	66 in.	563.20	563.95	1 - A	7.52	3.62	2.33	0.0330	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
59.50	1	60 in.	562.98	563.45	1 - A	7.29	2.93	2.17	0.0260	OUTLET*	0.00	D	0.00
59.50	1	66 in.	562.85	563.27	1 - A	7.10	2.75	2.11	0.0260	OUTLET*	0.00	D + 1	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
71.90	1	60 in.	563.34	563.91	1 - A	7.74	3.32	2.39	0.0260	OUTLET*	0.00	F	0.00
71.90	1	66 in.	563.20	563.68	1 - A	7.52	3.09	2.33	0.0260	OUTLET*	0.00	F + 1	0.00

48" REQUIRED USE 60" STRUCTURAL PLATE


SR 823 STA 128+98
PROPOSED CULVERT
STA 128+98
@ 7° L.F. SKEW
PATH OF WATER
AREA 6
14.2 AC
=0.022 Sq.mi

SR 823 128+98.00

TECHNIQUES FOR ESTIMATING FLOOD-PEAK DISCHARGES OF RURAL, UNREGULATED STREAMS IN OHIO AREA A

U.S. GEOLOGICAL SURVEY Water Resources Investigations Report 89-4126

Values	Units	Definitions
618239.30	SQ. FT.	
0.022	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
1160.00	FT.	**TOTAL CHANNEL LENGTH**
116.00	FT.	L_{10} = 10% of the Distance along channel
527	FT.	$Elev_{10}$ = Elevation at point L_{10}
986.00	FT.	L_{85} = 85% of the Distance along channel
555	FT.	$Elev_{85}$ = Elevation at point L_{85}
870.00	FT.	**Length** = $L_{85} - L_{10}$
167.50	FT./MI.	**SLOPE** = $(Elev_{10}-Elev_{85})/Length$
	CFS	$Q_{\#}$ = Flood-Peak Discharge # = Frequency of Storm

Q_2	6.89	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	14.01	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	19.77	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	27.58	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	34.04	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	40.37	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

Worksheet for SR 823 STA 128+98

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.02230	ft/ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Bottom Width	6.00	ft
Discharge	34.00	ft^3/s

Results

Normal Depth	0.88	ft
Flow Area	8.34	ft^2
Wetted Perimeter	13.23	ft
Top Width	13.02	ft
Critical Depth	0.83	ft
Critical Slope	0.02810	ft/ft
Velocity	4.08	ft/s
Velocity Head	0.26	ft
Specific Energy	1.14	ft
Froude Number	0.90	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.88	ft
Critical Depth	0.83	ft
Channel Slope	0.02230	ft/ft
Critical Slope	0.02810	ft/ft

UNIVERSAL CULVERT DESIGN

PID : 77366 **Date :** 03/16/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 6 , Sta. 128+98 **Designer :** mdc

HEADWATER CONTROL CODES:

INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 523.90 **Outlet Invert Elevation (ft.) :** 512.54 **Tailwater Elevation (ft.) :** 513.42 **Overflow Elevation (ft.) :** 596.97

Allowable Headwater Elevation (ft.) : 594.97 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 506.00 **Culvert Slope (ft./ft.) :** 0.0225 **Design Manning 'n' :** 0.0120

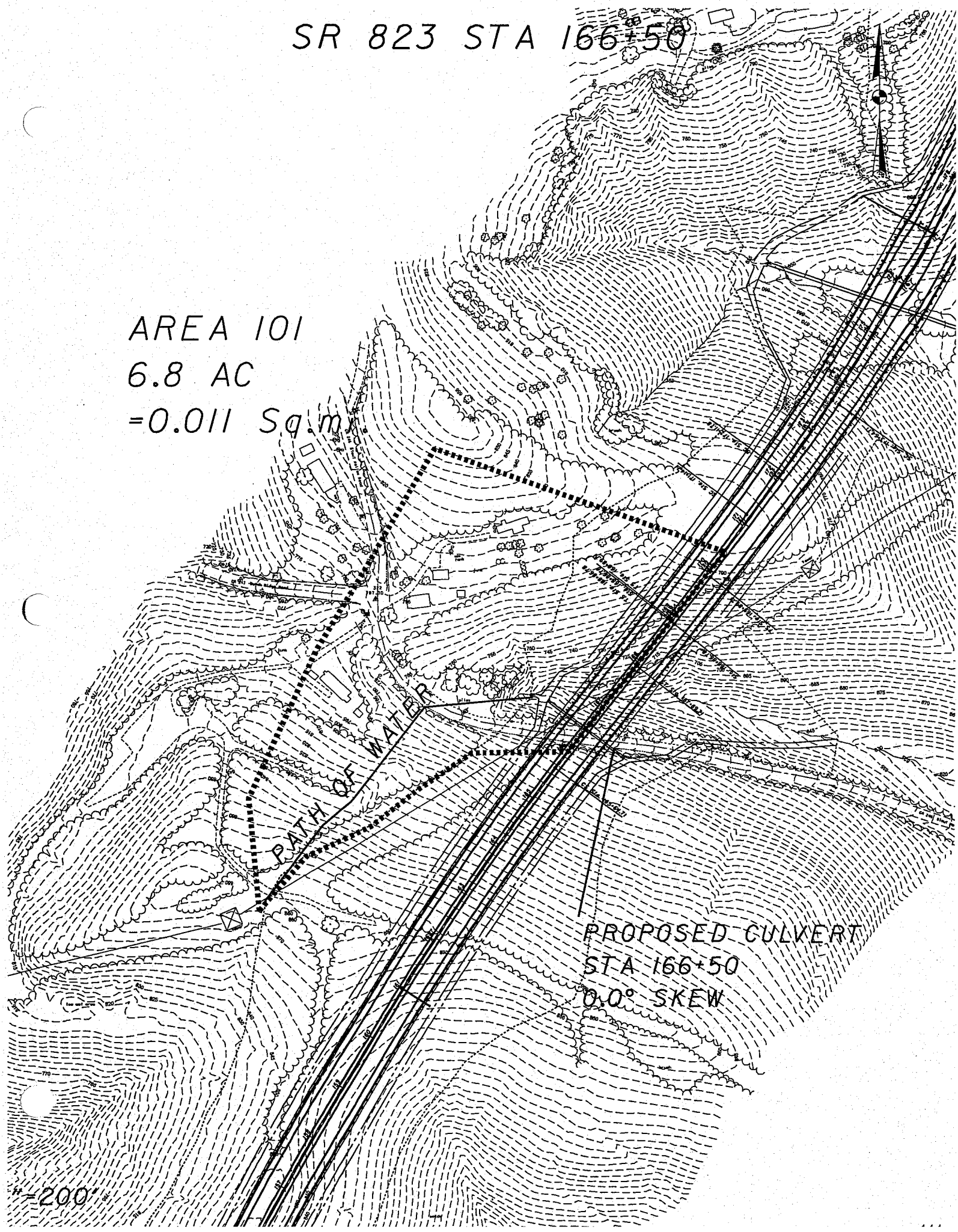
Design Discharge (cfs) : 34.00 **@** 50 yrs. **Flood Discharge (cfs) :** 40.40 **@** 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.20		
34.00	1	27 in.	527.73	521.19	2 - E	13.57	1.36	1.99	0.0120	INLET	0.00	D	0.00
34.00	1	24 in.	528.90	526.36	2 - E	13.27	1.52	1.91	0.0120	INLET	0.00	D - 1	0.00
34.00	1	21 in.	531.20	537.74	2 - F	14.17	1.75	1.73	0.0120	OUTLET**	0.00	D - 2	0.00
34.00	1	30 in.	527.14	518.62	2 - E	13.64	1.27	1.98	0.0120	INLET	0.00	D + 1	0.00
40.40	1	27 in.	528.66	523.93	2 - E	14.06	1.53	2.10	0.0120	INLET	0.00	F	0.00
40.40	1	24 in.	530.35	531.27	2 - F	12.94	2.00	1.95	0.0120	OUTLET**	0.00	F - 1	0.00
40.40	1	21 in.	534.11	547.41	2 - F	16.81	1.75	1.74	0.0120	OUTLET**	0.00	F - 2	0.00
40.40	1	30 in.	527.74	520.28	2 - E	14.21	1.41	2.14	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.90		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
34.00	1	30 in.	527.85	528.38	2 - F	8.15	2.15	1.98	0.0244	OUTLET**	0.00	D	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
34.00	1	27 in.	528.97	538.36	2 - F	9.13	2.25	1.99	0.0245	OUTLET**	0.00	D - 1	0.00
34.00	1	24 in.	530.80	558.98	2 - F	11.00	2.00	1.91	0.0247	OUTLET**	0.00	D - 2	0.00
34.00	1	33 in.	527.22	523.00	2 - E	7.99	1.85	1.94	0.0241	INLET	0.00	D + 1	0.00
40.40	1	30 in.	528.86	534.05	2 - F	9.04	2.50	2.14	0.0244	OUTLET**	0.00	F	0.00
40.40	1	27 in.	530.40	548.17	2 - F	10.47	2.25	2.10	0.0245	OUTLET**	0.00	F - 1	0.00
40.40	1	24 in.	532.89	577.32	2 - F	12.94	2.00	1.95	0.0247	OUTLET**	0.00	F - 2	0.00
40.40	1	33 in.	527.91	528.01	2 - F	8.25	2.13	2.11	0.0241	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
34.00	1	36 in.	526.89	527.32	1 - A	7.23	1.91	1.89	0.0281	OUTLET*	0.00	D	0.00
34.00	1	42 in.	526.58	N/A	1 - C	7.26	1.71	1.81	0.0278	INLET	0.00	D + 1	0.00
40.40	1	36 in.	527.37	527.67	2 - F	7.77	2.17	2.07	0.0281	OUTLET*	0.00	F	0.00
40.40	1	42 in.	526.89	N/A	1 - C	7.58	1.90	1.98	0.0278	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
34.00	1	60 in.	526.20	N/A	1 - C	6.26	1.60	1.62	0.0332	INLET	0.00	D	0.00
34.00	1	66 in.	526.10	N/A	1 - C	6.24	1.54	1.58	0.0330	INLET	0.00	D + 1	0.00
40.40	1	60 in.	526.44	N/A	1 - C	6.57	1.75	1.77	0.0332	INLET	0.00	F	0.00
40.40	1	66 in.	526.33	N/A	1 - C	6.55	1.68	1.72	0.0330	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
34.00	1	60 in.	526.20	N/A	1 - C	7.46	1.41	1.62	0.0260	INLET	0.00	D	0.00
34.00	1	66 in.	526.10	N/A	1 - C	7.39	1.37	1.58	0.0260	INLET	0.00	D + 1	0.00
40.40	1	60 in.	526.44	N/A	1 - C	7.84	1.54	1.77	0.0260	INLET	0.00	F	0.00
40.40	1	66 in.	526.33	N/A	1 - C	7.77	1.49	1.72	0.0260	INLET	0.00	F + 1	0.00

REQUIRED 30" USE 60" STRUCTURAL STEEL PLATE


SR 823 STA 166+50
AREA 101
6.8 AC
=0.011 Sq.m.
PATH OF WATER
PROPOSED CULVERT
STA 166+50
0.0° SKEW
H=200'

Client: ODOT Sheet: of

Subject: Pipe Culvert Calculations @ STA 166+50 Order No:

Computed by: MDC Date: 7/24/2006

Checked by: Date:

Rational Method

Coefficient of Runoff (1101.2.3)

	Area (Sft)	Area (Ac)	C
Pavement Area	18677	0.43	0.9
Non-paved Area	278728	6.40	0.45
Other			
Total Area		**6.83 acres**	**Weighted "C" =** **0.48**

Overland Flow

Length	10
High Elevation	1
Low Elevation	0
Slope %	10

t_o 1.64 (1101.2.2)

t_o 0.00 Compare with Fig 1101-1 Negligible

Shallow Concentrated Flow

Length	630
High Elevation	876
Low Elevation	731
Slope %	23.01587
k	0.457 (Grassed waterways - Table 1101-1)
V	7.193432 (1101.2.2)
t_s	1.459665 (1101.2.2)

Since the time of concentration = to + ts t_c **10.00** min

For Intensity Zone D

Frequency	a	b	c	Ac	t_c	C	I	Q cu ft/s
2 Years	85.568	16.5	0.95	6.827479	10.00	0.48	3.80	12.42
5 Years	118.822	18.7	0.969	6.827479	10.00	0.48	4.59	15.00
10 Years	112.172	16.8	0.923	6.827479	10.00	0.48	5.39	17.61
25 Years	198.92	19.3	1.004	6.827479	10.00	0.48	6.70	21.87
50 Years	206.025	19.6	0.99	6.827479	10.00	0.48	7.20	23.51
100 Years	355.551	23.199	1.076	6.827479	10.00	0.48	8.21	26.80

Worksheet for SR 823 STA 166+50

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.10000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	10.00	ft
Discharge	23.50	ft^3/s

Results

Normal Depth	0.38	ft
Flow Area	4.05	ft^2
Wetted Perimeter	11.69	ft
Top Width	11.51	ft
Critical Depth	0.54	ft
Critical Slope	0.03043	ft/ft
Velocity	5.80	ft/s
Velocity Head	0.52	ft
Specific Energy	0.90	ft
Froude Number	1.72	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.38	ft
Critical Depth	0.54	ft
Channel Slope	0.10000	ft/ft
Critical Slope	0.03043	ft/ft

UNIVERSAL CULVERT DESIGN

PID : 77366 **Date :** 04/06/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 101, Sta. 166+50 **Designer :** mdc

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 711.74 ✓ **Outlet Invert Elevation (ft.) :** 710.12 ✓ **Tailwater Elevation (ft.) :** 710.50 ✓ **Overflow Elevation (ft.) :** 727.00

Allowable Headwater Elevation (ft.) : 725.00 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 162.00 **Culvert Slope (ft./ft.) :** 0.0100 **Design Manning 'n' :** 0.0120

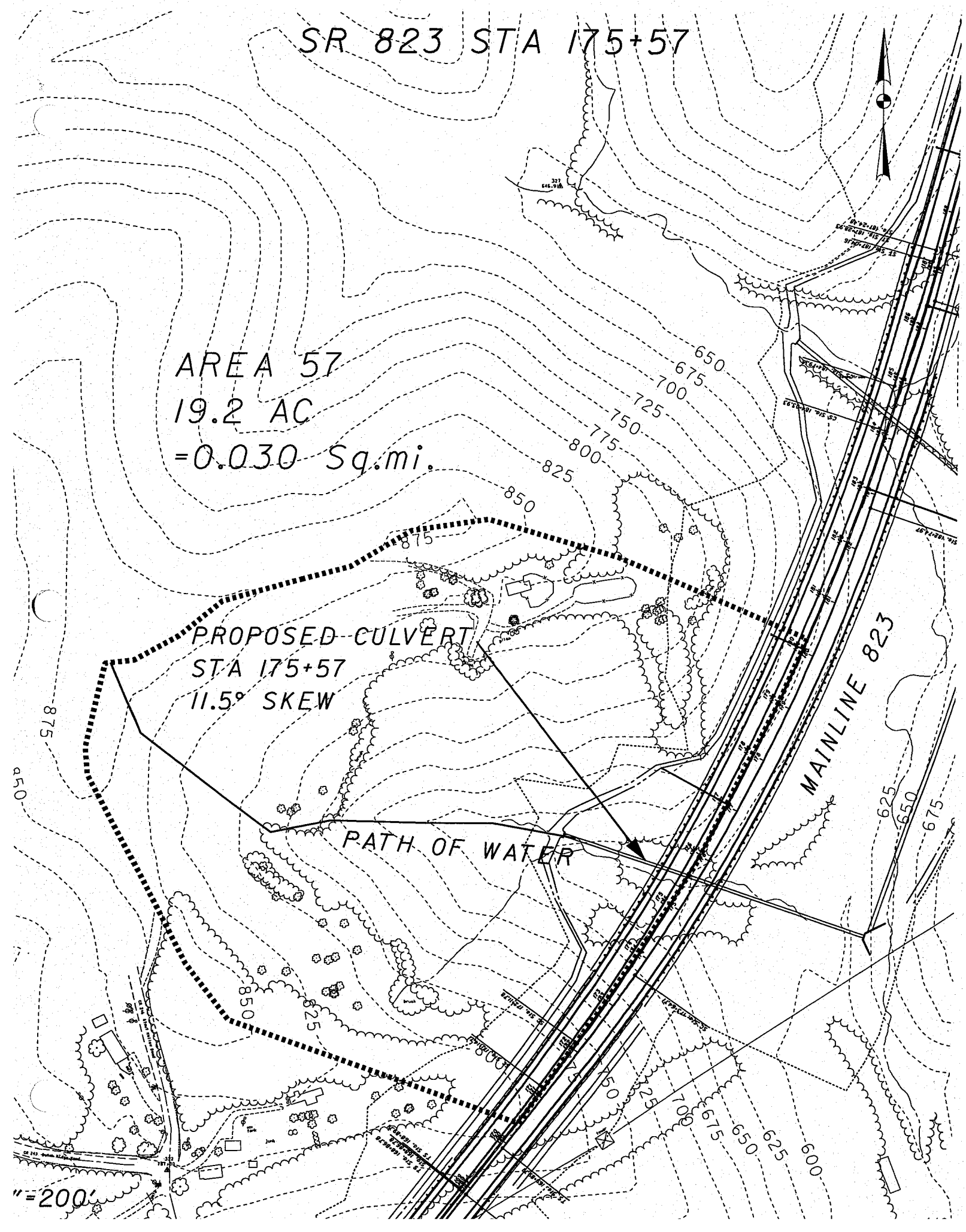
Design Discharge (cfs) : 23.50 @ 50 yrs. **Flood Discharge (cfs) :** 26.80 @ 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.20		
23.50	1	24 in.	714.87	714.50	2 - E	8.89	1.57	1.72	0.0120	INLET	0.00	D	0.00
23.50	1	21 in.	715.91	716.62	2 - F	9.96	1.75	1.66	0.0120	OUTLET**	0.00	D - 1	0.00
23.50	1	18 in.	718.17	721.78	2 - F	13.33	1.50	1.48	0.0120	OUTLET**	0.00	D - 2	0.00
23.50	1	27 in.	714.40	N/A	1 - C	9.13	1.39	1.70	0.0120	INLET	0.00	D + 1	0.00
26.80	1	24 in.	715.38	715.30	2 - E	8.53	2.00	1.80	0.0120	INLET	0.00	F	0.00
26.80	1	21 in.	716.77	718.08	2 - F	11.24	1.75	1.70	0.0120	OUTLET**	0.00	F - 1	0.00
26.80	1	18 in.	720.01	724.84	2 - F	15.18	1.50	1.49	0.0120	OUTLET**	0.00	F - 2	0.00
26.80	1	27 in.	714.72	714.02	2 - E	9.37	1.52	1.81	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.90		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
23.50	1	30 in.	714.41	714.71	1 - A	6.84	2.28	1.65	0.0244	OUTLET*	0.00	D	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
23.50	1	27 in.	714.87	716.42	2 - F	7.31	2.25	1.70	0.0245	OUTLET**	0.00	D - 1	0.00
23.50	1	24 in.	715.80	719.91	2 - F	8.17	2.00	1.72	0.0247	OUTLET**	0.00	D - 2	0.00
23.50	1	33 in.	714.19	714.47	1 - A	6.53	1.90	1.60	0.0241	OUTLET*	0.00	D + 1	0.00
26.80	1	30 in.	714.76	715.55	2 - F	7.24	2.50	1.76	0.0244	OUTLET**	0.00	F	0.00
26.80	1	27 in.	715.41	717.77	2 - F	7.84	2.25	1.81	0.0245	OUTLET**	0.00	F - 1	0.00
26.80	1	24 in.	716.63	722.33	2 - F	8.99	2.00	1.80	0.0247	OUTLET**	0.00	F - 2	0.00
26.80	1	33 in.	714.43	714.72	1 - A	6.87	2.12	1.72	0.0241	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
23.50	1	36 in.	714.06	714.35	1 - A	6.32	1.96	1.56	0.0281	OUTLET*	0.00	D	0.00
23.50	1	42 in.	713.91	714.19	1 - A	6.02	1.75	1.49	0.0278	OUTLET*	0.00	D + 1	0.00
26.80	1	36 in.	714.26	714.59	1 - A	6.62	2.16	1.67	0.0281	OUTLET*	0.00	F	0.00
26.80	1	42 in.	714.08	714.36	1 - A	6.28	1.89	1.60	0.0278	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
23.50	1	60 in.	713.59	713.88	1 - A	5.55	1.63	1.34	0.0332	OUTLET*	0.00	D	0.00
23.50	1	66 in.	713.52	713.82	1 - A	5.45	1.57	1.30	0.0330	OUTLET*	0.00	D + 1	0.00
26.80	1	60 in.	713.74	714.05	1 - A	5.75	1.75	1.43	0.0332	OUTLET*	0.00	F	0.00
26.80	1	66 in.	713.65	713.96	1 - A	5.65	1.68	1.40	0.0330	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
23.50	1	60 in.	713.59	713.92	1 - A	5.55	1.44	1.34	0.0260	OUTLET*	0.00	D	0.00
23.50	1	66 in.	713.52	713.86	1 - A	5.45	1.39	1.30	0.0260	OUTLET*	0.00	D + 1	0.00
26.80	1	60 in.	713.74	714.08	1 - A	5.75	1.54	1.43	0.0260	OUTLET*	0.00	F	0.00
26.80	1	66 in.	713.65	714.01	1 - A	5.65	1.49	1.40	0.0260	OUTLET*	0.00	F + 1	0.00

REQUIRED 30" USE 36"


SR 823 STA 175+57
AREA 57
19.2 AC
=0.030 Sq.mi.
650
675
700
725
750
775
800
825
850
875
PROPOSED CULVERT
STA 175+57
11.5° SKEW
PATH OF WATER
MAINLINE 823
625
650
675
700
675
650
625
600
850
825
875
850
"=200'

SR 823 175+57.00

TECHNIQUES FOR ESTIMATING FLOOD-PEAK DISCHARGES OF RURAL, UNREGULATED STREAMS IN OHIO AREA A

U.S. GEOLOGICAL SURVEY Water Resources Investigations Report 89-4126

Values	Units	Definitions
838426.20	SQ. FT.	
0.030	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
936.00	FT.	**TOTAL CHANNEL LENGTH**
93.60	FT.	L_{10} = 10% of the Distance along channel
667	FT.	$Elev_{10}$ = Elevation at point L_{10}
795.60	FT.	L_{85} = 85% of the Distance along channel
855	FT.	$Elev_{85}$ = Elevation at point L_{85}
702.00	FT.	**Length** = $L_{85} - L_{10}$
1414.02	FT./MI.	**SLOPE** = $(Elev_{10}-Elev_{85})/Length$
	CFS	$Q_{\#}$ = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	12.61	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	28.37	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	41.98	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	61.06	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	77.23	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	93.35	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

Worksheet for SR 823 STA 175+57

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.08550	ft/ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Bottom Width	6.00	ft
Discharge	77.20	ft^3/s

Results

Normal Depth	0.95	ft
Flow Area	9.27	ft^2
Wetted Perimeter	13.81	ft
Top Width	13.58	ft
Critical Depth	1.29	ft
Critical Slope	0.02492	ft/ft
Velocity	8.33	ft/s
Velocity Head	1.08	ft
Specific Energy	2.02	ft
Froude Number	1.78	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.95	ft
Critical Depth	1.29	ft
Channel Slope	0.08550	ft/ft
Critical Slope	0.02492	ft/ft

UNIVERSAL CULVERT DESIGN

PID : 77366 **Date :** 04/10/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 57 , Sta. 175+57 **Designer :** mdc

HEADWATER CONTROL CODES:

INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 649.20 **Outlet Invert Elevation (ft.) :** 602.79 **Tailwater Elevation (ft.) :** 603.74 **Overflow Elevation (ft.) :** 715.38

Allowable Headwater Elevation (ft.) : 711.21 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 552.00 **Culvert Slope (ft./ft.) :** 0.0841 **Design Manning 'n' :** 0.0120

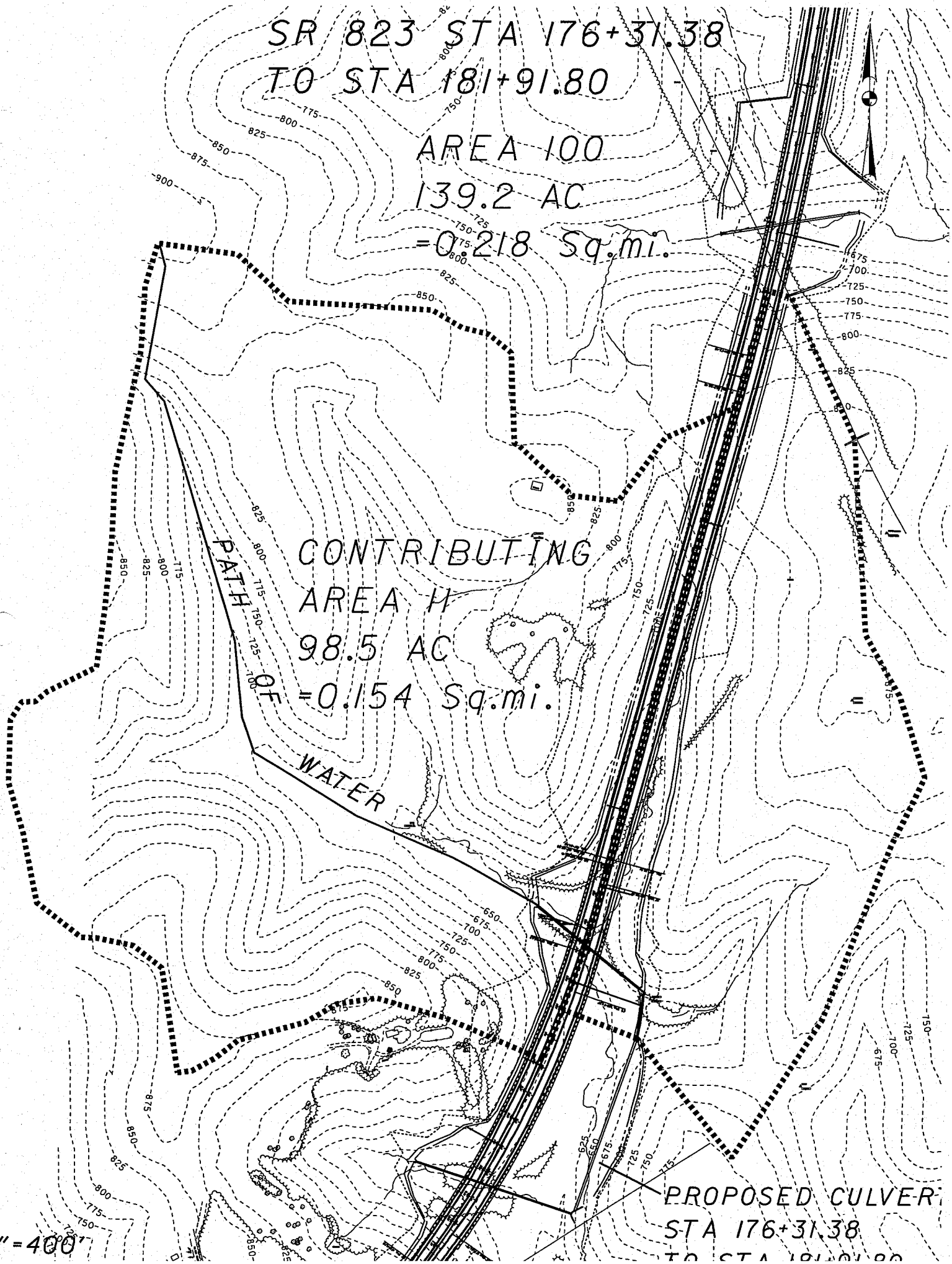
Design Discharge (cfs) : 77.20 @ 50 yrs. **Flood Discharge (cfs) :** 93.40 @ 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall							**Entrance Loss (Ke) :** 0.20			
77.20	1	42 in.	653.65	609.87	2 - E	27.13	1.18	2.75	0.0120	INLET	0.00	D	0.00
77.20	1	36 in.	654.98	614.15	2 - E	27.39	1.26	2.74	0.0120	INLET	0.00	D - 1	0.00
77.20	1	33 in.	656.32	618.60	2 - E	27.45	1.32	2.64	0.0120	INLET	0.00	D - 2	0.00
77.20	1	48 in.	653.15	N/A	1 - C	26.80	1.12	2.66	0.0120	INLET	0.00	D + 1	0.00
93.40	1	42 in.	654.56	611.82	2 - E	28.62	1.30	2.99	0.0120	INLET	0.00	F	0.00
93.40	1	36 in.	656.67	618.15	2 - E	28.81	1.40	2.87	0.0120	INLET	0.00	F - 1	0.00
93.40	1	33 in.	658.65	624.71	2 - E	28.79	1.48	2.70	0.0120	INLET	0.00	F - 2	0.00
93.40	1	48 in.	653.72	N/A	1 - C	28.30	1.24	2.93	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall							**Entrance Loss (Ke) :** 0.90			
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
77.20	1	42 in.	654.59	618.55	2 - E	16.49	1.71	2.75	0.0237	INLET	0.00	D	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
77.20	1	36 in.	657.02	634.45	2 - E	16.15	1.92	2.74	0.0241	INLET	0.00	D - 1	0.00
77.20	1	33 in.	659.03	650.66	2 - E	15.83	2.10	2.64	0.0241	INLET	0.00	D - 2	0.00
77.20	1	48 in.	653.53	N/A	1 - C	16.52	1.59	2.66	0.0235	INLET	0.00	D + 1	0.00
93.40	1	42 in.	656.11	624.54	2 - E	17.28	1.92	2.99	0.0237	INLET	0.00	F	0.00
93.40	1	36 in.	659.51	647.87	2 - E	16.69	2.22	2.87	0.0241	INLET	0.00	F - 1	0.00
93.40	1	33 in.	662.50	671.64	2 - F	15.80	2.75	2.70	0.0241	OUTLET**	0.00	F - 2	0.00
93.40	1	48 in.	654.42	615.47	2 - E	17.38	1.77	2.93	0.0235	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
77.20	1	42 in.	654.59	622.59	2 - E	14.62	1.88	2.75	0.0278	INLET	0.00	D	0.00
77.20	1	36 in.	657.02	643.54	2 - E	14.24	2.15	2.74	0.0281	INLET	0.00	D - 1	0.00
77.20	1	48 in.	653.53	N/A	1 - C	14.72	1.74	2.66	0.0275	INLET	0.00	D + 1	0.00
93.40	1	42 in.	656.11	630.45	2 - E	15.26	2.13	2.99	0.0278	INLET	0.00	F	0.00
93.40	1	36 in.	659.51	661.16	2 - F	13.43	2.60	2.87	0.0281	OUTLET**	0.00	F - 1	0.00
93.40	1	48 in.	654.42	618.27	2 - E	15.47	1.94	2.93	0.0275	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
77.20	1	60 in.	652.87	N/A	1 - C	12.67	1.74	2.49	0.0332	INLET	0.00	D	0.00
77.20	1	66 in.	652.73	N/A	1 - C	12.63	1.67	2.41	0.0330	INLET	0.00	D + 1	0.00
93.40	1	60 in.	653.32	N/A	1 - C	13.35	1.93	2.75	0.0332	INLET	0.00	F	0.00
93.40	1	66 in.	653.13	N/A	1 - C	13.32	1.85	2.67	0.0330	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
77.20	1	60 in.	652.87	N/A	1 - C	15.11	1.53	2.49	0.0260	INLET	0.00	D	0.00
77.20	1	66 in.	652.73	N/A	1 - C	14.98	1.48	2.41	0.0260	INLET	0.00	D + 1	0.00
93.40	1	60 in.	653.32	N/A	1 - C	15.93	1.69	2.75	0.0260	INLET	0.00	F	0.00
93.40	1	66 in.	653.13	N/A	1 - C	15.82	1.63	2.67	0.0260	INLET	0.00	F + 1	0.00

REQUIRED 42" USE 60" STRUCTURAL STEEL PLATE


SR 823 STA 176+31.38
TO STA 181+91.80
AREA 100
139.2 AC
=0.218 Sq.mi.
CONTRIBUTING
AREA M
98.5 AC
=0.154 Sq.mi.
PATH OF WATER
PROPOSED CULVERT
STA 176+31.38
1"=400'

SR 823 STA 176+31.38 to 181+91.80
TECHNIQUES FOR ESTIMATING FLOOD-PEAK
DISCHARGES OF RURAL, UNREGULATED STREAMS IN OHIO AREA A
U.S. GEOLOGICAL SURVEY Water Resources Investigations Report 89-4126

Values	Units	Definitions
6065377.00	SQ. FT.	
0.218	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
3462.00	FT.	**TOTAL CHANNEL LENGTH**
346.20	FT.	L_{10} = 10% of the Distance along channel
626	FT.	**$Elev_{10}$** = Elevation at point L_{10}
2942.70	FT.	L_{85} = 85% of the Distance along channel
780	FT.	**$Elev_{85}$** = Elevation at point L_{85}
2596.50	FT.	**Length = L_{85} - L_{10}**
313.16	FT./MI.	**SLOPE** = ($Elev_{10}$-$Elev_{85}$)/Length
	CFS	**$Q_{\#}$** = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	45.73	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	93.12	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	131.80	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	184.52	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	227.85	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	271.16	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

Worksheet for SR 823 STA 176+31 TO 181+91

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.03700	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	10.00	ft
Discharge	227.90	ft^3/s

Results

Normal Depth	1.86	ft
Flow Area	25.56	ft^2
Wetted Perimeter	18.33	ft
Top Width	17.45	ft
Critical Depth	2.17	ft
Critical Slope	0.02112	ft/ft
Velocity	8.92	ft/s
Velocity Head	1.24	ft
Specific Energy	3.10	ft
Froude Number	1.30	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.86	ft
Critical Depth	2.17	ft
Channel Slope	0.03700	ft/ft
Critical Slope	0.02112	ft/ft

UNIVERSAL CULVERT DESIGN

PID : 77366 **Date :** 04/06/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 100, Sta. 176+31.38 TO 181+91.80 **Designer :** mdc

HEADWATER CONTROL CODES:

INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 618.75 **Outlet Invert Elevation (ft.) :** 601.28 **Tailwater Elevation (ft.) :** 603.14 **Overflow Elevation (ft.) :** 687.67

Allowable Headwater Elevation (ft.) : 685.00 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 606.00 **Culvert Slope (ft./ft.) :** 0.0288 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 227.90 **@** 50 yrs. **Flood Discharge (cfs) :** 271.20 **@** 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall							**Entrance Loss (Ke) :** 0.20			
227.90	1	66 in.	625.46	610.22	2 - E	24.03	2.31	4.22	0.0120	INLET	0.00	D	0.00
227.90	1	60 in.	626.41	612.36	2 - E	24.09	2.43	4.27	0.0120	INLET	0.00	D - 1	0.00
227.90	1	54 in.	628.23	616.35	2 - E	24.04	2.59	4.19	0.0120	INLET	0.00	D - 2	0.00
227.90	1	72 in.	624.95	N/A	1 - C	23.92	2.22	4.13	0.0120	INLET	0.00	D + 1	0.00
271.20	1	66 in.	626.63	612.09	2 - E	25.15	2.55	4.57	0.0120	INLET	0.00	F	0.00
271.20	1	60 in.	628.13	615.17	2 - E	25.15	2.69	4.54	0.0120	INLET	0.00	F - 1	0.00
271.20	1	54 in.	630.83	620.88	2 - E	24.95	2.91	4.33	0.0120	INLET	0.00	F - 2	0.00
271.20	1	72 in.	625.81	N/A	1 - C	25.08	2.44	4.51	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall							**Entrance Loss (Ke) :** 0.90			
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
227.90	1	72 in.	625.67	N/A	1 - C	14.84	3.20	4.13	0.0229	INLET	0.00	D	0.00

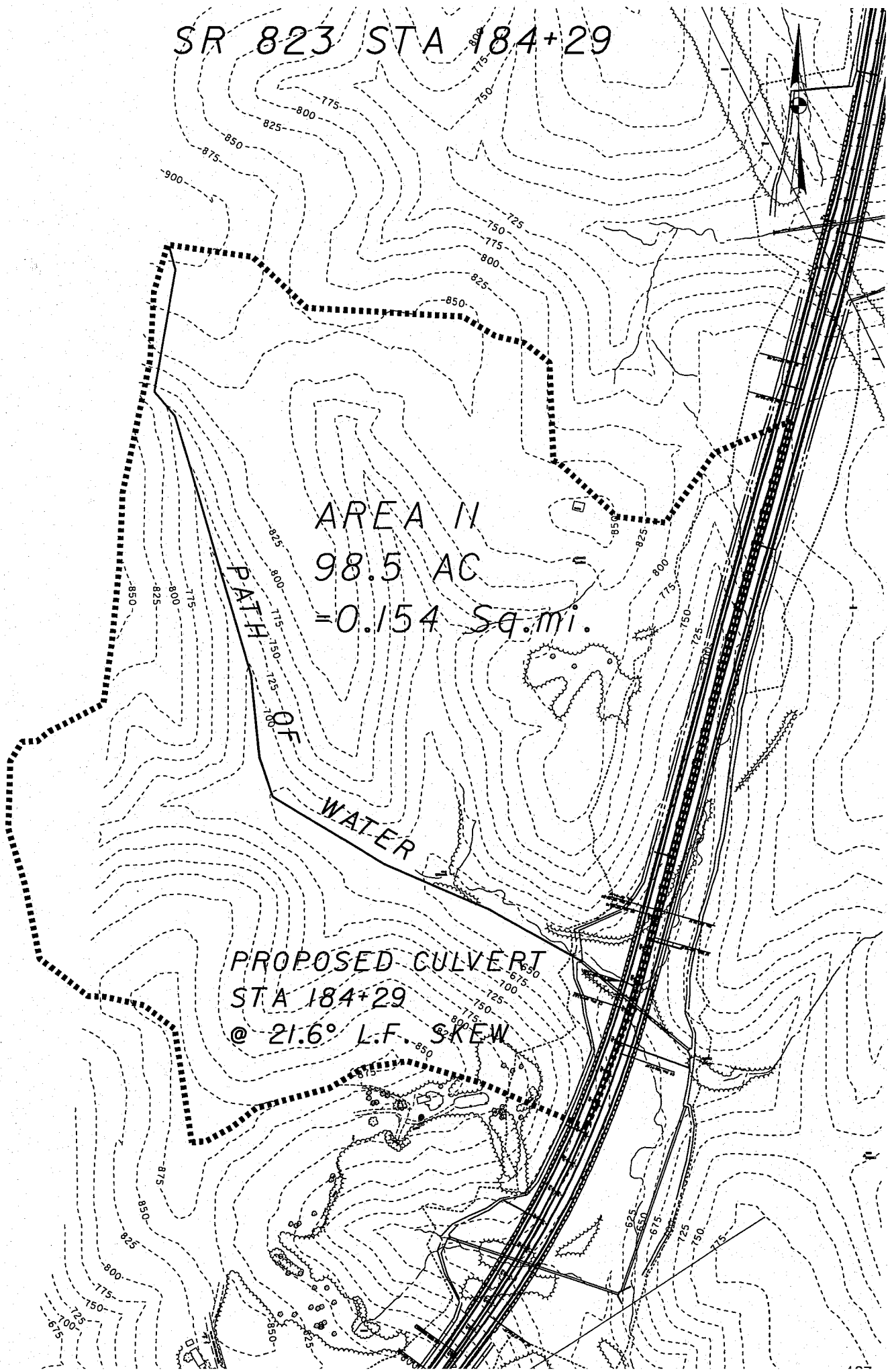
UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
227.90	1	66 in.	626.75	617.62	2 - E	14.66	3.42	4.22	0.0231	INLET	0.00	D - 1	0.00
227.90	1	60 in.	628.63	624.58	2 - E	14.32	3.78	4.27	0.0232	INLET	0.00	D - 2	0.00
227.90	1	78 in.	625.07	N/A	1 - C	14.89	3.05	4.04	0.0228	INLET	0.00	D + 1	0.00
271.20	1	72 in.	627.04	616.92	2 - E	15.45	3.57	4.51	0.0229	INLET	0.00	F	0.00
271.20	1	66 in.	628.71	622.57	2 - E	15.14	3.88	4.57	0.0231	INLET	0.00	F - 1	0.00
271.20	1	60 in.	631.40	632.49	2 - F	14.47	5.00	4.54	0.0232	OUTLET**	0.00	F - 2	0.00
271.20	1	78 in.	626.06	N/A	1 - C	15.55	3.38	4.42	0.0228	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
227.90	1	72 in.	625.67	N/A	1 - C	13.19	3.53	4.13	0.0267	INLET	0.00	D	0.00
227.90	1	66 in.	626.75	620.74	2 - E	12.96	3.81	4.22	0.0269	INLET	0.00	D - 1	0.00
227.90	1	60 in.	628.63	629.94	2 - F	12.76	5.00	4.27	0.0271	OUTLET**	0.00	D - 2	0.00
227.90	1	78 in.	625.07	N/A	1 - C	13.26	3.34	4.04	0.0266	INLET	0.00	D + 1	0.00
271.20	1	72 in.	627.04	619.67	2 - E	13.68	3.97	4.51	0.0267	INLET	0.00	F	0.00
271.20	1	66 in.	628.71	626.99	2 - E	13.22	4.43	4.57	0.0269	INLET	0.00	F - 1	0.00
271.20	1	60 in.	631.40	640.07	2 - F	14.47	5.00	4.54	0.0271	OUTLET**	0.00	F - 2	0.00
271.20	1	78 in.	626.06	N/A	1 - C	13.82	3.72	4.42	0.0266	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
227.90	1	72 in.	625.67	N/A	1 - C	11.22	4.05	4.13	0.0327	INLET	0.00	D	0.00
227.90	1	66 in.	626.75	626.75	2 - F	11.64	4.58	4.22	0.0330	OUTLET*	0.00	D - 1	0.00
227.90	1	60 in.	628.63	639.98	2 - F	12.76	5.00	4.27	0.0332	OUTLET**	0.00	D - 2	0.00
227.90	1	78 in.	625.07	N/A	1 - C	11.39	3.78	4.04	0.0325	INLET	0.00	D + 1	0.00
271.20	1	72 in.	627.04	627.32	2 - F	11.90	4.66	4.51	0.0327	OUTLET*	0.00	F	0.00
271.20	1	66 in.	628.71	635.49	2 - F	12.85	5.50	4.57	0.0330	OUTLET**	0.00	F - 1	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
271.20	1	60 in.	631.40	654.30	2 - F	14.47	5.00	4.54	0.0332	OUTLET**	0.00	F - 2	0.00
271.20	1	78 in.	626.06	N/A	1 - C	11.81	4.25	4.42	0.0325	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
227.90	1	72 in.	625.67	N/A	1 - C	13.46	3.47	4.13	0.0260	INLET	0.00	D	0.00
227.90	1	66 in.	626.75	619.96	2 - E	13.33	3.72	4.22	0.0260	INLET	0.00	D - 1	0.00
227.90	1	60 in.	628.63	628.35	2 - E	12.81	4.25	4.27	0.0260	INLET	0.00	D - 2	0.00
227.90	1	78 in.	625.07	N/A	1 - C	13.50	3.30	4.04	0.0260	INLET	0.00	D + 1	0.00
271.20	1	72 in.	627.04	619.13	2 - E	13.97	3.89	4.51	0.0260	INLET	0.00	F	0.00
271.20	1	66 in.	628.71	625.88	2 - E	13.66	4.28	4.57	0.0260	INLET	0.00	F - 1	0.00
271.20	1	60 in.	631.40	637.82	2 - F	14.47	5.00	4.54	0.0260	OUTLET**	0.00	F - 2	0.00
271.20	1	78 in.	626.06	N/A	1 - C	14.07	3.66	4.42	0.0260	INLET	0.00	F + 1	0.00

REQUIRED 72" USE 78" S.S.P


SR 823 STA 184+29
AREA II
98.5 AC
=0.154 Sq.mi.
PATH OF WATER
PROPOSED CULVERT
STA 184+29
@ 21.6° L.F. SKEW
1" = 400'

SR 823 STA 184+29.00
TECHNIQUES FOR ESTIMATING FLOOD-PEAK
DISCHARGES OF RURAL, UNREGULATED STREAMS IN OHIO AREA A
U.S. GEOLOGICAL SURVEY Water Resources Investigations Report 89-4126

Values	Units	Definitions
4289215.00	SQ. FT.	
0.154	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
2980.00	FT.	**TOTAL CHANNEL LENGTH**
298.00	FT.	L_{10} = 10% of the Distance along channel
624	FT.	$Elev_{10}$ = Elevation at point L_{10}
2533.00	FT.	L_{85} = 85% of the Distance along channel
792	FT.	$Elev_{85}$ = Elevation at point L_{85}
2235.00	FT.	**Length** = $L_{85} - L_{10}$
396.89	FT./MI.	**SLOPE** = $(Elev_{10}-Elev_{85})$/Length
	CFS	$Q_{\#}$ = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	36.33	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	75.17	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	107.17	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	150.95	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	187.13	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	223.25	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

Worksheet for SR 823 STA 184+29

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.02150	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	6.00	ft
Discharge	187.10	ft^3/s

Results

Normal Depth	2.39	ft
Flow Area	25.73	ft^2
Wetted Perimeter	16.68	ft
Top Width	15.55	ft
Critical Depth	2.38	ft
Critical Slope	0.02165	ft/ft
Velocity	7.27	ft/s
Velocity Head	0.82	ft
Specific Energy	3.21	ft
Froude Number	1.00	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.39	ft
Critical Depth	2.38	ft
Channel Slope	0.02150	ft/ft
Critical Slope	0.02165	ft/ft

UNIVERSAL CULVERT DESIGN

PID : 77366 **Date :** 03/19/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 11, Sta. 184+29 **Designer :** mdc

HEADWATER CONTROL CODES:

INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 628.12 **Outlet Invert Elevation (ft.) :** 624.80 **Tailwater Elevation (ft.) :** 627.19 **Overflow Elevation (ft.) :** 687.67

Allowable Headwater Elevation (ft.) : 746.00 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 442.00 **Culvert Slope (ft./ft.) :** 0.0075 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 187.10 @ 50 yrs. **Flood Discharge (cfs) :** 223.30 @ 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.20		
187.10	1	60 in.	634.43	632.88	2 - E	13.72	3.28	3.91	0.0120	INLET	0.00	D	0.00
187.10	1	54 in.	635.54	634.99	2 - E	13.23	3.74	3.94	0.0120	INLET	0.00	D - 1	0.00
187.10	1	48 in.	637.75	639.19	2 - F	15.16	4.00	3.80	0.0120	OUTLET**	0.00	D - 2	0.00
187.10	1	66 in.	633.89	N/A	1 - C	13.83	3.05	3.83	0.0120	INLET	0.00	D + 1	0.00
223.30	1	60 in.	635.61	634.58	2 - E	14.12	3.75	4.23	0.0120	INLET	0.00	F	0.00
223.30	1	54 in.	637.35	637.64	2 - F	14.52	4.50	4.17	0.0120	OUTLET**	0.00	F - 1	0.00
223.30	1	48 in.	640.57	643.68	2 - F	17.89	4.00	3.90	0.0120	OUTLET**	0.00	F - 2	0.00
223.30	1	66 in.	634.71	N/A	1 - C	14.40	3.42	4.18	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.90		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
187.10	1	66 in.	634.59	635.60	2 - F	10.60	5.50	3.83	0.0231	OUTLET**	0.00	D	0.00

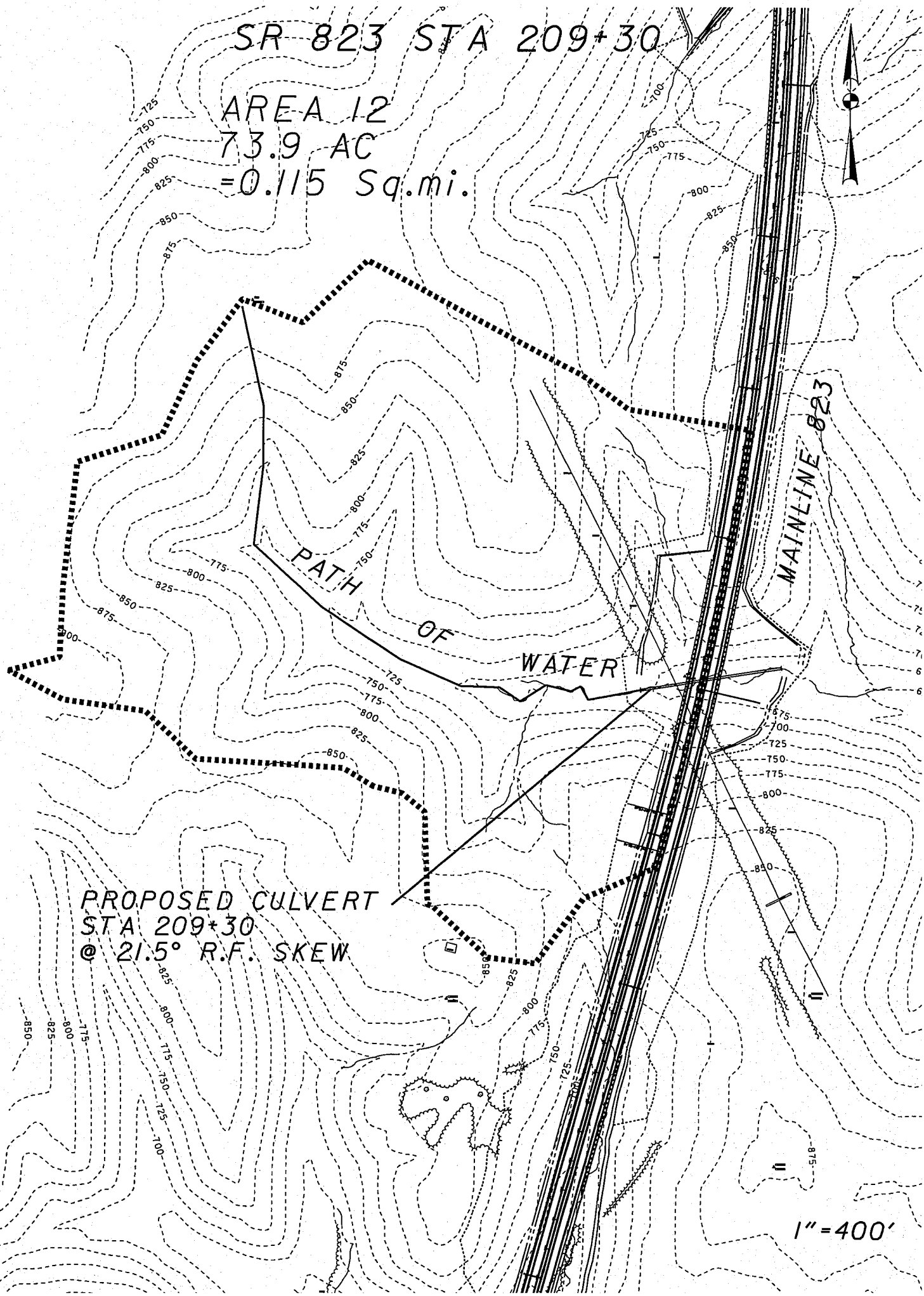
UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
187.10	1	60 in.	635.76	639.16	2 - F	11.35	5.00	3.91	0.0232	OUTLET**	0.00	D - 1	0.00
187.10	1	54 in.	637.88	645.89	2 - F	12.67	4.50	3.94	0.0233	OUTLET**	0.00	D - 2	0.00
187.10	1	72 in.	633.96	634.60	1 - A	10.12	4.44	3.73	0.0229	OUTLET*	0.00	D + 1	0.00
223.30	1	66 in.	635.93	638.38	2 - F	11.52	5.50	4.18	0.0231	OUTLET**	0.00	F	0.00
223.30	1	60 in.	637.73	643.52	2 - F	12.59	5.00	4.23	0.0232	OUTLET**	0.00	F - 1	0.00
223.30	1	54 in.	640.70	653.16	2 - F	14.52	4.50	4.17	0.0233	OUTLET**	0.00	F - 2	0.00
223.30	1	72 in.	634.91	635.49	2 - F	10.87	6.00	4.09	0.0229	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
187.10	1	72 in.	633.96	634.76	1 - A	10.12	5.22	3.73	0.0267	OUTLET*	0.00	D	0.00
187.10	1	66 in.	634.59	637.14	2 - F	10.60	5.50	3.83	0.0269	OUTLET**	0.00	D - 1	0.00
187.10	1	60 in.	635.76	641.79	2 - F	11.35	5.00	3.91	0.0271	OUTLET**	0.00	D - 2	0.00
187.10	1	78 in.	633.62	634.34	1 - A	9.78	4.57	3.64	0.0266	OUTLET*	0.00	D + 1	0.00
223.30	1	72 in.	634.91	636.84	2 - F	10.87	6.00	4.09	0.0267	OUTLET**	0.00	F	0.00
223.30	1	66 in.	635.93	640.57	2 - F	11.52	5.50	4.18	0.0269	OUTLET**	0.00	F - 1	0.00
223.30	1	60 in.	637.73	647.27	2 - F	12.59	5.00	4.23	0.0271	OUTLET**	0.00	F - 2	0.00
223.30	1	78 in.	634.34	635.15	1 - A	10.43	5.36	4.00	0.0266	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
187.10	1	78 in.	633.62	634.64	1 - A	9.78	5.52	3.64	0.0325	OUTLET*	0.00	D	0.00
187.10	1	72 in.	633.96	636.39	2 - F	10.12	6.00	3.73	0.0327	OUTLET**	0.00	D - 1	0.00
187.10	1	66 in.	634.59	640.09	2 - F	10.60	5.50	3.83	0.0330	OUTLET**	0.00	D - 2	0.00
187.10	1	84 in.	633.40	634.25	1 - A	9.51	4.91	3.56	0.0323	OUTLET*	0.00	D + 1	0.00
223.30	1	78 in.	634.34	636.37	2 - F	10.43	6.50	4.00	0.0325	OUTLET**	0.00	F	0.00
223.30	1	72 in.	634.91	639.42	2 - F	10.87	6.00	4.09	0.0327	OUTLET**	0.00	F - 1	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
223.30	1	66 in.	635.93	644.77	2 - F	11.52	5.50	4.18	0.0330	OUTLET**	0.00	F - 2	0.00
223.30	1	84 in.	634.01	635.04	1 - A	10.11	5.75	3.91	0.0323	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
187.10	1	72 in.	633.96	634.72	1 - A	10.12	5.03	3.73	0.0260	OUTLET*	0.00	D	0.00
187.10	1	66 in.	634.59	636.75	2 - F	10.60	5.50	3.83	0.0260	OUTLET**	0.00	D - 1	0.00
187.10	1	60 in.	635.76	641.01	2 - F	11.35	5.00	3.91	0.0260	OUTLET**	0.00	D - 2	0.00
187.10	1	78 in.	633.62	634.32	1 - A	9.78	4.49	3.64	0.0260	OUTLET*	0.00	D + 1	0.00
223.30	1	72 in.	634.91	636.57	2 - F	10.87	6.00	4.09	0.0260	OUTLET**	0.00	F	0.00
223.30	1	66 in.	635.93	640.02	2 - F	11.52	5.50	4.18	0.0260	OUTLET**	0.00	F - 1	0.00
223.30	1	60 in.	637.73	646.16	2 - F	12.59	5.00	4.23	0.0260	OUTLET**	0.00	F - 2	0.00
223.30	1	78 in.	634.34	635.11	1 - A	10.43	5.23	4.00	0.0260	OUTLET*	0.00	F + 1	0.00

REQUIRED 66" USE 78" S.S.P


SR 823 STA 209+30
AREA 12
73.9 AC
=0.115 Sq.mi.
PATH OF WATER
MAINLINE 823
PROPOSED CULVERT
STA 209+30
@ 21.5° R.F. SKEW
1" = 400'

SR 823 209+30.00

TECHNIQUES FOR ESTIMATING FLOOD-PEAK DISCHARGES OF RURAL, UNREGULATED STREAMS IN OHIO AREA A

U.S. GEOLOGICAL SURVEY Water Resources Investigations Report 89-4126

Values	Units	Definitions
3218115.00	SQ. FT.	
0.115	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
2268.00	FT.	**TOTAL CHANNEL LENGTH**
226.80	FT.	L_{10} = 10% of the Distance along channel
717	FT.	$Elev_{10}$ = Elevation at point L_{10}
1927.80	FT.	L_{85} = 85% of the Distance along channel
832	FT.	$Elev_{85}$ = Elevation at point L_{85}
1701.00	FT.	**Length** = $L_{85} - L_{10}$
356.97	FT./MI.	**SLOPE** = $(Elev_{10}-Elev_{85})$/Length
	CFS	$Q_{\#}$ = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	28.49	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	58.87	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	83.85	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	117.99	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	146.21	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	174.32	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

Worksheet for SR 823 STA 209+30

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.03610	ft/ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Bottom Width	5.50	ft
Discharge	146.20	ft^3/s

Results

Normal Depth	1.66	ft
Flow Area	20.08	ft^2
Wetted Perimeter	19.16	ft
Top Width	18.75	ft
Critical Depth	1.85	ft
Critical Slope	0.02277	ft/ft
Velocity	7.28	ft/s
Velocity Head	0.82	ft
Specific Energy	2.48	ft
Froude Number	1.24	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.66	ft
Critical Depth	1.85	ft
Channel Slope	0.03610	ft/ft
Critical Slope	0.02277	ft/ft

UNIVERSAL CULVERT DESIGN

PID : 77366 **Date :** 01/10/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 12, Sta. 209+30 **Designer :** hjs

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 675.75 **Outlet Invert Elevation (ft.) :** 658.59 **Tailwater Elevation (ft.) :** 660.25 **Overflow Elevation (ft.) :** 748.13

Allowable Headwater Elevation (ft.) : 746.13 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 476.00 **Culvert Slope (ft./ft.) :** 0.0361 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 146.20 @ 50 yrs. **Flood Discharge (cfs) :** 174.30 @ 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall							**Entrance Loss (Ke) :** 0.20			
146.20	1	54 in.	681.52	666.42	2 - E	23.38	1.87	3.55	0.0120	INLET	0.00	D	0.00
146.20	1	48 in.	682.72	669.07	2 - E	23.46	1.99	3.57	0.0120	INLET	0.00	D - 1	0.00
146.20	1	42 in.	685.29	674.85	2 - E	23.32	2.17	3.38	0.0120	INLET	0.00	D - 2	0.00
146.20	1	60 in.	680.96	N/A	1 - C	23.23	1.79	3.46	0.0120	INLET	0.00	D + 1	0.00
174.30	1	54 in.	682.61	668.16	2 - E	24.48	2.06	3.84	0.0120	INLET	0.00	F	0.00
174.30	1	48 in.	684.48	671.99	2 - E	24.48	2.21	3.75	0.0120	INLET	0.00	F - 1	0.00
174.30	1	42 in.	688.18	680.28	2 - E	24.10	2.46	3.44	0.0120	INLET	0.00	F - 2	0.00
174.30	1	60 in.	681.70	N/A	1 - C	24.38	1.96	3.78	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall							**Entrance Loss (Ke) :** 0.90			
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
146.20	1	60 in.	681.58	N/A	1 - C	14.30	2.58	3.46	0.0232	INLET	0.00	D	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
146.20	1	54 in.	682.76	673.51	2 - E	14.18	2.78	3.55	0.0233	INLET	0.00	D - 1	0.00
146.20	1	48 in.	685.03	682.39	2 - E	13.68	3.17	3.57	0.0235	INLET	0.00	D - 2	0.00
146.20	1	66 in.	680.99	N/A	1 - C	14.33	2.44	3.37	0.0231	INLET	0.00	D + 1	0.00
174.30	1	60 in.	682.77	672.06	2 - E	14.91	2.88	3.78	0.0232	INLET	0.00	F	0.00
174.30	1	54 in.	684.59	678.25	2 - E	14.67	3.15	3.84	0.0233	INLET	0.00	F - 1	0.00
174.30	1	48 in.	687.71	690.91	2 - F	14.24	4.00	3.75	0.0235	OUTLET**	0.00	F - 2	0.00
174.30	1	66 in.	681.80	N/A	1 - C	14.99	2.70	3.69	0.0231	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
146.20	1	60 in.	681.58	N/A	1 - C	12.71	2.84	3.46	0.0271	INLET	0.00	D	0.00
146.20	1	54 in.	682.76	676.65	2 - E	12.48	3.11	3.55	0.0273	INLET	0.00	D - 1	0.00
146.20	1	48 in.	685.03	688.31	2 - F	12.36	4.00	3.57	0.0275	OUTLET**	0.00	D - 2	0.00
146.20	1	66 in.	680.99	N/A	1 - C	12.80	2.67	3.37	0.0269	INLET	0.00	D + 1	0.00
174.30	1	60 in.	682.77	674.52	2 - E	13.20	3.19	3.78	0.0271	INLET	0.00	F	0.00
174.30	1	54 in.	684.59	682.70	2 - E	12.74	3.61	3.84	0.0273	INLET	0.00	F - 1	0.00
174.30	1	48 in.	687.71	699.33	2 - F	14.24	4.00	3.75	0.0275	OUTLET**	0.00	F - 2	0.00
174.30	1	66 in.	681.80	N/A	1 - C	13.37	2.96	3.69	0.0269	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
146.20	1	60 in.	681.58	N/A	1 - C	10.83	3.25	3.46	0.0332	INLET	0.00	D	0.00
146.20	1	66 in.	680.99	N/A	1 - C	10.97	3.01	3.37	0.0330	INLET	0.00	D + 1	0.00
174.30	1	60 in.	682.77	679.13	2 - E	11.16	3.71	3.78	0.0332	INLET	0.00	F	0.00
174.30	1	66 in.	681.80	N/A	1 - C	11.42	3.37	3.69	0.0330	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
146.20	1	60 in.	681.58	N/A	1 - C	13.11	2.77	3.46	0.0260	INLET	0.00	D	0.00
146.20	1	66 in.	680.99	N/A	1 - C	13.13	2.62	3.37	0.0260	INLET	0.00	D + 1	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
174.30	1	60 in.	682.77	673.79	2 - E	13.64	3.10	3.78	0.0260	INLET	0.00	F	0.00
174.30	1	66 in.	681.80	N/A	1 - C	13.71	2.90	3.69	0.0260	INLET	0.00	F + 1	0.00

REQUIRED 60" USE 72" S.S.P

CULVERT ANALYSIS

PID : 77366 **Date :** 01/10/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth, Ohio

Description : Drainage Area 12, 209+30 **Designer :** hjs

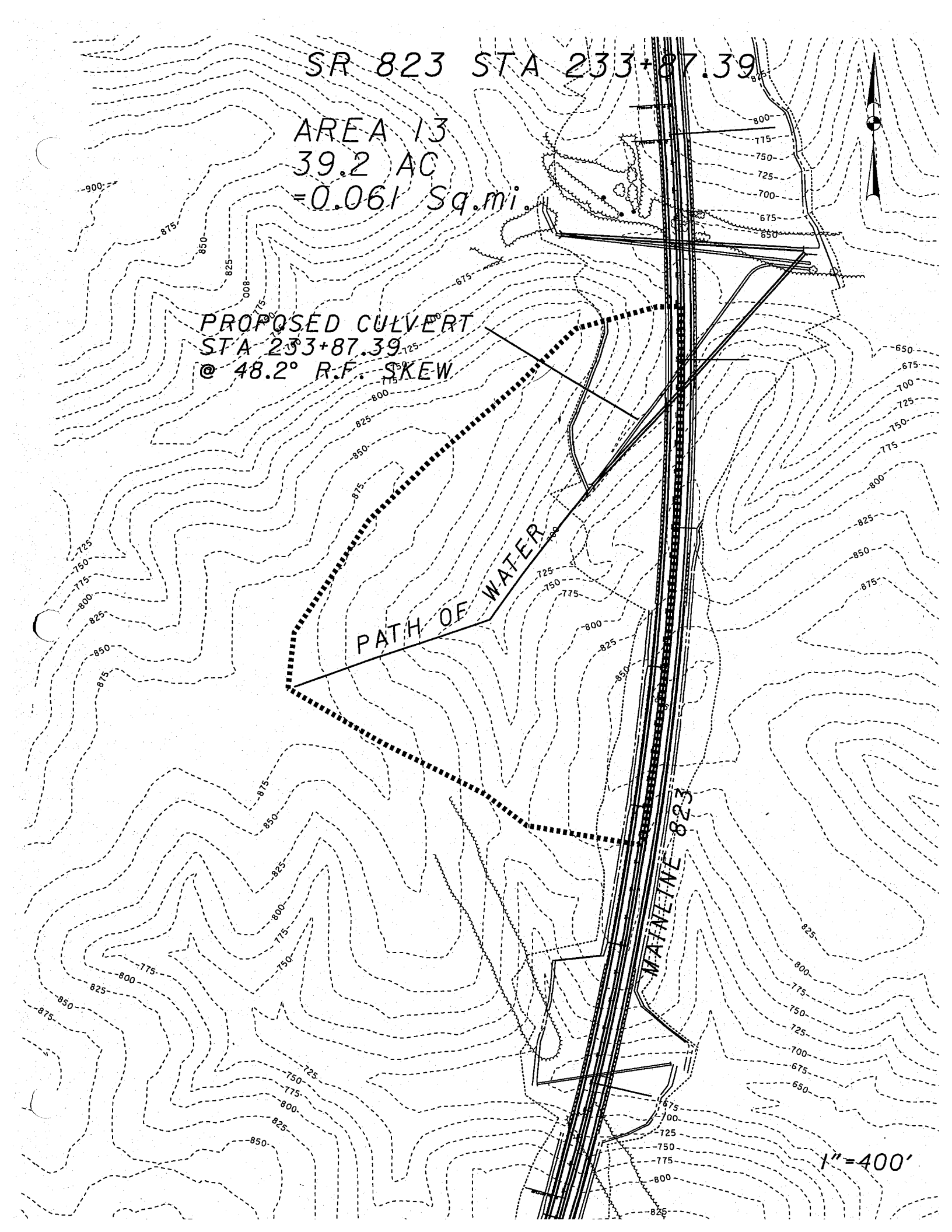
HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Pipe Number : 1 **Use HW :** 0 **Inlet Invert Elevation (ft.) :** 675.75 **Outlet Invert Elevation (ft.) :** 658.59
Pipe Quantity : 1

Culvert Type : Circular Corrugated
Corrugation Type : Corrugated Metal Pipe (6 x 2 in. corrugations) **Pipe Length (ft.) :** 476.00 **Culvert Slope (ft./ft.) :** 0.0361
Pipe Size : 72 in.
Design Manning 'n' : (default)

Entrance Type : Half Headwall **Loss Coef. Ke :** 0.9000

FLOW (cfs.)	HEAD LOSS (ft.)	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	BURIED DEPTH (ft.)	TAILWATER ELEVATION (ft.)
146.20	17.44	680.67	N/A	1 - C	11.05	2.85	3.28	0.0327	INLET	0.00	658.59
174.30	17.90	681.29	N/A	1 - C	11.55	3.16	3.60	0.0327	INLET	0.00	658.59


SR 823 STA 233+87.39
AREA 13
39.2 AC
=0.061 Sq.mi.
PROPOSED CULVERT
STA 233+87.39
@ 48.2° R.F. SKEW
PATH OF WATER
MAINLINE 823
1"=400'

SR 823 STA 233+87.39
TECHNIQUES FOR ESTIMATING FLOOD-PEAK
DISCHARGES OF RURAL, UNREGULATED STREAMS IN OHIO AREA A
U.S. GEOLOGICAL SURVEY Water Resources Investigations Report 89-4126

Values	Units	Definitions
1705828.00	SQ. FT.	
0.061	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
1370.00	FT.	**TOTAL CHANNEL LENGTH**
137.00	FT.	L_{10} = 10% of the Distance along channel
695	FT.	**$Elev_{10}$** = Elevation at point L_{10}
1164.50	FT.	L_{85} = 85% of the Distance along channel
830	FT.	**$Elev_{85}$** = Elevation at point L_{85}
1027.50	FT.	**Length** = $L_{85} - L_{10}$
693.72	FT./MI.	**SLOPE** = $(Elev_{10}-Elev_{85})$/Length
	CFS	$Q_{\#}$ = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	19.45	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	41.85	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	60.72	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	86.80	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	108.63	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	130.37	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

HY-8 Culvert Analysis Report

BOX CULVERT AT STA. 233+87.39

Table 1 - Summary of Culvert Flows at Crossing: CUL233+87.39

Headwater Elevation (ft)	Total Discharge (cfs)	233+87.39 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
684.68	19.45	19.45	0.00	1
684.96	30.54	30.54	0.00	1
685.22	41.63	41.63	0.00	1
685.46	52.73	52.73	0.00	1
685.68	63.82	63.82	0.00	1
685.89	74.91	74.91	0.00	1
686.09	86.00	86.00	0.00	1
686.28	97.09	97.09	0.00	1
686.46	108.19	108.19	0.00	1
686.47	108.63	108.63	0.00	1
686.81	130.37	130.37	0.00	1

Rating Curve Plot for Crossing: CUL233+87.39

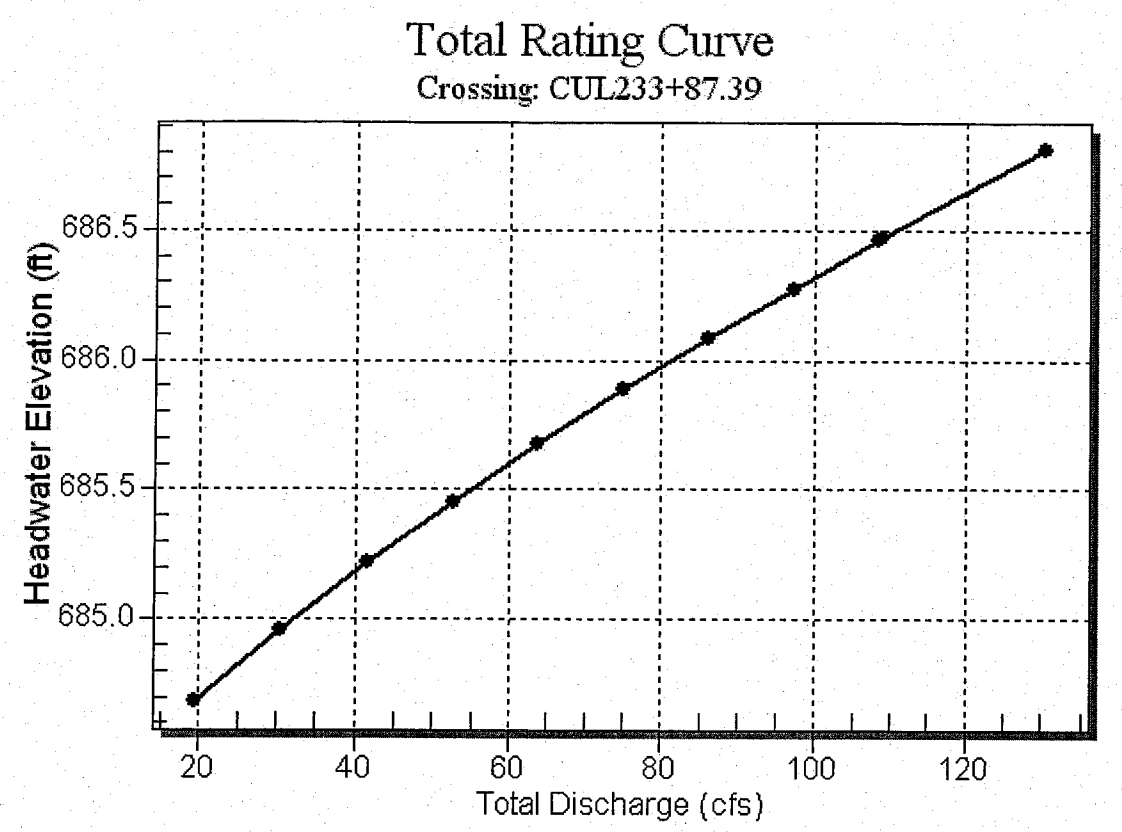


Table 2 - Culvert Summary Table: 233+87.39

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
19.45	19.45	684.68	0.863	0.863	1-S2n	0.129	0.570	0.170	0.485	14.340	2.873
30.54	30.54	684.96	1.136	1.136	1-S2n	0.203	0.769	0.269	0.633	14.169	3.380
41.63	41.63	685.22	1.397	1.397	1-S2n	0.276	0.946	0.346	0.760	15.042	3.772
52.73	52.73	685.46	1.636	1.636	1-S2n	0.350	1.107	0.407	0.873	16.181	4.094
63.82	63.82	685.68	1.858	1.858	1-S2n	0.424	1.258	0.458	0.976	17.432	4.375
74.91	74.91	685.89	2.067	2.067	1-S2n	0.497	1.399	0.499	1.071	18.750	4.619
86.00	86.00	686.09	2.266	2.266	1-S2n	0.571	1.534	0.624	1.160	17.218	4.841
97.09	97.09	686.28	2.457	2.457	1-S2n	0.645	1.664	0.654	1.244	18.569	5.038
108.19	108.19	686.46	2.641	2.641	1-S2n	0.718	1.788	0.738	1.324	18.324	5.223
108.63	108.63	686.47	2.648	2.648	1-S2n	0.721	1.793	0.743	1.327	18.279	5.231
130.37	130.37	686.81	2.990	2.990	1-S2n	0.835	2.025	0.844	1.474	19.314	5.545

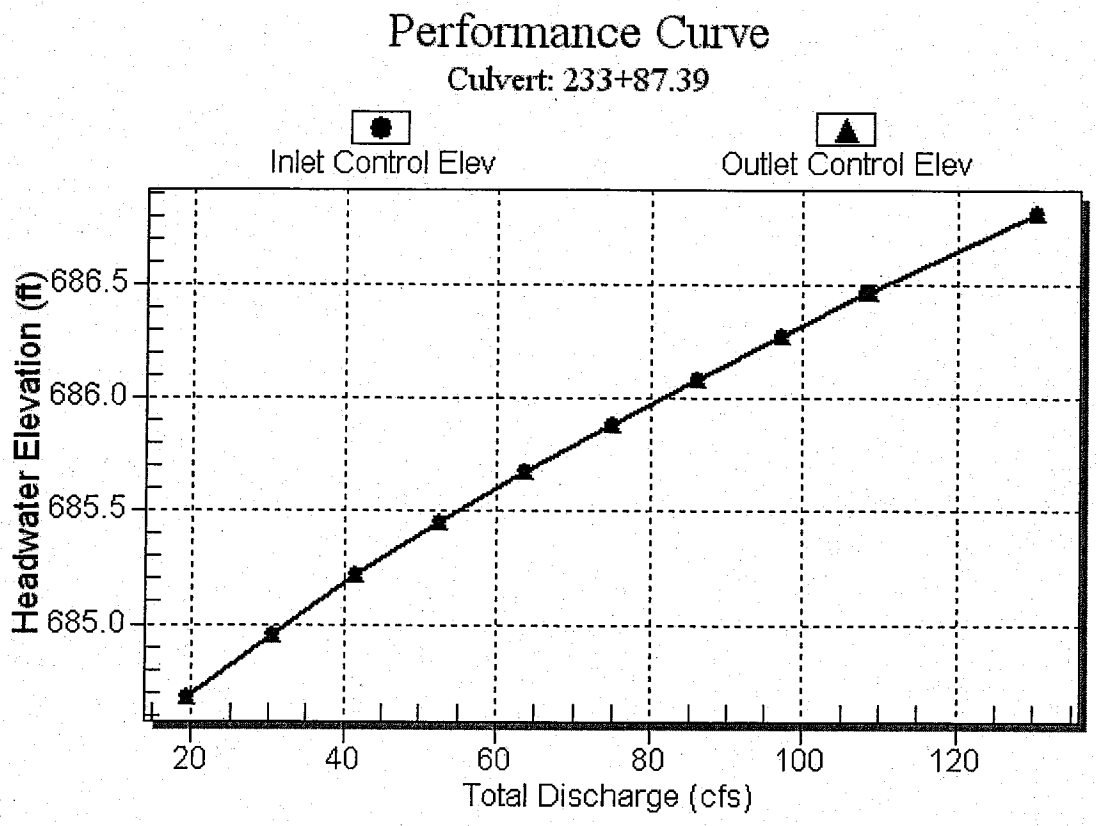
****

Inlet Elevation (invert): 683.82 ft, Outlet Elevation (invert): 639.44 ft

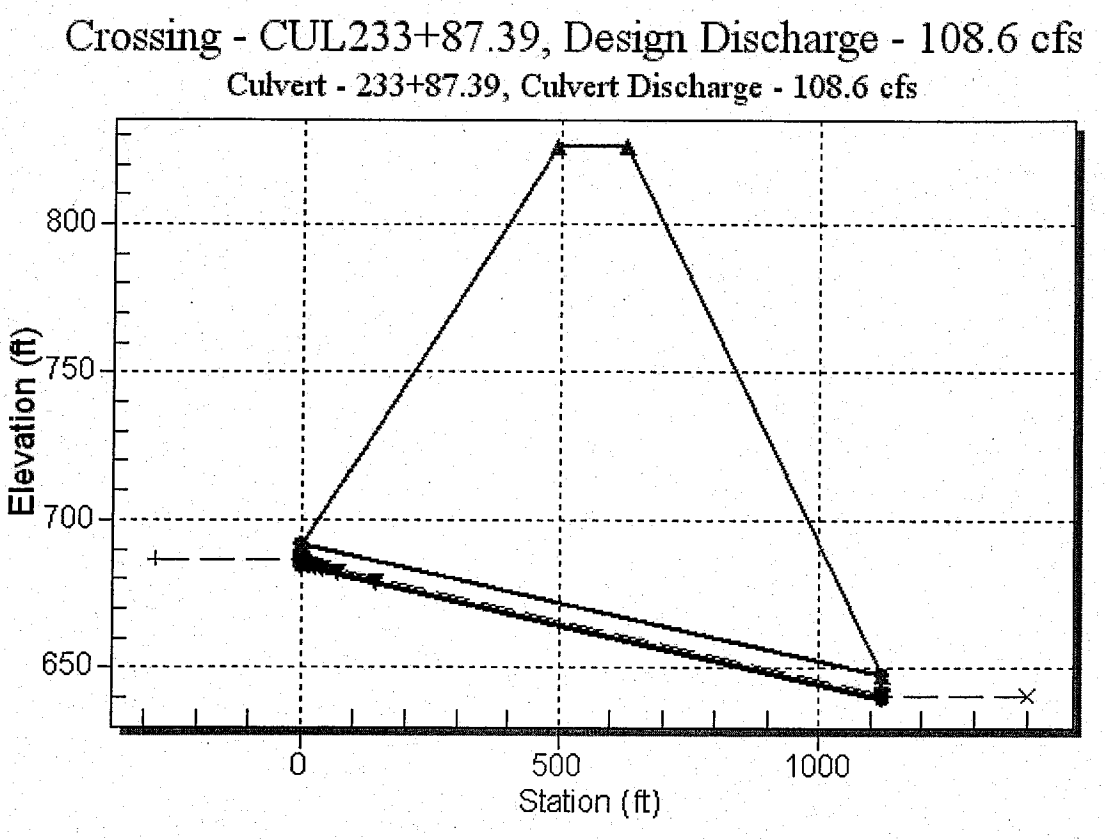
Culvert Length: 1123.18 ft, Culvert Slope: 0.0395

****

Culvert Performance Curve Plot: 233+87.39



Water Surface Profile Plot for Culvert: 233+87.39



Site Data - 233+87.39

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 683.82 ft

Outlet Station: 1122.30 ft

Outlet Elevation: 639.44 ft

Number of Barrels: 1

Culvert Data Summary - 233+87.39

Barrel Shape: Concrete Box

Barrel Span: 8.00 ft

Barrel Rise: 8.00 ft

Barrel Material: Concrete

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge (30-75° flare) Wingwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: CUL233+87.39)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
19.45	639.92	0.48	2.87	0.53	0.75
30.54	640.07	0.63	3.38	0.69	0.78
41.63	640.20	0.76	3.77	0.83	0.80
52.73	640.31	0.87	4.09	0.95	0.82
63.82	640.42	0.98	4.38	1.07	0.83
74.91	640.51	1.07	4.62	1.17	0.84
86.00	640.60	1.16	4.84	1.27	0.85
97.09	640.68	1.24	5.04	1.36	0.86
108.19	640.76	1.32	5.22	1.45	0.87
108.63	640.77	1.33	5.23	1.45	0.87
130.37	640.91	1.47	5.55	1.61	0.88

Tailwater Channel Data - CUL233+87.39

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 13.00 ft

Side Slope (H:V): 2.00 (_:1)

Channel Slope: 0.0175

Channel Manning's n: 0.0400

Channel Invert Elevation: 639.44 ft

Roadway Data for Crossing: CUL233+87.39

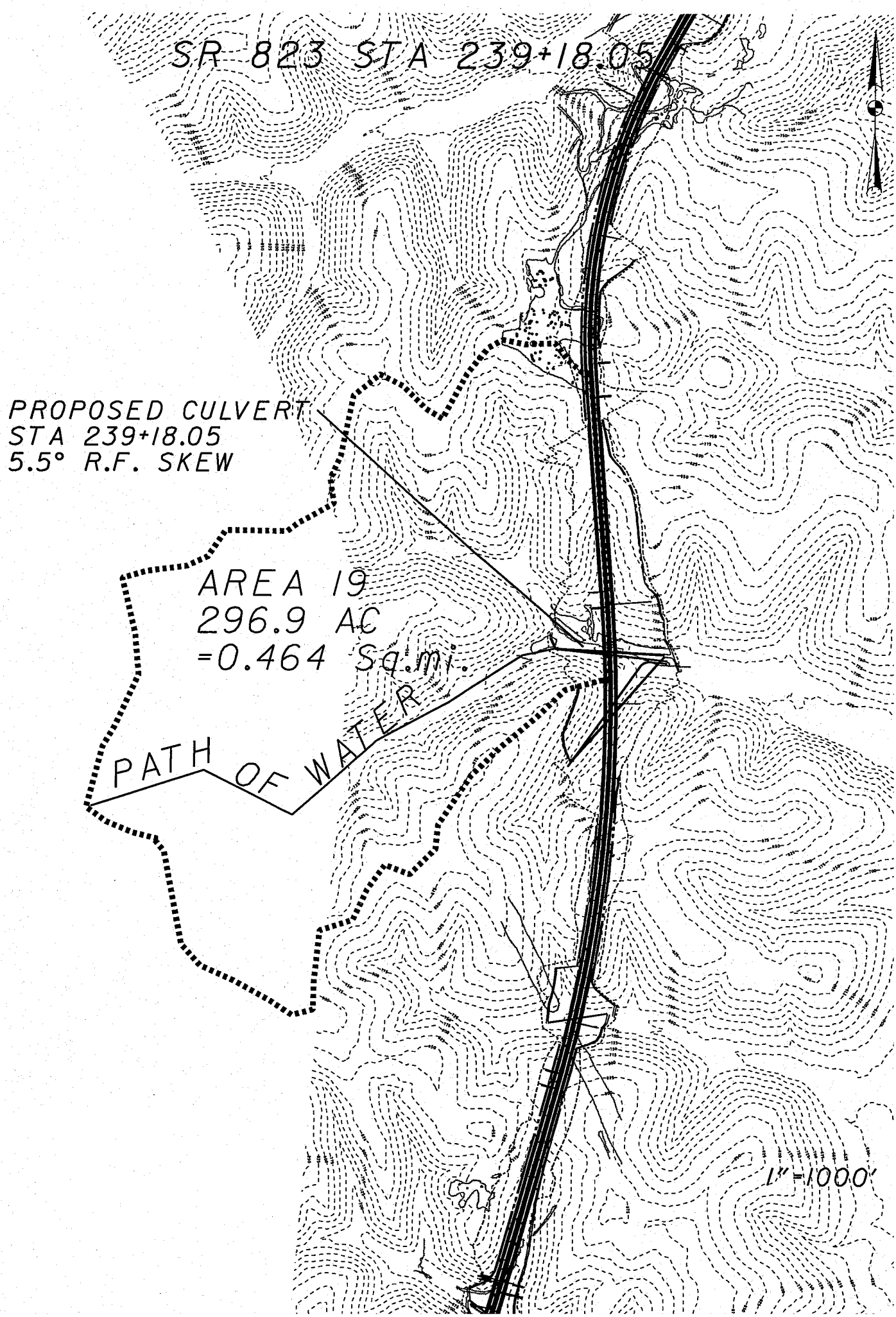
Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 1000.00 ft

Crest Elevation: 826.00 ft

Roadway Surface: Paved

Roadway Top Width: 134.00 ft


SR 823 STA 239+18.05
PROPOSED CULVERT
STA 239+18.05
5.5° R.F. SKEW
AREA 19
296.9 AC
=0.464 Sq.mi.
PATH OF WATER
1"=1000'

SR 823 STA 239+18.05
TECHNIQUES FOR ESTIMATING FLOOD-PEAK
DISCHARGES OF RURAL, UNREGULATED STREAMS IN OHIO AREA A
U.S. GEOLOGICAL SURVEY Water Resources Investigations Report 89-4126

Values	Units	Definitions
12930826.00	SQ. FT.	
0.464	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
4305.00	FT.	**TOTAL CHANNEL LENGTH**
430.50	FT.	L_{10} = 10% of the Distance along channel
667	FT.	$Elev_{10}$ = Elevation at point L_{10}
3659.25	FT.	L_{85} = 85% of the Distance along channel
813	FT.	$Elev_{85}$ = Elevation at point L_{85}
3228.75	FT.	**Length** = $L_{85} - L_{10}$
238.75	FT./MI.	**SLOPE** = $(Elev_{10}-Elev_{85})/Length$
	CFS	$Q_{\#}$ = Flood-Peak Discharge # = Frequency of Storm

Q_2	78.90	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	156.97	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	219.96	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	305.35	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	374.98	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	444.84	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

HY-8 Culvert Analysis Report

BOX CULVERT AT STA. 239+18.05

Table 1 - Summary of Culvert Flows at Crossing: CUL239+18

Headwater Elevation (ft)	Total Discharge (cfs)	CUL239+18 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
654.39	78.90	78.90	0.00	1
655.03	115.49	115.49	0.00	1
655.59	152.09	152.09	0.00	1
656.12	188.68	188.68	0.00	1
656.63	225.28	225.28	0.00	1
657.11	261.87	261.87	0.00	1
657.57	298.46	298.46	0.00	1
658.00	335.06	335.06	0.00	1
658.42	371.65	371.65	0.00	1
658.46	374.98	374.98	0.00	1
659.24	444.84	444.84	0.00	1

Rating Curve Plot for Crossing: CUL239+18

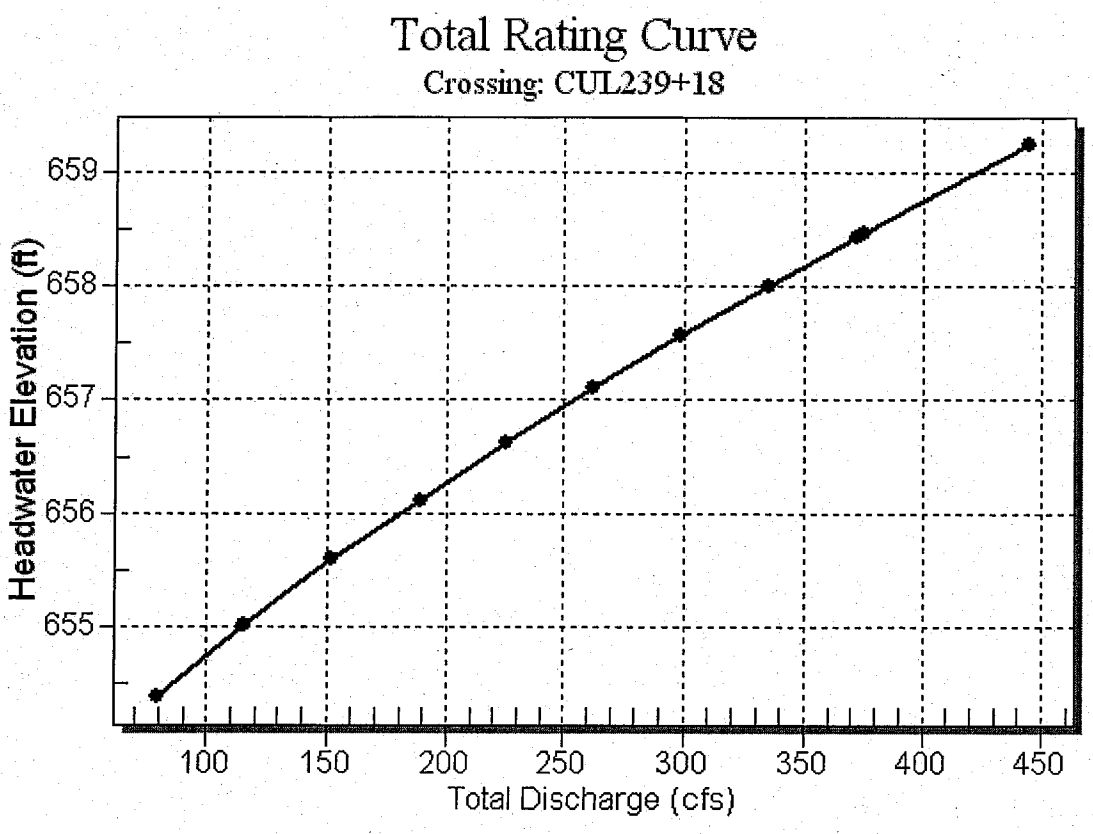


Table 2 - Culvert Summary Table: CUL239+18

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
78.90	78.90	654.39	2.192	2.192	1-S2n	0.831	1.449	0.839	1.104	11.760	4.700
115.49	115.49	655.03	2.825	2.825	1-S2n	1.045	1.868	1.058	1.375	13.650	5.334
152.09	152.09	655.59	3.394	3.394	1-S2n	1.258	2.244	1.274	1.609	14.925	5.828
188.68	188.68	656.12	3.918	3.918	1-S2n	1.472	2.591	1.481	1.818	15.929	6.240
225.28	225.28	656.63	4.428	4.428	1-S2n	1.669	2.916	1.675	2.008	16.816	6.594
261.87	261.87	657.11	4.910	4.910	1-S2n	1.844	3.223	1.857	2.184	17.624	6.905
298.46	298.46	657.57	5.365	5.365	1-S2n	2.018	3.517	2.027	2.347	18.405	7.187
335.06	335.06	658.00	5.801	5.801	1-S2n	2.192	3.799	2.198	2.502	19.055	7.440
371.65	371.65	658.42	6.223	6.223	1-S2n	2.366	4.071	2.370	2.648	19.604	7.672
374.98	374.98	658.46	6.260	6.260	1-S2n	2.382	4.095	2.385	2.661	19.653	7.693
444.84	444.84	659.24	7.039	7.039	1-S2n	2.683	4.589	2.714	2.920	20.488	8.086

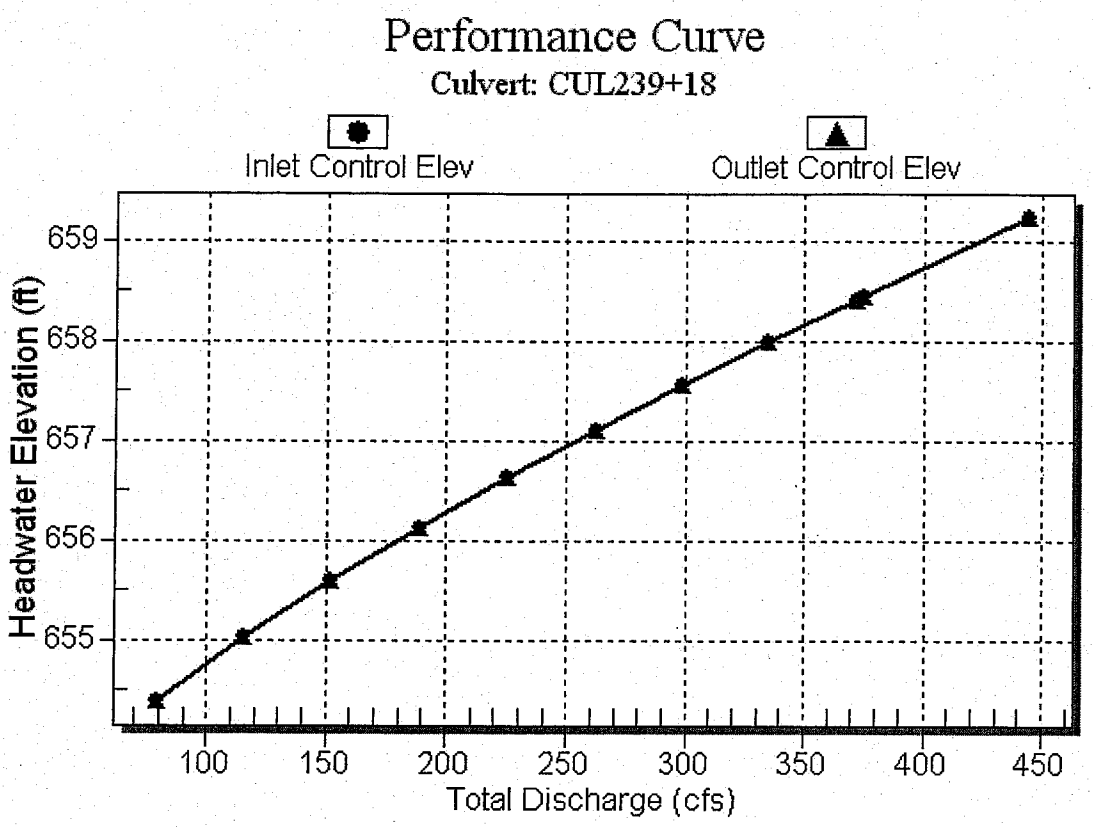
****

Inlet Elevation (invert): 652.20 ft, Outlet Elevation (invert): 639.44 ft

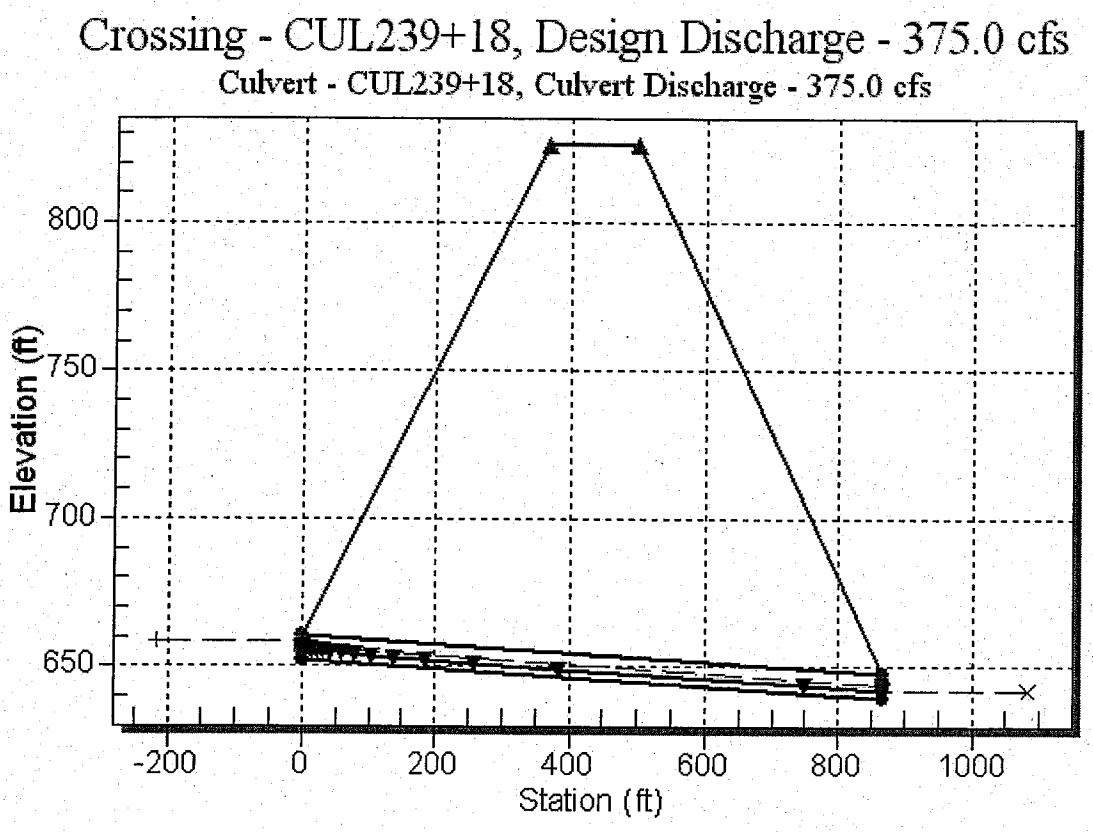
Culvert Length: 866.69 ft, Culvert Slope: 0.0147

****

Culvert Performance Curve Plot: CUL239+18



Water Surface Profile Plot for Culvert: CUL239+18



Site Data - CUL239+18

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 652.20 ft

Outlet Station: 866.60 ft

Outlet Elevation: 639.44 ft

Number of Barrels: 1

Culvert Data Summary - CUL239+18

Barrel Shape: Concrete Box

Barrel Span: 8.00 ft

Barrel Rise: 8.00 ft

Barrel Material: Concrete

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge (30-75º flare) Wingwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: CUL239+18)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
78.90	640.54	1.10	4.70	1.21	0.84
115.49	640.81	1.37	5.33	1.50	0.87
152.09	641.05	1.61	5.83	1.76	0.89
188.68	641.26	1.82	6.24	1.98	0.90
225.28	641.45	2.01	6.59	2.19	0.91
261.87	641.62	2.18	6.90	2.38	0.92
298.46	641.79	2.35	7.19	2.56	0.93
335.06	641.94	2.50	7.44	2.73	0.94
371.65	642.09	2.65	7.67	2.89	0.94
374.98	642.10	2.66	7.69	2.91	0.94
444.84	642.36	2.92	8.09	3.19	0.95

Tailwater Channel Data - CUL239+18

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 13.00 ft

Side Slope (H:V): 2.00 (_:1)

Channel Slope: 0.0175

Channel Manning's n: 0.0400

Channel Invert Elevation: 639.44 ft

Roadway Data for Crossing: CUL239+18

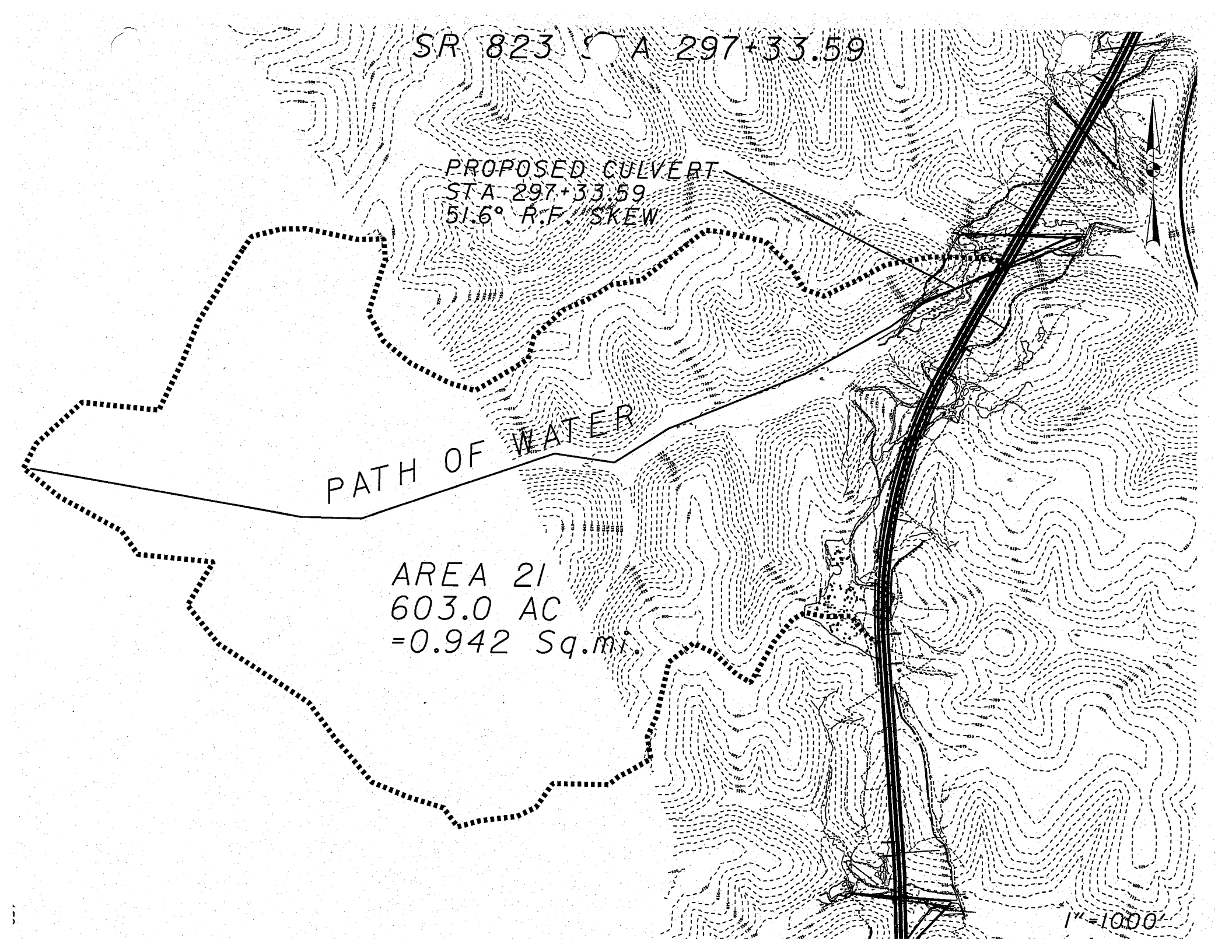
Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 1000.00 ft

Crest Elevation: 826.00 ft

Roadway Surface: Paved

Roadway Top Width: 134.00 ft


SR 823 ℄ A 297+33.59
PROPOSED CULVERT
STA 297+33.59
51.6° R.F. SKEW
PATH OF WATER
AREA 21
603.0 AC
=0.942 Sq.mi.
1"=1000'

SR 823 STA 297+33.59
TECHNIQUES FOR ESTIMATING FLOOD-PEAK
DISCHARGES OF RURAL, UNREGULATED STREAMS IN OHIO AREA A
U.S. GEOLOGICAL SURVEY Water Resources Investigations Report 89-4126

Values	Units	Definitions
26266462.00	SQ. FT.	
0.942	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
8430.00	FT.	**TOTAL CHANNEL LENGTH**
843.00	FT.	L_{10} = 10% of the Distance along channel
579	FT.	$Elev_{10}$ = Elevation at point L_{10}
7165.50	FT.	L_{85} = 85% of the Distance along channel
759	FT.	$Elev_{85}$ = Elevation at point L_{85}
6322.50	FT.	**Length** = L_{85} - L_{10}
150.32	FT./MI.	**SLOPE** = ($Elev_{10}$-$Elev_{85}$)/Length
	CFS	$Q_{\#}$ = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	126.82	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	244.39	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	337.65	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	463.09	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	564.34	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	666.21	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

HY-8 Culvert Analysis Report

BOX CULVERT AT STA. 297+33.59

Table 1 - Summary of Culvert Flows at Crossing: CUL297+33.59

Headwater Elevation (ft)	Total Discharge (cfs)	CUL297+33 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
579.27	126.82	126.82	0.00	1
580.07	180.76	180.76	0.00	1
580.82	234.70	234.70	0.00	1
581.51	288.64	288.64	0.00	1
582.15	342.58	342.58	0.00	1
582.76	396.52	396.52	0.00	1
583.36	450.45	450.45	0.00	1
583.96	504.39	504.39	0.00	1
584.56	558.33	558.33	0.00	1
584.63	564.34	564.34	0.00	1
585.84	666.21	666.21	0.00	1

Rating Curve Plot for Crossing: CUL297+33.59

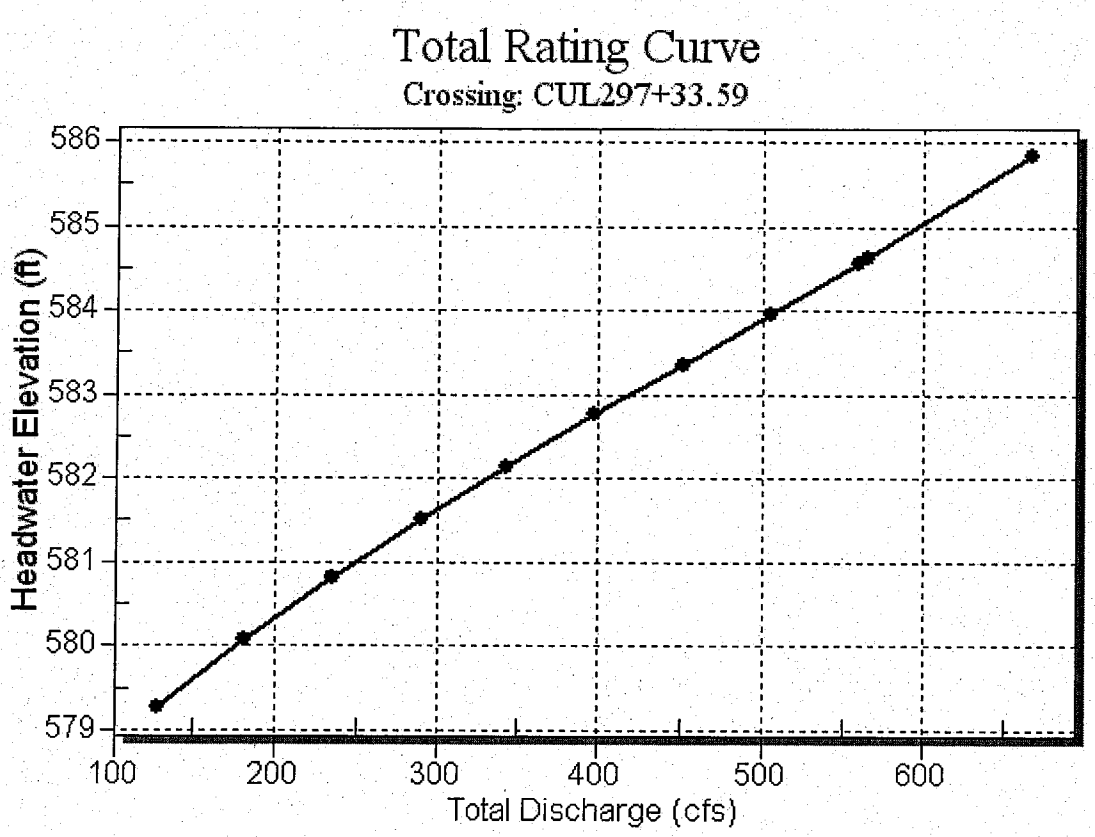


Table 2 - Culvert Summary Table: CUL297+33

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
126.82	126.82	579.27	3.008	0.000	1-S2n	1.115	1.988	1.138	1.072	13.932	7.808
180.76	180.76	580.07	3.808	0.000	1-S2n	1.431	2.518	1.438	1.315	15.717	8.793
234.70	234.70	580.82	4.556	0.000	1-S2n	1.720	2.996	1.729	1.528	16.964	9.566
288.64	288.64	581.51	5.246	0.000	1-S2n	1.979	3.439	1.989	1.718	18.136	10.220
342.58	342.58	582.15	5.890	0.000	1-S2n	2.237	3.856	2.246	1.893	19.070	10.782
396.52	396.52	582.76	6.504	0.000	1-S2n	2.485	4.250	2.489	2.053	19.911	11.290
450.45	450.45	583.36	7.102	0.000	1-S2n	2.717	4.628	2.718	2.205	20.720	11.734
504.39	504.39	583.96	7.698	0.000	1-S2n	2.950	4.990	2.950	2.347	21.373	12.146
558.33	558.33	584.56	8.304	0.000	5-S2n	3.182	5.340	3.189	2.482	21.888	12.524
564.34	564.34	584.63	8.373	0.000	5-S2n	3.207	5.378	3.211	2.497	21.967	12.558
666.21	666.21	585.84	9.583	0.000	5-S2n	3.619	6.007	3.626	2.734	22.966	13.192

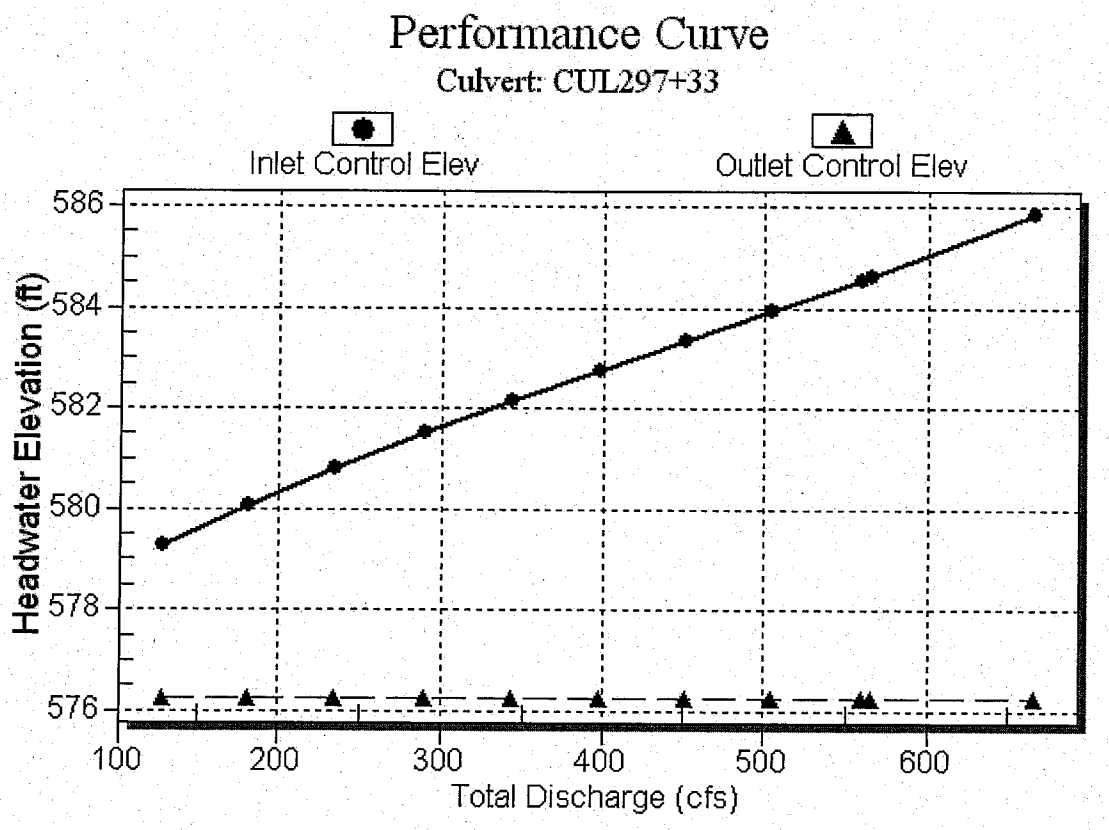
****

Inlet Elevation (invert): 576.26 ft, Outlet Elevation (invert): 554.27 ft

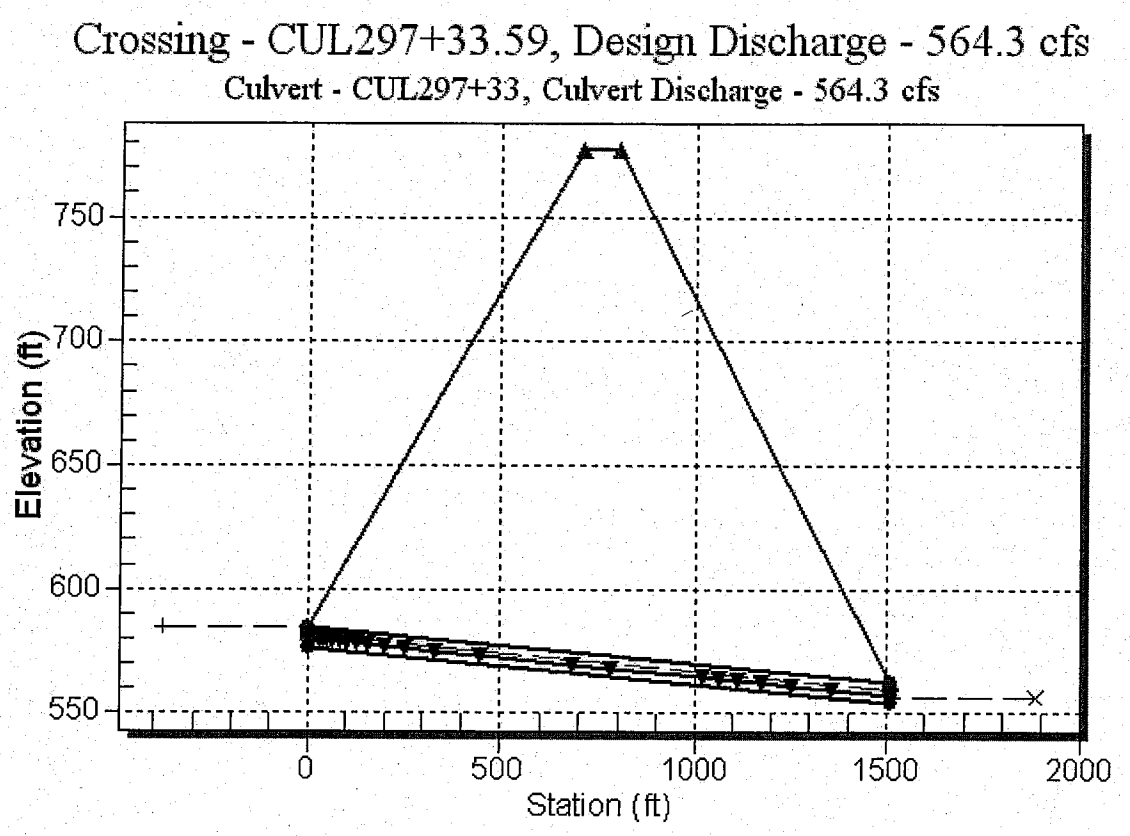
Culvert Length: 1510.08 ft, Culvert Slope: 0.0146

****

Culvert Performance Curve Plot: CUL297+33



Water Surface Profile Plot for Culvert: CUL297+33



Site Data - CUL297+33

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 576.26 ft

Outlet Station: 1509.92 ft

Outlet Elevation: 554.27 ft

Number of Barrels: 1

Culvert Data Summary - CUL297+33

Barrel Shape: Concrete Box

Barrel Span: 8.00 ft

Barrel Rise: 8.00 ft

Barrel Material: Concrete

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge (30-75° flare) Wingwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: CUL297+33.59)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
126.82	555.34	1.07	7.81	3.35	1.42
180.76	555.59	1.32	8.79	4.10	1.46
234.70	555.80	1.53	9.57	4.77	1.49
288.64	555.99	1.72	10.22	5.36	1.51
342.58	556.16	1.89	10.78	5.91	1.53
396.52	556.32	2.05	11.29	6.41	1.55
450.45	556.48	2.21	11.73	6.88	1.56
504.39	556.62	2.35	12.15	7.32	1.57
558.33	556.75	2.48	12.52	7.74	1.58
564.34	556.77	2.50	12.56	7.79	1.58
666.21	557.00	2.73	13.19	8.53	1.60

Tailwater Channel Data - CUL297+33.59

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 13.00 ft

Side Slope (H:V): 2.00 (_:1)

Channel Slope: 0.0500

Channel Manning's n: 0.0400

Channel Invert Elevation: 554.27 ft

Roadway Data for Crossing: CUL297+33.59

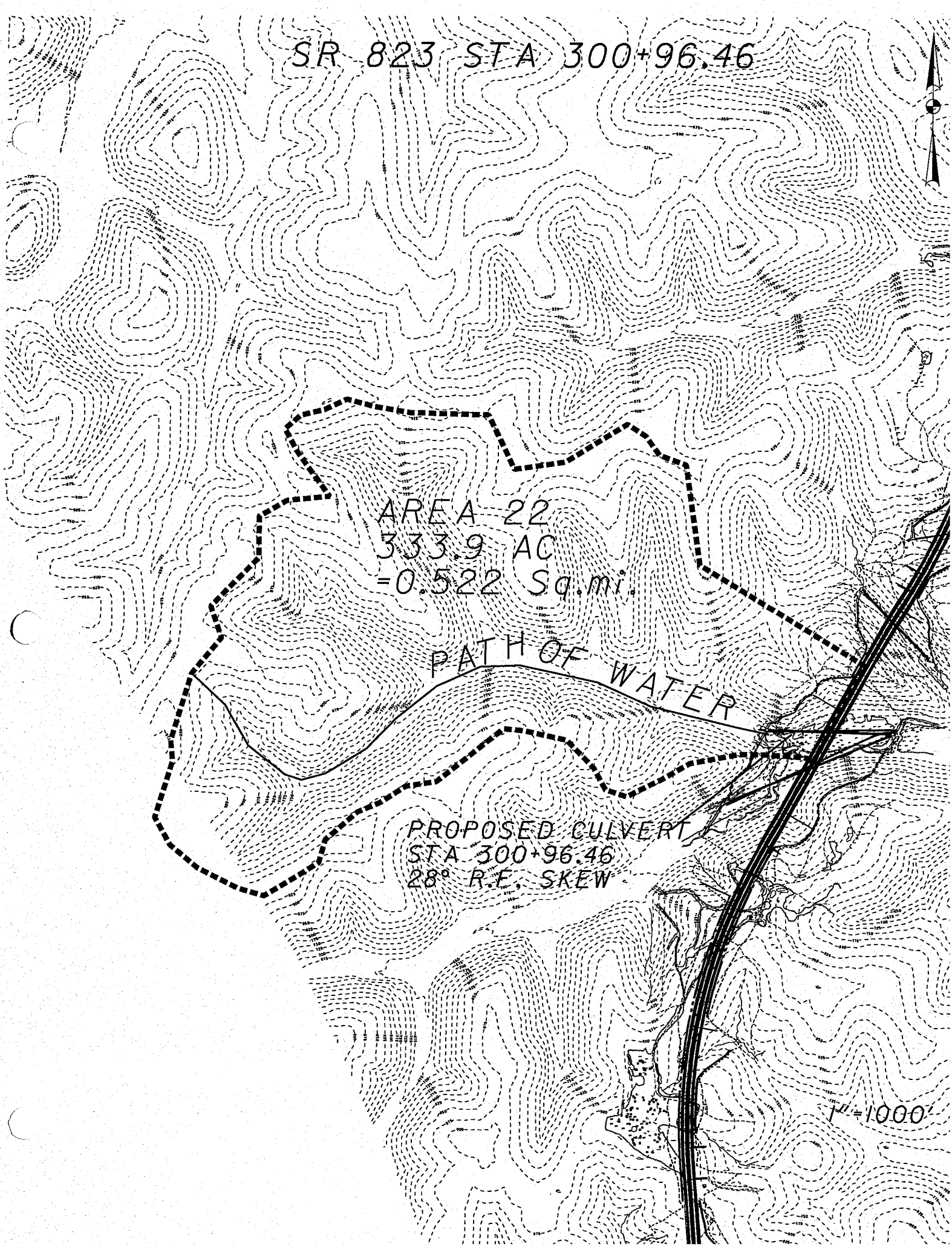
Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 1000.00 ft

Crest Elevation: 777.00 ft

Roadway Surface: Paved

Roadway Top Width: 90.00 ft


SR 823 STA 300+96.46
AREA 22
333.9 AC
=0.522 Sq.mi.
PATH OF WATER
PROPOSED CULVERT
STA 300+96.46
28° R.F. SKEW
1"=1000'

SR 823 STA 300+96.46
TECHNIQUES FOR ESTIMATING FLOOD-PEAK
DISCHARGES OF RURAL, UNREGULATED STREAMS IN OHIO AREA A
U.S. GEOLOGICAL SURVEY Water Resources Investigations Report 89-4126

Values	Units	Definitions
14545689.00	SQ. FT.	
0.522	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
5740.00	FT.	**TOTAL CHANNEL LENGTH**
574.00	FT.	L_{10} = 10% of the Distance along channel
585	FT.	$Elev_{10}$ = Elevation at point L_{10}
4879.00	FT.	L_{85} = 85% of the Distance along channel
770	FT.	$Elev_{85}$ = Elevation at point L_{85}
4305.00	FT.	**Length** = $L_{85} - L_{10}$
226.90	FT./MI.	**SLOPE** = $(Elev_{10}-Elev_{85})/Length$
	CFS	$Q_{\#}$ = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	85.75	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	169.91	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	237.68	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	329.46	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	404.20	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	479.22	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

HY-8 Culvert Analysis Report

BOX CULVERT AT STA. 300+96.46

Table 1 - Summary of Culvert Flows at Crossing: CUL300+96.46

Headwater Elevation (ft)	Total Discharge (cfs)	CUL300+96 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
568.86	85.75	85.75	0.00	1
569.53	125.10	125.10	0.00	1
570.12	164.44	164.44	0.00	1
570.68	203.79	203.79	0.00	1
571.22	243.14	243.14	0.00	1
571.72	282.49	282.49	0.00	1
572.20	321.83	321.83	0.00	1
572.66	361.18	361.18	0.00	1
573.10	400.53	400.53	0.00	1
573.14	404.20	404.20	0.00	1
573.97	479.22	479.22	0.00	1

Rating Curve Plot for Crossing: CUL300+96.46

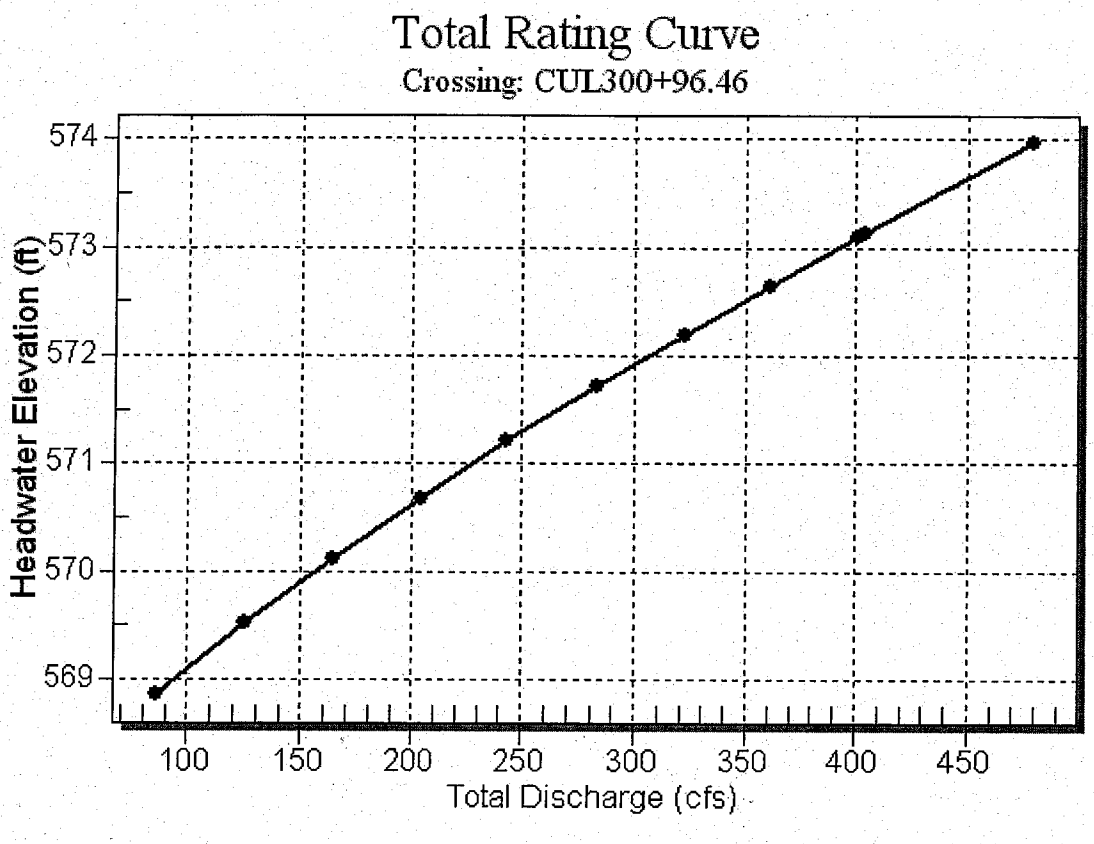


Table 2 - Culvert Summary Table: CUL300+96

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
85.75	85.75	568.86	2.323	0.000	1-S2n	0.929	1.531	0.930	0.853	11.521	6.837
125.10	125.10	569.53	2.988	0.000	1-S2n	1.186	1.970	1.210	1.063	12.926	7.781
164.44	164.44	570.12	3.585	0.000	1-S2n	1.442	2.364	1.454	1.246	14.140	8.522
203.79	203.79	570.68	4.143	0.000	1-S2n	1.680	2.727	1.686	1.409	15.108	9.145
243.14	243.14	571.22	4.678	0.000	1-S2n	1.889	3.068	1.898	1.558	16.015	9.684
282.49	282.49	571.72	5.181	0.000	1-S2n	2.098	3.390	2.100	1.697	16.812	10.154
321.83	321.83	572.20	5.658	0.000	1-S2n	2.307	3.698	2.308	1.826	17.428	10.584
361.18	361.18	572.66	6.115	0.000	1-S2n	2.504	3.994	2.513	1.950	17.966	10.963
400.53	400.53	573.10	6.559	0.000	1-S2n	2.692	4.279	2.703	2.065	18.522	11.326
404.20	404.20	573.14	6.600	0.000	1-S2n	2.710	4.305	2.715	2.076	18.609	11.352
479.22	479.22	573.97	7.431	0.000	1-S2n	3.068	4.823	3.076	2.282	19.474	11.959

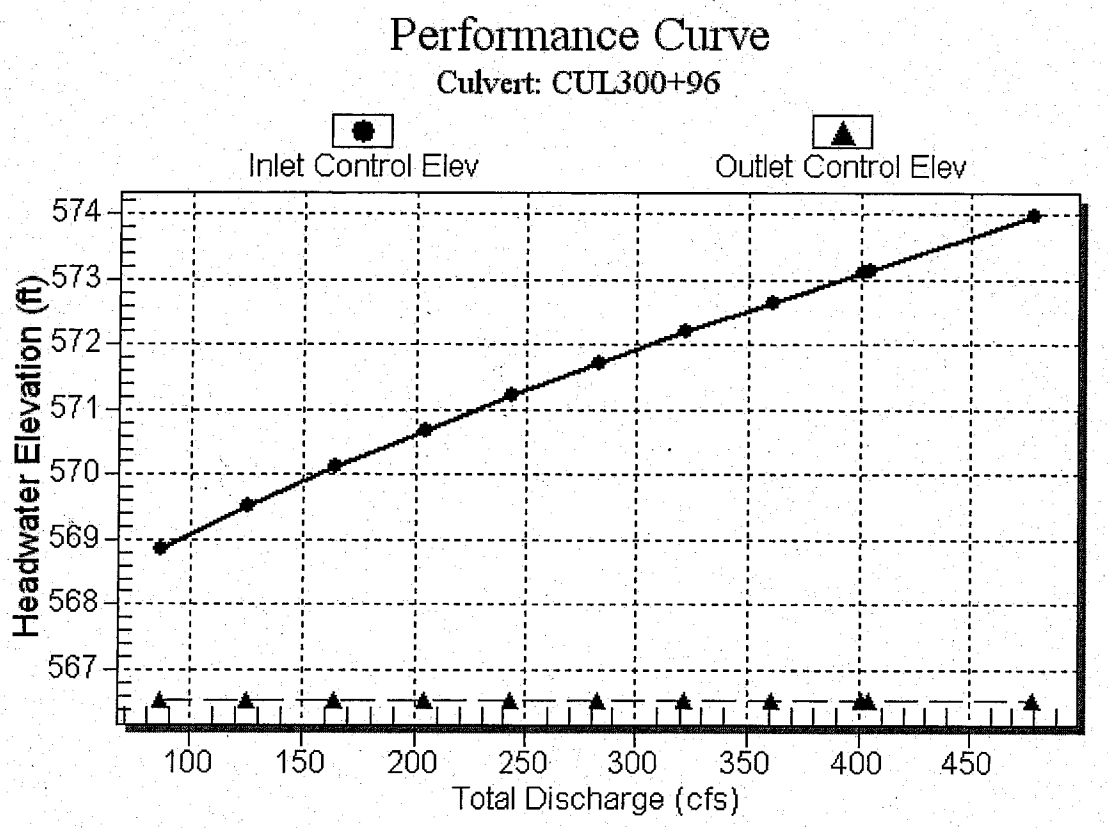
****

Inlet Elevation (invert): 566.54 ft, Outlet Elevation (invert): 554.27 ft

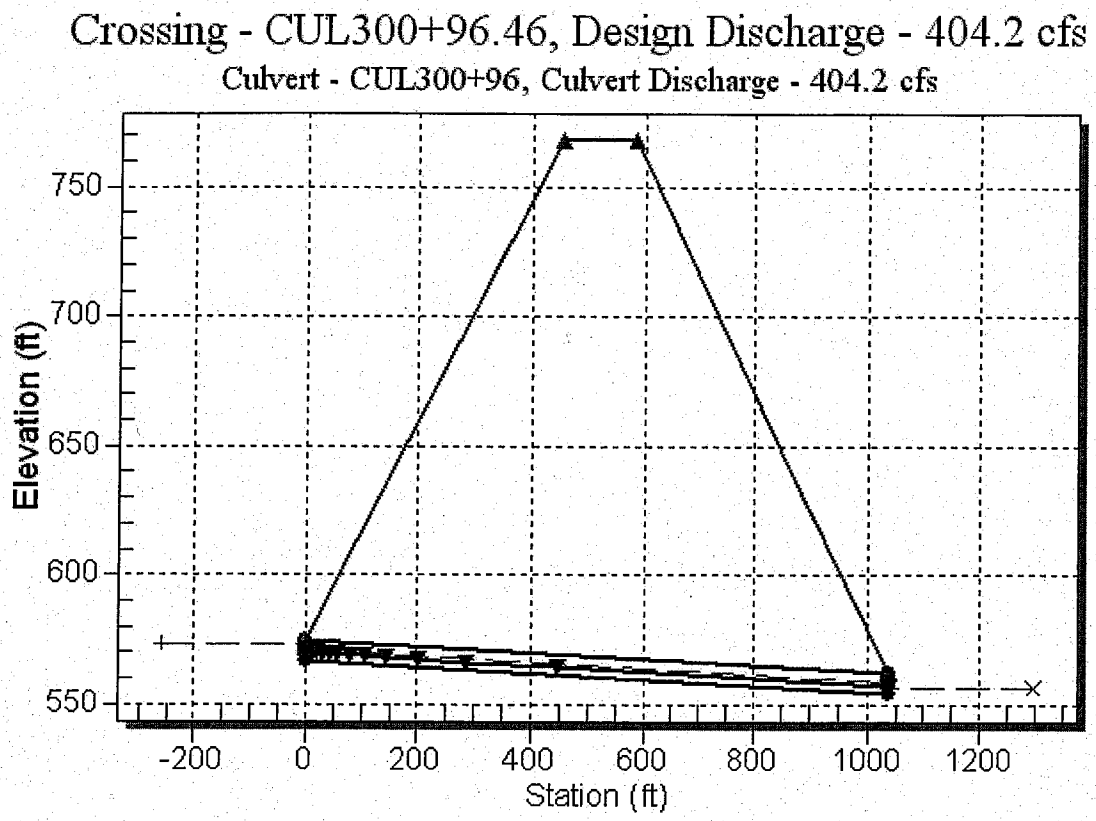
Culvert Length: 1038.28 ft, Culvert Slope: 0.0118

****

Culvert Performance Curve Plot: CUL300+96



Water Surface Profile Plot for Culvert: CUL300+96



Site Data - CUL300+96

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 566.54 ft

Outlet Station: 1038.21 ft

Outlet Elevation: 554.27 ft

Number of Barrels: 1

Culvert Data Summary - CUL300+96

Barrel Shape: Concrete Box

Barrel Span: 8.00 ft

Barrel Rise: 8.00 ft

Barrel Material: Concrete

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge (30-75° flare) Wingwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: CUL300+96.46)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
85.75	555.12	0.85	6.84	2.66	1.38
125.10	555.33	1.06	7.78	3.32	1.42
164.44	555.52	1.25	8.52	3.89	1.45
203.79	555.68	1.41	9.14	4.40	1.47
243.14	555.83	1.56	9.68	4.86	1.49
282.49	555.97	1.70	10.15	5.29	1.51
321.83	556.10	1.83	10.58	5.70	1.52
361.18	556.22	1.95	10.96	6.08	1.53
400.53	556.33	2.06	11.33	6.44	1.55
404.20	556.35	2.08	11.35	6.48	1.55
479.22	556.55	2.28	11.96	7.12	1.57

Tailwater Channel Data - CUL300+96.46

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 13.00 ft

Side Slope (H:V): 2.00 (_:1)

Channel Slope: 0.0500

Channel Manning's n: 0.0400

Channel Invert Elevation: 554.27 ft

Roadway Data for Crossing: CUL300+96.46

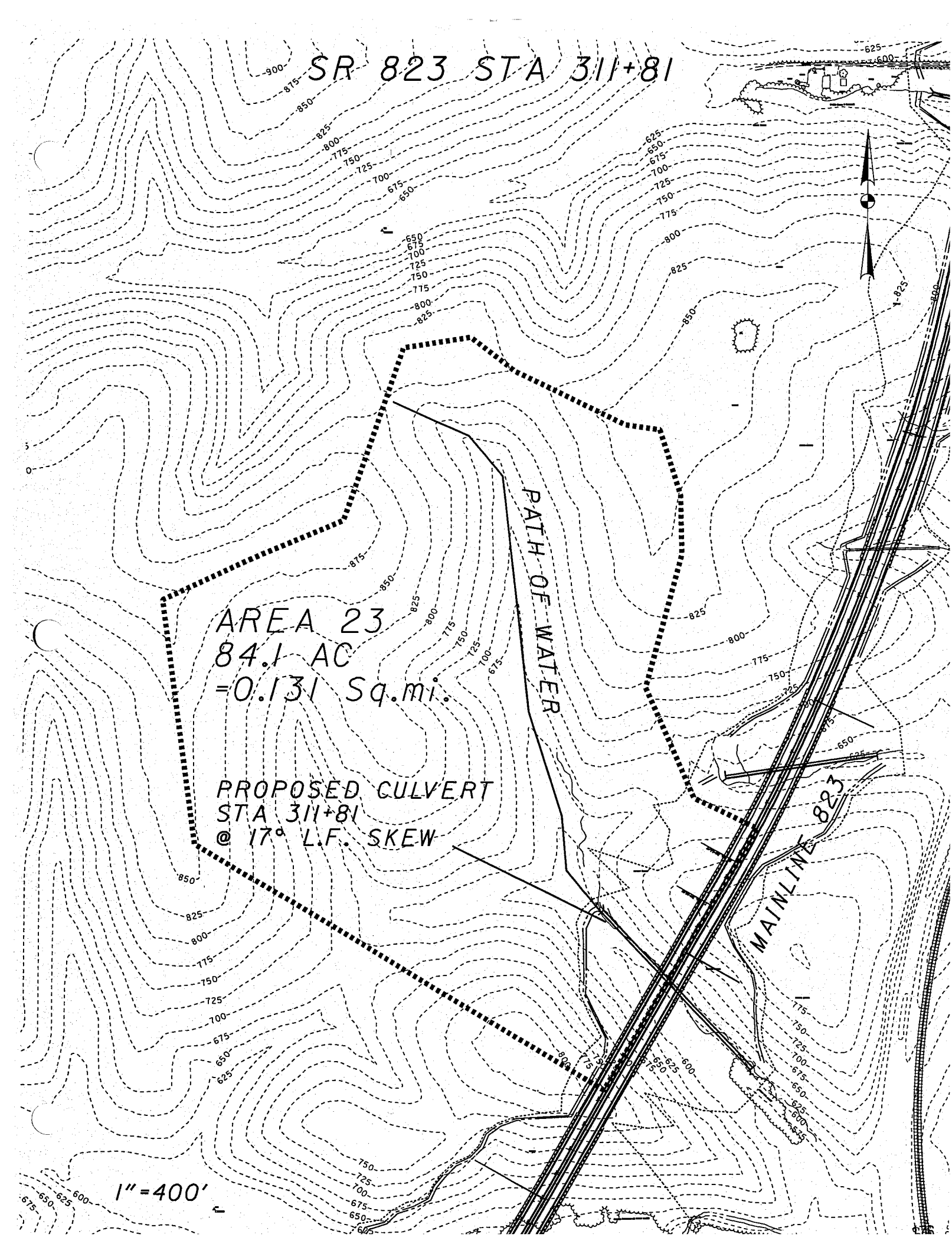
Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 1000.00 ft

Crest Elevation: 768.00 ft

Roadway Surface: Paved

Roadway Top Width: 134.00 ft


SR 823 STA 311+81
AREA 23
84.1 AC
=0.131 Sq.mi.
PROPOSED CULVERT
STA 311+81
@ 17° L.F. SKEW
PATH OF WATER
MAINLINE 823
1"=400'

SR 823 STA 311+81.00
TECHNIQUES FOR ESTIMATING FLOOD-PEAK
DISCHARGES OF RURAL, UNREGULATED STREAMS IN OHIO AREA A
U.S. GEOLOGICAL SURVEY Water Resources Investigations Report 89-4126

Values	Units	Definitions
3662580.60	SQ. FT.	
0.131	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
2108.00	FT.	**TOTAL CHANNEL LENGTH**
210.80	FT.	L_{10} = 10% of the Distance along channel
625	FT.	$Elev_{10}$ = Elevation at point L_{10}
1791.80	FT.	L_{85} = 85% of the Distance along channel
749	FT.	$Elev_{85}$ = Elevation at point L_{85}
1581.00	FT.	**Length** = $L_{85} - L_{10}$
414.12	FT./MI.	**SLOPE** = $(Elev_{10}-Elev_{85})$/Length
	CFS	$Q_{\#}$ = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	32.34	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	67.20	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	95.98	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	135.39	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	168.00	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	200.54	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

HY-8 Culvert Analysis Report

BOX CULVERT AT STA. 311+81.00

Table 1 - Summary of Culvert Flows at Crossing: 311+81.00

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
601.97	0.00	0.00	0.00	1
602.85	20.05	20.05	0.00	1
603.33	40.10	40.10	0.00	1
603.75	60.15	60.15	0.00	1
604.13	80.20	80.20	0.00	1
604.48	100.25	100.25	0.00	1
604.80	120.30	120.30	0.00	1
605.11	140.35	140.35	0.00	1
605.40	160.40	160.40	0.00	1
605.51	168.00	168.00	0.00	1
605.95	200.50	200.50	0.00	1

Rating Curve Plot for Crossing: 311+81.00

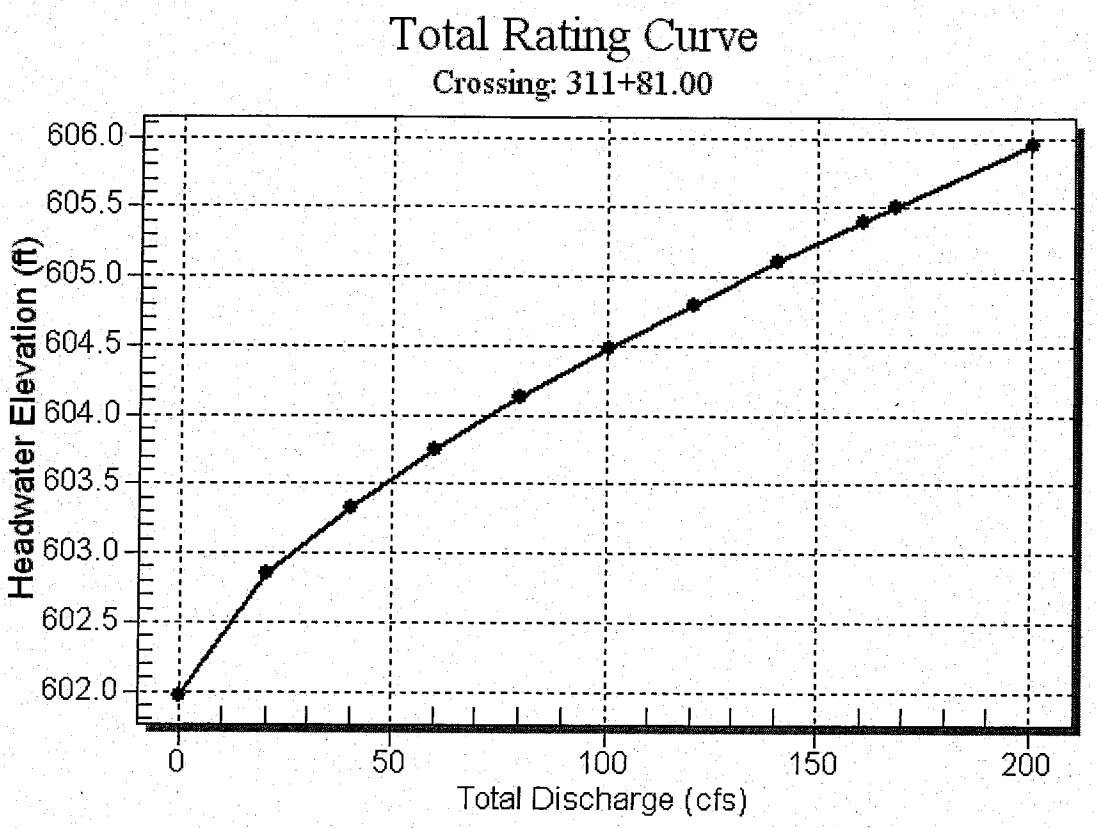


Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	601.97	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
20.05	20.05	602.85	0.877	0.877	1-S2n	0.131	0.581	0.181	0.509	13.831	4.367
40.10	40.10	603.33	1.361	1.361	1-S2n	0.263	0.923	0.323	0.761	15.538	5.537
60.15	60.15	603.75	1.784	1.784	1-S2n	0.394	1.209	0.409	0.960	18.386	6.312
80.20	80.20	604.13	2.161	2.161	1-S2n	0.526	1.465	0.605	1.130	16.583	6.917
100.25	100.25	604.48	2.508	2.508	1-S2n	0.657	1.699	0.689	1.280	18.176	7.416
120.30	120.30	604.80	2.832	2.832	1-S2n	0.789	1.919	0.792	1.418	18.985	7.832
140.35	140.35	605.11	3.138	3.138	1-S2n	0.864	2.127	0.867	1.543	20.240	8.208
160.40	160.40	605.40	3.431	3.431	1-S2n	0.935	2.325	0.945	1.660	21.221	8.533
168.00	168.00	605.51	3.538	3.538	1-S2n	0.961	2.398	0.988	1.701	21.262	8.659
200.50	200.50	605.95	3.981	3.981	1-S2n	1.076	2.698	1.088	1.873	23.042	9.112

****

Inlet Elevation (invert): 601.97 ft, Outlet Elevation (invert): 570.86 ft

Culvert Length: 767.63 ft, Culvert Slope: 0.0406

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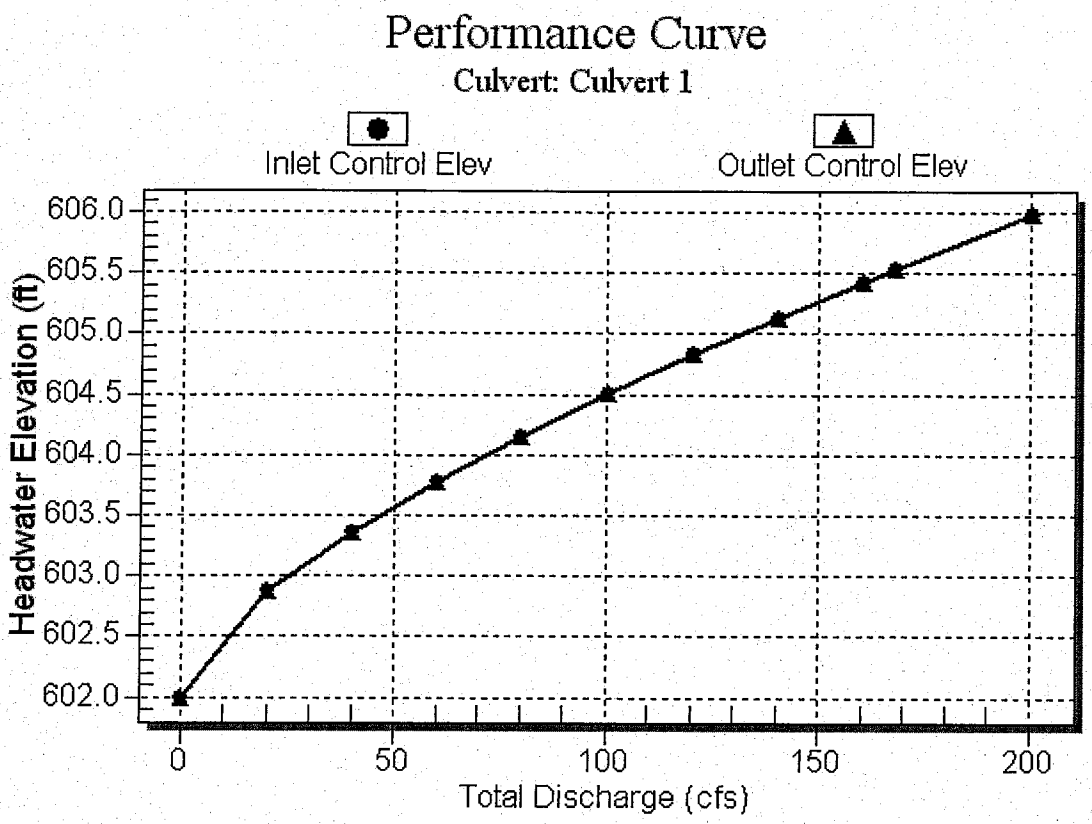
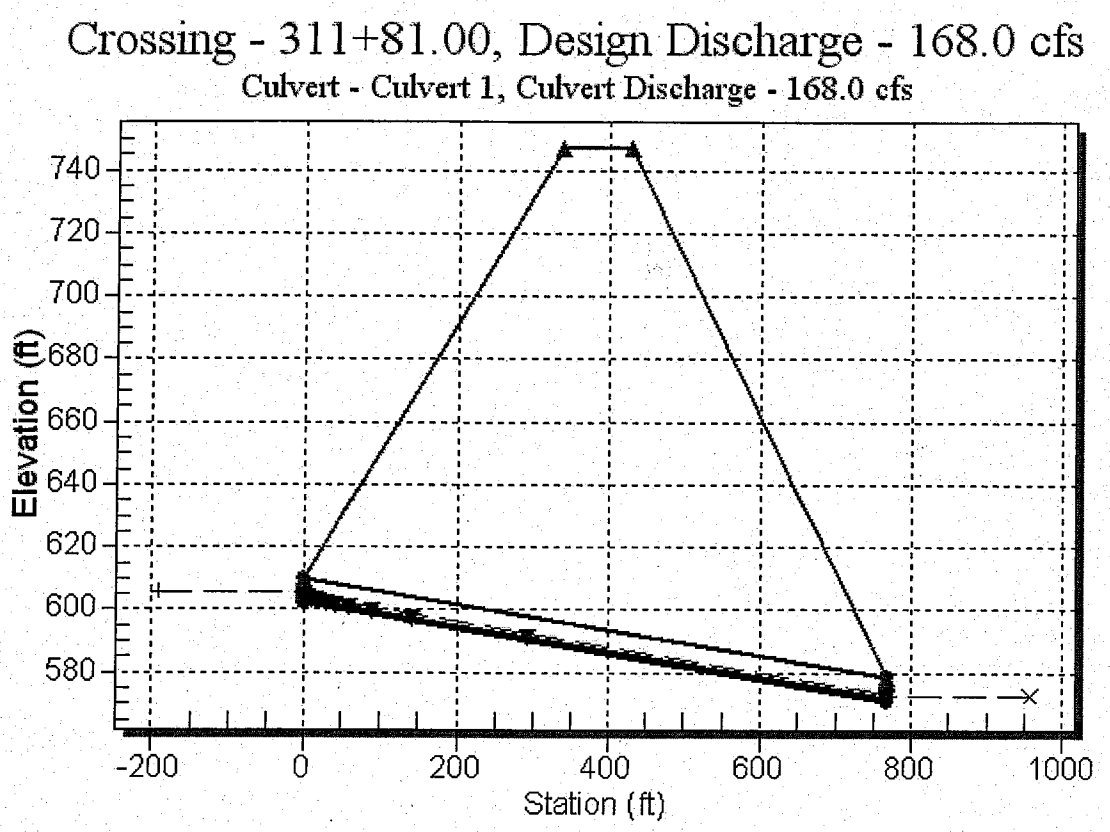
Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 601.97 ft

Outlet Station: 767.00 ft

Outlet Elevation: 570.86 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 8.00 ft

Barrel Rise: 8.00 ft

Barrel Material: Concrete

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge (30-75° flare) Wingwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: 311+81.00)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	570.86	0.00	0.00	0.00	0.00
20.05	571.37	0.51	4.37	1.29	1.14
40.10	571.62	0.76	5.54	1.93	1.20
60.15	571.82	0.96	6.31	2.43	1.24
80.20	571.99	1.13	6.92	2.86	1.27
100.25	572.14	1.28	7.42	3.24	1.29
120.30	572.28	1.42	7.83	3.59	1.30
140.35	572.40	1.54	8.21	3.91	1.32
160.40	572.52	1.66	8.53	4.21	1.33
168.00	572.56	1.70	8.66	4.31	1.33
200.50	572.73	1.87	9.11	4.75	1.35

Tailwater Channel Data - 311+81.00

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 8.00 ft

Side Slope (H:V): 2.00 (_:1)

Channel Slope: 0.0406

Channel Manning's n: 0.0400

Channel Invert Elevation: 570.86 ft

Roadway Data for Crossing: 311+81.00

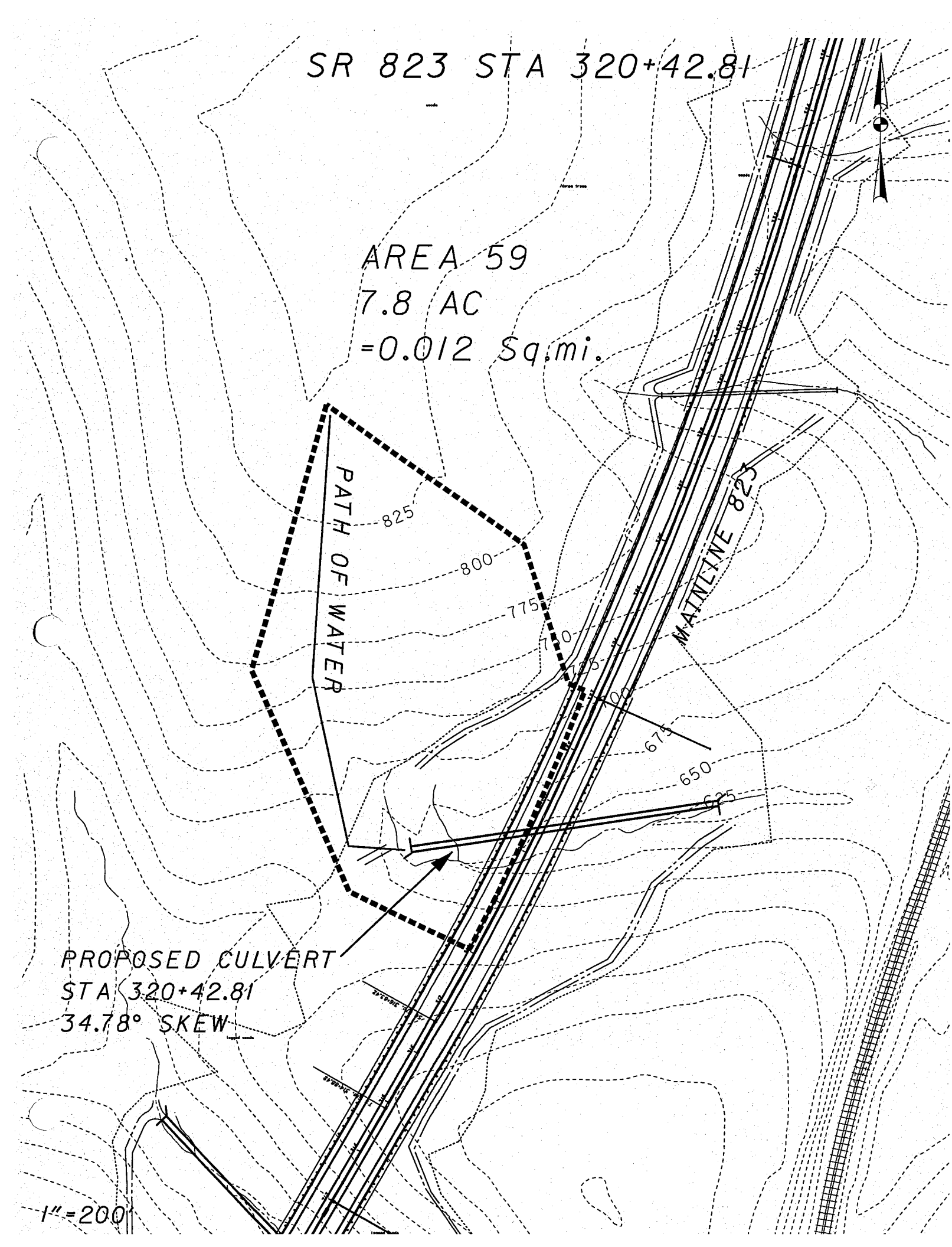
Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 1000.00 ft

Crest Elevation: 747.00 ft

Roadway Surface: Paved

Roadway Top Width: 90.00 ft


SR 823 STA 320+42.81
AREA 59
7.8 AC
=0.012 Sq.mi.
PATH OF WATER
825
800
775
750
725
700
675
650
625
MAINLINE 823
PROPOSED CULVERT
STA 320+42.81
34.78° SKEW
1"=200'

SR 823 STA 320+42.81

TECHNIQUES FOR ESTIMATING FLOOD-PEAK DISCHARGES OF RURAL, UNREGULATED STREAMS IN OHIO AREA A

U.S. GEOLOGICAL SURVEY Water Resources Investigations Report 89-4126

Values	Units	Definitions
338493.00	SQ. FT.	
0.012	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
865.00	FT.	**TOTAL CHANNEL LENGTH**
86.50	FT.	L_{10} = 10% of the Distance along channel
667	FT.	**$Elev_{10}$** = Elevation at point L_{10}
735.25	FT.	L_{85} = 85% of the Distance along channel
832	FT.	**$Elev_{85}$** = Elevation at point L_{85}
648.75	FT.	**Length** = $L_{85} - L_{10}$
1342.89	FT./MI.	**SLOPE** = ($Elev_{10}$-$Elev_{85}$)/Length
	CFS	$Q_{\#}$ = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	6.15	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	13.96	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	20.73	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	30.23	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	38.32	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	46.34	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

UNIVERSAL CULVERT DESIGN

PID : 77366 **Date :** 02/24/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth, Ohio

Description : Drainage area 59, Sta. 320+42.81 **Designer :** mdc

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 660.56 **Outlet Invert Elevation (ft.) :** 616.59 **Tailwater Elevation (ft.) :** 617.20 **Overflow Elevation (ft.) :** 736.67

Allowable Headwater Elevation (ft.) : 734.67 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 567.30 **Culvert Slope (ft./ft.) :** 0.0775 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 38.30 @ 50 yrs. **Flood Discharge (cfs) :** 46.30 @ 100 yrs.

	FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH				**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.20		
	38.30	1	30 in.	664.19	624.21	2 - E	22.21	0.96	2.09	0.0120	INLET	0.00	D	0.00
	38.30	1	27 in.	665.00	627.83	2 - E	22.33	1.00	2.07	0.0120	INLET	0.00	D - 1	0.00
	38.30	1	24 in.	666.51	635.11	2 - E	22.36	1.07	1.94	0.0120	INLET	0.00	D - 2	0.00
	38.30	1	33 in.	663.78	N/A	1 - C	22.06	0.92	2.06	0.0120	INLET	0.00	D + 1	0.00
	46.30	1	30 in.	665.05	626.75	2 - E	23.40	1.06	2.25	0.0120	INLET	0.00	F	0.00
	46.30	1	27 in.	666.31	632.06	2 - E	23.45	1.12	2.15	0.0120	INLET	0.00	F - 1	0.00
	46.30	1	24 in.	668.55	642.76	2 - E	23.34	1.21	1.97	0.0120	INLET	0.00	F - 2	0.00
	46.30	1	33 in.	664.36	623.91	2 - E	23.27	1.01	2.25	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED				**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.90		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)														
	38.30	1	33 in.	664.33	630.39	2 - E	13.25	1.35	2.06	0.0241	INLET	0.00	D	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
38.30	1	30 in.	665.17	638.01	2 - E	13.10	1.44	2.09	0.0244	INLET	0.00	D - 1	0.00
38.30	1	27 in.	666.58	652.13	2 - E	12.88	1.57	2.07	0.0245	INLET	0.00	D - 2	0.00
38.30	1	36 in.	663.86	N/A	1 - C	13.22	1.29	2.01	0.0241	INLET	0.00	D + 1	0.00
46.30	1	33 in.	665.32	635.74	2 - E	13.88	1.51	2.25	0.0241	INLET	0.00	F	0.00
46.30	1	30 in.	666.57	646.91	2 - E	13.65	1.63	2.25	0.0244	INLET	0.00	F - 1	0.00
46.30	1	27 in.	668.49	667.57	2 - E	13.11	1.87	2.15	0.0245	INLET	0.00	F - 2	0.00
46.30	1	36 in.	664.55	629.81	2 - E	13.89	1.43	2.22	0.0241	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
38.30	1	36 in.	663.86	N/A	1 - C	11.80	1.40	2.01	0.0281	INLET	0.00	D	0.00
38.30	1	42 in.	663.45	N/A	1 - C	11.82	1.30	1.92	0.0278	INLET	0.00	D + 1	0.00
46.30	1	36 in.	664.55	633.16	2 - E	12.38	1.57	2.22	0.0281	INLET	0.00	F	0.00
46.30	1	42 in.	663.84	N/A	1 - C	12.45	1.44	2.12	0.0278	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
38.30	1	60 in.	663.02	N/A	1 - C	10.08	1.24	1.73	0.0332	INLET	0.00	D	0.00
38.30	1	66 in.	662.92	N/A	1 - C	10.02	1.20	1.68	0.0330	INLET	0.00	D + 1	0.00
46.30	1	60 in.	663.31	N/A	1 - C	10.65	1.37	1.90	0.0332	INLET	0.00	F	0.00
46.30	1	66 in.	663.20	N/A	1 - C	10.60	1.32	1.85	0.0330	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
38.30	1	60 in.	663.02	N/A	1 - C	11.99	1.10	1.73	0.0260	INLET	0.00	D	0.00
38.30	1	66 in.	662.92	N/A	1 - C	11.87	1.06	1.68	0.0260	INLET	0.00	D + 1	0.00
46.30	1	60 in.	663.31	N/A	1 - C	12.68	1.21	1.90	0.0260	INLET	0.00	F	0.00
46.30	1	66 in.	663.20	N/A	1 - C	12.55	1.17	1.85	0.0260	INLET	0.00	F + 1	0.00

USE F2" S.S.P

CULVERT ANALYSIS

PID : 77366 **Date :** 02/24/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth OH

Description : Drainage area 59, Sta. 320+42.81 **Designer :** mdc

HEADWATER CONTROL CODES:

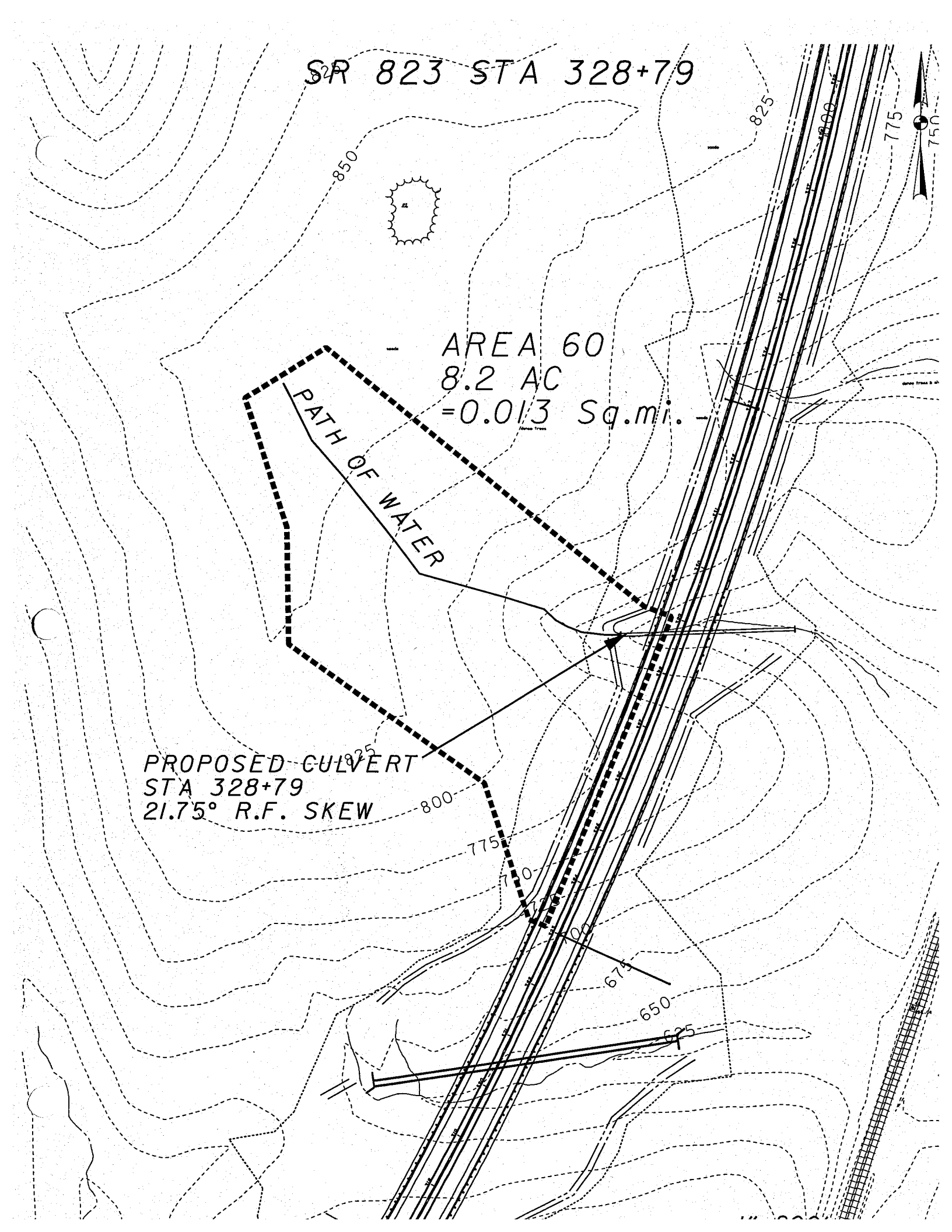
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Pipe Number : 1 **Use HW :** 0 **Inlet Invert Elevation (ft.) :** 660.56 **Outlet Invert Elevation (ft.) :** 616.59
Pipe Quantity : 1

Culvert Type : Circular Corrugated
Corrugation Type : Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert) **Pipe Length (ft.) :** 567.30 **Culvert Slope (ft./ft.) :** 0.0775
Pipe Size : 72 in.
Design Manning 'n' : (default) **Buried Manning 'n' :** N/A

Entrance Type : Headwall **Loss Coef. Ke :** 0.2500 **K :** 0.0083 **M :** 2.00 **Max. Q :** 3.30
CD : 0.6405 **c :** 0.0379 **Y :** 0.6900 **Min. Q :** 3.80

FLOW (cfs.)	HEAD LOSS (ft.)	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	BURIED DEPTH (ft.)	TAILWATER ELEVATION (ft.)
38.30	42.16	662.56	N/A	1 - C	11.74	1.04	1.64	0.0260	INLET	0.00	616.59
46.30	42.31	662.80	N/A	1 - C	12.42	1.14	1.80	0.0260	INLET	0.00	616.59


SR 823 STA 328+79
AREA 60
8.2 AC
=0.013 Sq.mi.
PATH OF WATER
PROPOSED CULVERT
STA 328+79
21.75° R.F. SKEW
850
825
800
775
750
700
675
650
625

SR 823 STA 328+79.00
TECHNIQUES FOR ESTIMATING FLOOD-PEAK
DISCHARGES OF RURAL, UNREGULATED STREAMS IN OHIO AREA A
U.S. GEOLOGICAL SURVEY Water Resources Investigations Report 89-4126

Values	Units	Definitions
355411.00	SQ. FT.	
0.013	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
800.00	FT.	**TOTAL CHANNEL LENGTH**
80.00	FT.	L_{10} = 10% of the Distance along channel
717	FT.	$Elev_{10}$ = Elevation at point L_{10}
680.00	FT.	L_{85} = 85% of the Distance along channel
863	FT.	$Elev_{85}$ = Elevation at point L_{85}
600.00	FT.	**Length** = $L_{85} - L_{10}$
1284.80	FT./MI.	**SLOPE** = $(Elev_{10}-Elev_{85})$/Length
	CFS	$Q_{\#}$ = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	6.34	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	14.36	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	21.29	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	31.01	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	39.28	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	47.47	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

UNIVERSAL CULVERT DESIGN

PID : 77366 **Date :** 03/23/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth, Ohio

Description : Drainage area 60, Sta. 328+79 **Designer :** mdc

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 695.94 **Outlet Invert Elevation (ft.) :** 651.31 **Tailwater Elevation (ft.) :** 651.93 **Overflow Elevation (ft.) :** 717.33

Allowable Headwater Elevation (ft.) : 714.50 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 312.00 **Culvert Slope (ft./ft.) :** 0.1430 **Design Manning 'n' :** 0.0120

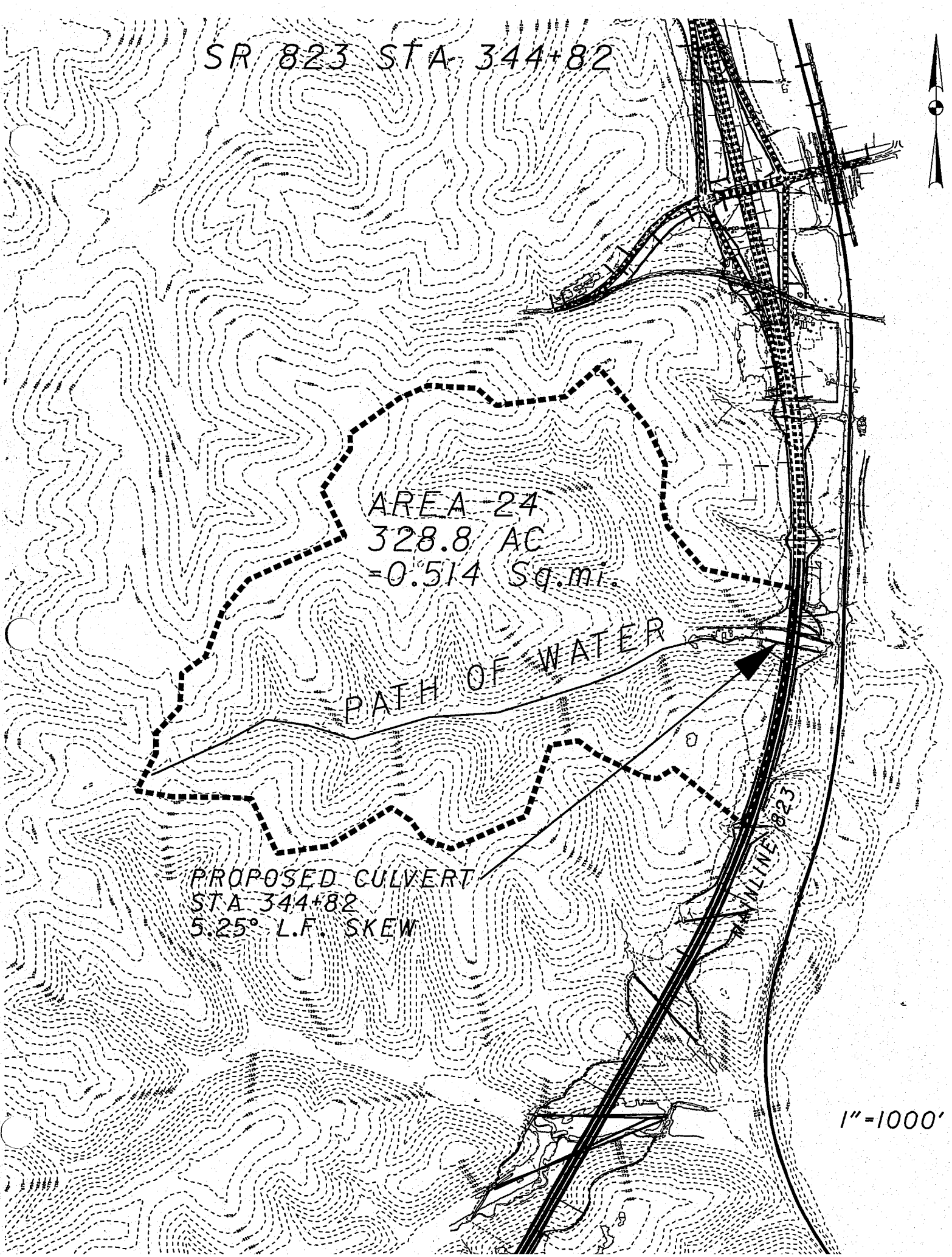
Design Discharge (cfs) : 39.30 @ 50 yrs. **Flood Discharge (cfs) :** 47.50 @ 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.20		
39.30	1	30 in.	699.67	657.24	2 - E	27.95	0.82	2.11	0.0120	INLET	0.00	D	0.00
39.30	1	27 in.	700.53	659.55	2 - E	28.14	0.86	2.08	0.0120	INLET	0.00	D - 1	0.00
39.30	1	24 in.	702.12	664.18	2 - E	28.29	0.91	1.95	0.0120	INLET	0.00	D - 2	0.00
39.30	1	33 in.	699.22	N/A	1 - C	27.71	0.79	2.09	0.0120	INLET	0.00	D + 1	0.00
47.50	1	30 in.	700.58	658.98	2 - E	29.46	0.91	2.27	0.0120	INLET	0.00	F	0.00
47.50	1	27 in.	701.90	662.39	2 - E	29.59	0.95	2.16	0.0120	INLET	0.00	F - 1	0.00
47.50	1	24 in.	704.29	669.21	2 - E	29.69	1.01	1.98	0.0120	INLET	0.00	F - 2	0.00
47.50	1	33 in.	699.84	657.15	2 - E	29.23	0.87	2.28	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.90		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
39.30	1	33 in.	699.82	660.91	2 - E	16.75	1.15	2.09	0.0241	INLET	0.00	D	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
39.30	1	30 in.	700.72	665.54	2 - E	16.62	1.21	2.11	0.0244	INLET	0.00	D - 1	0.00
39.30	1	27 in.	702.19	674.10	2 - E	16.54	1.30	2.08	0.0245	INLET	0.00	D - 2	0.00
39.30	1	36 in.	699.32	N/A	1 - C	16.66	1.10	2.04	0.0241	INLET	0.00	D + 1	0.00
47.50	1	33 in.	700.86	664.31	2 - E	17.58	1.28	2.28	0.0241	INLET	0.00	F	0.00
47.50	1	30 in.	702.18	671.11	2 - E	17.42	1.36	2.27	0.0244	INLET	0.00	F - 1	0.00
47.50	1	27 in.	704.17	683.65	2 - E	17.22	1.47	2.16	0.0245	INLET	0.00	F - 2	0.00
47.50	1	36 in.	700.04	660.67	2 - E	17.52	1.22	2.24	0.0241	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
39.30	1	36 in.	699.32	N/A	1 - C	14.90	1.20	2.04	0.0281	INLET	0.00	D	0.00
39.30	1	42 in.	698.87	N/A	1 - C	14.87	1.12	1.95	0.0278	INLET	0.00	D + 1	0.00
47.50	1	36 in.	700.04	662.62	2 - E	15.67	1.33	2.24	0.0281	INLET	0.00	F	0.00
47.50	1	42 in.	699.29	N/A	1 - C	15.66	1.23	2.15	0.0278	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
39.30	1	60 in.	698.44	N/A	1 - C	12.62	1.08	1.75	0.0332	INLET	0.00	D	0.00
39.30	1	66 in.	698.34	N/A	1 - C	12.54	1.04	1.70	0.0330	INLET	0.00	D + 1	0.00
47.50	1	60 in.	698.73	N/A	1 - C	13.35	1.18	1.93	0.0332	INLET	0.00	F	0.00
47.50	1	66 in.	698.62	N/A	1 - C	13.26	1.14	1.88	0.0330	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
39.30	1	60 in.	698.44	N/A	1 - C	15.01	0.96	1.75	0.0260	INLET	0.00	D	0.00
39.30	1	66 in.	698.34	N/A	1 - C	14.85	0.93	1.70	0.0260	INLET	0.00	D + 1	0.00
47.50	1	60 in.	698.73	N/A	1 - C	15.86	1.05	1.93	0.0260	INLET	0.00	F	0.00
47.50	1	66 in.	698.62	N/A	1 - C	15.68	1.02	1.88	0.0260	INLET	0.00	F + 1	0.00

REQUIRED 33" USE 60" S.S.P


SR 823 STA 344+82
AREA 24
328.8 AC
=0.514 Sq.mi.
PATH OF WATER
PROPOSED CULVERT
STA 344+82
5.25° L.F. SKEW
WYNLINE 823
1"=1000'

SR 823 STA 344+82.00
TECHNIQUES FOR ESTIMATING FLOOD-PEAK
DISCHARGES OF RURAL, UNREGULATED STREAMS IN OHIO AREA A
U.S. GEOLOGICAL SURVEY Water Resources Investigations Report 89-4126

Values	Units	Definitions
14322402.00	SQ. FT.	
0.514	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
5536.00	FT.	**TOTAL CHANNEL LENGTH**
553.60	FT.	L_{10} = 10% of the Distance along channel
586	FT.	$Elev_{10}$ = Elevation at point L_{10}
4705.60	FT.	L_{85} = 85% of the Distance along channel
774	FT.	$Elev_{85}$ = Elevation at point L_{85}
4152.00	FT.	**Length** = $L_{85} - L_{10}$
239.08	FT./MI.	**SLOPE** = $(Elev_{10}-Elev_{85})$/Length
	CFS	$Q_{\#}$ = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	85.48	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	169.85	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	237.91	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	330.13	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	405.30	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	480.76	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

HY-8 Culvert Analysis Report

BOX CULVERT AT STA. 344+82.00

Table 1 - Summary of Culvert Flows at Crossing: 344+82

Headwater Elevation (ft)	Total Discharge (cfs)	344+82 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
572.79	0.00	0.00	0.00	1
574.35	48.08	48.08	0.00	1
575.27	96.16	96.16	0.00	1
576.03	144.24	144.24	0.00	1
576.72	192.32	192.32	0.00	1
577.38	240.40	240.40	0.00	1
577.99	288.48	288.48	0.00	1
578.57	336.56	336.56	0.00	1
579.12	384.64	384.64	0.00	1
579.35	405.30	405.30	0.00	1
580.19	480.80	480.80	0.00	1

Rating Curve Plot for Crossing: 344+82

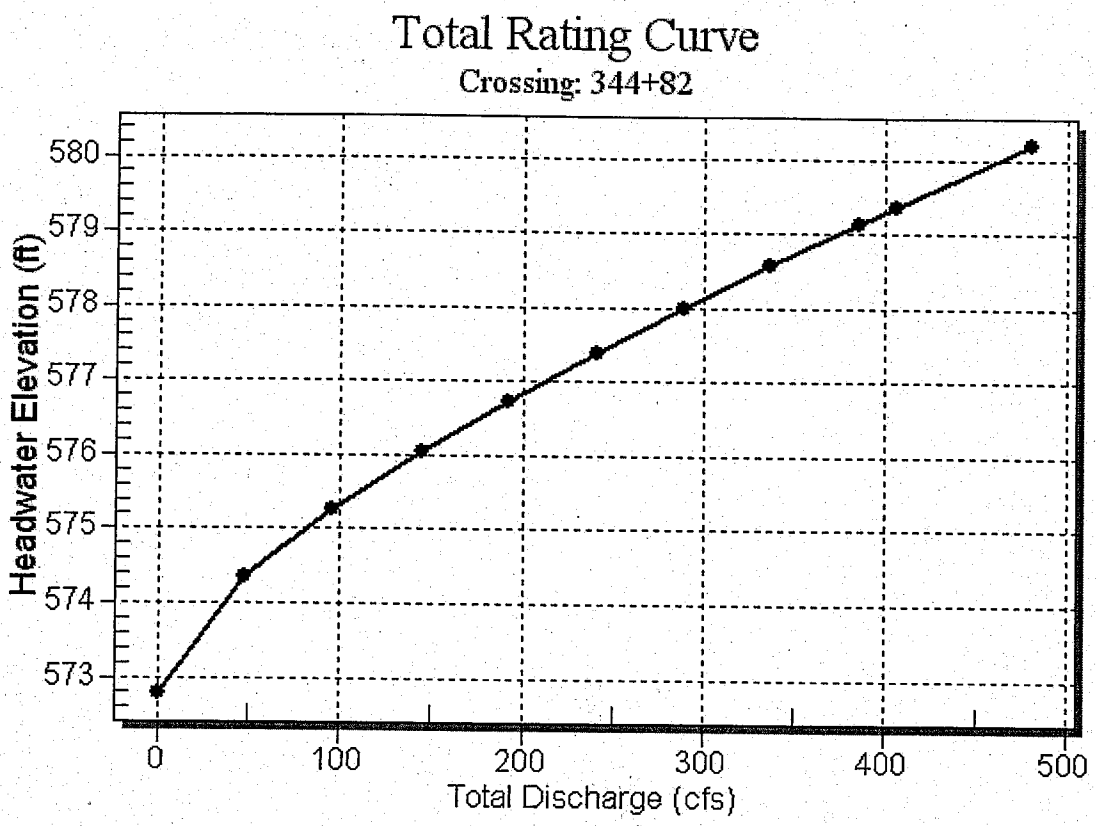


Table 2 - Culvert Summary Table: 344+82

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	572.79	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
48.08	48.08	574.35	1.561	1.561	1-S2n	0.403	1.041	0.441	0.864	13.620	4.746
96.16	96.16	575.27	2.476	2.476	1-S2n	0.803	1.653	0.804	1.286	14.952	5.950
144.24	144.24	576.03	3.245	3.245	1-S2n	1.020	2.166	1.056	1.615	17.075	6.752
192.32	192.32	576.72	3.930	3.930	1-S2n	1.236	2.624	1.254	1.893	19.173	7.372
240.40	240.40	577.38	4.590	4.590	1-S2n	1.452	3.045	1.469	2.139	20.451	7.871
288.48	288.48	577.99	5.203	5.203	1-S2n	1.656	3.438	1.663	2.361	21.679	8.300
336.56	336.56	578.57	5.779	5.779	1-S2n	1.832	3.810	1.840	2.564	22.860	8.678
384.64	384.64	579.12	6.329	6.329	1-S2n	2.008	4.165	2.114	2.753	22.743	9.012
405.30	405.30	579.35	6.561	6.561	1-S2n	2.084	4.313	2.198	2.829	23.051	9.150
480.80	480.80	580.19	7.396	7.396	1-S2n	2.361	4.833	2.505	3.094	23.991	9.598

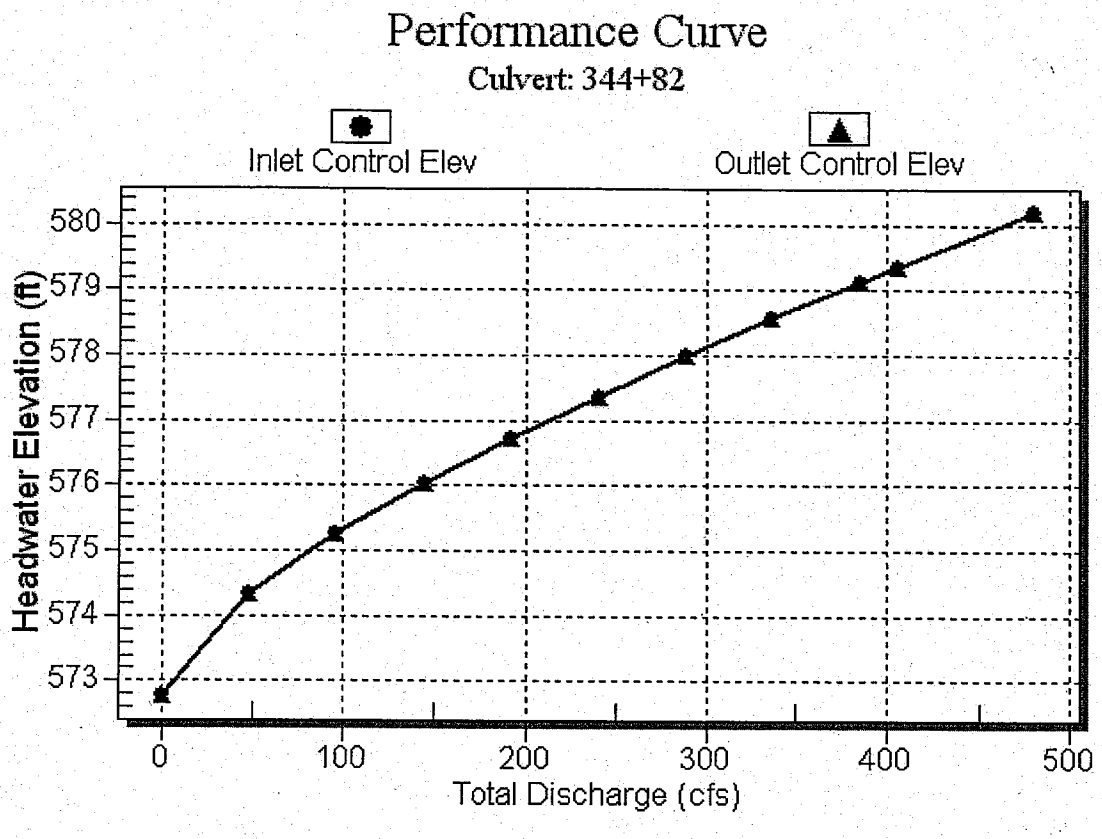
****

Inlet Elevation (invert): 572.79 ft, Outlet Elevation (invert): 561.92 ft

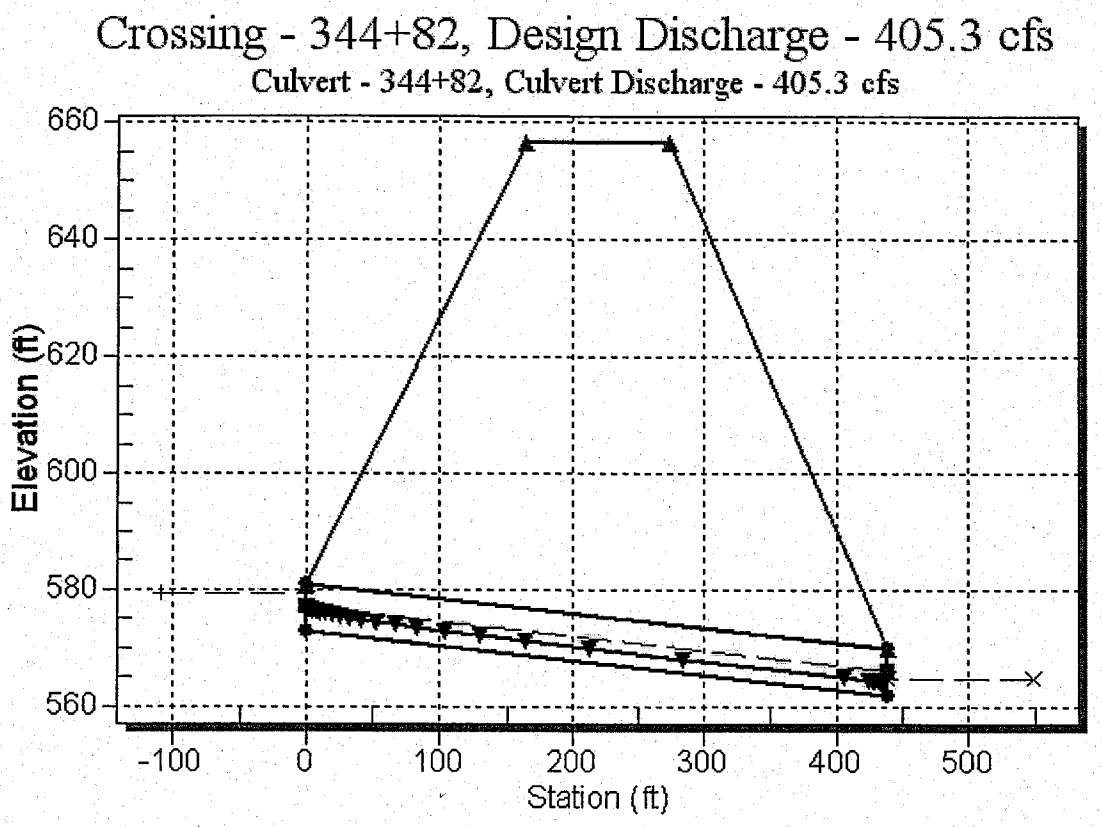
Culvert Length: 438.83 ft, Culvert Slope: 0.0248

****

Culvert Performance Curve Plot: 344+82



Water Surface Profile Plot for Culvert: 344+82



Site Data - 344+82

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 572.79 ft

Outlet Station: 438.70 ft

Outlet Elevation: 561.92 ft

Number of Barrels: 1

Culvert Data Summary - 344+82

Barrel Shape: Concrete Box

Barrel Span: 8.00 ft

Barrel Rise: 8.00 ft

Barrel Material: Concrete

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge (30-75° flare) Wingwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: 344+82)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	561.92	0.00	0.00	0.00	0.00
48.08	562.78	0.86	4.75	1.34	0.96
96.16	563.21	1.29	5.95	1.99	1.02
144.24	563.53	1.61	6.75	2.50	1.04
192.32	563.81	1.89	7.37	2.93	1.07
240.40	564.06	2.14	7.87	3.31	1.08
288.48	564.28	2.36	8.30	3.65	1.09
336.56	564.48	2.56	8.68	3.97	1.11
384.64	564.67	2.75	9.01	4.26	1.11
405.30	564.75	2.83	9.15	4.38	1.12
480.80	565.01	3.09	9.60	4.79	1.13

Tailwater Channel Data - 344+82

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 2.00 (_:1)

Channel Slope: 0.0248

Channel Manning's n: 0.0400

Channel Invert Elevation: 561.92 ft

Roadway Data for Crossing: 344+82

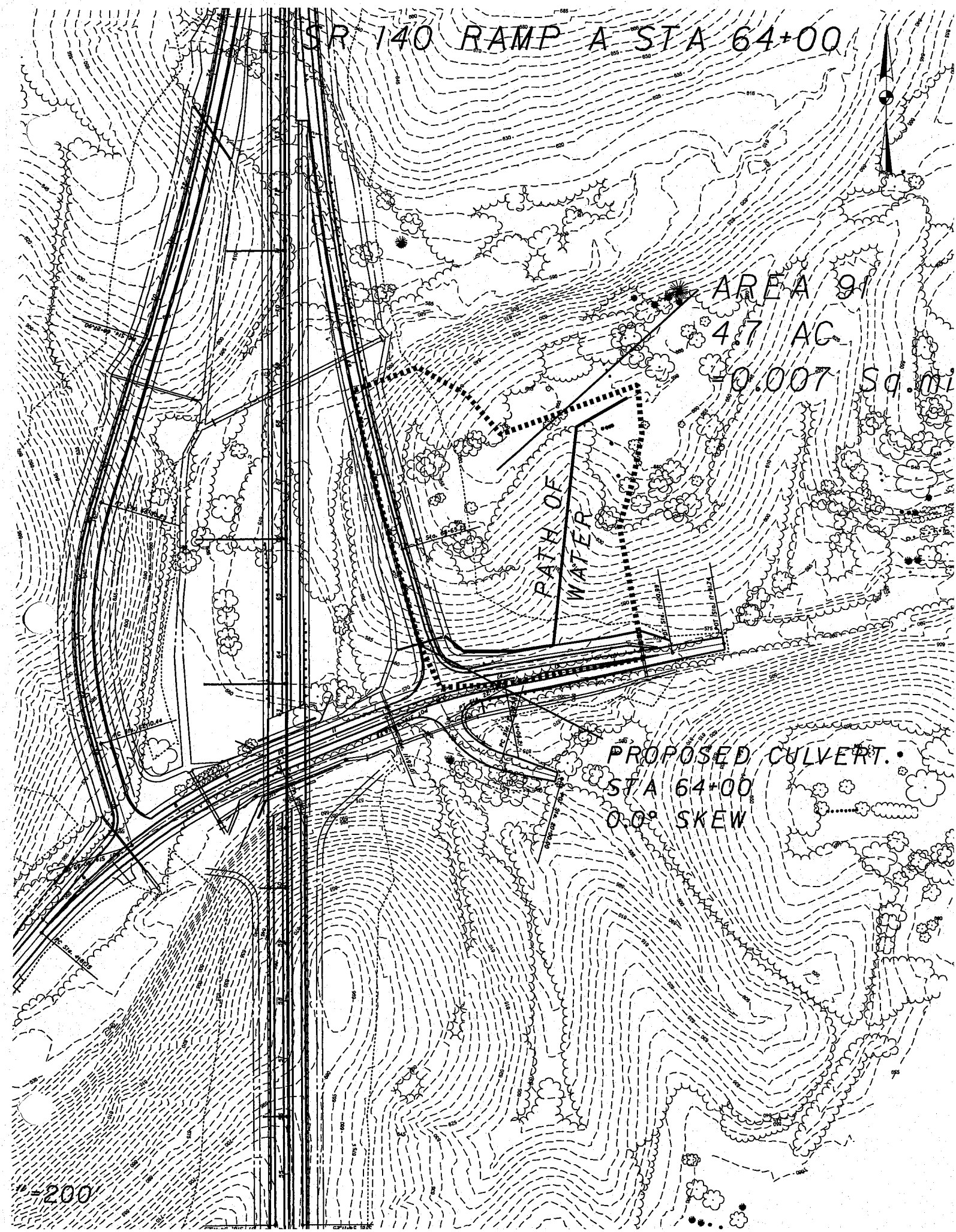
Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 1000.00 ft

Crest Elevation: 656.56 ft

Roadway Surface: Paved

Roadway Top Width: 110.00 ft


SR 140 RAMP A STA 64+00
AREA 91
47 AC
=0.007 Sq.mi
PATH OF WATER
PROPOSED CULVERT.
STA 64+00
0.0° SKEW
1"=200'

SR 140 RAMP A STA 64+00

Client: ODOT Sheet: of

Subject: Pipe Culvert Calculations Order No:

Computed by: MC Date: 2/15/2007

Checked by: Date:

Rational Method

Coefficient of Runoff (1101.2.3)

	Area (Sft)	Area (Ac)	C	
Pavement Area	25040	0.57	0.9	
Non-paved Area	177489	4.07	0.7	BERMS STEEPER THAN 4:1
Other				
Total Area	202529	**4.65 acres**		**Weighted "C" =** **0.72**

Overland Flow

Length
High Elevation
Low Elevation
Slope % #DIV/0!

t_o #DIV/0! (1101.2.2)

t_o 0.00 Compare with Fig 1101-1 negligible

Shallow Concentrated Flow

Length	681	
High Elevation	665	
Low Elevation	554	
Slope %	16.29956	
k	0.457	(Grassed waterways - Table 1101-1)
V	6.053553	(1101.2.2)
t_s	1.874932	(1101.2.2)

Since the time of concentration = to + ts t_c **10.00** min

For Intensity Zone D

Frequency	a	b	c	Ac	t_c	C	I	Q cu ft/s
2 Years	85.568	16.5	0.95	4.649426	10.00	0.72	3.80	12.82
5 Years	118.822	18.7	0.969	4.649426	10.00	0.72	4.59	15.48
10 Years	112.172	16.8	0.923	4.649426	10.00	0.72	5.39	18.17
25 Years	198.92	19.3	1.004	4.649426	10.00	0.72	6.70	22.57
50 Years	206.025	19.6	0.99	4.649426	10.00	0.72	7.20	24.26
100 Years	355.551	23.199	1.076	4.649426	10.00	0.72	8.21	27.65

Worksheet for SR 140 ramp A STA 64+00

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.00400	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	10.00	ft
Discharge	23.00	ft^3/s

Results

Normal Depth	0.96	ft
Flow Area	11.38	ft^2
Wetted Perimeter	14.27	ft
Top Width	13.82	ft
Critical Depth	0.53	ft
Critical Slope	0.03055	ft/ft
Velocity	2.02	ft/s
Velocity Head	0.06	ft
Specific Energy	1.02	ft
Froude Number	0.39	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.96	ft
Critical Depth	0.53	ft
Channel Slope	0.00400	ft/ft
Critical Slope	0.03055	ft/ft

UNIVERSAL CULVERT DESIGN

PID : 77366 **Date :** 05/13/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 91, SR 140 RAMP A Sta. 64+00 **Designer :** mdc

HEADWATER CONTROL CODES:

INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 555.89 **Outlet Invert Elevation (ft.) :** 554.05 **Tailwater Elevation (ft.) :** 554.98 **Overflow Elevation (ft.) :** 561.30

Allowable Headwater Elevation (ft.) : 560.30 **or** Diameter + 2 ft. *(whichever is less)*

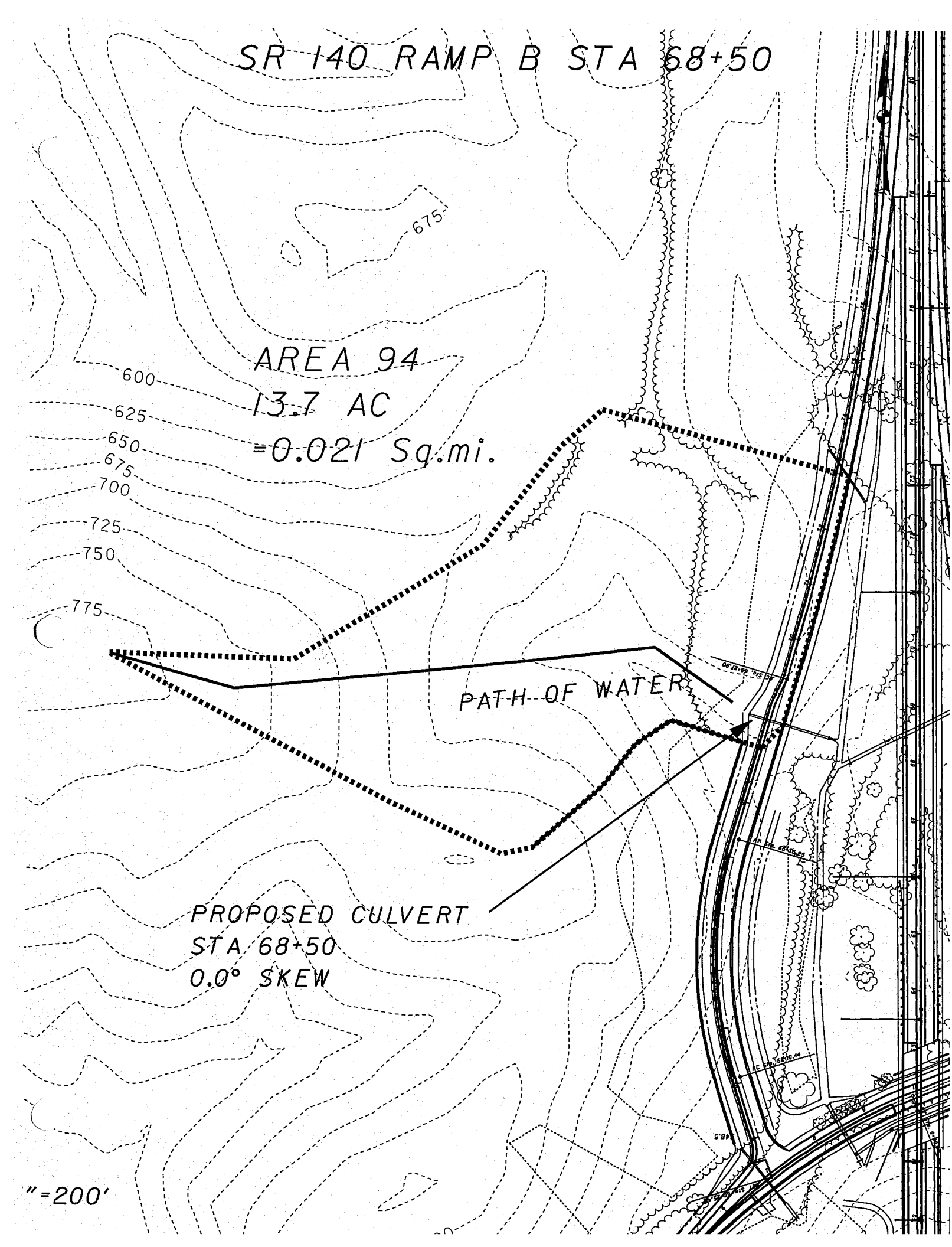
Pipe Length (ft.) : 76.00 **Culvert Slope (ft./ft.) :** 0.0242 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 22.60 @ 25 yrs. **Flood Discharge (cfs) :** 27.60 @ 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.20		
22.60	1	24 in.	558.89	557.50	2 - E	12.65	1.11	1.69	0.0120	INLET	0.00	D	0.00
22.60	1	21 in.	559.84	558.70	2 - E	12.46	1.23	1.65	0.0120	INLET	0.00	D - 1	0.00
21.10	1	18 in.	561.91	561.57	2 - E	11.94	1.50	1.47	0.0120	INLET	1.50	D - 2	0.00
22.60	1	27 in.	558.47	N/A	1 - C	12.65	1.04	1.66	0.0120	INLET	0.00	D + 1	0.00
27.60	1	24 in.	559.67	558.36	2 - E	13.23	1.26	1.82	0.0120	INLET	0.00	F	0.00
27.60	1	21 in.	561.14	560.18	2 - E	12.63	1.49	1.70	0.0120	INLET	0.00	F - 1	0.00
21.10	1	18 in.	564.73	564.54	2 - E	11.94	1.50	1.47	0.0120	INLET	6.50	F - 2	0.00
27.60	1	27 in.	558.96	557.50	2 - E	13.31	1.16	1.83	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.90		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
22.60	1	27 in.	558.89	558.39	2 - E	7.26	1.64	1.66	0.0245	INLET	0.00	D	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
22.60	1	24 in.	559.73	560.15	2 - F	7.96	2.00	1.69	0.0247	OUTLET**	0.00	D - 1	0.00
18.60	1	21 in.	561.31	563.95	2 - F	8.20	1.75	1.56	0.0248	OUTLET**	4.00	D - 2	0.00
22.60	1	30 in.	558.48	N/A	1 - C	7.41	1.49	1.62	0.0244	INLET	0.00	D + 1	0.00
27.60	1	27 in.	559.70	559.64	2 - E	6.94	2.25	1.83	0.0245	INLET	0.00	F	0.00
25.30	1	24 in.	560.99	562.30	2 - F	8.61	2.00	1.77	0.0247	OUTLET**	2.30	F - 1	0.00
18.60	1	21 in.	563.18	568.01	2 - F	8.20	1.75	1.56	0.0248	OUTLET**	9.00	F - 2	0.00
27.60	1	30 in.	559.00	558.33	2 - E	7.72	1.71	1.79	0.0244	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
22.60	1	36 in.	558.16	N/A	1 - C	6.69	1.45	1.53	0.0281	INLET	0.00	D	0.00
22.60	1	42 in.	558.01	N/A	1 - C	6.70	1.34	1.46	0.0278	INLET	0.00	D + 1	0.00
27.60	1	36 in.	558.46	N/A	1 - C	7.03	1.63	1.70	0.0281	INLET	0.00	F	0.00
27.60	1	42 in.	558.27	N/A	1 - C	7.07	1.49	1.62	0.0278	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
22.60	1	60 in.	557.70	N/A	1 - C	5.73	1.28	1.31	0.0332	INLET	0.00	D	0.00
22.60	1	66 in.	557.63	N/A	1 - C	5.69	1.23	1.28	0.0330	INLET	0.00	D + 1	0.00
27.60	1	60 in.	557.93	N/A	1 - C	6.06	1.41	1.46	0.0332	INLET	0.00	F	0.00
27.60	1	66 in.	557.84	N/A	1 - C	6.03	1.36	1.42	0.0330	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
22.60	1	60 in.	557.70	N/A	1 - C	6.81	1.13	1.31	0.0260	INLET	0.00	D	0.00
22.60	1	66 in.	557.63	N/A	1 - C	6.74	1.09	1.28	0.0260	INLET	0.00	D + 1	0.00
27.60	1	60 in.	557.93	N/A	1 - C	7.21	1.25	1.46	0.0260	INLET	0.00	F	0.00
27.60	1	66 in.	557.84	N/A	1 - C	7.14	1.21	1.42	0.0260	INLET	0.00	F + 1	0.00


SR 140 RAMP B STA 68+50
675
600
625
650
675
700
725
750
775
AREA 94
13.7 AC
=0.021 Sq.mi.
PATH OF WATER
PROPOSED CULVERT
STA 68+50
0.0° SKEW
"=200'

SR 140 RAMP B STA 68+50

TECHNIQUES FOR ESTIMATING FLOOD-PEAK DISCHARGES OF RURAL, UNREGULATED STREAMS IN OHIO AREA A

U.S. GEOLOGICAL SURVEY Water Resources Investigations Report 89-4126

Values	Units	Definitions
595342.00	SQ. FT.	
0.021	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
1135.00	FT.	**TOTAL CHANNEL LENGTH**
113.50	FT.	L_{10} = 10% of the Distance along channel
598	FT.	**$Elev_{10}$** = Elevation at point L_{10}
964.75	FT.	L_{85} = 85% of the Distance along channel
775	FT.	**$Elev_{85}$** = Elevation at point L_{85}
851.25	FT.	**Length** = $L_{85} - L_{10}$
1097.87	FT./MI.	**SLOPE** = $(Elev_{10}-Elev_{85})/Length$
	CFS	$Q_{\#}$ = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	9.24	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	20.62	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	30.39	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	44.03	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	55.58	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	67.05	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

Worksheet for SR 140 ramp B STA 68+50

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.06730	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	10.00	ft
Discharge	44.00	ft^3/s

Results

Normal Depth	0.61	ft
Flow Area	6.89	ft^2
Wetted Perimeter	12.74	ft
Top Width	12.45	ft
Critical Depth	0.80	ft
Critical Slope	0.02724	ft/ft
Velocity	6.39	ft/s
Velocity Head	0.63	ft
Specific Energy	1.25	ft
Froude Number	1.51	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.61	ft
Critical Depth	0.80	ft
Channel Slope	0.06730	ft/ft
Critical Slope	0.02724	ft/ft

UNIVERSAL CULVERT DESIGN

PID : 77366 **Date :** 05/16/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 94, SR 140 RAMP B Sta. 68+50 **Designer :** mdc

HEADWATER CONTROL CODES:

INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 572.85 **Outlet Invert Elevation (ft.) :** 570.00 **Tailwater Elevation (ft.) :** 570.61 **Overflow Elevation (ft.) :** 587.70

Allowable Headwater Elevation (ft.) : 586.70 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 146.00 **Culvert Slope (ft./ft.) :** 0.0195 **Design Manning 'n' :** 0.0120

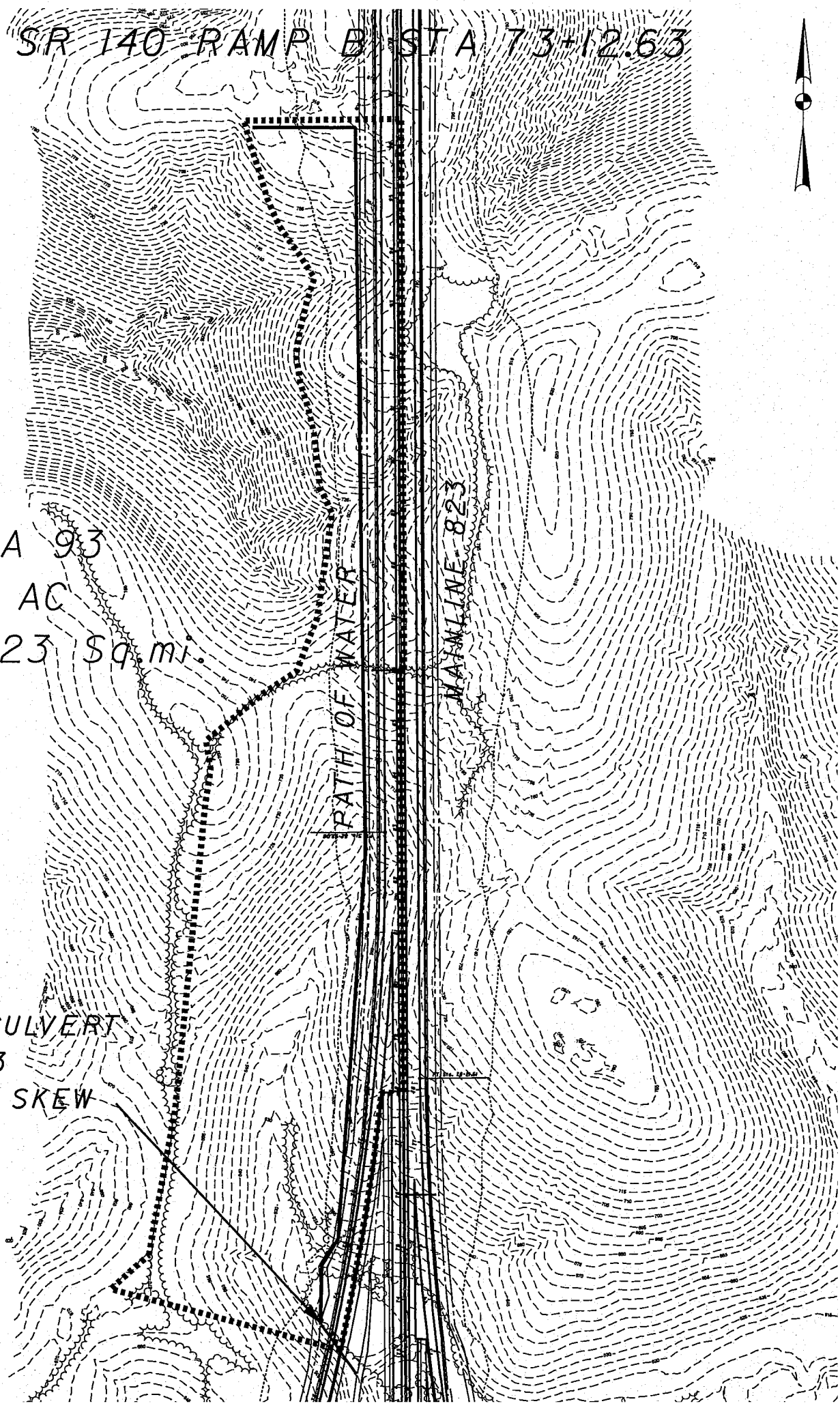
Design Discharge (cfs) : 44.00 @ 25 yrs. **Flood Discharge (cfs) :** 67.10 @ 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.20		
44.00	1	30 in.	577.08	575.27	2 - E	13.71	1.55	2.21	0.0120	INLET	0.00	D	0.00
44.00	1	27 in.	578.20	576.97	2 - E	13.41	1.73	2.14	0.0120	INLET	0.00	D - 1	0.00
44.00	1	24 in.	580.21	580.32	2 - F	14.05	2.00	1.97	0.0120	OUTLET**	0.00	D - 2	0.00
44.00	1	33 in.	576.47	574.35	2 - E	13.80	1.45	2.20	0.0120	INLET	0.00	D + 1	0.00
67.10	1	30 in.	580.32	579.26	2 - E	13.67	2.50	2.43	0.0120	INLET	0.00	F	0.00
67.10	1	27 in.	583.12	583.35	2 - F	16.90	2.25	2.23	0.0120	OUTLET**	0.00	F - 1	0.00
60.30	1	24 in.	592.12	591.38	2 - F	19.19	2.00	1.99	0.0120	OUTLET**	6.80	F - 2	0.00
67.10	1	33 in.	578.71	577.03	2 - E	15.10	1.93	2.57	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.90		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
44.00	1	33 in.	577.30	577.55	2 - F	8.64	2.75	2.20	0.0241	OUTLET**	0.00	D	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
44.00	1	30 in.	578.44	580.61	2 - F	9.59	2.50	2.21	0.0244	OUTLET**	0.00	D - 1	0.00
44.00	1	27 in.	580.21	586.21	2 - F	11.28	2.25	2.14	0.0245	OUTLET**	0.00	D - 2	0.00
44.00	1	36 in.	576.63	576.92	2 - F	8.07	2.17	2.16	0.0241	OUTLET*	0.00	D + 1	0.00
67.10	1	33 in.	580.86	584.46	2 - F	11.63	2.75	2.57	0.0241	OUTLET**	0.00	F	0.00
59.80	1	30 in.	583.21	591.66	2 - F	12.37	2.50	2.39	0.0244	OUTLET**	7.30	F - 1	0.00
46.20	1	27 in.	588.87	604.85	2 - F	11.79	2.25	2.15	0.0245	OUTLET**	20.90	F - 2	0.00
67.10	1	36 in.	579.25	580.52	2 - F	10.26	3.00	2.62	0.0241	OUTLET**	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
44.00	1	36 in.	576.63	576.78	2 - F	8.07	2.52	2.16	0.0281	OUTLET*	0.00	D	0.00
44.00	1	42 in.	576.02	576.53	1 - A	7.44	2.09	2.07	0.0278	OUTLET*	0.00	D + 1	0.00
67.10	1	36 in.	579.25	582.33	2 - F	10.26	3.00	2.62	0.0281	OUTLET**	0.00	F	0.00
67.10	1	42 in.	577.43	577.56	2 - F	8.87	2.94	2.57	0.0278	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
44.00	1	60 in.	575.52	575.96	1 - A	6.64	1.91	1.85	0.0332	OUTLET*	0.00	D	0.00
44.00	1	66 in.	575.41	575.88	1 - A	6.50	1.83	1.80	0.0330	OUTLET*	0.00	D + 1	0.00
67.10	1	60 in.	576.24	576.77	1 - A	7.57	2.41	2.31	0.0332	OUTLET*	0.00	F	0.00
67.10	1	66 in.	576.11	576.65	1 - A	7.37	2.29	2.24	0.0330	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
44.00	1	60 in.	575.52	N/A	1 - C	7.63	1.67	1.85	0.0260	INLET	0.00	D	0.00
44.00	1	66 in.	575.41	N/A	1 - C	7.57	1.61	1.80	0.0260	INLET	0.00	D + 1	0.00
67.10	1	60 in.	576.24	N/A	1 - C	8.57	2.10	2.31	0.0260	INLET	0.00	F	0.00
67.10	1	66 in.	576.11	N/A	1 - C	8.52	2.01	2.24	0.0260	INLET	0.00	F + 1	0.00

USE 36"


SR 140 RAMP B STA 73+12.63
AREA 93
14.8 AC
=0.023 Sq.mi.
PATH OF WATER
MAINLINE 823
PROPOSED CULVERT
STA 73+12.63
@ 43.5° L.F. SKEW
1"=250'

SR 140 RAMP B STA 73+12.63

TECHNIQUES FOR ESTIMATING FLOOD-PEAK DISCHARGES OF RURAL, UNREGULATED STREAMS IN OHIO AREA A

U.S. GEOLOGICAL SURVEY Water Resources Investigations Report 89-4126

Values	Units	Definitions
645439.00	SQ. FT.	
0.023	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
2392.00	FT.	**TOTAL CHANNEL LENGTH**
239.20	FT.	L_{10} = 10% of the Distance along channel
626	FT.	$Elev_{10}$ = Elevation at point L_{10}
2033.20	FT.	L_{85} = 85% of the Distance along channel
693	FT.	$Elev_{85}$ = Elevation at point L_{85}
1794.00	FT.	**Length** = $L_{85} - L_{10}$
197.19	FT./MI.	**SLOPE** = $(Elev_{10}-Elev_{85})$/Length
	CFS	$Q_{\#}$ = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	7.32	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	15.01	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	21.26	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	29.75	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	36.78	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	43.69	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

Worksheet for SR 140 ramp B STA 73+12

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.07520	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	10.00	ft
Discharge	29.80	ft^3/s

Results

Normal Depth	0.47	ft
Flow Area	5.16	ft^2
Wetted Perimeter	12.11	ft
Top Width	11.89	ft
Critical Depth	0.62	ft
Critical Slope	0.02916	ft/ft
Velocity	5.77	ft/s
Velocity Head	0.52	ft
Specific Energy	0.99	ft
Froude Number	1.54	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.47	ft
Critical Depth	0.62	ft
Channel Slope	0.07520	ft/ft
Critical Slope	0.02916	ft/ft

UNIVERSAL CULVERT DESIGN

PID : 77366 **Date :** 05/16/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 93, SR 140 RAMP B Sta. 73+12.63 **Designer :** mdc

HEADWATER CONTROL CODES:

INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 606.50 **Outlet Invert Elevation (ft.) :** 603.18 **Tailwater Elevation (ft.) :** 603.70 **Overflow Elevation (ft.) :** 612.55

Allowable Headwater Elevation (ft.) : 611.55 **or** Diameter + 2 ft. *(whichever is less)*

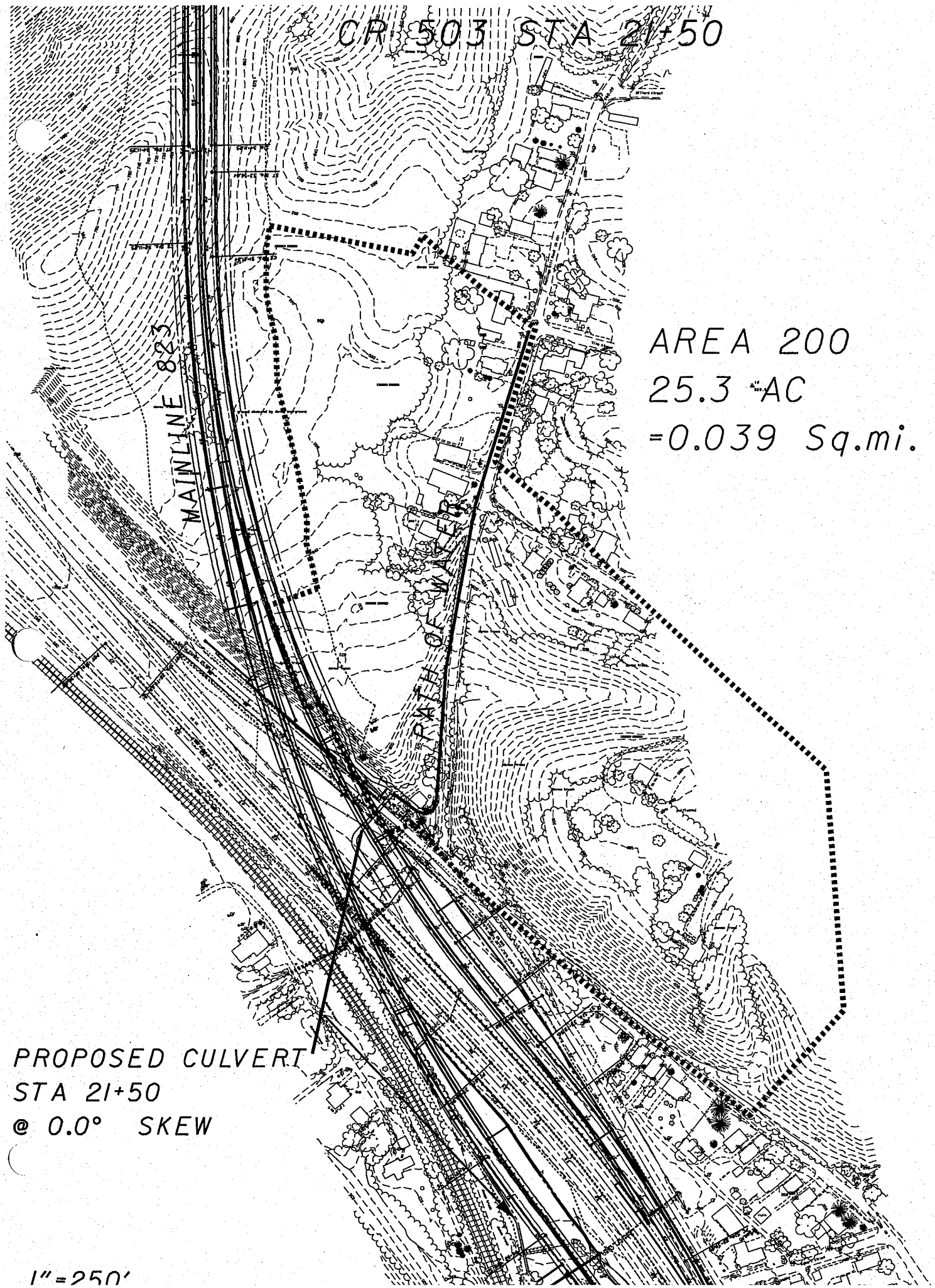
Pipe Length (ft.) : 110.00 **Culvert Slope (ft./ft.) :** 0.0302 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 29.80 @ 25 yrs. **Flood Discharge (cfs) :** 43.70 @ 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.20		
29.80	1	27 in.	609.81	607.16	2 - E	14.74	1.14	1.89	0.0120	INLET	0.00	D	0.00
29.80	1	24 in.	610.67	608.40	2 - E	14.66	1.23	1.86	0.0120	INLET	0.00	D - 1	0.00
29.80	1	21 in.	612.40	611.07	2 - E	14.14	1.43	1.71	0.0120	INLET	0.00	D - 2	0.00
29.80	1	30 in.	609.39	N/A	1 - C	14.70	1.08	1.86	0.0120	INLET	0.00	D + 1	0.00
43.70	1	27 in.	611.80	609.48	2 - E	16.09	1.45	2.13	0.0120	INLET	0.00	F	0.00
38.70	1	24 in.	613.78	612.25	2 - E	15.36	1.50	1.95	0.0120	INLET	5.00	F - 1	0.00
30.20	1	21 in.	618.96	618.17	2 - E	14.13	1.46	1.71	0.0120	INLET	13.50	F - 2	0.00
43.70	1	30 in.	610.69	608.07	2 - E	16.20	1.35	2.20	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.90		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
29.80	1	27 in.	610.72	610.50	2 - E	8.15	1.95	1.89	0.0245	INLET	0.00	D	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
26.40	1	24 in.	612.20	614.62	2 - F	8.88	2.00	1.80	0.0247	OUTLET**	3.40	D - 1	0.00
19.10	1	21 in.	614.78	N/A	2 - F	8.37	1.75	1.58	0.0248	OUTLET**	10.70	D - 2	0.00
29.80	1	30 in.	609.88	608.48	2 - E	8.56	1.67	1.86	0.0244	INLET	0.00	D + 1	0.00
34.90	1	27 in.	613.79	616.67	2 - F	9.31	2.25	2.01	0.0245	OUTLET**	8.80	F	0.00
26.40	1	24 in.	616.86	625.61	2 - F	8.88	2.00	1.80	0.0247	OUTLET**	17.30	F - 1	0.00
19.10	1	21 in.	633.93	644.94	2 - F	8.37	1.75	1.58	0.0248	OUTLET**	24.60	F - 2	0.00
43.70	1	30 in.	612.04	612.24	2 - F	9.54	2.50	2.20	0.0244	OUTLET**	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
29.80	1	36 in.	609.21	N/A	1 - C	7.79	1.60	1.77	0.0281	INLET	0.00	D	0.00
29.80	1	42 in.	608.98	N/A	1 - C	7.83	1.46	1.69	0.0278	INLET	0.00	D + 1	0.00
43.70	1	36 in.	610.25	609.08	2 - E	8.45	2.06	2.15	0.0281	INLET	0.00	F	0.00
43.70	1	42 in.	609.65	N/A	1 - C	8.64	1.82	2.06	0.0278	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
29.80	1	60 in.	608.63	N/A	1 - C	6.71	1.39	1.52	0.0332	INLET	0.00	D	0.00
29.80	1	66 in.	608.54	N/A	1 - C	6.67	1.34	1.47	0.0330	INLET	0.00	D + 1	0.00
43.70	1	60 in.	609.16	N/A	1 - C	7.48	1.69	1.85	0.0332	INLET	0.00	F	0.00
43.70	1	66 in.	609.05	N/A	1 - C	7.44	1.63	1.80	0.0330	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
29.80	1	60 in.	608.63	N/A	1 - C	7.98	1.23	1.52	0.0260	INLET	0.00	D	0.00
29.80	1	66 in.	608.54	N/A	1 - C	7.90	1.19	1.47	0.0260	INLET	0.00	D + 1	0.00
43.70	1	60 in.	609.16	N/A	1 - C	8.90	1.49	1.85	0.0260	INLET	0.00	F	0.00
43.70	1	66 in.	609.05	N/A	1 - C	8.83	1.44	1.80	0.0260	INLET	0.00	F + 1	0.00


CR 503 STA 21+50
MAINLINE 823
PWTH OF WAY
AREA 200
25.3 AC
=0.039 Sq.mi.
PROPOSED CULVERT
STA 21+50
@ 0.0° SKEW
1"=250'

CR 503 STA 21+50.00
TECHNIQUES FOR ESTIMATING FLOOD-PEAK
DISCHARGES OF RURAL, UNREGULATED STREAMS IN OHIO AREA A
U.S. GEOLOGICAL SURVEY Water Resources Investigations Report 89-4126

Values	Units	Definitions
1100660.00	SQ. FT.	
0.039	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
1090.00	FT.	**TOTAL CHANNEL LENGTH**
109.00	FT.	L_{10} = 10% of the Distance along channel
559	FT.	**Elev$_{10}$** = Elevation at point L_{10}
926.50	FT.	L_{85} = 85% of the Distance along channel
662	FT.	**Elev$_{85}$** = Elevation at point L_{85}
817.50	FT.	**Length** = $L_{85} - L_{10}$
663.96	FT./MI.	**SLOPE** = (Elev$_{10}$-Elev$_{85}$)/Length
	CFS	$Q_{\#}$ = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	13.70	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	29.59	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	42.98	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	61.50	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	77.03	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	92.45	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

Worksheet for CR 503 STA 21+50

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.03000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	10.00	ft
Discharge	61.50	ft^3/s

Results

Normal Depth	0.94	ft
Flow Area	11.20	ft^2
Wetted Perimeter	14.21	ft
Top Width	13.77	ft
Critical Depth	0.98	ft
Critical Slope	0.02576	ft/ft
Velocity	5.49	ft/s
Velocity Head	0.47	ft
Specific Energy	1.41	ft
Froude Number	1.07	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.94	ft
Critical Depth	0.98	ft
Channel Slope	0.03000	ft/ft
Critical Slope	0.02576	ft/ft

UNIVERSAL CULVERT DESIGN

PID : 77366 **Date :** 06/07/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 200, CR 503 Sta. 21+50.00 **Designer :** mdc

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 549.25 **Outlet Invert Elevation (ft.) :** 546.63 **Tailwater Elevation (ft.) :** 547.60 **Overflow Elevation (ft.) :** 560.00

Allowable Headwater Elevation (ft.) : 559.00 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 88.00 **Culvert Slope (ft./ft.) :** 0.0298 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 61.50 @ 25 yrs. **Flood Discharge (cfs) :** 92.50 @ 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.20		
61.50	1	36 in.	553.69	551.44	2 - E	17.59	1.49	2.53	0.0120	INLET	0.00	D	0.00
61.50	1	33 in.	554.48	552.26	2 - E	17.55	1.57	2.51	0.0120	INLET	0.00	D - 1	0.00
61.50	1	30 in.	555.82	553.68	2 - E	17.36	1.69	2.40	0.0120	INLET	0.00	D - 2	0.00
61.50	1	42 in.	552.96	N/A	1 - C	17.50	1.38	2.46	0.0120	INLET	0.00	D + 1	0.00
92.50	1	36 in.	556.62	554.18	2 - E	19.31	1.92	2.86	0.0120	INLET	0.00	F	0.00
92.50	1	33 in.	558.56	556.15	2 - E	18.91	2.11	2.69	0.0120	INLET	0.00	F - 1	0.00
84.40	1	30 in.	561.99	559.53	2 - E	17.19	2.50	2.47	0.0120	INLET	8.10	F - 2	0.00
92.50	1	42 in.	554.55	552.22	2 - E	19.46	1.73	2.98	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.90		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
61.50	1	42 in.	553.44	N/A	1 - C	10.52	2.05	2.46	0.0237	INLET	0.00	D	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
61.50	1	36 in.	554.92	554.18	2 - E	10.01	2.43	2.53	0.0241	INLET	0.00	D - 1	0.00
61.50	1	33 in.	556.31	556.49	2 - F	10.83	2.75	2.51	0.0241	OUTLET**	0.00	D - 2	0.00
61.50	1	48 in.	552.87	N/A	1 - C	10.61	1.88	2.36	0.0235	INLET	0.00	D + 1	0.00
92.50	1	42 in.	556.07	555.05	2 - E	11.28	2.78	2.98	0.0237	INLET	0.00	F	0.00
90.80	1	36 in.	559.41	560.40	2 - F	13.09	3.00	2.85	0.0241	OUTLET**	1.70	F - 1	0.00
74.70	1	33 in.	562.32	565.71	2 - F	12.79	2.75	2.62	0.0241	OUTLET**	17.80	F - 2	0.00
92.50	1	48 in.	554.41	552.87	2 - E	11.71	2.41	2.92	0.0235	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
61.50	1	42 in.	553.44	N/A	1 - C	9.28	2.28	2.46	0.0278	INLET	0.00	D	0.00
61.50	1	36 in.	554.92	555.10	2 - F	9.68	3.00	2.53	0.0281	OUTLET**	0.00	D - 1	0.00
61.50	1	48 in.	552.87	N/A	1 - C	9.44	2.06	2.36	0.0275	INLET	0.00	D + 1	0.00
92.50	1	42 in.	556.07	555.98	2 - E	9.61	3.50	2.98	0.0278	INLET	0.00	F	0.00
83.20	1	36 in.	559.41	562.48	2 - F	12.12	3.00	2.80	0.0281	OUTLET**	9.30	F - 1	0.00
92.50	1	48 in.	554.41	553.31	2 - E	10.33	2.68	2.92	0.0275	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
61.50	1	60 in.	552.48	N/A	1 - C	8.16	2.04	2.21	0.0332	INLET	0.00	D	0.00
61.50	1	66 in.	552.35	N/A	1 - C	8.15	1.95	2.14	0.0330	INLET	0.00	D + 1	0.00
92.50	1	60 in.	553.35	N/A	1 - C	9.08	2.58	2.73	0.0332	INLET	0.00	F	0.00
92.50	1	66 in.	553.16	N/A	1 - C	9.11	2.44	2.65	0.0330	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
61.50	1	60 in.	552.48	N/A	1 - C	9.75	1.79	2.21	0.0260	INLET	0.00	D	0.00
61.50	1	66 in.	552.35	N/A	1 - C	9.68	1.72	2.14	0.0260	INLET	0.00	D + 1	0.00
92.50	1	60 in.	553.35	N/A	1 - C	10.88	2.24	2.73	0.0260	INLET	0.00	F	0.00
92.50	1	66 in.	553.16	N/A	1 - C	10.85	2.14	2.65	0.0260	INLET	0.00	F + 1	0.00

MATCH EXISTING USE 78"

CULVERT ANALYSIS

PID : 19415 **Date :** 06/07/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth OH

Description : Drainage area 200, CR 503 Sta. 21+50.00 **Designer :** mdc

HEADWATER CONTROL CODES:

INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Pipe Number : 1 **Use HW :** 0 **Inlet Invert Elevation (ft.) :** 549.25 **Outlet Invert Elevation (ft.) :** 546.63

Pipe Quantity : 1

Culvert Type : Circular Smooth **Pipe Length (ft.) :** 88.00 **Culvert Slope (ft./ft.) :** 0.0298

Corrugation Type :

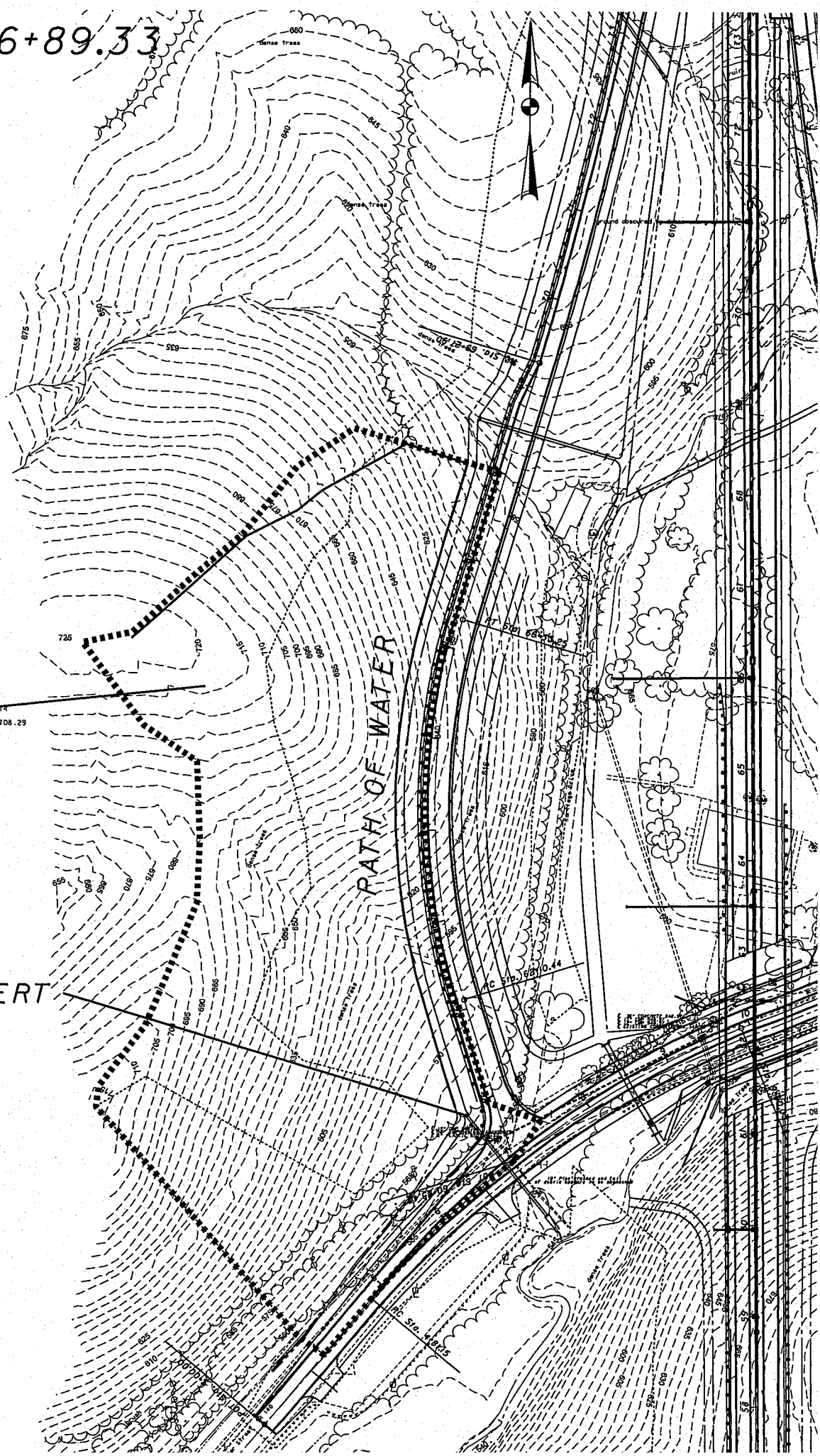
Pipe Size : 78 in.

Design Manning 'n' : (default)

Entrance Type : Half Headwall **Loss Coef. Ke :** 0.2000

FLOW (cfs.)	HEAD LOSS (ft.)	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	BURIED DEPTH (ft.)	TAILWATER ELEVATION (ft.)
61.50	1.11	552.01	N/A	1 - C	16.47	1.10	2.04	0.0120	INLET	0.00	546.63
92.50	1.63	552.77	N/A	1 - C	18.56	1.35	2.52	0.0120	INLET	0.00	546.63

SR140 STA. 6+89.33



Client: ODOT Sheet: of

Subject: Pipe Culvert Calculations @ STA 6+89.33 SR140 Order No:

Computed by: DL Date: 5/10/2007

Checked by: Date:

Rational Method

Coefficient of Runoff (1101.2.3)

	Area (Sft)	Area (Ac)	C
Pavement Area	12126	0.28	0.9
Non-paved Area	270704	6.21	0.45
Other			
Total Area		**6.49**	**acres**

Weighted "C" = 0.47

Overland Flow

Length	0
High Elevation	0
Low Elevation	0
Slope %	0

t_o 0.00 (1101.2.2)

t_o 0.00 Compare with Fig 1101-1

Negligible

Shallow Concentrated Flow

Length	1190	
High Elevation	722.5	
Low Elevation	548.4	
Slope %	14.63025	
k	0.457	(Grassed waterways - Table 1101-1)
V	5.735197	(1101.2.2)
t_s	3.458178	(1101.2.2)

Since the time of concentration = to + ts t_c **10.00** min

For Intensity Zone D

Frequency	a	b	c	Ac	t_c	C	I	Q cu ft/s
2 Years	85.568	16.5	0.95	6.492886	10.00	0.47	3.80	11.59
5 Years	118.822	18.7	0.969	6.49	10.00	0.47	4.59	14.00
10 Years	112.172	16.8	0.923	6.492886	10.00	0.47	5.39	16.43
25 Years	198.92	19.3	1.004	6.492886	10.00	0.47	6.70	20.41
50 Years	206.025	19.6	0.99	6.492886	10.00	0.47	7.20	21.94
100 Years	355.551	23.199	1.076	6.492886	10.00	0.47	8.21	25.01

Worksheet for SR 140 STA 6+89.33

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.09200	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	5.00	ft
Discharge	20.41	ft^3/s

Results

Normal Depth	0.52	ft
Flow Area	3.17	ft^2
Wetted Perimeter	7.34	ft
Top Width	7.10	ft
Critical Depth	0.73	ft
Critical Slope	0.02938	ft/ft
Velocity	6.44	ft/s
Velocity Head	0.64	ft
Specific Energy	1.17	ft
Froude Number	1.70	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.52	ft
Critical Depth	0.73	ft
Channel Slope	0.09200	ft/ft
Critical Slope	0.02938	ft/ft

UNIVERSAL CULVERT DESIGN

PID : 77366 **Date :** 05/09/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 104, Sta. 6+89.33, SR140 **Designer :** DL

HEADWATER CONTROL CODES:

INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 548.15 **Outlet Invert Elevation (ft.) :** 546.91 **Tailwater Elevation (ft.) :** 547.43 **Overflow Elevation (ft.) :** 554.47

Allowable Headwater Elevation (ft.) : 553.47 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 124.50 **Culvert Slope (ft./ft.) :** 0.0100 **Design Manning 'n' :** 0.0120

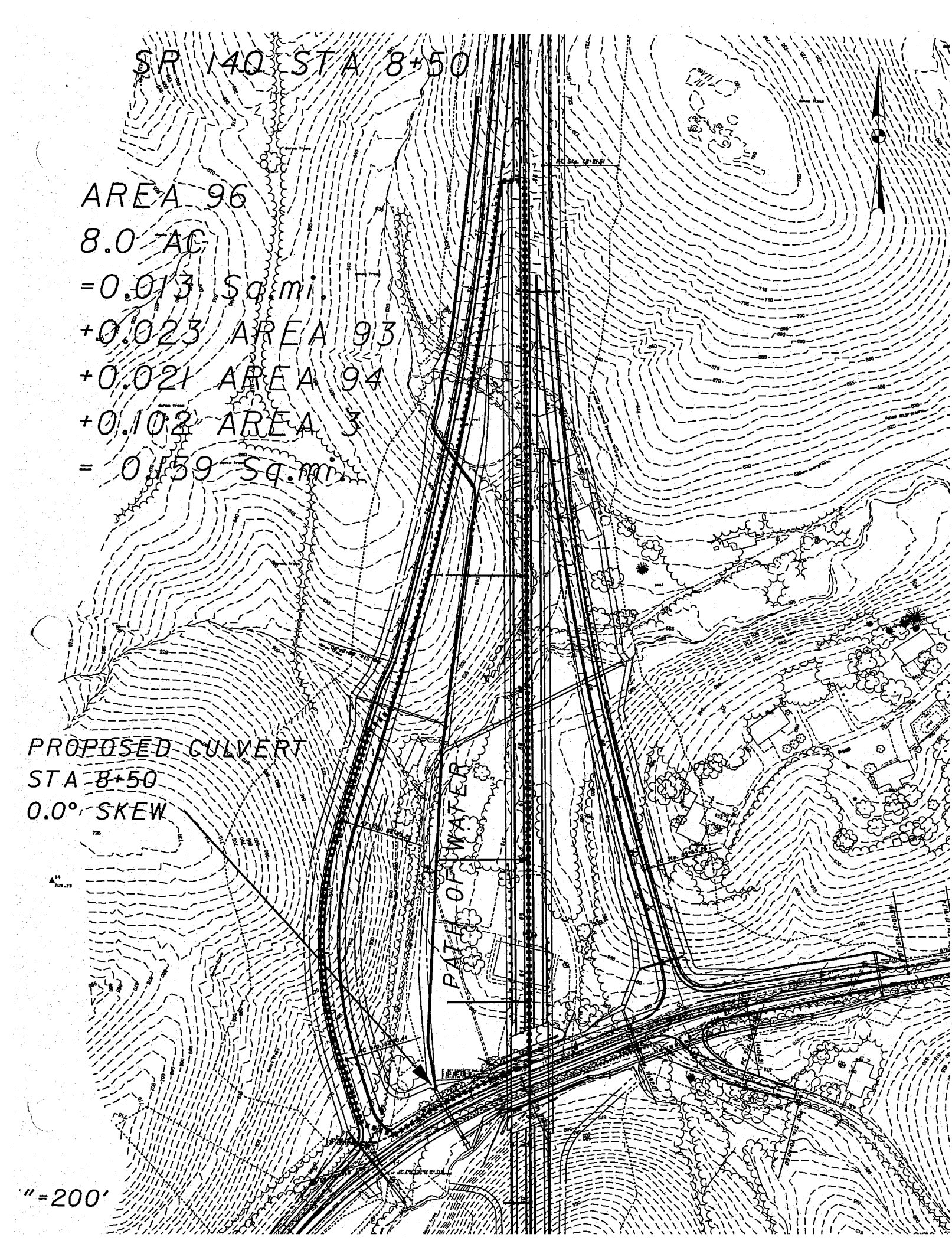
Design Discharge (cfs) : 20.41 @ 25 yrs. **Flood Discharge (cfs) :** 25.01 @ 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.20		
20.41	1	21 in.	551.60	551.68	2 - F	8.83	1.75	1.61	0.0120	OUTLET**	0.00	D	0.00
19.71	1	18 in.	553.26	554.86	2 - F	11.22	1.50	1.47	0.0120	OUTLET**	0.70	D - 1	0.00
12.91	1	15 in.	559.57	563.84	2 - F	10.57	1.25	1.22	0.0120	OUTLET**	7.50	D - 2	0.00
20.41	1	24 in.	550.86	550.37	2 - E	8.72	1.40	1.62	0.0120	INLET	0.00	D + 1	0.00
25.01	1	21 in.	552.70	553.27	2 - F	10.54	1.75	1.68	0.0120	OUTLET**	0.00	F	0.00
19.71	1	18 in.	555.34	558.12	2 - F	11.22	1.50	1.47	0.0120	OUTLET**	5.30	F - 1	0.00
12.91	1	15 in.	576.16	N/A	2 - F	10.52	1.25	1.22	0.0120	OUTLET**	12.10	F - 2	0.00
25.01	1	24 in.	551.50	551.26	2 - E	8.87	1.68	1.76	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.90		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
20.41	1	27 in.	550.85	551.51	2 - F	6.83	2.25	1.58	0.0245	OUTLET**	0.00	D	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
20.41	1	24 in.	551.51	553.60	2 - F	7.49	2.00	1.62	0.0247	OUTLET**	0.00	D - 1	0.00
16.01	1	21 in.	552.82	558.19	2 - F	7.40	1.75	1.48	0.0248	OUTLET**	4.40	D - 2	0.00
20.41	1	30 in.	550.53	550.80	1 - A	6.46	1.92	1.53	0.0244	OUTLET*	0.00	D + 1	0.00
25.01	1	27 in.	551.52	552.94	2 - F	7.55	2.25	1.75	0.0245	OUTLET**	0.00	F	0.00
22.01	1	24 in.	552.58	556.12	2 - F	7.83	2.00	1.67	0.0247	OUTLET**	3.00	F - 1	0.00
16.01	1	21 in.	554.43	563.04	2 - F	7.40	1.75	1.48	0.0248	OUTLET**	9.00	F - 2	0.00
25.01	1	30 in.	550.98	551.40	2 - F	7.02	2.50	1.70	0.0244	OUTLET**	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
20.41	1	36 in.	550.29	550.56	1 - A	6.03	1.78	1.45	0.0281	OUTLET*	0.00	D	0.00
20.41	1	42 in.	550.15	550.40	1 - A	5.77	1.61	1.38	0.0278	OUTLET*	0.00	D + 1	0.00
25.01	1	36 in.	550.56	550.87	1 - A	6.45	2.05	1.61	0.0281	OUTLET*	0.00	F	0.00
25.01	1	42 in.	550.40	550.68	1 - A	6.14	1.82	1.54	0.0278	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
20.41	1	60 in.	549.86	550.14	1 - A	5.34	1.52	1.25	0.0332	OUTLET*	0.00	D	0.00
20.41	1	66 in.	549.79	550.07	1 - A	5.24	1.46	1.21	0.0330	OUTLET*	0.00	D + 1	0.00
25.01	1	60 in.	550.07	550.37	1 - A	5.65	1.69	1.38	0.0332	OUTLET*	0.00	F	0.00
25.01	1	66 in.	549.99	550.30	1 - A	5.54	1.62	1.35	0.0330	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
20.41	1	60 in.	549.86	550.17	1 - A	5.34	1.34	1.25	0.0260	OUTLET*	0.00	D	0.00
20.41	1	66 in.	549.79	550.11	1 - A	5.24	1.30	1.21	0.0260	OUTLET*	0.00	D + 1	0.00
25.01	1	60 in.	550.07	550.41	1 - A	5.65	1.49	1.38	0.0260	OUTLET*	0.00	F	0.00
25.01	1	66 in.	549.99	550.34	1 - A	5.54	1.44	1.35	0.0260	OUTLET*	0.00	F + 1	0.00

USE 30" SINCE IT IS READILY AVAILABLE


SR 140 STA 8+50
AREA 96
8.0 AC
=0.013 Sq.mi.
+0.023 AREA 93
+0.021 AREA 94
+0.102 AREA 3
= 0.159 Sq.mi.
PROPOSED CULVERT
STA 8+50
0.0° SKEW
PATH OF WATER
"=200'

SR 140 STA 8+50

TECHNIQUES FOR ESTIMATING FLOOD-PEAK DISCHARGES OF RURAL, UNREGULATED STREAMS IN OHIO AREA A

U.S. GEOLOGICAL SURVEY Water Resources Investigations Report 89-4126

Values	Units	Definitions
4420510.00	SQ. FT.	
0.159	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
3735.00	FT.	**TOTAL CHANNEL LENGTH**
373.50	FT.	L_{10} = 10% of the Distance along channel
559	FT.	$Elev_{10}$ = Elevation at point L_{10}
3174.75	FT.	L_{85} = 85% of the Distance along channel
691	FT.	$Elev_{85}$ = Elevation at point L_{85}
2801.25	FT.	**Length** = $L_{85} - L_{10}$
248.80	FT./MI.	**SLOPE** = $(Elev_{10}-Elev_{85})$/Length
	CFS	$Q_{\#}$ = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	34.32	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	69.39	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	97.85	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	136.54	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	168.30	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	199.94	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

UNIVERSAL CULVERT DESIGN

PID : 77366 **Date :** 05/14/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 96, SR 140 Sta. 8+50 **Designer :** mdc

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 547.30 **Outlet Invert Elevation (ft.) :** 546.77 **Tailwater Elevation (ft.) :** 548.75 **Overflow Elevation (ft.) :** 555.27

Allowable Headwater Elevation (ft.) : 554.27 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 100.00 **Culvert Slope (ft./ft.) :** 0.0053 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 136.50 @ 25 yrs. **Flood Discharge (cfs) :** 199.90 @ 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.20		
136.50	1	54 in.	552.74	552.52	2 - E	11.00	3.28	3.44	0.0120	INLET	0.00	D	0.00
136.50	1	48 in.	553.74	553.47	2 - E	10.86	4.00	3.48	0.0120	INLET	0.00	D - 1	0.00
128.70	1	42 in.	555.95	555.50	2 - E	13.38	3.50	3.30	0.0120	INLET	7.80	D - 2	0.00
136.50	1	60 in.	552.28	N/A	1 - C	11.19	2.98	3.35	0.0120	INLET	0.00	D + 1	0.00
198.80	1	54 in.	555.32	554.86	2 - E	12.50	4.50	4.03	0.0120	INLET	1.10	F	0.00
162.60	1	48 in.	557.88	557.05	2 - E	12.94	4.00	3.68	0.0120	INLET	37.30	F - 1	0.00
128.70	1	42 in.	562.91	561.64	2 - E	13.38	3.50	3.30	0.0120	INLET	71.20	F - 2	0.00
199.90	1	60 in.	554.01	553.72	2 - E	11.92	3.98	4.04	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.90		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
136.50	1	60 in.	552.77	553.29	1 - A	9.78	4.57	3.35	0.0232	OUTLET*	0.00	D	0.00

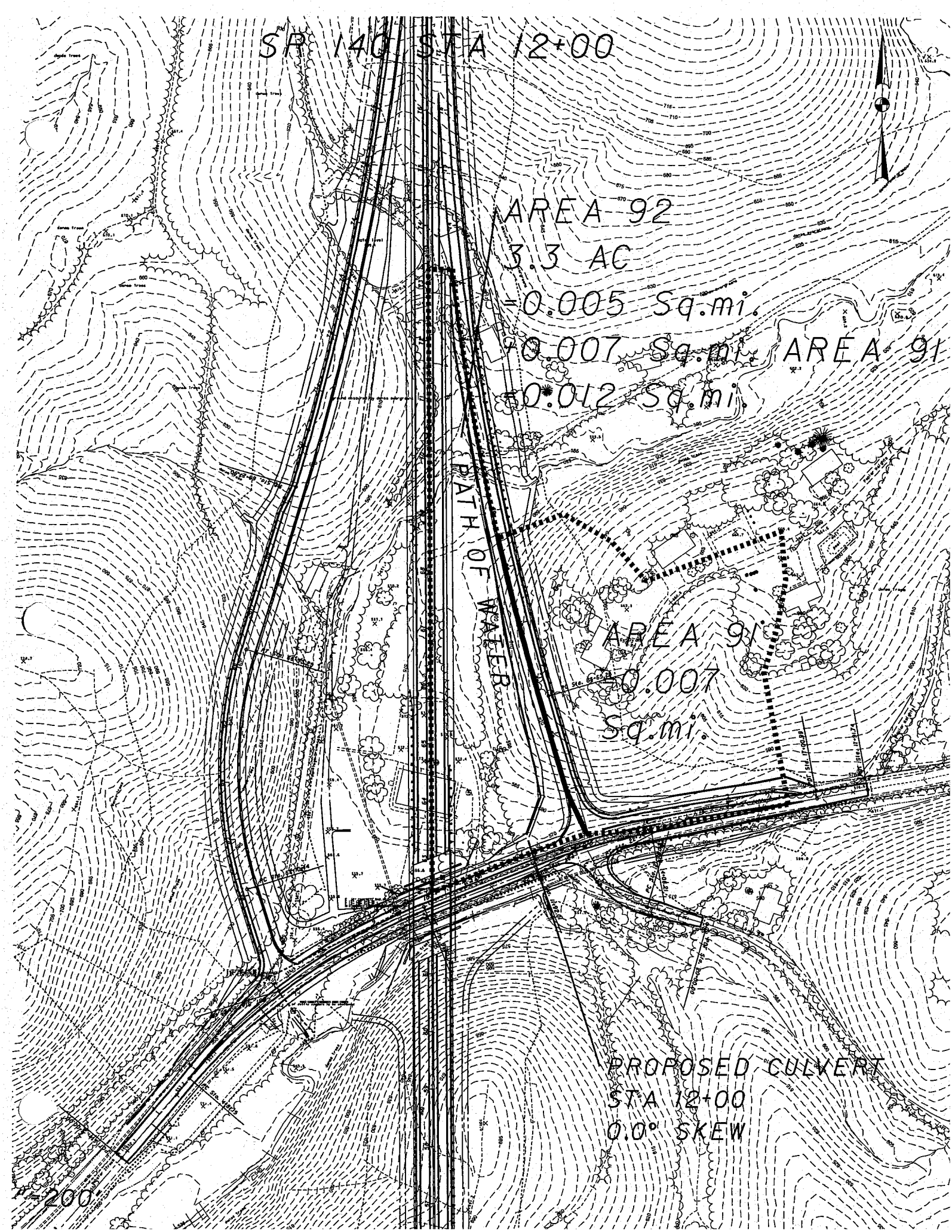
USE 60"

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
136.50	1	54 in.	553.76	554.45	2 - F	10.48	4.50	3.44	0.0233	OUTLET**	0.00	D - 1	0.00
118.70	1	48 in.	555.72	556.92	2 - F	10.76	4.00	3.28	0.0235	OUTLET**	17.80	D - 2	0.00
136.50	1	66 in.	552.28	552.90	1 - A	9.33	4.47	3.25	0.0231	OUTLET*	0.00	D + 1	0.00
181.70	1	60 in.	555.60	556.21	2 - F	11.17	5.00	3.86	0.0232	OUTLET**	18.20	F	0.00
149.50	1	54 in.	558.02	559.00	2 - F	11.00	4.50	3.59	0.0233	OUTLET**	50.40	F - 1	0.00
118.70	1	48 in.	561.91	564.45	2 - F	10.76	4.00	3.28	0.0235	OUTLET**	81.20	F - 2	0.00
199.90	1	66 in.	554.21	554.70	2 - F	10.92	5.50	3.96	0.0231	OUTLET**	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
136.50	1	60 in.	552.77	553.56	2 - F	9.78	5.00	3.35	0.0271	OUTLET**	0.00	D	0.00
136.50	1	54 in.	553.76	555.02	2 - F	10.48	4.50	3.44	0.0273	OUTLET**	0.00	D - 1	0.00
110.40	1	48 in.	555.72	558.01	2 - F	10.32	4.00	3.17	0.0275	OUTLET**	26.10	D - 2	0.00
136.50	1	66 in.	552.28	552.95	1 - A	9.33	5.02	3.25	0.0269	OUTLET*	0.00	D + 1	0.00
171.40	1	60 in.	555.60	556.89	2 - F	10.85	5.00	3.75	0.0271	OUTLET**	28.50	F	0.00
140.00	1	54 in.	558.02	560.23	2 - F	10.61	4.50	3.48	0.0273	OUTLET**	59.90	F - 1	0.00
110.40	1	48 in.	561.91	566.78	2 - F	10.32	4.00	3.17	0.0275	OUTLET**	89.50	F - 2	0.00
199.90	1	66 in.	554.21	555.10	2 - F	10.92	5.50	3.96	0.0269	OUTLET**	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
136.50	1	60 in.	552.77	554.15	2 - F	9.78	5.00	3.35	0.0332	OUTLET**	0.00	D	0.00
136.50	1	66 in.	552.28	553.14	1 - A	9.33	5.02	3.25	0.0330	OUTLET*	0.00	D + 1	0.00
156.30	1	60 in.	555.60	558.17	2 - F	10.37	5.00	3.58	0.0332	OUTLET**	43.60	F	0.00
187.40	1	66 in.	554.21	555.86	2 - F	10.61	5.50	3.83	0.0330	OUTLET**	12.50	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
136.50	1	60 in.	552.77	553.40	2 - F	9.78	5.00	3.35	0.0260	OUTLET*	0.00	D	0.00
136.50	1	66 in.	552.28	552.94	1 - A	9.33	5.02	3.25	0.0260	OUTLET*	0.00	D + 1	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
174.30	1	60 in.	555.60	556.69	2 - F	10.93	5.00	3.78	0.0260	OUTLET**	25.60	F	0.00
199.90	1	66 in.	554.21	555.00	2 - F	10.92	5.50	3.96	0.0260	OUTLET**	0.00	F + 1	0.00


SR 140 STA 12+00
AREA 92
3.3 AC
= 0.005 Sq.mi.
+ 0.007 Sq.mi. AREA 91
= 0.012 Sq.mi.
PATH OF WATER
AREA 91
0.007
Sq.mi.
PROPOSED CULVERT
STA 12+00
0.0° SKEW
200'

SR 140 STA 12+00

Client: ODOT Sheet: of

Subject: Pipe Culvert Calculations Order No:

Computed by: DL Date: 12/18/2007

Checked by: Date:

Rational Method

Coefficient of Runoff (1101.2.3)

	Area (Sft)	Area (Ac)	C	
Pavement Area	82851	1.90	0.9	
Non-paved Area	262720	6.03	0.6	Wieghted "C" for non-paved area
Other				
Total Area	345571	**7.93**	**acres**	**Weighted "C" = 0.70**

Overland Flow

Length
High Elevation
Low Elevation
Slope % #DIV/0!

t_o #DIV/0! (1101.2.2)

t_o 0.00 Compare with Fig 1101-1
negligible

Shallow Concentrated Flow

Length	1000	
High Elevation	611	
Low Elevation	553	
Slope %	5.8	
k	0.457	(Grassed waterways - Table 1101-1)
V	3.611074	(1101.2.2)
t_s	4.615432	(1101.2.2)

Since the time of concentration = to + ts t_c **10.00** min

For Intensity Zone D

Frequency	a	b	c	Ac	t_c	C	I	Q cu ft/s
2 Years	85.568	16.5	0.95	7.933219	10.00	0.70	3.80	21.08
5 Years	118.822	18.7	0.969	7.933219	10.00	0.70	4.59	25.46
10 Years	112.172	16.8	0.923	7.933219	10.00	0.70	5.39	29.88
25 Years	198.92	19.3	1.004	7.933219	10.00	0.70	6.70	37.12
50 Years	206.025	19.6	0.99	7.933219	10.00	0.70	7.20	39.90
100 Years	355.551	23.199	1.076	7.933219	10.00	0.70	8.21	45.48

Worksheet for SR 140 STA 12+00

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.01000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	10.00	ft
Discharge	37.12	ft^3/s

Results

Normal Depth	0.97	ft
Flow Area	11.54	ft^2
Wetted Perimeter	14.32	ft
Top Width	13.87	ft
Critical Depth	0.72	ft
Critical Slope	0.02805	ft/ft
Velocity	3.22	ft/s
Velocity Head	0.16	ft
Specific Energy	1.13	ft
Froude Number	0.62	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.97	ft
Critical Depth	0.72	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.02805	ft/ft

UNIVERSAL CULVERT DESIGN

PID : 77366 **Date :** 12/18/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 92, SR 140 Sta. 12+00 **Designer :** DL

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 553.72 **Outlet Invert Elevation (ft.) :** 552.80 **Tailwater Elevation (ft.) :** 553.77 **Overflow Elevation (ft.) :** 559.15

Allowable Headwater Elevation (ft.) : 558.15 **or** Diameter + 2 ft. *(whichever is less)*

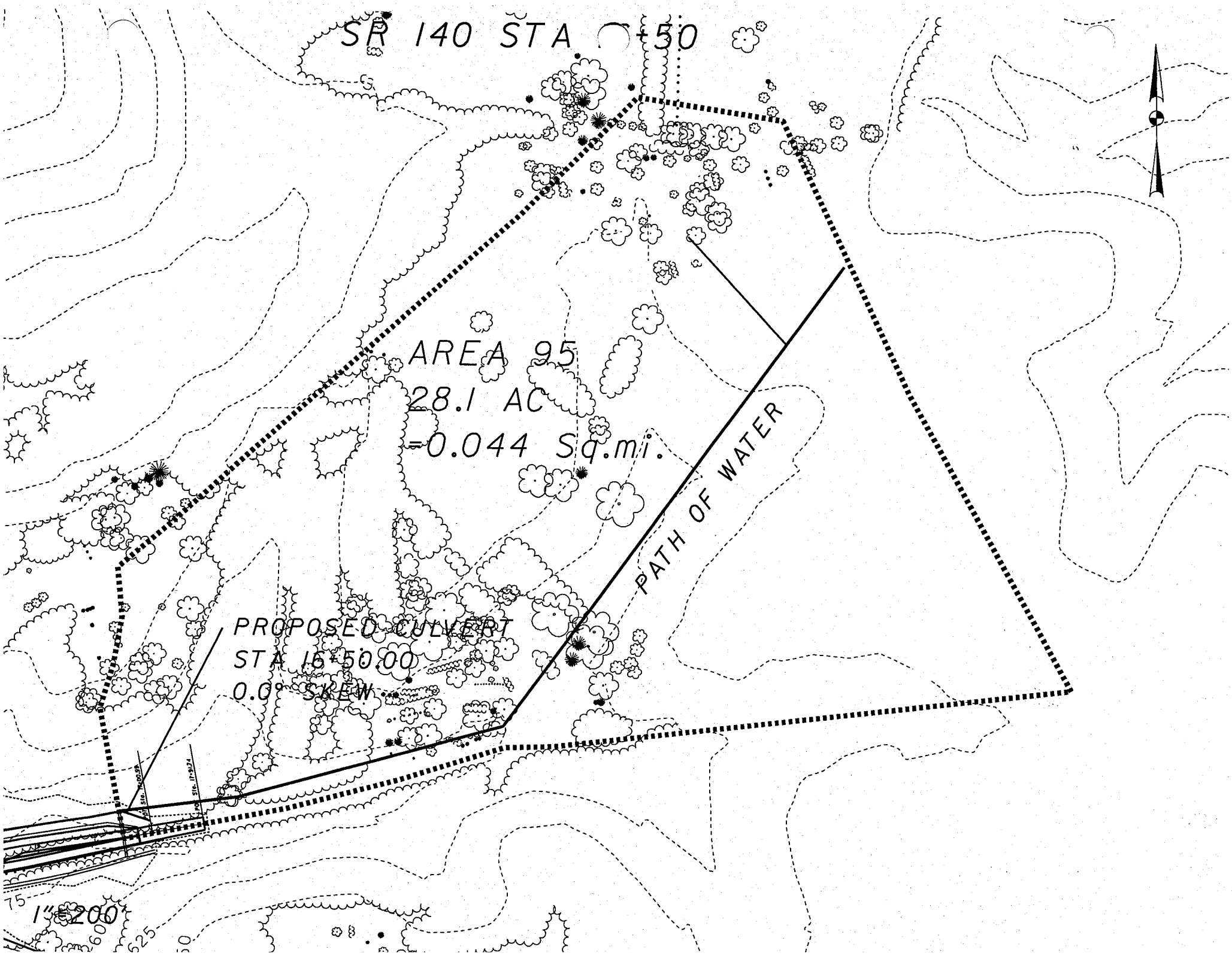
Pipe Length (ft.) : 92.00 **Culvert Slope (ft./ft.) :** 0.0100 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 37.10 @ 25 yrs. **Flood Discharge (cfs) :** 45.50 @ 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.20		
37.10	1	30 in.	557.24	556.78	2 - E	10.13	1.75	2.06	0.0120	INLET	0.00	D	0.00
37.10	1	27 in.	557.98	557.69	2 - E	9.33	2.25	2.05	0.0120	INLET	0.00	D - 1	0.00
35.80	1	24 in.	559.40	559.46	2 - F	11.53	2.00	1.93	0.0120	OUTLET**	1.30	D - 2	0.00
37.10	1	33 in.	556.86	N/A	1 - C	10.26	1.61	2.03	0.0120	INLET	0.00	D + 1	0.00
45.50	1	30 in.	558.12	557.73	2 - E	10.30	2.11	2.23	0.0120	INLET	0.00	F	0.00
44.40	1	27 in.	559.33	559.12	2 - E	11.17	2.25	2.14	0.0120	INLET	1.10	F - 1	0.00
35.80	1	24 in.	561.49	561.85	2 - F	11.53	2.00	1.93	0.0120	OUTLET**	9.70	F - 2	0.00
45.50	1	33 in.	557.46	556.96	2 - E	10.70	1.85	2.23	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.90		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
37.10	1	33 in.	557.36	557.89	2 - F	7.90	2.75	2.03	0.0241	OUTLET**	0.00	D	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
36.00	1	30 in.	558.14	559.40	2 - F	8.42	2.50	2.03	0.0244	OUTLET**	1.10	D - 1	0.00
28.50	1	27 in.	559.47	562.18	2 - F	8.12	2.25	1.86	0.0245	OUTLET**	8.60	D - 2	0.00
37.10	1	36 in.	556.93	557.23	1 - A	7.49	2.55	1.98	0.0241	OUTLET*	0.00	D + 1	0.00
44.40	1	33 in.	558.37	559.35	2 - F	8.68	2.75	2.21	0.0241	OUTLET**	1.10	F	0.00
36.00	1	30 in.	559.59	561.67	2 - F	8.42	2.50	2.03	0.0244	OUTLET**	9.50	F - 1	0.00
28.50	1	27 in.	561.45	565.88	2 - F	8.12	2.25	1.86	0.0245	OUTLET**	17.00	F - 2	0.00
45.50	1	36 in.	557.63	558.08	2 - F	8.20	3.00	2.20	0.0241	OUTLET**	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
37.10	1	36 in.	556.93	557.33	2 - F	7.49	3.00	1.98	0.0281	OUTLET*	0.00	D	0.00
37.10	1	42 in.	556.55	556.91	1 - A	7.00	2.34	1.89	0.0278	OUTLET*	0.00	D + 1	0.00
45.50	1	36 in.	557.63	558.61	2 - F	8.20	3.00	2.20	0.0281	OUTLET**	0.00	F	0.00
45.50	1	42 in.	556.96	557.36	1 - A	7.53	2.77	2.10	0.0278	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
37.10	1	60 in.	556.14	556.46	1 - A	6.32	2.09	1.70	0.0332	OUTLET*	0.00	D	0.00
37.10	1	66 in.	556.04	556.36	1 - A	6.19	1.99	1.65	0.0330	OUTLET*	0.00	D + 1	0.00
45.50	1	60 in.	556.44	556.79	1 - A	6.71	2.34	1.89	0.0332	OUTLET*	0.00	F	0.00
45.50	1	66 in.	556.33	556.68	1 - A	6.56	2.22	1.83	0.0330	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
37.10	1	60 in.	556.14	556.50	1 - A	6.32	1.83	1.70	0.0260	OUTLET*	0.00	D	0.00
37.10	1	66 in.	556.04	556.43	1 - A	6.19	1.76	1.65	0.0260	OUTLET*	0.00	D + 1	0.00
45.50	1	60 in.	556.44	556.83	1 - A	6.71	2.04	1.89	0.0260	OUTLET*	0.00	F	0.00
45.50	1	66 in.	556.33	556.74	1 - A	6.56	1.96	1.83	0.0260	OUTLET*	0.00	F + 1	0.00


SR 140 STA 1+50
AREA 95
28.1 AC
=0.044 Sq.mi.
PATH OF WATER
PROPOSED CULVERT
STA 16+50.00
0.0° SKEW
1"=200'

SR 140 STA 16+50
TECHNIQUES FOR ESTIMATING FLOOD-PEAK
DISCHARGES OF RURAL, UNREGULATED STREAMS IN OHIO AREA A
U.S. GEOLOGICAL SURVEY Water Resources Investigations Report 89-4126

Values	Units	Definitions
1225120.00	SQ. FT.	
0.044	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
1681.00	FT.	**TOTAL CHANNEL LENGTH**
168.10	FT.	L_{10} = 10% of the Distance along channel
573	FT.	$Elev_{10}$ = Elevation at point L_{10}
1428.85	FT.	L_{85} = 85% of the Distance along channel
652	FT.	$Elev_{85}$ = Elevation at point L_{85}
1260.75	FT.	**Length** = $L_{85} - L_{10}$
330.85	FT./MI.	**SLOPE** = $(Elev_{10}-Elev_{85})$/Length
	CFS	$Q_{\#}$ = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	13.22	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	27.55	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	39.36	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	55.51	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	68.92	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	82.20	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

Worksheet for SR 140 STA 16+50

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.04800	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	10.00	ft
Discharge	55.50	ft^3/s

Results

Normal Depth	0.78	ft
Flow Area	8.95	ft^2
Wetted Perimeter	13.47	ft
Top Width	13.10	ft
Critical Depth	0.92	ft
Critical Slope	0.02620	ft/ft
Velocity	6.20	ft/s
Velocity Head	0.60	ft
Specific Energy	1.37	ft
Froude Number	1.32	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.78	ft
Critical Depth	0.92	ft
Channel Slope	0.04800	ft/ft
Critical Slope	0.02620	ft/ft

UNIVERSAL CULVERT DESIGN

PID : 77366 **Date :** 05/13/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 91A, SR 140 Sta. 16+50 **Designer :** mdc

HEADWATER CONTROL CODES:

INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 566.94 **Outlet Invert Elevation (ft.) :** 566.16 **Tailwater Elevation (ft.) :** 566.94 **Overflow Elevation (ft.) :** 573.15

Allowable Headwater Elevation (ft.) : 572.15 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 78.00 **Culvert Slope (ft./ft.) :** 0.0100 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 55.50 @ 25 yrs. **Flood Discharge (cfs) :** 82.20 @ 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.20		
55.50	1	33 in.	571.56	571.10	2 - E	10.99	2.18	2.42	0.0120	INLET	0.00	D	0.00
55.50	1	30 in.	572.63	572.18	2 - E	11.31	2.50	2.36	0.0120	INLET	0.00	D - 1	0.00
48.80	1	27 in.	574.45	574.14	2 - E	12.27	2.25	2.17	0.0120	INLET	6.70	D - 2	0.00
55.50	1	36 in.	570.95	570.47	2 - E	11.27	1.97	2.42	0.0120	INLET	0.00	D + 1	0.00
70.00	1	33 in.	574.74	574.03	2 - E	11.79	2.75	2.59	0.0120	INLET	12.20	F	0.00
59.00	1	30 in.	577.21	576.52	2 - E	12.02	2.50	2.39	0.0120	INLET	23.20	F - 1	0.00
48.80	1	27 in.	583.11	581.02	2 - E	12.27	2.25	2.17	0.0120	INLET	33.40	F - 2	0.00
81.60	1	36 in.	573.21	572.58	2 - E	11.54	3.00	2.78	0.0120	INLET	0.60	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.90		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
55.50	1	42 in.	570.74	571.07	1 - A	8.15	2.89	2.33	0.0237	OUTLET*	0.00	D	0.00

use 42" Conc. Pipe

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
55.50	1	36 in.	571.89	572.53	2 - F	9.10	3.00	2.42	0.0241	OUTLET**	0.00	D - 1	0.00
49.80	1	33 in.	573.04	574.26	2 - F	9.30	2.75	2.32	0.0241	OUTLET**	5.70	D - 2	0.00
55.50	1	48 in.	570.32	570.77	1 - A	7.66	2.46	2.24	0.0235	OUTLET*	0.00	D + 1	0.00
81.70	1	42 in.	572.77	573.20	2 - F	9.83	3.50	2.82	0.0237	OUTLET**	0.50	F	0.00
59.70	1	36 in.	575.50	577.09	2 - F	9.50	3.00	2.50	0.0241	OUTLET**	22.50	F - 1	0.00
49.80	1	33 in.	577.74	580.96	2 - F	9.30	2.75	2.32	0.0241	OUTLET**	32.40	F - 2	0.00
82.20	1	48 in.	571.53	571.85	2 - F	8.93	3.42	2.75	0.0235	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
55.50	1	42 in.	570.74	571.14	1 - A	8.15	3.20	2.33	0.0278	OUTLET*	0.00	D	0.00
55.20	1	36 in.	571.89	573.20	2 - F	9.07	3.00	2.41	0.0281	OUTLET**	0.30	D - 1	0.00
55.50	1	48 in.	570.32	570.75	1 - A	7.66	2.75	2.24	0.0275	OUTLET*	0.00	D + 1	0.00
76.00	1	42 in.	572.77	573.85	2 - F	9.44	3.50	2.73	0.0278	OUTLET**	6.20	F	0.00
55.20	1	36 in.	575.50	578.55	2 - F	9.07	3.00	2.41	0.0281	OUTLET**	27.00	F - 1	0.00
82.20	1	48 in.	571.53	571.91	2 - F	8.93	4.00	2.75	0.0275	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
55.50	1	60 in.	569.99	570.39	1 - A	7.13	2.63	2.09	0.0332	OUTLET*	0.00	D	0.00
55.50	1	66 in.	569.87	570.24	1 - A	6.96	2.48	2.03	0.0330	OUTLET*	0.00	D + 1	0.00
82.20	1	60 in.	570.75	571.27	1 - A	8.09	3.40	2.57	0.0332	OUTLET*	0.00	F	0.00
82.20	1	66 in.	570.59	571.08	1 - A	7.85	3.14	2.49	0.0330	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
55.50	1	60 in.	569.99	570.41	1 - A	7.13	2.28	2.09	0.0260	OUTLET*	0.00	D	0.00
55.50	1	66 in.	569.87	570.29	1 - A	6.96	2.18	2.03	0.0260	OUTLET*	0.00	D + 1	0.00
82.20	1	60 in.	570.75	571.26	1 - A	8.09	2.88	2.57	0.0260	OUTLET*	0.00	F	0.00
82.20	1	66 in.	570.59	571.10	1 - A	7.85	2.72	2.49	0.0260	OUTLET*	0.00	F + 1	0.00

CULVERT ANALYSIS

PID : 77366 **Date :** 09/18/2007 **Project :** SR823 Portsmouth Bypass **Location :** Portsmouth, Ohio

Description : Drainage Area 91A, SR140 Sta. 16+50 **Designer :** rn

HEADWATER CONTROL CODES:

INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Pipe Number : 1 **Use HW :** 0 **Inlet Invert Elevation (ft.) :** 566.94 **Outlet Invert Elevation (ft.) :** 566.16

Pipe Quantity : 1

Culvert Type : Circular Smooth **Pipe Length (ft.) :** 78.00 **Culvert Slope (ft./ft.) :** 0.0100

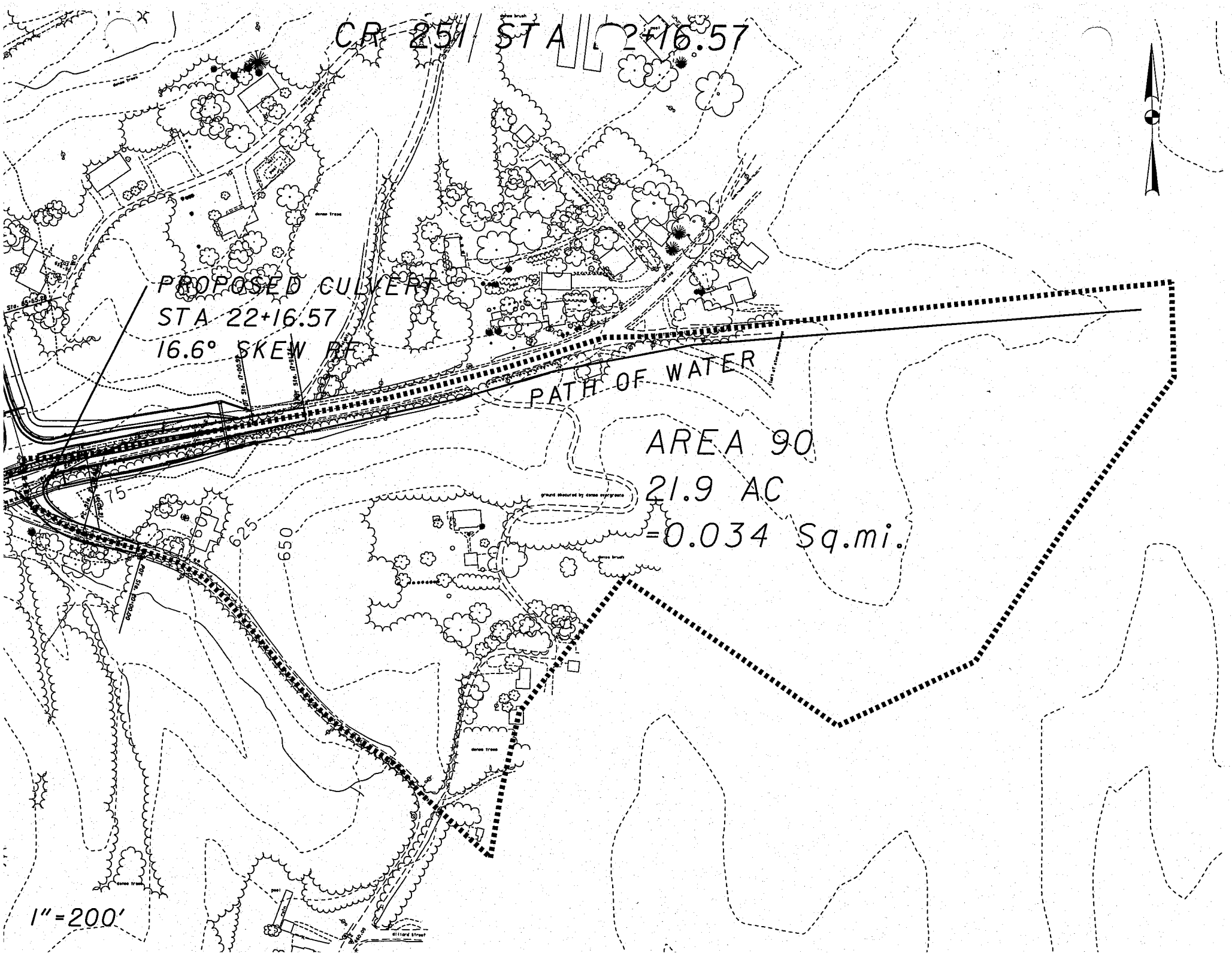
Corrugation Type :

Pipe Size : 42 in.

Design Manning 'n' : (default)

Entrance Type : Half Headwall **Loss Coef. Ke :** 0.2000

FLOW (cfs.)	HEAD LOSS (ft.)	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	BURIED DEPTH (ft.)	TAILWATER ELEVATION (ft.)
55.50	1.33	570.40	N/A	1 - C	11.37	1.77	2.33	0.0120	INLET	0.00	566.94
82.20	2.32	571.65	571.13	2 - E	12.45	2.27	2.83	0.0120	INLET	0.00	566.94


CR 251 / STA 22+16.57
PROPOSED CULVERT
STA 22+16.57
16.6° SKEW RF
PATH OF WATER
AREA 90
21.9 AC
=0.034 Sq.mi.
1" = 200'

CR 251 STA 22+19.21

TECHNIQUES FOR ESTIMATING FLOOD-PEAK DISCHARGES OF RURAL, UNREGULATED STREAMS IN OHIO AREA A

U.S. GEOLOGICAL SURVEY Water Resources Investigations Report 89-4126

Values	Units	Definitions
956129.00	SQ. FT.	
0.034	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
1943.00	FT.	**TOTAL CHANNEL LENGTH**
194.30	FT.	L_{10} = 10% of the Distance along channel
561	FT.	$Elev_{10}$ = Elevation at point L_{10}
1651.55	FT.	L_{85} = 85% of the Distance along channel
638	FT.	$Elev_{85}$ = Elevation at point L_{85}
1457.25	FT.	**Length** = $L_{85} - L_{10}$
278.99	FT./MI.	**SLOPE** = $(Elev_{10}-Elev_{85})/Length$
	CFS	$Q_{\#}$ = Flood-Peak Discharge # = Frequency of Storm

Q_2	10.57	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	21.92	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	31.24	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	43.96	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	54.50	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	64.92	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

UNIVERSAL CULVERT DESIGN

PID : 77366 **Date :** 05/21/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 90, CR 251 Sta. 22+16.57 **Designer :** mdc

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 555.24 **Outlet Invert Elevation (ft.) :** 553.50 **Tailwater Elevation (ft.) :** 556.02 **Overflow Elevation (ft.) :** 562.85

Allowable Headwater Elevation (ft.) : 561.85 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 100.00 **Culvert Slope (ft./ft.) :** 0.0174 **Design Manning 'n' :** 0.0120

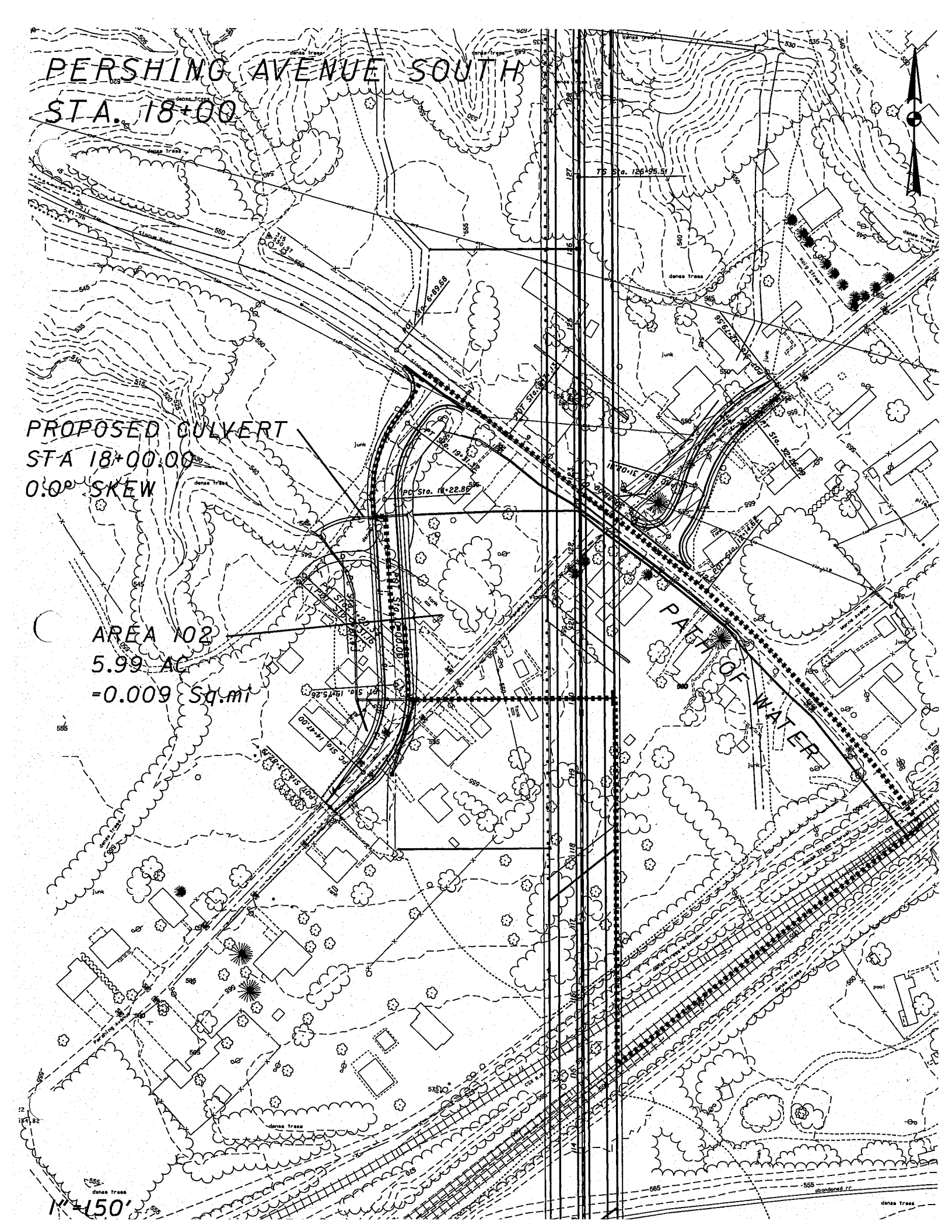
Design Discharge (cfs) : 44.00 @ 25 yrs. **Flood Discharge (cfs) :** 64.90 @ 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.20		
44.00	1	30 in.	559.47	558.49	2 - H	13.10	1.62	2.21	0.0120	INLET	0.00	D	0.00
44.00	1	27 in.	560.59	560.01	2 - H	12.69	1.83	2.14	0.0120	INLET	0.00	D - 1	0.00
43.90	1	24 in.	562.60	562.88	2 - G	13.97	2.00	1.97	0.0120	OUTLET	0.10	D - 2	0.00
44.00	1	33 in.	558.86	557.63	2 - E	13.20	1.51	2.20	0.0120	INLET	0.00	D + 1	0.00
64.90	1	30 in.	562.35	561.40	2 - H	13.22	2.50	2.42	0.0120	INLET	0.00	F	0.00
55.90	1	27 in.	564.92	564.71	2 - H	14.06	2.25	2.20	0.0120	INLET	9.00	F - 1	0.00
43.90	1	24 in.	572.42	570.95	2 - G	13.97	2.00	1.97	0.0120	OUTLET	21.00	F - 2	0.00
64.90	1	33 in.	560.85	559.65	2 - E	14.30	1.96	2.55	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.90		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
44.00	1	36 in.	559.02	559.25	2 - F	6.94	2.28	2.16	0.0241	OUTLET*	0.00	D	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
44.00	1	33 in.	559.69	560.00	2 - F	7.72	2.75	2.20	0.0241	OUTLET	0.00	D - 1	0.00
44.00	1	30 in.	560.83	562.42	2 - G	8.96	2.50	2.21	0.0244	OUTLET	0.00	D - 2	0.00
44.00	1	42 in.	558.41	N/A	1 - C	7.92	1.96	2.07	0.0237	INLET	0.00	D + 1	0.00
64.90	1	36 in.	561.34	562.01	2 - F	10.02	3.00	2.58	0.0241	OUTLET**	0.00	F	0.00
57.20	1	33 in.	562.88	564.82	2 - F	10.03	2.75	2.45	0.0241	OUTLET**	7.70	F - 1	0.00
45.40	1	30 in.	565.08	569.95	2 - G	9.25	2.50	2.23	0.0244	OUTLET	19.50	F - 2	0.00
64.90	1	42 in.	559.66	559.97	2 - F	8.73	2.58	2.53	0.0237	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
44.00	1	36 in.	559.02	559.21	2 - F	6.94	3.00	2.16	0.0281	OUTLET*	0.00	D	0.00
44.00	1	42 in.	558.41	558.87	1 - B	5.93	2.18	2.07	0.0278	OUTLET*	0.00	D + 1	0.00
63.30	1	36 in.	561.34	563.18	2 - F	9.86	3.00	2.56	0.0281	OUTLET**	1.60	F	0.00
64.90	1	42 in.	559.66	559.85	2 - F	8.73	3.04	2.53	0.0278	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
44.00	1	60 in.	557.91	558.32	1 - B	4.44	1.97	1.85	0.0332	OUTLET*	0.00	D	0.00
44.00	1	66 in.	557.80	558.23	1 - B	4.14	1.88	1.80	0.0330	OUTLET*	0.00	D + 1	0.00
64.90	1	60 in.	558.57	559.05	1 - B	6.54	2.45	2.27	0.0332	OUTLET*	0.00	F	0.00
64.90	1	66 in.	558.44	558.94	1 - B	6.11	2.32	2.21	0.0330	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
44.00	1	60 in.	557.91	N/A	1 - C	7.32	1.73	1.85	0.0260	INLET	0.00	D	0.00
44.00	1	66 in.	557.80	N/A	1 - C	7.27	1.66	1.80	0.0260	INLET	0.00	D + 1	0.00
64.90	1	60 in.	558.57	N/A	1 - C	8.13	2.13	2.27	0.0260	INLET	0.00	F	0.00
64.90	1	66 in.	558.44	N/A	1 - C	8.10	2.04	2.21	0.0260	INLET	0.00	F + 1	0.00

USE 36"


PERSHING AVENUE SOUTH
STA. 18+00
PROPOSED CULVERT
STA 18+00.00
0.0° SKEW
AREA 102
5.99 AC
=0.009 Sq.mi
PATH OF WATER
1"=150'

Client: ODOT Sheet: of

Subject: Pipe Culvert Calculations @ STA 18+00 PERSHING SOUTH Order No:

Computed by: DL Date: 5/10/2007

Checked by: Date:

Rational Method

Coefficient of Runoff (1101.2.3)

	Area (Sft)	Area (Ac)	C
Pavement Area	13376	0.31	0.9
Non-paved Area	247760	5.69	0.45
Other			
Total Area		**5.99**	**acres**

Weighted "C" = 0.47

Overland Flow

Length	0	
High Elevation	0	
Low Elevation	0	
Slope %	0	

t_o 0.00 (1101.2.2)

t_o **0.00** Compare with Fig 1101-1

Negligible

Shallow Concentrated Flow

Length	864	
High Elevation	589.71	
Low Elevation	547	
Slope %	4.943287	
k	0.457	(Grassed waterways - Table 1101-1)
V	3.333729	(1101.2.2)
t_s	4.319487	(1101.2.2)

Since the time of concentration = to + ts t_c **10.00** min

For Intensity Zone D

Frequency	a	b	c	Ac	t_c	C	I	Q cu ft/s
2 Years	85.568	16.5	0.95	5.994845	10.00	0.47	3.80	10.79
5 Years	118.822	18.7	0.969	5.99	10.00	0.47	4.59	13.03
10 Years	112.172	16.8	0.923	5.994845	10.00	0.47	5.39	15.29 ✓
25 Years	198.92	19.3	1.004	5.994845	10.00	0.47	6.70	18.99
50 Years	206.025	19.6	0.99	5.994845	10.00	0.47	7.20	20.42
100 Years	355.551	23.199	1.076	5.994845	10.00	0.47	8.21	23.27

Worksheet for PERSS STA 18+00

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.07800	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	4.00	ft
Discharge	15.29	ft^3/s

Results

Normal Depth	0.51	ft
Flow Area	2.71	ft^2
Wetted Perimeter	6.77	ft
Top Width	6.57	ft
Critical Depth	0.66	ft
Critical Slope	0.03052	ft/ft
Velocity	5.64	ft/s
Velocity Head	0.49	ft
Specific Energy	1.01	ft
Froude Number	1.55	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.51	ft
Critical Depth	0.66	ft
Channel Slope	0.07800	ft/ft
Critical Slope	0.03052	ft/ft

UNIVERSAL CULVERT DESIGN

PID : 77366 **Date :** 05/09/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 102, Sta. 18+00, Pershing Avenue South **Designer :** DL

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 547.15 **Outlet Invert Elevation (ft.) :** 544.51 **Tailwater Elevation (ft.) :** 545.97 545.02 **Overflow Elevation (ft.) :** 551.59

Allowable Headwater Elevation (ft.) : 550.59 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 67.00 **Culvert Slope (ft./ft.) :** 0.0394 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 15.29 @ 10 yrs. **Flood Discharge (cfs) :** 18.99 @ 25 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.20		
15.29	1	18 in.	550.51	548.57	2 - E	13.73	0.90	1.41	0.0120	INLET	0.00	D	0.00
13.19	1	15 in.	552.76	552.04	2 - H	12.88	0.97	1.23	0.0120	INLET	2.10	D - 1	0.00
8.59	1	12 in.	579.36	563.49	2 - G	10.94	1.00	0.99	0.0120	OUTLET	6.70	D - 2	0.00
15.29	1	21 in.	549.62	547.39	2 - E	13.79	0.82	1.45	0.0120	INLET	0.00	D + 1	0.00
18.59	1	18 in.	551.73	550.00	2 - E	14.27	1.04	1.46	0.0120	INLET	0.40	F	0.00
13.19	1	15 in.	556.24	555.34	2 - H	12.88	0.97	1.23	0.0120	INLET	5.80	F - 1	0.00
8.59	1	12 in.	668.12	572.99	2 - G	10.94	1.00	0.99	0.0120	OUTLET	10.40	F - 2	0.00
18.99	1	21 in.	550.30	548.15	2 - E	14.54	0.93	1.57	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.90		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
15.29	1	21 in.	550.27	549.56	2 - E	7.78	1.33	1.45	0.0248	INLET	0.00	D	0.00

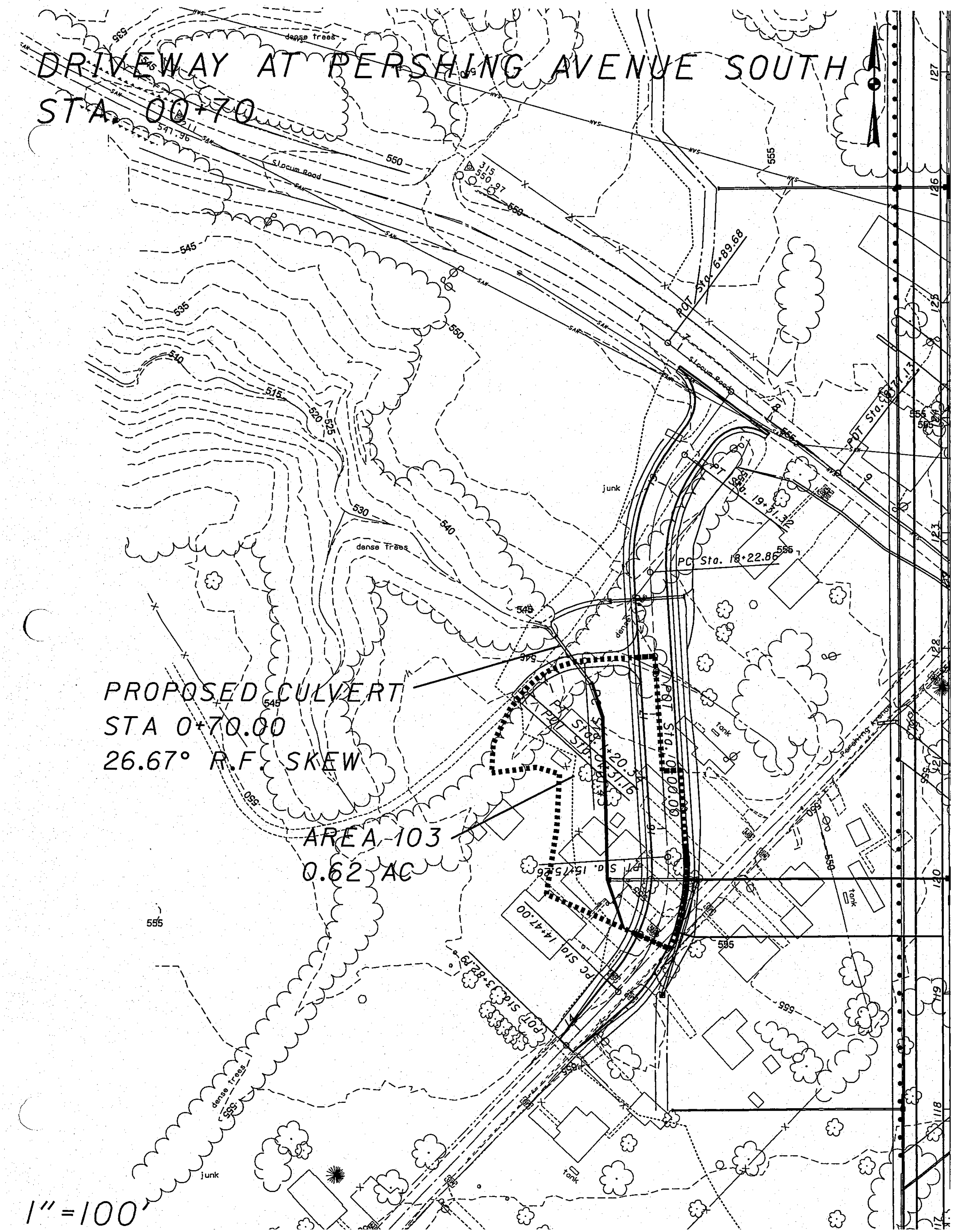
UNIVERSAL CULVERT DESIGN

	FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
	13.29	1	18 in.	551.76	553.36	2 - F	7.58	1.50	1.36	0.0249	OUTLET	2.00	D - 1	0.00
	8.39	1	15 in.	555.81	564.35	2 - G	6.84	1.25	1.13	0.0250	OUTLET	6.90	D - 2	0.00
	15.29	1	24 in.	549.56	548.01	2 - E	8.00	1.17	1.41	0.0247	INLET	0.00	D + 1	0.00
	18.99	1	21 in.	551.36	551.49	2 - F	8.34	1.75	1.57	0.0248	OUTLET**	0.00	F	0.00
	13.29	1	18 in.	553.51	557.39	2 - F	7.58	1.50	1.36	0.0249	OUTLET	5.70	F - 1	0.00
	8.39	1	15 in.	567.53	574.33	2 - G	6.84	1.25	1.13	0.0250	OUTLET	10.60	F - 2	0.00
	18.99	1	24 in.	550.22	549.07	2 - E	8.36	1.36	1.57	0.0247	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)														
	15.29	1	36 in.	548.96	N/A	1 - C	7.20	1.02	1.25	0.0281	INLET	0.00	D	0.00
	15.29	1	42 in.	548.85	N/A	1 - C	7.16	0.96	1.19	0.0278	INLET	0.00	D + 1	0.00
	18.99	1	36 in.	549.20	N/A	1 - C	7.65	1.15	1.40	0.0281	INLET	0.00	F	0.00
	18.99	1	42 in.	549.07	N/A	1 - C	7.61	1.07	1.33	0.0278	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)														
Diameter exceeds 1.25 HWA	15.29	1	60 in.	548.60	N/A	1 - C	6.07	0.93	1.07	0.0332	INLET	0.00	D	0.00
	15.29	1	66 in.	548.55	N/A	1 - C	6.03	0.90	1.05	0.0330	INLET	0.00	D + 1	0.00
	18.99	1	60 in.	548.79	N/A	1 - C	6.47	1.03	1.20	0.0332	INLET	0.00	F	0.00
	18.99	1	66 in.	548.73	N/A	1 - C	6.43	1.00	1.17	0.0330	INLET	0.00	F + 1	0.00
Diameter exceeds 1.25 HWA	7.65	2	60 in.	548.17	N/A	1 - C	4.95	0.66	0.76	0.0332	INLET	0.00	D	0.00
	7.65	2	66 in.	548.17	N/A	1 - C	4.89	0.65	0.74	0.0330	INLET	0.00	D + 1	0.00
	9.50	2	60 in.	548.28	N/A	1 - C	5.28	0.74	0.84	0.0332	INLET	0.00	F	0.00
	9.50	2	66 in.	548.26	N/A	1 - C	5.23	0.72	0.82	0.0330	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)														
Diameter exceeds 1.25 HWA	15.29	1	60 in.	548.60	N/A	1 - C	7.22	0.82	1.07	0.0260	INLET	0.00	D	0.00
	15.29	1	66 in.	548.55	N/A	1 - C	7.12	0.80	1.05	0.0260	INLET	0.00	D + 1	0.00

USE 24"

UNIVERSAL CULVERT DESIGN

	FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
	18.99	1	60 in.	548.79	N/A	1 - C	7.69	0.92	1.20	0.0260	INLET	0.00	F	0.00
	18.99	1	66 in.	548.73	N/A	1 - C	7.60	0.89	1.17	0.0260	INLET	0.00	F + 1	0.00
Diameter exceeds 1.25 HWA	7.65	2	60 in.	548.17	N/A	1 - C	5.87	0.59	0.76	0.0260	INLET	0.00	D	0.00
	7.65	2	66 in.	548.17	N/A	1 - C	5.79	0.58	0.74	0.0260	INLET	0.00	D + 1	0.00
	9.50	2	60 in.	548.28	N/A	1 - C	6.26	0.65	0.84	0.0260	INLET	0.00	F	0.00
	9.50	2	66 in.	548.26	N/A	1 - C	6.17	0.64	0.82	0.0260	INLET	0.00	F + 1	0.00


DRIVEWAY AT PERSHING AVENUE SOUTH
STA. 00+70
PROPOSED CULVERT
STA 0+70.00
26.67° R.F. SKEW
AREA 103
0.62 AC
1"=100'
Slocum Road
Pershing Avenue
dense trees
junk
tank
POT Sta. 6+89.68
PC Sta. 18+22.86
PC Sta. 14+47.00
POT Sta. 10+00.00

Client: ODOT Sheet: of

Subject: Pipe Culvert Calculations Order No:
@ STA 0+75 DRIVEWAY AT PERSHING SOUTH

Computed by: DL Date: 5/10/2007

Checked by: Date:

Rational Method

Coefficient of Runoff (1101.2.3)

	Area (Sft)	Area (Ac)	C
Pavement Area	6907	0.16	0.9
Non-paved Area	20231	0.46	0.45
Other			
Total Area		**0.62**	**acres**

Weighted "C" = 0.56

Overland Flow

Length	0
High Elevation	0
Low Elevation	0
Slope %	#DIV/0!

t_o #DIV/0! (1101.2.2)

t_o 0.00 Compare with Fig 1101-1

Negligible

Shallow Concentrated Flow

Length	259	
High Elevation	554.97	
Low Elevation	543.5	
Slope %	4.428571	
k	0.457	(Grassed waterways - Table 1101-1)
V	3.155399	(1101.2.2)
t_s	1.368026	(1101.2.2)

Since the time of concentration = to + ts t_c **10.00** min

For Intensity Zone D

Frequency	a	b	c	Ac	t_c	C	I	Q cu ft/s
2 Years	85.568	16.5	0.95	0.623003	10.00	0.56	3.80	1.34
5 Years	118.822	18.7	0.969	0.62	10.00	0.56	4.59	1.62
10 Years	112.172	16.8	0.923	0.623003	10.00	0.56	5.39	1.90
25 Years	198.92	19.3	1.004	0.623003	10.00	0.56	6.70	2.36
50 Years	206.025	19.6	0.99	0.623003	10.00	0.56	7.20	2.53
100 Years	355.551	23.199	1.076	0.623003	10.00	0.56	8.21	2.89

Worksheet for DRIV PERSS STA 0+70

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.25000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	1.90	ft^3/s

Results

Normal Depth	0.16	ft
Flow Area	0.38	ft^2
Wetted Perimeter	2.73	ft
Top Width	2.65	ft
Critical Depth	0.28	ft
Critical Slope	0.04039	ft/ft
Velocity	4.99	ft/s
Velocity Head	0.39	ft
Specific Energy	0.55	ft
Froude Number	2.32	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.16	ft
Critical Depth	0.28	ft
Channel Slope	0.25000	ft/ft
Critical Slope	0.04039	ft/ft

UNIVERSAL CULVERT DESIGN

PID : 77366 **Date :** 05/10/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 103, Sta. 0+70, Driveway Pershing South. **Designer :** DL

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 543.46 **Outlet Invert Elevation (ft.) :** 540.86 **Tailwater Elevation (ft.) :** 541.00 **Overflow Elevation (ft.) :** 547.91

Allowable Headwater Elevation (ft.) : 546.91 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 52.00 **Culvert Slope (ft./ft.) :** 0.0500 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 1.90 @ 10 yrs. **Flood Discharge (cfs) :** 2.36 @ 25 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.20		
1.90	1	12 in.	544.31	N/A	1 - C	8.79	0.32	0.59	0.0120	INLET	0.00	D	0.00
1.90	1	15 in.	544.24	N/A	1 - C	8.65	0.29	0.55	0.0120	INLET	0.00	D + 1	0.00
2.36	1	12 in.	544.43	N/A	1 - C	9.40	0.36	0.66	0.0120	INLET	0.00	F	0.00
2.36	1	15 in.	544.34	N/A	1 - C	9.20	0.33	0.61	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.90		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
1.90	1	12 in.	544.36	N/A	1 - C	5.16	0.48	0.59	0.0251	INLET	0.00	D	0.00
1.90	1	15 in.	544.26	N/A	1 - C	5.10	0.43	0.55	0.0250	INLET	0.00	D + 1	0.00
2.36	1	12 in.	544.52	N/A	1 - C	5.43	0.54	0.66	0.0251	INLET	0.00	F	0.00
2.36	1	15 in.	544.37	N/A	1 - C	5.41	0.48	0.61	0.0250	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													

USE 24"

UNIVERSAL CULVERT DESIGN

	FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
	1.90	1	36 in.	544.04	N/A	1 - C	4.26	0.34	0.43	0.0281	INLET	0.00	D	0.00
	1.90	1	42 in.	544.05	N/A	1 - C	4.19	0.33	0.41	0.0278	INLET	0.00	D + 1	0.00
	2.36	1	36 in.	544.10	N/A	1 - C	4.54	0.38	0.48	0.0281	INLET	0.00	F	0.00
	2.36	1	42 in.	544.10	N/A	1 - C	4.50	0.36	0.46	0.0278	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)														
Diameter exceeds 1.25 HWA	1.90	1	60 in.	544.12	N/A	1 - C	3.52	0.32	0.37	0.0332	INLET	0.00	D	0.00
	1.90	1	66 in.	544.16	N/A	1 - C	3.50	0.31	0.36	0.0330	INLET	0.00	D + 1	0.00
	2.36	1	60 in.	544.15	N/A	1 - C	3.77	0.36	0.42	0.0332	INLET	0.00	F	0.00
	2.36	1	66 in.	544.19	N/A	1 - C	3.74	0.35	0.41	0.0330	INLET	0.00	F + 1	0.00
Diameter exceeds 1.25 HWA	0.95	2	60 in.	544.06	N/A	1 - C	2.86	0.23	0.26	0.0332	INLET	0.00	D	0.00
	0.95	2	66 in.	544.10	N/A	1 - C	2.83	0.23	0.26	0.0330	INLET	0.00	D + 1	0.00
	1.18	2	60 in.	544.07	N/A	1 - C	3.04	0.26	0.29	0.0332	INLET	0.00	F	0.00
	1.18	2	66 in.	544.12	N/A	1 - C	3.03	0.25	0.29	0.0330	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)														
Diameter exceeds 1.25 HWA	1.90	1	60 in.	544.12	N/A	1 - C	4.18	0.29	0.37	0.0260	INLET	0.00	D	0.00
	1.90	1	66 in.	544.16	N/A	1 - C	4.14	0.28	0.36	0.0260	INLET	0.00	D + 1	0.00
	2.36	1	60 in.	544.15	N/A	1 - C	4.48	0.32	0.42	0.0260	INLET	0.00	F	0.00
	2.36	1	66 in.	544.19	N/A	1 - C	4.40	0.31	0.41	0.0260	INLET	0.00	F + 1	0.00
Diameter exceeds 1.25 HWA	0.95	2	60 in.	544.06	N/A	1 - C	3.40	0.21	0.26	0.0260	INLET	0.00	D	0.00
	0.95	2	66 in.	544.10	N/A	1 - C	3.35	0.20	0.26	0.0260	INLET	0.00	D + 1	0.00
	1.18	2	60 in.	544.07	N/A	1 - C	3.61	0.23	0.29	0.0260	INLET	0.00	F	0.00
	1.18	2	66 in.	544.12	N/A	1 - C	3.58	0.22	0.29	0.0260	INLET	0.00	F + 1	0.00

CULVERT ANALYSIS

PID : 77366 **Date :** 05/10/2007 **Project :** SR 823, Portsmouth Bypass **Location :** Portsmouth, Ohio

Description : Drainage area 103, Sta. 0+70, Driveway at Pershing Avenue (Sta. 17+50' Lt.) **Designer :** dl

HEADWATER CONTROL CODES:

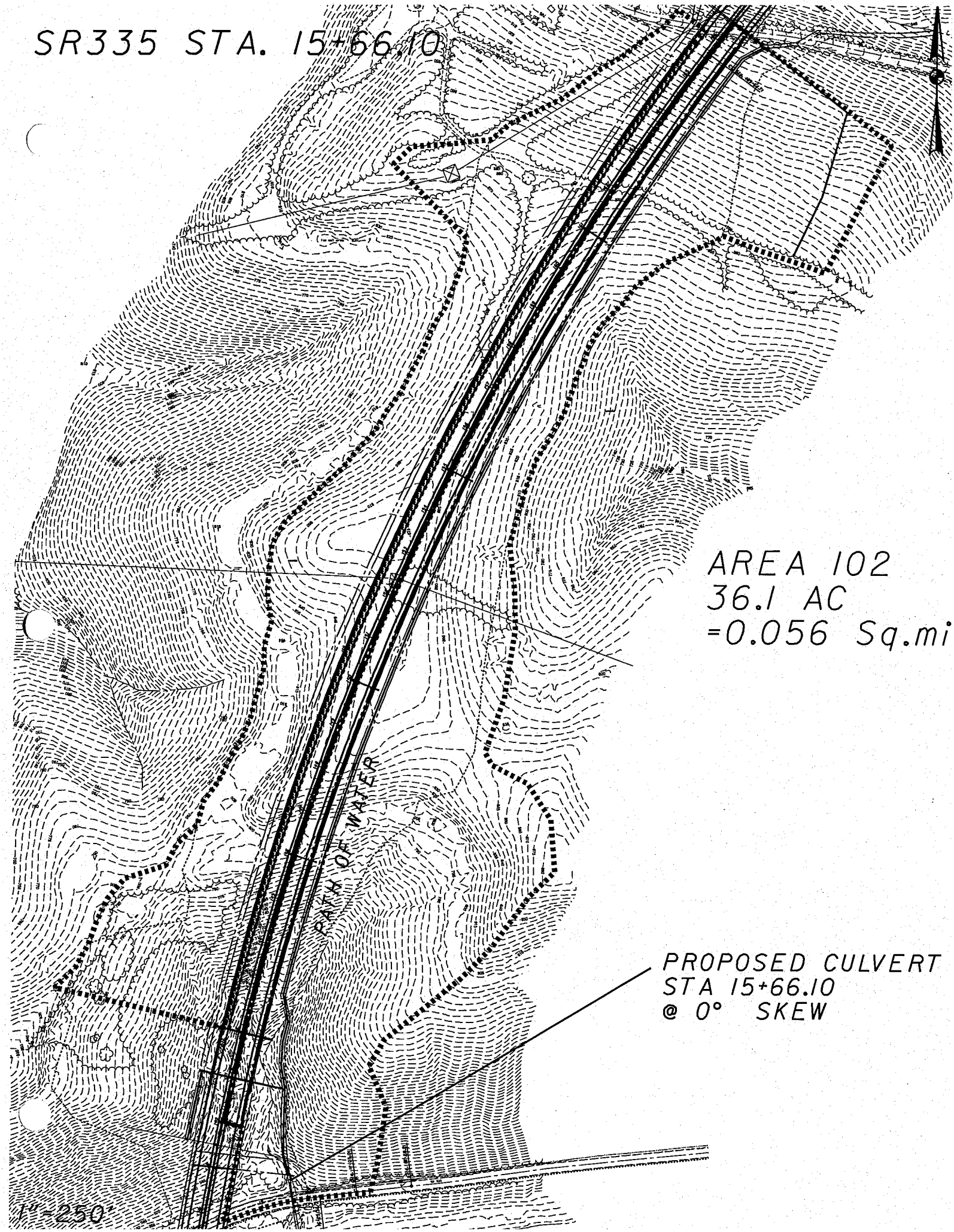
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Pipe Number : 1 **Use HW :** 0 **Inlet Invert Elevation (ft.) :** 543.46 **Outlet Invert Elevation (ft.) :** 540.86
Pipe Quantity : 1

Culvert Type : Circular Corrugated
Corrugation Type : Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations) **Pipe Length (ft.) :** 52.00 **Culvert Slope (ft./ft.) :** 0.0500
Pipe Size : 24 in.
Design Manning 'n' : (default)

Entrance Type : Half Headwall **Loss Coef. Ke :** 0.9000

FLOW (cfs.)	HEAD LOSS (ft.)	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	BURIED DEPTH (ft.)	TAILWATER ELEVATION (ft.)
1.90	2.01	544.11	N/A	1 - C	4.90	0.36	0.48	0.0247	INLET	0.00	540.86
2.36	2.07	544.20	N/A	1 - C	5.21	0.40	0.53	0.0247	INLET	0.00	540.86


SR335 STA. 15+66.10
AREA 102
36.1 AC
=0.056 Sq.mi
OAK HOLLOW
PROPOSED CULVERT
STA 15+66.10
@ 0° SKEW
1"=250'

STA. 15+66.10, SR 335
TECHNIQUES FOR ESTIMATING FLOOD-PEAK
DISCHARGES OF RURAL, UNREGULATED STREAMS IN OHIO AREA A
U.S. GEOLOGICAL SURVEY Water Resources Investigations Report 89-4126

Values	Units	Definitions
1571049.50	SQ. FT.	
0.056	SQ. MI.	**CONTDA** = Contributing Drainage Area
0.00	SQ. FT.	
0.00	%	**STORAGE** = Storage Area
3285.00	FT.	**TOTAL CHANNEL LENGTH**
328.50	FT.	L_{10} = 10% of the Distance along channel
626	FT.	$Elev_{10}$ = Elevation at point L_{10}
2792.25	FT.	L_{85} = 85% of the Distance along channel
736	FT.	$Elev_{85}$ = Elevation at point L_{85}
2463.75	FT.	**Length** = $L_{85} - L_{10}$
234.91	FT./MI.	**SLOPE** = $(Elev_{10}-Elev_{85})$/Length
	CFS	$Q_{\#}$ = Flood-Peak Discharge
		# = Frequency of Storm

Q_2	15.13	CFS	$= 56.1(CONTDA)^{0.782}(SLOPE)^{0.172}(STORAGE+1)^{-0.297}$
Q_5	30.92	CFS	$= 84.5(CONTDA)^{0.769}(SLOPE)^{0.221}(STORAGE+1)^{-0.322}$
Q_{10}	43.78	CFS	$= 104(CONTDA)^{0.764}(SLOPE)^{0.244}(STORAGE+1)^{-0.335}$
Q_{25}	61.26	CFS	$= 129(CONTDA)^{0.760}(SLOPE)^{0.264}(STORAGE+1)^{-0.347}$
Q_{50}	75.70	CFS	$= 148(CONTDA)^{0.757}(SLOPE)^{0.276}(STORAGE+1)^{-0.355}$
Q_{100}	89.97	CFS	$= 167(CONTDA)^{0.756}(SLOPE)^{0.285}(STORAGE+1)^{-0.363}$

Worksheet for SR335_15+66.10

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.35000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	5.00	ft
Discharge	61.26	ft^3/s

Results

Normal Depth	0.67	ft
Flow Area	4.25	ft^2
Wetted Perimeter	8.00	ft
Top Width	7.68	ft
Critical Depth	1.38	ft
Critical Slope	0.02511	ft/ft
Velocity	14.41	ft/s
Velocity Head	3.23	ft
Specific Energy	3.90	ft
Froude Number	3.42	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.67	ft
Critical Depth	1.38	ft
Channel Slope	0.35000	ft/ft
Critical Slope	0.02511	ft/ft

UNIVERSAL CULVERT DESIGN

PID : 77366 **Date :** 06/14/2007 **Project :** SR 823 Portsmouth Bypass **Location :** Portsmouth Ohio

Description : Drainage area 102, 15+66.10, SR335 **Designer :** DL

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 528.22 **Outlet Invert Elevation (ft.) :** 527.56 **Tailwater Elevation (ft.) :** 528.23 **Overflow Elevation (ft.) :** 535.39

Allowable Headwater Elevation (ft.) : 534.39 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 66.50 **Culvert Slope (ft./ft.) :** 0.0100 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 61.26 @ 25 yrs. **Flood Discharge (cfs) :** 90.00 @ 50 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.20		
61.26	1	36 in.	532.64	532.19	2 - E	11.46	2.12	2.52	0.0120	INLET	0.00	D	0.00
61.26	1	33 in.	533.43	532.92	2 - E	10.31	2.75	2.50	0.0120	INLET	0.00	D - 1	0.00
61.26	1	30 in.	534.76	534.17	2 - E	12.48	2.50	2.40	0.0120	INLET	0.00	D - 2	0.00
61.26	1	42 in.	531.92	N/A	1 - C	11.66	1.88	2.45	0.0120	INLET	0.00	D + 1	0.00
90.00	1	36 in.	535.31	534.53	2 - E	12.73	3.00	2.85	0.0120	INLET	0.00	F	0.00
77.50	1	33 in.	537.15	536.18	2 - E	13.05	2.75	2.64	0.0120	INLET	12.50	F - 1	0.00
65.20	1	30 in.	540.29	539.02	2 - E	13.28	2.50	2.42	0.0120	INLET	24.80	F - 2	0.00
90.00	1	42 in.	533.37	532.86	2 - E	12.65	2.43	2.94	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall								**Entrance Loss (Ke) :** 0.90		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
61.26	1	42 in.	532.39	532.64	2 - F	8.50	3.50	2.45	0.0237	OUTLET*	0.00	D	0.00

USE 42" CONC. PIPE

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
61.26	1	36 in.	533.86	534.45	2 - F	9.65	3.00	2.52	0.0241	OUTLET**	0.00	D - 1	0.00
56.36	1	33 in.	535.24	536.37	2 - F	10.13	2.75	2.44	0.0241	OUTLET**	4.90	D - 2	0.00
61.26	1	48 in.	531.83	532.28	1 - A	7.95	2.64	2.36	0.0235	OUTLET*	0.00	D + 1	0.00
90.00	1	42 in.	534.79	535.12	2 - F	10.42	3.50	2.94	0.0237	OUTLET**	0.00	F	0.00
67.50	1	36 in.	537.98	539.40	2 - F	10.30	3.00	2.62	0.0241	OUTLET**	22.50	F - 1	0.00
56.30	1	33 in.	540.69	543.63	2 - F	10.12	2.75	2.44	0.0241	OUTLET**	33.70	F - 2	0.00
90.00	1	48 in.	533.24	533.46	2 - F	9.31	4.00	2.88	0.0235	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
61.26	1	42 in.	532.39	532.85	2 - F	8.50	3.50	2.45	0.0278	OUTLET**	0.00	D	0.00
61.26	1	36 in.	533.86	535.14	2 - F	9.65	3.00	2.52	0.0281	OUTLET**	0.00	D - 1	0.00
61.26	1	48 in.	531.83	532.27	1 - A	7.95	2.97	2.36	0.0275	OUTLET*	0.00	D + 1	0.00
86.60	1	42 in.	534.79	535.78	2 - F	10.17	3.50	2.90	0.0278	OUTLET**	3.40	F	0.00
62.70	1	36 in.	537.98	540.89	2 - F	9.80	3.00	2.55	0.0281	OUTLET**	27.30	F - 1	0.00
90.00	1	48 in.	533.24	533.67	2 - F	9.31	4.00	2.88	0.0275	OUTLET**	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
61.26	1	60 in.	531.44	531.87	1 - A	7.35	2.79	2.20	0.0332	OUTLET*	0.00	D	0.00
61.26	1	66 in.	531.32	531.71	1 - A	7.16	2.63	2.14	0.0330	OUTLET*	0.00	D + 1	0.00
90.00	1	60 in.	532.25	532.80	1 - A	8.35	3.65	2.69	0.0332	OUTLET*	0.00	F	0.00
90.00	1	66 in.	532.07	532.58	1 - A	8.08	3.33	2.62	0.0330	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
61.26	1	60 in.	531.44	531.88	1 - A	7.35	2.41	2.20	0.0260	OUTLET*	0.00	D	0.00
61.26	1	66 in.	531.32	531.76	1 - A	7.16	2.30	2.14	0.0260	OUTLET*	0.00	D + 1	0.00
90.00	1	60 in.	532.25	532.77	1 - A	8.35	3.06	2.69	0.0260	OUTLET*	0.00	F	0.00
90.00	1	66 in.	532.07	532.60	1 - A	8.08	2.87	2.62	0.0260	OUTLET*	0.00	F + 1	0.00

APPENDIX E

Ditch Calculations

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : US52 A, STA. 44+50 TO STA. 44+00, RHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
44+50	40+00	R	450.00	10.00	3.00	1.00	0.0899	1.11	1.11	0.72	0.80	Seed	3.68	5	0.030	17.40	3.04	0.53	2.94	0.10	10.38
												Jute Mat	3.63	5	0.040	17.87	2.54	0.63	2.91	0.11	10.45
												Temp. Mat	3.63	5	0.040	17.87	2.54	0.63	2.91	0.11	10.45
												Temp. Mat	4.27	10	0.040	17.69	2.70	0.69	3.42	0.12	10.49

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : US52 A, STA. 44+50 TO STA. 62+50, RHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
44+50	61+00	R	1650.0	10.00	3.00	0.50	0.0078	6.81	6.81	0.73	4.97	Seed	3.09	5	0.030	24.54	2.65	0.26	15.36	0.53	11.86
												Seed	3.51	10	0.040	25.90	2.30	0.33	17.45	0.68	12.38
61+00	62+50	R	150.00	10.00	3.00	0.50	0.1587 *	0.34	7.16	0.71	5.22	Seed	3.06	5	0.030	24.90	6.96	2.19	15.99	0.22	10.77
												Jute Mat	3.06	5	0.040	24.97	5.82	2.60	15.96	0.26	10.92
												Temp. Mat	3.06	5	0.040	24.97	5.82	2.60	15.96	0.26	10.92
												Perm, Type 1	3.06	5	0.040	24.97	5.82	2.60	15.96	0.26	10.92
												Perm, Type 2	3.06	5	0.040	24.97	5.82	2.60	15.96	0.26	10.92
												Perm, Type 2	3.48	10	0.040	26.31	6.10	2.80	18.14	0.28	10.99

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR140 A, STA. 68+50 TO STA. 64+00, RHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
68+50	64+00	R	400.00	10.00	3.00	0.50	0.0618	1.58	1.58	0.73	1.15	Seed	3.71	5	0.030	17.08	3.14	0.51	4.27	0.13	10.47
												Jute Mat	3.67	5	0.040	17.48	2.62	0.61	4.22	0.16	10.55
												Temp. Mat	3.67	5	0.040	17.48	2.62	0.61	4.22	0.16	10.55
												Temp. Mat	4.31	10	0.040	17.34	2.79	0.67	4.96	0.17	10.61

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR140 A, STA. 68+50 TO STA. 69+00, RHS

Designer : MDC

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
68+50	69+00	R	50.00	10.00	2.00	2.00	0.0340	0.12	0.12	0.74	0.09	Seed	3.84	5	0.030	15.86	0.99	0.07	0.35	0.03	10.14
												Seed	4.48	10	0.040	15.95	0.88	0.10	0.40	0.05	10.18

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 96+00 TO STA. 69+50, RHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
96+00	76+00	R	2000.0	10.00	3.00	0.50	0.0348	11.34	11.34	0.73	8.28	Seed	3.36	5	0.030	20.94	5.30	1.05	27.80	0.48	11.69
												Jute Mat	3.26	5	0.040	22.16	4.36	1.22	27.00	0.56	11.97
												Temp. Mat	3.26	5	0.040	22.16	4.36	1.22	27.00	0.56	11.97
												Perm, Type 1	3.26	5	0.040	22.16	4.36	1.22	27.00	0.56	11.97
												Perm, Type 1	3.85	10	0.040	21.78	4.62	1.35	31.88	0.62	12.18
76+00	69+50	R	650.00	10.00	3.00	1.00	0.0730	4.24	15.58	0.74	11.41	Seed	3.15	5	0.030	23.62	7.34	2.05	35.99	0.45	11.80
												Jute Mat	3.13	5	0.040	23.91	6.09	2.42	35.75	0.53	12.12
												Temp. Mat	3.13	5	0.040	23.91	6.09	2.42	35.75	0.53	12.12
												Perm, Type 1	3.13	5	0.040	23.91	6.09	2.42	35.75	0.53	12.12
												Perm, Type 2	3.13	5	0.040	23.91	6.09	2.42	35.75	0.53	12.12
												Perm, Type 2	3.71	10	0.040	23.43	6.46	2.67	42.29	0.59	12.34

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 96+00 TO STA. 105+00, RHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
96+00	105+00	R	900.00	10.00	3.00	0.50	0.0172	2.72	2.72	0.75	2.04	Seed	3.39	5	0.030	20.58	2.54	0.28	6.91	0.26	10.91
												Seed	3.90	10	0.040	21.31	2.24	0.36	7.94	0.34	11.17

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 105+50 TO STA. 107+00, RHS

Designer : MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
105+50	106+00	R	50.00	10.00	4.00	4.00	0.0740	15.87	15.87	0.73	11.59	Seed	3.92	5	0.030	15.11	7.60	2.30	45.41	0.50	13.99
												Jute Mat	3.92	5	0.040	15.13	6.27	2.71	45.38	0.59	14.69
												Temp. Mat	3.92	5	0.040	15.13	6.27	2.71	45.38	0.59	14.69
												Perm, Type 1	3.92	5	0.040	15.13	6.27	2.71	45.38	0.59	14.69
												Perm, Type 2	3.92	5	0.040	15.13	6.27	2.71	45.38	0.59	14.69
												Perm, Type 2	4.59	10	0.040	15.13	6.59	2.96	53.14	0.64	15.13
106+00	107+00	R	100.00	10.00	4.00	4.00	0.0800	0.99	16.86	0.72	12.30	Seed	3.89	5	0.030	15.34	7.94	2.51	47.88	0.50	14.02
												Jute Mat	3.89	5	0.040	15.39	6.54	2.95	47.82	0.59	14.73
												Temp. Mat	3.89	5	0.040	15.39	6.54	2.95	47.82	0.59	14.73
												Perm, Type 1	3.89	5	0.040	15.39	6.54	2.95	47.82	0.59	14.73
												Perm, Type 2	3.89	5	0.040	15.39	6.54	2.95	47.82	0.59	14.73
												Perm, Type 2	4.56	10	0.040	15.37	6.89	3.23	56.01	0.65	15.17

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 118+50 TO STA. 120+50, RHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
118+50	120+50	R	200.00	10.00	4.00	4.00	0.0150	0.93	0.93	0.70	0.65	Seed	3.71	5	0.030	17.04	1.60	0.13	2.42	0.14	11.14
												Seed	4.32	10	0.040	17.31	1.41	0.17	2.81	0.19	11.48

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 124+50 TO STA. 128+50, RHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
124+50	128+50	R	400.00	12.00	3.00	3.00	0.0538	2.27	2.27	0.70	1.59	Seed	3.71	5	0.030	17.07	3.16	0.50	5.90	0.15	12.90
												Jute Mat	3.67	5	0.040	17.47	2.63	0.59	5.83	0.18	13.06
												Temp. Mat	3.67	5	0.040	17.47	2.63	0.59	5.83	0.18	13.06
												Temp. Mat	4.31	10	0.040	17.33	2.80	0.65	6.85	0.19	13.17

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 131+50 TO STA. 129+00, RHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
131+50	130+00	R	150.00	10.00	4.00	4.00	0.0167	0.63	0.63	0.70	0.44	Seed	3.75	5	0.030	16.72	1.43	0.12	1.65	0.11	10.89
												Seed	4.36	10	0.040	16.94	1.27	0.15	1.92	0.14	11.15
130+00	129+50	R	50.00	10.00	4.00	4.00	0.0900	2.02	2.65	0.87	2.20	Seed	3.73	5	0.030	16.91	4.42	0.97	8.19	0.17	11.39
												Jute Mat	3.72	5	0.040	16.95	3.68	1.15	8.18	0.21	11.64
												Temp. Mat	3.72	5	0.040	16.95	3.68	1.15	8.18	0.21	11.64
												Perm, Type 1	3.72	5	0.040	16.95	3.68	1.15	8.18	0.21	11.64
												Perm, Type 1	4.33	10	0.040	17.15	3.89	1.26	9.52	0.22	11.80
129+50	129+00	R	75.00	15.00	4.00	4.00	0.2933 *	0.95	3.60	0.70	2.86	Seed	3.70	5	0.030	17.15	6.12	2.05	10.59	0.11	15.90
												Jute Mat	3.70	5	0.040	17.19	5.12	2.44	10.58	0.13	16.06
												Temp. Mat	3.70	5	0.040	17.19	5.12	2.44	10.58	0.13	16.06
												Perm, Type 1	3.70	5	0.040	17.19	5.12	2.44	10.58	0.13	16.06
												Perm, Type 2	3.70	5	0.040	17.19	5.12	2.44	10.58	0.13	16.06
												Perm, Type 2	4.31	10	0.040	17.38	5.43	2.67	12.32	0.15	16.17

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 166+00 TO STA. 140+00, RHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
166+00	161+00	R	500.00	10.00	3.00	0.50	0.0150	2.14	2.14	0.74	1.58	Seed	3.57	5	0.030	18.56	2.26	0.22	5.64	0.24	10.84
												Seed	4.12	10	0.040	19.02	1.99	0.29	6.52	0.31	11.09
161+00	155+00	R	600.00	10.00	3.00	0.50	0.0363	2.62	4.76	0.78	3.63	Seed	3.35	5	0.030	21.02	3.97	0.66	12.16	0.29	11.02
												Jute Mat	3.31	5	0.040	21.51	3.30	0.78	12.02	0.34	11.20
												Temp. Mat	3.31	5	0.040	21.51	3.30	0.78	12.02	0.34	11.20
												Temp. Mat	3.85	10	0.040	21.82	3.48	0.85	13.96	0.38	11.32
155+00	150+00	R	500.00	10.00	3.00	0.50	0.0498	3.01	7.77	0.76	5.91	Seed	3.19	5	0.030	23.11	5.16	1.07	18.86	0.34	11.21
												Jute Mat	3.17	5	0.040	23.42	4.29	1.27	18.73	0.41	11.43
												Temp. Mat	3.17	5	0.040	23.42	4.29	1.27	18.73	0.41	11.43
												Perm, Type 1	3.17	5	0.040	23.42	4.29	1.27	18.73	0.41	11.43
												Perm, Type 1	3.69	10	0.040	23.63	4.53	1.39	21.81	0.45	11.56
150+00	146+00	R	400.00	10.00	3.00	0.50	0.0500	2.54	10.31	0.76	7.84	Seed	3.08	5	0.030	24.59	5.66	1.25	24.20	0.40	11.40
												Jute Mat	3.07	5	0.040	24.83	4.70	1.48	24.07	0.47	11.65

DITCH ANALYSIS

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
												Temp. Mat	3.07	5	0.040	24.83	4.70	1.48	24.07	0.47	11.65
												Perm, Type 1	3.07	5	0.040	24.83	4.70	1.48	24.07	0.47	11.65
												Perm, Type 1	3.58	10	0.040	24.96	4.97	1.62	28.09	0.52	11.81
146+00	143+00	R	300.00	10.00	3.00	0.50	0.0500	1.17	11.48	0.80	8.78	Seed	3.01	5	0.030	25.68	5.84	1.31	26.45	0.42	11.48
												Jute Mat	3.00	5	0.040	25.85	4.86	1.56	26.35	0.50	11.75
												Temp. Mat	3.00	5	0.040	25.85	4.86	1.56	26.35	0.50	11.75
												Perm, Type 1	3.00	5	0.040	25.85	4.86	1.56	26.35	0.50	11.75
												Perm, Type 1	3.51	10	0.040	25.92	5.13	1.71	30.79	0.55	11.92
143+00	142+00	R	100.00	10.00	4.00	2.00	0.0760	4.36	15.84	0.70	11.83	Seed	2.99	5	0.030	26.08	7.21	2.06	35.33	0.43	12.60
												Jute Mat	2.98	5	0.040	26.13	5.97	2.43	35.30	0.51	13.07
												Temp. Mat	2.98	5	0.040	26.13	5.97	2.43	35.30	0.51	13.07
												Perm, Type 1	2.98	5	0.040	26.13	5.97	2.43	35.30	0.51	13.07
												Perm, Type 2	2.98	5	0.040	26.13	5.97	2.43	35.30	0.51	13.07
												Perm, Type 2	3.49	10	0.040	26.19	6.30	2.66	41.25	0.56	13.36
142+00	141+00	R	100.00	15.00	4.00	2.00	0.1800*	12.37	28.21	0.89	22.84	Seed	2.97	5	0.030	26.28	10.69	4.41	67.89	0.39	17.36
												Jute Mat	2.97	5	0.040	26.31	8.90	5.22	67.85	0.46	17.79
												Temp. Mat	2.97	5	0.040	26.31	8.90	5.22	67.85	0.46	17.79
												Perm, Type 1	2.97	5	0.040	26.31	8.90	5.22	67.85	0.46	17.79
												Perm, Type 2	2.97	5	0.040	26.31	8.90	5.22	67.85	0.46	17.79
												Perm, Type 3	2.97	5	0.040	26.31	8.90	5.22	67.85	0.46	17.79

DITCH ANALYSIS

STATION BEGIN	STATION END	SIDE LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
												2.97	5	0.060	26.37	6.86		67.77	0.59	18.54

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 166+00 TO STA. 168+50, RHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
166+00	166+50	R	50.00	10.00	3.00	0.50	0.2240*	0.29	0.29	0.73	0.21	Seed	3.89	5	0.030	15.34	2.40	0.47	0.81	0.03	10.12
												Jute Mat	3.89	5	0.040	15.41	2.03	0.55	0.81	0.04	10.14
												Temp. Mat	3.89	5	0.040	15.41	2.03	0.55	0.81	0.04	10.14
												Temp. Mat	4.55	10	0.040	15.38	2.15	0.61	0.95	0.04	10.15
166+50	168+50	R	300.00	10.00	2.00	4.00	0.2020*	8.07	8.36	0.87	7.23	Seed	3.83	5	0.030	15.96	9.05	3.55	27.67	0.28	11.69
												Jute Mat	3.82	5	0.040	16.07	7.52	4.20	27.58	0.33	12.00
												Temp. Mat	3.82	5	0.040	16.07	7.52	4.20	27.58	0.33	12.00
												Perm, Type 1	3.82	5	0.040	16.07	7.52	4.20	27.58	0.33	12.00
												Perm, Type 2	3.82	5	0.040	16.07	7.52	4.20	27.58	0.33	12.00
												Perm, Type 3	3.82	5	0.040	16.07	7.52	4.20	27.58	0.33	12.00
												Perm, Type 3	4.47	10	0.040	16.01	7.96	4.61	32.34	0.37	12.20

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 169+50 TO STA. 173+00, RHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
169+50	173+00	R	350.00	10.00	3.00	0.50	0.0114	0.78	0.78	0.74	0.58	Seed	3.53	5	0.030	18.98	1.41	0.10	2.03	0.14	10.49
												Seed	4.08	10	0.040	19.48	1.25	0.13	2.35	0.18	10.64

APPENDIX E

Ditch Calculations

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : US52 A, STA. 44+50 TO STA. 44+00, RHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	Jute Mat: 0.45	Temporary Mat:	1.00
Permanent Mat	Type 1:	2.00	Type 2: 3.00	Type 3:	5.00
RCP	Type B:	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
44+50	40+00	R	450.00	10.00	3.00	1.00	0.0899	1.11	1.11	0.72	0.80	Seed	3.68	5	0.030	17.40	3.04	0.53	2.94	0.10	10.38
												Jute Mat	3.63	5	0.040	17.87	2.54	0.63	2.91	0.11	10.45
												Temp. Mat	3.63	5	0.040	17.87	2.54	0.63	2.91	0.11	10.45
												Temp. Mat	4.27	10	0.040	17.69	2.70	0.69	3.42	0.12	10.49

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : US52 A, STA. 44+50 TO STA. 62+50, RHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
44+50	61+00	R	1650.0	10.00	3.00	0.50	0.0078	6.81	6.81	0.73	4.97	Seed	3.09	5	0.030	24.54	2.65	0.26	15.36	0.53	11.86
												Seed	3.51	10	0.040	25.90	2.30	0.33	17.45	0.68	12.38
61+00	62+50	R	150.00	10.00	3.00	0.50	0.1587 *	0.34	7.16	0.71	5.22	Seed	3.06	5	0.030	24.90	6.96	2.19	15.99	0.22	10.77
												Jute Mat	3.06	5	0.040	24.97	5.82	2.60	15.96	0.26	10.92
												Temp. Mat	3.06	5	0.040	24.97	5.82	2.60	15.96	0.26	10.92
												Perm, Type 1	3.06	5	0.040	24.97	5.82	2.60	15.96	0.26	10.92
												Perm, Type 2	3.06	5	0.040	24.97	5.82	2.60	15.96	0.26	10.92
												Perm, Type 2	3.48	10	0.040	26.31	6.10	2.80	18.14	0.28	10.99

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR140 A, STA. 68+50 TO STA. 64+00, RHS

Designer : MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
68+50	64+00	R	400.00	10.00	3.00	0.50	0.0618	1.58	1.58	0.73	1.15	Seed	3.71	5	0.030	17.08	3.14	0.51	4.27	0.13	10.47
												Jute Mat	3.67	5	0.040	17.48	2.62	0.61	4.22	0.16	10.55
												Temp. Mat	3.67	5	0.040	17.48	2.62	0.61	4.22	0.16	10.55
												Temp. Mat	4.31	10	0.040	17.34	2.79	0.67	4.96	0.17	10.61

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR140 A, STA. 68+50 TO STA. 69+00, RHS

Designer : MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	Jute Mat: 0.45	Temporary Mat:	1.00
Permanent Mat	Type 1:	2.00	Type 2: 3.00	Type 3:	5.00
RCP	Type B:	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
68+50	69+00	R	50.00	10.00	2.00	2.00	0.0340	0.12	0.12	0.74	0.09	Seed	3.84	5	0.030	15.86	0.99	0.07	0.35	0.03	10.14
												Seed	4.48	10	0.040	15.95	0.88	0.10	0.40	0.05	10.18

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 96+00 TO STA. 69+50, RHS

Designer : MDC

Rainfall Area : D

Allowable Shears

		Seed:	0.40	Jute Mat:	0.45	Temporary Mat:	1.00
	Permanent Mat	Type 1:	2.00	Type 2:	3.00	Type 3:	5.00
	RCP	Type B:	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
96+00	76+00	R	2000.0	10.00	3.00	0.50	0.0348	11.34	11.34	0.73	8.28	Seed	3.36	5	0.030	20.94	5.30	1.05	27.80	0.48	11.69
												Jute Mat	3.26	5	0.040	22.16	4.36	1.22	27.00	0.56	11.97
												Temp. Mat	3.26	5	0.040	22.16	4.36	1.22	27.00	0.56	11.97
												Perm, Type 1	3.26	5	0.040	22.16	4.36	1.22	27.00	0.56	11.97
												Perm, Type 1	3.85	10	0.040	21.78	4.62	1.35	31.88	0.62	12.18
76+00	69+50	R	650.00	10.00	3.00	1.00	0.0730	4.24	15.58	0.74	11.41	Seed	3.15	5	0.030	23.62	7.34	2.05	35.99	0.45	11.80
												Jute Mat	3.13	5	0.040	23.91	6.09	2.42	35.75	0.53	12.12
												Temp. Mat	3.13	5	0.040	23.91	6.09	2.42	35.75	0.53	12.12
												Perm, Type 1	3.13	5	0.040	23.91	6.09	2.42	35.75	0.53	12.12
												Perm, Type 2	3.13	5	0.040	23.91	6.09	2.42	35.75	0.53	12.12
												Perm, Type 2	3.71	10	0.040	23.43	6.46	2.67	42.29	0.59	12.34

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 96+00 TO STA. 105+00, RHS

Designer : MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
96+00	105+00	R	900.00	10.00	3.00	0.50	0.0172	2.72	2.72	0.75	2.04	Seed	3.39	5	0.030	20.58	2.54	0.28	6.91	0.26	10.91
												Seed	3.90	10	0.040	21.31	2.24	0.36	7.94	0.34	11.17

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 105+50 TO STA. 107+00, RHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	Jute Mat: 0.45	Temporary Mat:	1.00
Permanent Mat	Type 1:	2.00	Type 2: 3.00	Type 3:	5.00
RCP	Type B:	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
105+50	106+00	R	50.00	10.00	4.00	4.00	0.0740	15.87	15.87	0.73	11.59	Seed	3.92	5	0.030	15.11	7.60	2.30	45.41	0.50	13.99
												Jute Mat	3.92	5	0.040	15.13	6.27	2.71	45.38	0.59	14.69
												Temp. Mat	3.92	5	0.040	15.13	6.27	2.71	45.38	0.59	14.69
												Perm, Type 1	3.92	5	0.040	15.13	6.27	2.71	45.38	0.59	14.69
												Perm, Type 2	3.92	5	0.040	15.13	6.27	2.71	45.38	0.59	14.69
												Perm, Type 2	4.59	10	0.040	15.13	6.59	2.96	53.14	0.64	15.13
106+00	107+00	R	100.00	10.00	4.00	4.00	0.0800	0.99	16.86	0.72	12.30	Seed	3.89	5	0.030	15.34	7.94	2.51	47.88	0.50	14.02
												Jute Mat	3.89	5	0.040	15.39	6.54	2.95	47.82	0.59	14.73
												Temp. Mat	3.89	5	0.040	15.39	6.54	2.95	47.82	0.59	14.73
												Perm, Type 1	3.89	5	0.040	15.39	6.54	2.95	47.82	0.59	14.73
												Perm, Type 2	3.89	5	0.040	15.39	6.54	2.95	47.82	0.59	14.73
												Perm, Type 2	4.56	10	0.040	15.37	6.89	3.23	56.01	0.65	15.17

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 118+50 TO STA. 120+50, RHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
118+50	120+50	R	200.00	10.00	4.00	4.00	0.0150	0.93	0.93	0.70	0.65	Seed	3.71	5	0.030	17.04	1.60	0.13	2.42	0.14	11.14
												Seed	4.32	10	0.040	17.31	1.41	0.17	2.81	0.19	11.48

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 124+50 TO STA. 128+50, RHS

Designer : MDC

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
124+50	128+50	R	400.00	12.00	3.00	3.00	0.0538	2.27	2.27	0.70	1.59	Seed	3.71	5	0.030	17.07	3.16	0.50	5.90	0.15	12.90
												Jute Mat	3.67	5	0.040	17.47	2.63	0.59	5.83	0.18	13.06
												Temp. Mat	3.67	5	0.040	17.47	2.63	0.59	5.83	0.18	13.06
												Temp. Mat	4.31	10	0.040	17.33	2.80	0.65	6.85	0.19	13.17

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 131+50 TO STA. 129+00, RHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
Permanent Mat		**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP		**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
131+50	130+00	R	150.00	10.00	4.00	4.00	0.0167	0.63	0.63	0.70	0.44	Seed	3.75	5	0.030	16.72	1.43	0.12	1.65	0.11	10.89
												Seed	4.36	10	0.040	16.94	1.27	0.15	1.92	0.14	11.15
130+00	129+50	R	50.00	10.00	4.00	4.00	0.0900	2.02	2.65	0.87	2.20	Seed	3.73	5	0.030	16.91	4.42	0.97	8.19	0.17	11.39
												Jute Mat	3.72	5	0.040	16.95	3.68	1.15	8.18	0.21	11.64
												Temp. Mat	3.72	5	0.040	16.95	3.68	1.15	8.18	0.21	11.64
												Perm, Type 1	3.72	5	0.040	16.95	3.68	1.15	8.18	0.21	11.64
												Perm, Type 1	4.33	10	0.040	17.15	3.89	1.26	9.52	0.22	11.80
129+50	129+00	R	75.00	15.00	4.00	4.00	0.2933 *	0.95	3.60	0.70	2.86	Seed	3.70	5	0.030	17.15	6.12	2.05	10.59	0.11	15.90
												Jute Mat	3.70	5	0.040	17.19	5.12	2.44	10.58	0.13	16.06
												Temp. Mat	3.70	5	0.040	17.19	5.12	2.44	10.58	0.13	16.06
												Perm, Type 1	3.70	5	0.040	17.19	5.12	2.44	10.58	0.13	16.06
												Perm, Type 2	3.70	5	0.040	17.19	5.12	2.44	10.58	0.13	16.06
												Perm, Type 2	4.31	10	0.040	17.38	5.43	2.67	12.32	0.15	16.17

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 166+00 TO STA. 140+00, RHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
166+00	161+00	R	500.00	10.00	3.00	0.50	0.0150	2.14	2.14	0.74	1.58	Seed	3.57	5	0.030	18.56	2.26	0.22	5.64	0.24	10.84
												Seed	4.12	10	0.040	19.02	1.99	0.29	6.52	0.31	11.09
161+00	155+00	R	600.00	10.00	3.00	0.50	0.0363	2.62	4.76	0.78	3.63	Seed	3.35	5	0.030	21.02	3.97	0.66	12.16	0.29	11.02
												Jute Mat	3.31	5	0.040	21.51	3.30	0.78	12.02	0.34	11.20
												Temp. Mat	3.31	5	0.040	21.51	3.30	0.78	12.02	0.34	11.20
												Temp. Mat	3.85	10	0.040	21.82	3.48	0.85	13.96	0.38	11.32
155+00	150+00	R	500.00	10.00	3.00	0.50	0.0498	3.01	7.77	0.76	5.91	Seed	3.19	5	0.030	23.11	5.16	1.07	18.86	0.34	11.21
												Jute Mat	3.17	5	0.040	23.42	4.29	1.27	18.73	0.41	11.43
												Temp. Mat	3.17	5	0.040	23.42	4.29	1.27	18.73	0.41	11.43
												Perm, Type 1	3.17	5	0.040	23.42	4.29	1.27	18.73	0.41	11.43
												Perm, Type 1	3.69	10	0.040	23.63	4.53	1.39	21.81	0.45	11.56
150+00	146+00	R	400.00	10.00	3.00	0.50	0.0500	2.54	10.31	0.76	7.84	Seed	3.08	5	0.030	24.59	5.66	1.25	24.20	0.40	11.40
												Jute Mat	3.07	5	0.040	24.83	4.70	1.48	24.07	0.47	11.65

DITCH ANALYSIS

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
												Temp. Mat	3.07	5	0.040	24.83	4.70	1.48	24.07	0.47	11.65
												Perm, Type 1	3.07	5	0.040	24.83	4.70	1.48	24.07	0.47	11.65
												Perm, Type 1	3.58	10	0.040	24.96	4.97	1.62	28.09	0.52	11.81
146+00	143+00	R	300.00	10.00	3.00	0.50	0.0500	1.17	11.48	0.80	8.78	Seed	3.01	5	0.030	25.68	5.84	1.31	26.45	0.42	11.48
												Jute Mat	3.00	5	0.040	25.85	4.86	1.56	26.35	0.50	11.75
												Temp. Mat	3.00	5	0.040	25.85	4.86	1.56	26.35	0.50	11.75
												Perm, Type 1	3.00	5	0.040	25.85	4.86	1.56	26.35	0.50	11.75
												Perm, Type 1	3.51	10	0.040	25.92	5.13	1.71	30.79	0.55	11.92
143+00	142+00	R	100.00	10.00	4.00	2.00	0.0760	4.36	15.84	0.70	11.83	Seed	2.99	5	0.030	26.08	7.21	2.06	35.33	0.43	12.60
												Jute Mat	2.98	5	0.040	26.13	5.97	2.43	35.30	0.51	13.07
												Temp. Mat	2.98	5	0.040	26.13	5.97	2.43	35.30	0.51	13.07
												Perm, Type 1	2.98	5	0.040	26.13	5.97	2.43	35.30	0.51	13.07
												Perm, Type 2	2.98	5	0.040	26.13	5.97	2.43	35.30	0.51	13.07
												Perm, Type 2	3.49	10	0.040	26.19	6.30	2.66	41.25	0.56	13.36
142+00	141+00	R	100.00	15.00	4.00	2.00	0.1800*	12.37	28.21	0.89	22.84	Seed	2.97	5	0.030	26.28	10.69	4.41	67.89	0.39	17.36
												Jute Mat	2.97	5	0.040	26.31	8.90	5.22	67.85	0.46	17.79
												Temp. Mat	2.97	5	0.040	26.31	8.90	5.22	67.85	0.46	17.79
												Perm, Type 1	2.97	5	0.040	26.31	8.90	5.22	67.85	0.46	17.79
												Perm, Type 2	2.97	5	0.040	26.31	8.90	5.22	67.85	0.46	17.79
												Perm, Type 3	2.97	5	0.040	26.31	8.90	5.22	67.85	0.46	17.79

DITCH ANALYSIS

STATION BEGIN	STATION END	SIDE LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
												2.97	5	0.060	26.37	6.86		67.77	0.59	18.54

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 166+00 TO STA. 168+50, RHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
166+00	166+50	R	50.00	10.00	3.00	0.50	0.2240 *	0.29	0.29	0.73	0.21	Seed	3.89	5	0.030	15.34	2.40	0.47	0.81	0.03	10.12
												Jute Mat	3.89	5	0.040	15.41	2.03	0.55	0.81	0.04	10.14
												Temp. Mat	3.89	5	0.040	15.41	2.03	0.55	0.81	0.04	10.14
												Temp. Mat	4.55	10	0.040	15.38	2.15	0.61	0.95	0.04	10.15
166+50	168+50	R	300.00	10.00	2.00	4.00	0.2020 *	8.07	8.36	0.87	7.23	Seed	3.83	5	0.030	15.96	9.05	3.55	27.67	0.28	11.69
												Jute Mat	3.82	5	0.040	16.07	7.52	4.20	27.58	0.33	12.00
												Temp. Mat	3.82	5	0.040	16.07	7.52	4.20	27.58	0.33	12.00
												Perm, Type 1	3.82	5	0.040	16.07	7.52	4.20	27.58	0.33	12.00
												Perm, Type 2	3.82	5	0.040	16.07	7.52	4.20	27.58	0.33	12.00
												Perm, Type 3	3.82	5	0.040	16.07	7.52	4.20	27.58	0.33	12.00
												Perm, Type 3	4.47	10	0.040	16.01	7.96	4.61	32.34	0.37	12.20

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 169+50 TO STA. 173+00, RHS

Designer : MDC

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
169+50	173+00	R	350.00	10.00	3.00	0.50	0.0114	0.78	0.78	0.74	0.58	Seed	3.53	5	0.030	18.98	1.41	0.10	2.03	0.14	10.49
												Seed	4.08	10	0.040	19.48	1.25	0.13	2.35	0.18	10.64

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 179+00 TO STA. 177+00, RHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
179+00	177+00	R	200.00	10.00	4.00	2.00	0.1975 *	2.36	2.36	0.70	1.65	Seed	3.86	5	0.030	15.64	5.18	1.46	6.37	0.12	10.71
												Jute Mat	3.85	5	0.040	15.76	4.33	1.73	6.35	0.14	10.84
												Temp. Mat	3.85	5	0.040	15.76	4.33	1.73	6.35	0.14	10.84
												Perm, Type 1	3.85	5	0.040	15.76	4.33	1.73	6.35	0.14	10.84
												Perm, Type 1	4.51	10	0.040	15.72	4.61	1.90	7.44	0.15	10.93

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 179+00 TO STA. 182+00, RHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
179+00	182+00	R	300.00	10.00	3.00	2.00	0.1150 *	3.45	3.45	0.70	2.41	Seed	3.82	5	0.030	15.98	5.07	1.25	9.22	0.17	10.87
												Jute Mat	3.80	5	0.040	16.17	4.23	1.48	9.17	0.21	11.03
												Temp. Mat	3.80	5	0.040	16.17	4.23	1.48	9.17	0.21	11.03
												Perm, Type 1	3.80	5	0.040	16.17	4.23	1.48	9.17	0.21	11.03
												Perm, Type 1	4.46	10	0.040	16.10	4.49	1.63	10.76	0.23	11.13

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 207+00 TO STA. 182+00, RHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
207+00	186+50	R	2050.0	10.00	3.00	1.00	0.0337	20.50	20.50	0.71	14.56	Seed	3.43	5	0.030	20.08	6.41	1.44	49.95	0.68	12.74
												Jute Mat	3.34	5	0.040	21.15	5.26	1.68	48.65	0.80	13.19
												Temp. Mat	3.34	5	0.040	21.15	5.26	1.68	48.65	0.80	13.19
												Perm, Type 1	3.34	5	0.040	21.15	5.26	1.68	48.65	0.80	13.19
												Perm, Type 1	3.94	10	0.040	20.84	5.56	1.84	57.36	0.88	13.51
186+50	185+00	R	150.00	10.00	2.00	2.00	0.0367	1.31	21.81	0.78	15.58	Seed	3.31	5	0.030	21.53	6.69	1.55	51.60	0.68	12.72
												Jute Mat	3.31	5	0.040	21.60	5.53	1.84	51.50	0.80	13.21
												Temp. Mat	3.31	5	0.040	21.60	5.53	1.84	51.50	0.80	13.21
												Perm, Type 1	3.31	5	0.040	21.60	5.53	1.84	51.50	0.80	13.21
												Perm, Type 1	3.90	10	0.040	21.26	5.85	2.02	60.75	0.88	13.53
185+00			150.00	10.00	2.00	2.00	0.2480	1.06	22.87	0.71	16.33		3.29	5	0.030	21.80	12.56		53.73	0.40	11.59

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 207+00 TO STA. 210+00, RHS **Designer :** MDC

Rainfall Area : D

		Seed:	0.40	**Allowable Shears**		
	Permanent Mat	**Type 1:**	2.00	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
	RCP	**Type B:**	6.00	**Type 2:** 3.00	**Type 3:**	5.00

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
207+00	209+00	R	200.00	10.00	3.00	3.00	0.2905 *	3.03	3.03	0.70	2.12	Seed	3.87	5	0.030	15.52	6.44	2.23	8.21	0.12	10.74
												Jute Mat	3.86	5	0.040	15.62	5.38	2.64	8.19	0.15	10.88
												Temp. Mat	3.86	5	0.040	15.62	5.38	2.64	8.19	0.15	10.88
												Perm, Type 1	3.86	5	0.040	15.62	5.38	2.64	8.19	0.15	10.88
												Perm, Type 2	3.86	5	0.040	15.62	5.38	2.64	8.19	0.15	10.88
												Perm, Type 2	4.53	10	0.040	15.58	5.71	2.91	9.60	0.16	10.96
209+00	210+00	R	100.00	15.00	3.00	4.00	0.1970 *	1.19	4.22	0.80	3.07	Seed	3.83	5	0.030	15.91	5.65	1.65	11.77	0.13	15.94
												Jute Mat	3.83	5	0.040	15.97	4.73	1.96	11.75	0.16	16.12
												Temp. Mat	3.83	5	0.040	15.97	4.73	1.96	11.75	0.16	16.12
												Perm, Type 1	3.83	5	0.040	15.97	4.73	1.96	11.75	0.16	16.12
												Perm, Type 1	4.49	10	0.040	15.91	5.03	2.16	13.78	0.18	16.23

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 229+00 TO STA. 210+50, RHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
229+00	212+50	R	1650.0	10.00	3.00	0.50	0.0300	4.52	4.52	0.74	3.34	Seed	3.26	5	0.030	22.15	3.59	0.54	10.91	0.29	11.01
												Jute Mat	3.16	5	0.040	23.57	2.96	0.63	10.56	0.34	11.18
												Temp. Mat	3.16	5	0.040	23.57	2.96	0.63	10.56	0.34	11.18
												Temp. Mat	3.73	10	0.040	23.09	3.15	0.70	12.49	0.37	11.30
212+50	210+50	R	325.00	12.00	2.00	3.00	0.2920*	1.13	5.64	0.71	4.14	Seed	3.10	5	0.030	24.32	7.21	2.63	12.86	0.14	12.72
												Jute Mat	3.09	5	0.040	24.46	6.03	3.12	12.82	0.17	12.86
												Temp. Mat	3.09	5	0.040	24.46	6.03	3.12	12.82	0.17	12.86
												Perm, Type 1	3.09	5	0.040	24.46	6.03	3.12	12.82	0.17	12.86
												Perm, Type 2	3.09	5	0.040	24.46	6.03	3.12	12.82	0.17	12.86
												Perm, Type 3	3.09	5	0.040	24.46	6.03	3.12	12.82	0.17	12.86
												Perm, Type 3	3.66	10	0.040	23.93	6.43	3.45	15.18	0.19	12.95

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 258+00 TO STA. 239+00, RHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
258+00	244+50	R	1350.0	10.00	5.00	3.00	0.0389	10.90	10.90	0.72	7.85	Seed	3.51	5	0.030	19.18	5.19	1.09	27.55	0.45	13.60
												Jute Mat	3.43	5	0.040	20.06	4.25	1.27	26.94	0.52	14.19
												Temp. Mat	3.43	5	0.040	20.06	4.25	1.27	26.94	0.52	14.19
												Perm, Type 1	3.43	5	0.040	20.06	4.25	1.27	26.94	0.52	14.19
												Perm, Type 1	4.04	10	0.040	19.81	4.49	1.39	31.72	0.57	14.60
244+50	239+00	R	550.00	12.00	4.00	4.00	0.3164 *	5.56	16.46	0.71	11.80	Seed	3.36	5	0.030	20.88	11.09	5.40	39.69	0.27	14.19
													3.35	5	0.040	21.05	9.21		39.53	0.32	14.58

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 264+00 TO STA. 271+50, RHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
264+00	268+50	R	450.00	10.00	3.00	1.00	0.0231	1.12	1.12	0.77	0.86	Seed	3.57	5	0.030	18.55	2.04	0.21	3.07	0.15	10.59
												Seed	4.13	10	0.040	18.99	1.81	0.27	3.55	0.19	10.76
268+50	270+50	R	200.00	10.00	4.00	4.00	0.1475 *	1.18	2.30	0.73	1.72	Seed	3.50	5	0.030	19.27	4.60	1.15	6.04	0.12	11.00
												Jute Mat	3.49	5	0.040	19.41	3.84	1.36	6.02	0.15	11.18
												Temp. Mat	3.49	5	0.040	19.41	3.84	1.36	6.02	0.15	11.18
												Perm, Type 1	3.49	5	0.040	19.41	3.84	1.36	6.02	0.15	11.18
												Perm, Type 1	4.04	10	0.040	19.80	4.05	1.49	6.97	0.16	11.29
270+50	271+50	R	100.00	10.00	3.00	4.00	0.3700 *	0.75	3.05	0.72	2.26	Seed	3.47	5	0.030	19.65	6.79	2.57	7.85	0.11	10.78
												Jute Mat	3.46	5	0.040	19.70	5.68	3.05	7.84	0.13	10.92
												Temp. Mat	3.46	5	0.040	19.70	5.68	3.05	7.84	0.13	10.92
												Perm, Type 1	3.46	5	0.040	19.70	5.68	3.05	7.84	0.13	10.92
												Perm, Type 2	3.46	5	0.040	19.70	5.68	3.05	7.84	0.13	10.92
												Perm, Type 3	3.46	5	0.040	19.70	5.68	3.05	7.84	0.13	10.92

DITCH ANALYSIS

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
												Perm, Type 3	4.02	10	0.040	20.08	6.01	3.32	9.09	0.14	11.01

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 274+00 TO STA. 301+50, RHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
274+00	283+00	R	900.00	10.00	3.00	0.50	0.0230	2.83	2.83	0.75	2.12	Seed	3.44	5	0.030	20.02	2.84	0.35	7.30	0.25	10.86
												Seed	3.96	10	0.040	20.67	2.50	0.46	8.40	0.32	11.11
283+00	290+00	R	700.00	10.00	3.00	0.50	0.0226	4.14	6.97	0.78	5.35	Seed	3.20	5	0.030	22.95	3.88	0.58	17.14	0.41	11.44
												Jute Mat	3.16	5	0.040	23.55	3.21	0.68	16.90	0.49	11.70
												Temp. Mat	3.16	5	0.040	23.55	3.21	0.68	16.90	0.49	11.70
												Temp. Mat	3.66	10	0.040	24.03	3.38	0.75	19.56	0.53	11.85
290+00	291+00	R	100.00	10.00	3.00	3.00	0.2740 *	1.68	8.65	0.71	6.55	Seed	3.15	5	0.030	23.73	8.95	3.70	20.59	0.22	11.30
												Jute Mat	3.14	5	0.040	23.77	7.45	4.38	20.58	0.26	11.54
												Temp. Mat	3.14	5	0.040	23.77	7.45	4.38	20.58	0.26	11.54
												Perm, Type 1	3.14	5	0.040	23.77	7.45	4.38	20.58	0.26	11.54
												Perm, Type 2	3.14	5	0.040	23.77	7.45	4.38	20.58	0.26	11.54
												Perm, Type 3	3.14	5	0.040	23.77	7.45	4.38	20.58	0.26	11.54
												Perm, Type 3	3.64	10	0.040	24.24	7.87	4.78	23.82	0.28	11.68

DITCH ANALYSIS

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
291+00	293+00	R	200.00	10.00	4.00	2.00	0.0550	3.70	12.35	0.71	9.17	Seed	3.10	5	0.030	24.32	6.02	1.44	28.47	0.42	12.52
												Jute Mat	3.10	5	0.040	24.43	4.99	1.70	28.40	0.50	12.97
												Temp. Mat	3.10	5	0.040	24.43	4.99	1.70	28.40	0.50	12.97
												Perm, Type 1	3.10	5	0.040	24.43	4.99	1.70	28.40	0.50	12.97
												Perm, Type 1	3.59	10	0.040	24.87	5.24	1.85	32.91	0.54	13.24
293+00	297+00	R	400.00	10.00	3.00	2.00	0.0200	5.84	18.19	0.74	13.49	Seed	3.01	5	0.030	25.77	4.95	0.87	40.56	0.70	13.49
												Jute Mat	2.99	5	0.040	26.05	4.08	1.02	40.31	0.82	14.10
												Temp. Mat	2.99	5	0.040	26.05	4.08	1.02	40.31	0.82	14.10
												Perm, Type 1	2.99	5	0.040	26.05	4.08	1.02	40.31	0.82	14.10
												Perm, Type 1	3.47	10	0.040	26.41	4.29	1.11	46.82	0.89	14.46
297+00	299+50	R	250.00	10.00	4.00	2.00	0.2080 *	3.87	22.06	0.71	16.24	Seed	2.96	5	0.030	26.42	11.15	5.02	48.13	0.39	12.32
												Jute Mat	2.96	5	0.040	26.50	9.24	5.93	48.05	0.46	12.74
												Temp. Mat	2.96	5	0.040	26.50	9.24	5.93	48.05	0.46	12.74
												Perm, Type 1	2.96	5	0.040	26.50	9.24	5.93	48.05	0.46	12.74
												Perm, Type 2	2.96	5	0.040	26.50	9.24	5.93	48.05	0.46	12.74
												Perm, Type 3	2.96	5	0.040	26.50	9.24	5.93	48.05	0.46	12.74
													2.95	5	0.060	26.64	7.07		47.91	0.58	13.46

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 314+50 TO STA. 311+00, RHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
314+50	313+00	R	260.00	10.00	4.00	2.00	0.1500 *	1.77	1.77	0.71	1.26	Seed	3.82	5	0.030	16.00	4.27	1.02	4.80	0.11	10.65
												Jute Mat	3.80	5	0.040	16.20	3.57	1.20	4.77	0.13	10.77
												Temp. Mat	3.80	5	0.040	16.20	3.57	1.20	4.77	0.13	10.77
												Perm, Type 1	3.80	5	0.040	16.20	3.57	1.20	4.77	0.13	10.77
												Perm, Type 1	4.46	10	0.040	16.13	3.79	1.33	5.60	0.14	10.85
313+00	311+00	R	240.00	10.00	4.00	2.00	0.4667 *	3.22	4.99	0.74	3.64	Seed	3.76	5	0.030	16.64	9.05	4.21	13.66	0.14	10.87
												Jute Mat	3.75	5	0.040	16.72	7.56	4.99	13.63	0.17	11.03
												Temp. Mat	3.75	5	0.040	16.72	7.56	4.99	13.63	0.17	11.03
												Perm, Type 1	3.75	5	0.040	16.72	7.56	4.99	13.63	0.17	11.03
												Perm, Type 2	3.75	5	0.040	16.72	7.56	4.99	13.63	0.17	11.03
												Perm, Type 3	3.75	5	0.040	16.72	7.56	4.99	13.63	0.17	11.03
												Perm, Type 3	4.40	10	0.040	16.63	8.03	5.49	15.99	0.19	11.13

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 314+50 TO STA. 322+00, RHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
314+50	319+00	R	450.00	10.00	4.00	2.00	0.0667	2.87	2.87	0.71	2.03	Seed	3.73	5	0.030	16.86	3.96	0.76	7.59	0.18	11.09
												Jute Mat	3.70	5	0.040	17.23	3.29	0.89	7.52	0.21	11.29
												Temp. Mat	3.70	5	0.040	17.23	3.29	0.89	7.52	0.21	11.29
												Temp. Mat	4.34	10	0.040	17.10	3.49	0.98	8.83	0.24	11.42
319+00	322+00	R	300.00	10.00	2.00	2.00	0.3000*	4.71	7.57	0.75	5.56	Seed	3.64	5	0.030	17.76	9.27	3.93	20.27	0.21	10.84
												Jute Mat	3.63	5	0.040	17.87	7.74	4.65	20.21	0.25	10.99
												Temp. Mat	3.63	5	0.040	17.87	7.74	4.65	20.21	0.25	10.99
												Perm, Type 1	3.63	5	0.040	17.87	7.74	4.65	20.21	0.25	10.99
												Perm, Type 2	3.63	5	0.040	17.87	7.74	4.65	20.21	0.25	10.99
												Perm, Type 3	3.63	5	0.040	17.87	7.74	4.65	20.21	0.25	10.99
												Perm, Type 3	4.27	10	0.040	17.70	8.23	5.12	23.75	0.27	11.09

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 325+00 TO STA. 329+00, RHS **Designer :** mdc

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
325+00	327+50	R	250.00	10.00	3.00	0.50	0.0180	0.46	0.46	0.73	0.34	Seed	3.61	5	0.030	18.06	1.32	0.10	1.21	0.09	10.32
												Seed	4.19	10	0.040	18.42	1.17	0.13	1.41	0.12	10.41
327+50	328+00	R	60.00	10.00	3.00	1.00	0.2050 *	1.18	1.64	0.88	1.38	Seed	3.59	5	0.030	18.27	4.79	1.30	4.95	0.10	10.41
												Jute Mat	3.59	5	0.040	18.31	4.02	1.54	4.94	0.12	10.48
												Temp. Mat	3.59	5	0.040	18.31	4.02	1.54	4.94	0.12	10.48
												Perm, Type 1	3.59	5	0.040	18.31	4.02	1.54	4.94	0.12	10.48
												Perm, Type 1	4.16	10	0.040	18.65	4.26	1.68	5.73	0.13	10.53
328+00	328+50	R	50.00	10.00	3.00	2.00	0.0060	2.28	3.92	0.89	3.41	Seed	3.56	5	0.030	18.68	2.20	0.18	12.11	0.49	12.45
												Seed	4.12	10	0.040	19.09	1.92	0.24	14.03	0.63	13.16
328+50	329+00	R	60.00	15.00	3.00	3.00	0.3750 *	3.37	7.29	0.89	6.40	Seed	3.55	5	0.030	18.80	8.90	3.85	22.70	0.16	15.99
												Jute Mat	3.54	5	0.040	18.82	7.45	4.57	22.69	0.20	16.17
												Temp. Mat	3.54	5	0.040	18.82	7.45	4.57	22.69	0.20	16.17
												Perm, Type 1	3.54	5	0.040	18.82	7.45	4.57	22.69	0.20	16.17

DITCH ANALYSIS

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
												Perm, Type 2	3.54	5	0.040	18.82	7.45	4.57	22.69	0.20	16.17
												Perm, Type 3	3.54	5	0.040	18.82	7.45	4.57	22.69	0.20	16.17
												Perm, Type 3	4.10	10	0.040	19.21	7.88	4.99	26.28	0.21	16.28

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 330+50 TO STA. 333+50, RHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00	
	Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00	
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
330+50	333+50	R	300.00	10.00	3.00	1.00	0.0743	0.59	0.59	0.72	0.42	Seed	3.70	5	0.030	17.17	2.24	0.32	1.57	0.07	10.28
												Seed	4.30	10	0.040	17.43	2.00	0.42	1.82	0.09	10.36

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 334+00 TO STA. 344+50, RHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
334+00	343+00	R	900.00	10.00	3.00	0.50	0.0446	2.08	2.08	0.72	1.49	Seed	3.47	5	0.030	19.67	3.06	0.46	5.18	0.16	10.58
												Jute Mat	3.39	5	0.040	20.58	2.54	0.54	5.07	0.19	10.68
												Temp. Mat	3.39	5	0.040	20.58	2.54	0.54	5.07	0.19	10.68
												Temp. Mat	4.00	10	0.040	20.25	2.71	0.59	5.98	0.21	10.74
343+00	344+50	R	250.00	10.00	2.00	3.00	0.3808*	1.37	3.44	0.71	2.47	Seed	3.34	5	0.030	21.17	7.03	2.71	8.24	0.11	10.57
												Jute Mat	3.33	5	0.040	21.28	5.89	3.21	8.21	0.13	10.67
												Temp. Mat	3.33	5	0.040	21.28	5.89	3.21	8.21	0.13	10.67
												Perm, Type 1	3.33	5	0.040	21.28	5.89	3.21	8.21	0.13	10.67
												Perm, Type 2	3.33	5	0.040	21.28	5.89	3.21	8.21	0.13	10.67
												Perm, Type 3	3.33	5	0.040	21.28	5.89	3.21	8.21	0.13	10.67
												Perm, Type 3	3.93	10	0.040	20.91	6.27	3.54	9.70	0.15	10.75

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 348+00 TO STA. 346+00, RHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
348+00	346+00	R	200.00	10.00	4.00	6.00	0.3825*	1.03	1.03	0.71	0.73	Seed	3.85	5	0.030	15.72	4.58	1.43	2.82	0.06	10.60
												Jute Mat	3.84	5	0.040	15.86	3.83	1.69	2.81	0.07	10.71
												Temp. Mat	3.84	5	0.040	15.86	3.83	1.69	2.81	0.07	10.71
												Perm, Type 1	3.84	5	0.040	15.86	3.83	1.69	2.81	0.07	10.71
												Perm, Type 1	4.50	10	0.040	15.81	4.08	1.85	3.29	0.08	10.78

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 348+00 TO STA. 352+00, RHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
348+00	352+00	R	400.00	10.00	3.00	2.00	0.0105	0.69	0.69	0.73	0.50	Seed	3.44	5	0.030	19.96	1.28	0.09	1.73	0.13	10.65
												Seed	3.97	10	0.040	20.58	1.13	0.11	1.99	0.17	10.85

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : US52 B, STA. 44+00 TO STA. 44+50, LHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
44+00	44+50	L	50.00	10.00	3.00	2.00	0.0040	1.14	1.14	0.70	0.80	Seed	3.85	5	0.030	15.70	1.18	0.06	3.07	0.25	11.23
												Seed	4.50	10	0.040	15.80	1.04	0.08	3.58	0.32	11.60

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : US52 B, STA. 45+00 TO STA. 44+50, LHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
44+00	44+50	L	50.00	10.00	3.00	0.50	0.0120	0.80	0.80	0.75	0.60	Seed	3.87	5	0.030	15.55	1.50	0.11	2.33	0.15	10.53
												Seed	4.52	10	0.040	15.62	1.33	0.15	2.72	0.20	10.69

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :US52 B, STA. 45+00 TO STA. 60+50, LHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
45+00	47+00	L	200.00	10.00	3.00	0.50	0.0045	0.50	0.50	0.71	0.35	Seed	3.56	5	0.030	18.67	0.88	0.04	1.26	0.14	10.49
												Seed	4.12	10	0.040	19.10	0.78	0.05	1.45	0.18	10.63
47+00	56+00	L	900.00	10.00	3.00	0.50	0.0082	3.62	4.12	0.72	2.96	Seed	3.05	5	0.030	25.04	2.23	0.20	9.04	0.38	11.33
												Seed	3.47	10	0.040	26.37	1.94	0.25	10.28	0.49	11.71
56+00	59+50	L	350.00	10.00	3.00	0.50	0.0051	1.08	5.20	0.77	3.80	Seed	2.88	5	0.030	27.83	2.05	0.16	10.92	0.49	11.71
												Seed	3.25	10	0.040	29.57	1.78	0.20	12.34	0.62	12.19
59+50	60+00	L	50.00	10.00	3.00	0.50	0.0580	0.08	5.28	0.70	3.85	Seed	2.87	5	0.030	28.01	4.43	0.87	11.04	0.24	10.84
												Jute Mat	2.86	5	0.040	28.05	3.70	1.03	11.03	0.28	10.99
												Temp. Mat	2.86	5	0.040	28.05	3.70	1.03	11.03	0.28	10.99
												Perm, Type 1	2.86	5	0.040	28.05	3.70	1.03	11.03	0.28	10.99
												Perm, Type 1	3.24	10	0.040	29.79	3.87	1.11	12.47	0.31	11.07
60+00	60+50	L	85.00	10.00	3.00	0.50	0.3824 *	0.60	5.89	0.87	4.38	Seed	2.85	5	0.030	28.22	8.31	3.49	12.48	0.15	10.51
												Jute Mat	2.85	5	0.040	28.25	6.96	4.15	12.48	0.17	10.61

DITCH ANALYSIS

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
												Temp. Mat	2.85	5	0.040	28.25	6.96	4.15	12.48	0.17	10.61
												Perm, Type 1	2.85	5	0.040	28.25	6.96	4.15	12.48	0.17	10.61
												Perm, Type 2	2.85	5	0.040	28.25	6.96	4.15	12.48	0.17	10.61
												Perm, Type 3	2.85	5	0.040	28.25	6.96	4.15	12.48	0.17	10.61
												Perm, Type 3	3.22	10	0.040	29.98	7.30	4.47	14.11	0.19	10.66

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR140 B, STA. 68+00 TO STA. 61+00, LHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
68+00	61+00	L	700.00	10.00	3.00	0.50	0.0444	3.94	3.94	0.70	2.75	Seed	3.63	5	0.030	17.88	3.93	0.68	10.00	0.24	10.86
												Jute Mat	3.58	5	0.040	18.45	3.26	0.80	9.85	0.29	11.01
												Temp. Mat	3.58	5	0.040	18.45	3.26	0.80	9.85	0.29	11.01
												Temp. Mat	4.21	10	0.040	18.26	3.47	0.88	11.59	0.32	11.11

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR140 B, STA. 68+00 TO STA. 68+50, LHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
68+00	68+50	L	50.00	10.00	3.00	0.50	0.1300 *	0.13	0.13	0.71	0.09	Seed	3.87	5	0.030	15.56	1.51	0.20	0.37	0.02	10.08
												Seed	4.52	10	0.040	15.62	1.35	0.26	0.43	0.03	10.11

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR140 B, STA. 73+00 TO STA. 68+50, LHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
73+00	68+50	L	450.00	10.00	3.00	0.50	0.0756	1.29	1.29	0.74	0.95	Seed	3.68	5	0.030	17.36	3.09	0.53	3.51	0.11	10.39
												Jute Mat	3.64	5	0.040	17.82	2.58	0.62	3.47	0.13	10.46
												Temp. Mat	3.64	5	0.040	17.82	2.58	0.62	3.47	0.13	10.46
												Temp. Mat	4.28	10	0.040	17.65	2.75	0.68	4.08	0.14	10.51

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR140 B, STA. 73+00 TO STA. 73+50, LHS **Designer :** MDC

Rainfall Area : D

		Seed:	0.40	**Allowable Shears**		
				Jute Mat:	0.45	**Temporary Mat:** 1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:** 5.00
	RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
73+00	73+50	L	50.00	10.00	2.00	2.00	0.8000 *	0.29	0.29	0.72	0.21	Seed	3.91	5	0.030	15.23	3.59	1.14	0.82	0.02	10.09
												Jute Mat	3.90	5	0.040	15.28	3.01	1.36	0.82	0.03	10.11
												Temp. Mat	3.90	5	0.040	15.28	3.01	1.36	0.82	0.03	10.11
												Perm, Type 1	3.90	5	0.040	15.28	3.01	1.36	0.82	0.03	10.11
												Perm, Type 1	4.57	10	0.040	15.26	3.21	1.49	0.96	0.03	10.12

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR140 B, STA. 96+00 TO STA. 73+50, LHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00	
	Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00	
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
96+00	86+00	L	1000.0	10.00	3.00	0.50	0.0203	2.93	2.93	0.75	2.20	Seed	3.38	5	0.030	20.73	2.75	0.33	7.41	0.26	10.90
												Seed	3.88	10	0.040	21.48	2.42	0.42	8.52	0.33	11.17
86+00	75+00	L	1100.0	10.00	3.00	0.50	0.0505	4.48	7.40	0.76	5.60	Seed	3.11	5	0.030	24.27	5.03	1.03	17.39	0.33	11.15
												Jute Mat	3.06	5	0.040	24.97	4.17	1.21	17.12	0.39	11.35
												Temp. Mat	3.06	5	0.040	24.97	4.17	1.21	17.12	0.39	11.35
												Perm, Type 1	3.06	5	0.040	24.97	4.17	1.21	17.12	0.39	11.35
												Perm, Type 1	3.54	10	0.040	25.51	4.39	1.32	19.80	0.42	11.47
75+00	74+50	L	50.00	10.00	3.00	2.00	0.1980*	0.09	7.49	0.76	5.67	Seed	3.05	5	0.030	25.08	7.62	2.66	17.29	0.22	11.08
												Jute Mat	3.05	5	0.040	25.10	6.36	3.15	17.28	0.26	11.28
												Temp. Mat	3.05	5	0.040	25.10	6.36	3.15	17.28	0.26	11.28
												Perm, Type 1	3.05	5	0.040	25.10	6.36	3.15	17.28	0.26	11.28
												Perm, Type 2	3.05	5	0.040	25.10	6.36	3.15	17.28	0.26	11.28
												Perm, Type 3	3.05	5	0.040	25.10	6.36	3.15	17.28	0.26	11.28

DITCH ANALYSIS

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
												Perm, Type 3	3.53	10	0.040	25.63	6.71	3.44	19.99	0.28	11.39
74+50	73+50	L	100.00	10.00	3.00	0.50	0.0150	0.20	7.69	0.75	5.81	Seed	3.02	5	0.030	25.59	3.43	0.44	17.54	0.47	11.65
												Jute Mat	3.01	5	0.040	25.68	2.85	0.52	17.50	0.56	11.96
												Temp. Mat	3.01	5	0.040	25.68	2.85	0.52	17.50	0.56	11.96
												Temp. Mat	3.49	10	0.040	26.19	3.00	0.57	20.26	0.61	12.14

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 68+00 TO STA. 110+50, LHS **Designer :** mdc

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
96+00	106+00	L	1000.0	10.00	3.00	0.50	0.0132	4.82	4.82	0.73	3.52	Seed	3.40	5	0.030	20.51	2.87	0.32	11.95	0.39	11.37
												Seed	3.90	10	0.040	21.26	2.51	0.42	13.72	0.50	11.76
106+00	108+50	L	380.00	10.00	4.00	2.00	0.4060*	2.80	7.62	0.71	5.51	Seed	3.34	5	0.030	21.16	9.70	4.56	18.41	0.18	11.08
												Jute Mat	3.33	5	0.040	21.29	8.09	5.40	18.35	0.21	11.28
												Temp. Mat	3.33	5	0.040	21.29	8.09	5.40	18.35	0.21	11.28
												Perm, Type 1	3.33	5	0.040	21.29	8.09	5.40	18.35	0.21	11.28
												Perm, Type 2	3.33	5	0.040	21.29	8.09	5.40	18.35	0.21	11.28
												Perm, Type 3	3.33	5	0.040	21.29	8.09	5.40	18.35	0.21	11.28
													3.31	5	0.060	21.51	6.25		18.25	0.27	11.62

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 111+50 TO STA. 110+50, LHS **Designer :** MDC

Rainfall Area : D

		Seed:	0.40	**Allowable Shears**		
	Permanent Mat	**Type 1:**	2.00	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
	RCP	**Type B:**	6.00	**Type 2:** 3.00	**Type 3:**	5.00

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
111+50	110+50	L	100.00	10.00	4.00	4.00	0.0750	0.87	0.87	0.72	0.62	Seed	3.86	5	0.030	15.63	2.62	0.41	2.41	0.09	10.71
												Jute Mat	3.85	5	0.040	15.75	2.20	0.49	2.40	0.10	10.84
												Temp. Mat	3.85	5	0.040	15.75	2.20	0.49	2.40	0.10	10.84
												Temp. Mat	4.51	10	0.040	15.71	2.34	0.54	2.81	0.12	10.92

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 118+00 TO STA. 119+00, LHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
118+00	119+00	L	100.00	10.00	4.00	4.00	0.0300	1.16	1.16	0.79	0.92	Seed	3.85	5	0.030	15.72	2.29	0.27	3.54	0.15	11.17
												Seed	4.50	10	0.040	15.82	2.03	0.36	4.13	0.19	11.52

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 125+50 TO STA. 125+00, LHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
125+50	125+00	L	50.00	10.00	4.00	4.00	0.0200	0.22	0.22	0.70	0.16	Seed	3.84	5	0.030	15.80	1.02	0.07	0.60	0.06	10.46
												Seed	4.49	10	0.040	15.91	0.91	0.09	0.70	0.08	10.60

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 125+50 TO STA. 129+00, LHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
125+50	126+00	L	50.00	10.00	4.00	4.00	0.0200	0.21	0.21	0.70	0.14	Seed	3.84	5	0.030	15.83	0.98	0.07	0.55	0.06	10.44
												Seed	4.48	10	0.040	15.94	0.88	0.09	0.65	0.07	10.57
126+00	128+00	L	200.00	10.00	4.00	4.00	0.0450	1.84	2.04	0.78	1.58	Seed	3.73	5	0.030	16.88	3.15	0.49	5.89	0.17	11.40
												Jute Mat	3.71	5	0.040	17.08	2.61	0.58	5.85	0.21	11.65
												Temp. Mat	3.71	5	0.040	17.08	2.61	0.58	5.85	0.21	11.65
												Temp. Mat	4.34	10	0.040	17.13	2.77	0.64	6.84	0.23	11.81
128+00	128+50	L	50.00	10.00	2.00	2.00	0.5000*	0.36	2.40	0.72	1.83	Seed	3.70	5	0.030	17.20	7.11	2.92	6.78	0.09	10.37
												Jute Mat	3.70	5	0.040	17.22	5.97	3.47	6.78	0.11	10.44
												Temp. Mat	3.70	5	0.040	17.22	5.97	3.47	6.78	0.11	10.44
												Perm, Type 1	3.70	5	0.040	17.22	5.97	3.47	6.78	0.11	10.44
												Perm, Type 2	3.70	5	0.040	17.22	5.97	3.47	6.78	0.11	10.44
												Perm, Type 3	3.70	5	0.040	17.22	5.97	3.47	6.78	0.11	10.44
												Perm, Type 3	4.32	10	0.040	17.26	6.34	3.81	7.93	0.12	10.49

DITCH ANALYSIS

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
128+50	129+00	L	50.00	10.00	2.00	3.00	0.1200*	0.37	2.77	0.72	2.10	Seed	3.68	5	0.030	17.40	4.81	1.16	7.73	0.15	10.77
												Jute Mat	3.68	5	0.040	17.43	4.02	1.37	7.72	0.18	10.92
												Temp. Mat	3.68	5	0.040	17.43	4.02	1.37	7.72	0.18	10.92
												Perm, Type 1	3.68	5	0.040	17.43	4.02	1.37	7.72	0.18	10.92
												Perm, Type 1	4.30	10	0.040	17.45	4.27	1.51	9.03	0.20	11.01

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 166+00 TO STA. 139+50, LHS **Designer :** MDC

Rainfall Area : D

		Seed:	0.40		
Permanent Mat		**Type 1:**	2.00		
RCP		**Type B:**	6.00		

Allowable Shears

Jute Mat:	0.45	**Temporary Mat:**	1.00
Type 2:	3.00	**Type 3:**	5.00

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
166+00	142+00	L	2400.0	10.00	3.00	0.50	0.0392	11.16	11.16	0.71	7.92	Seed	3.28	5	0.030	21.97	5.37	1.10	25.96	0.45	11.57
												Jute Mat	3.17	5	0.040	23.39	4.41	1.28	25.11	0.52	11.82
												Temp. Mat	3.17	5	0.040	23.39	4.41	1.28	25.11	0.52	11.82
												Perm, Type 1	3.17	5	0.040	23.39	4.41	1.28	25.11	0.52	11.82
												Perm, Type 1	3.75	10	0.040	22.94	4.69	1.41	29.69	0.58	12.01
142+00	141+00	L	100.00	10.00	3.00	0.50	0.0500	0.95	12.11	0.70	8.59	Seed	3.15	5	0.030	23.67	5.89	1.33	27.04	0.43	11.49
												Jute Mat	3.15	5	0.040	23.73	4.90	1.58	27.01	0.51	11.77
												Temp. Mat	3.15	5	0.040	23.73	4.90	1.58	27.01	0.51	11.77
												Perm, Type 1	3.15	5	0.040	23.73	4.90	1.58	27.01	0.51	11.77
												Perm, Type 1	3.72	10	0.040	23.26	5.20	1.74	31.94	0.56	11.96
141+00	139+50	L	150.00	10.00	3.00	0.50	0.0500	1.40	13.50	0.70	9.56	Seed	3.12	5	0.030	24.14	6.10	1.41	29.80	0.45	11.58
												Jute Mat	3.11	5	0.040	24.22	5.07	1.67	29.75	0.54	11.88
												Temp. Mat	3.11	5	0.040	24.22	5.07	1.67	29.75	0.54	11.88

DITCH ANALYSIS

STATION BEGIN	STATION END	SIDE LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
											Perm, Type 1	3.11	5	0.040	24.22	5.07	1.67	29.75	0.54	11.88
											Perm, Type 1	3.68	10	0.040	23.72	5.38	1.85	35.20	0.59	12.07

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 166+00 TO STA. 166+50, LHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
166+00	166+50	L	50.00	15.00	3.00	0.50	0.2080 *	0.08	0.08	0.73	0.06	Seed	3.86	5	0.030	15.66	1.23	0.17	0.24	0:01	15.04
												Seed	4.51	10	0.040	15.74	1.10	0.22	0.28	0.02	15.06

DITCH ANALYSIS

PID : . **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 167+50 TO STA. 166+50, LHS

Designer : MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
167+50	167+00	L	50.00	10.00	3.00	2.00	0.1360 *	0.35	0.35	0.72	0.25	Seed	3.89	5	0.030	15.37	2.23	0.36	0.97	0.04	10.21
												Seed	4.55	10	0.040	15.42	1.99	0.48	1.13	0.06	10.28
167+00	166+50	L	50.00	15.00	3.00	2.00	0.0700	0.12	0.47	0.72	0.33	Seed	3.84	5	0.030	15.85	1.73	0.21	1.29	0.05	15.25
												Seed	4.48	10	0.040	15.95	1.55	0.28	1.50	0.06	15.32

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 167+50 TO STA. 175+00, LHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
167+50	173+50	L	600.00	10.00	3.00	0.50	0.0205	2.74	2.74	0.74	2.03	Seed	3.57	5	0.030	18.53	2.74	0.32	7.25	0.25	10.89
												Seed	4.13	10	0.040	18.99	2.41	0.42	8.38	0.33	11.15
173+50	175+00	L	210.00	15.00	3.00	3.00	0.2857 *	3.07	5.82	0.71	4.21	Seed	3.52	5	0.030	19.03	6.95	2.47	14.84	0.14	15.83
												Jute Mat	3.52	5	0.040	19.13	5.82	2.93	14.80	0.16	15.98
												Temp. Mat	3.52	5	0.040	19.13	5.82	2.93	14.80	0.16	15.98
												Perm, Type 1	3.52	5	0.040	19.13	5.82	2.93	14.80	0.16	15.98
												Perm, Type 2	3.52	5	0.040	19.13	5.82	2.93	14.80	0.16	15.98
												Perm, Type 2	4.07	10	0.040	19.55	6.16	3.19	17.14	0.18	16.08

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 178+00 TO STA. 175+50, LHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
178+00	175+50	L	250.00	10.00	3.00	1.00	0.0020	0.13	0.13	0.77	0.10	Seed	3.09	5	0.030	24.55	0.39	0.01	0.30	0.08	10.30
												Seed	3.52	10	0.040	25.76	0.35	0.01	0.34	0.10	10.39
175+50	177+00	L	150.00	10.00	2.00	2.00	0.0967	1.94	2.06	0.80	1.65	Seed	3.04	5	0.030	25.20	3.83	0.77	5.01	0.13	10.51
												Jute Mat	3.04	5	0.040	25.32	3.20	0.91	5.00	0.15	10.61
												Temp. Mat	3.04	5	0.040	25.32	3.20	0.91	5.00	0.15	10.61
												Temp. Mat	3.46	10	0.040	26.50	3.37	0.99	5.70	0.16	10.66
177+00	175+50	L	150.00	15.00	2.00	2.00	0.2133 *	2.66	4.72	0.71	3.54	Seed	3.01	5	0.030	25.77	5.62	1.65	10.63	0.12	15.50
												Jute Mat	3.00	5	0.040	25.85	4.71	1.96	10.61	0.15	15.59
												Temp. Mat	3.00	5	0.040	25.85	4.71	1.96	10.61	0.15	15.59
												Perm, Type 1	3.00	5	0.040	25.85	4.71	1.96	10.61	0.15	15.59
												Perm, Type 1	3.43	10	0.040	27.00	4.96	2.12	12.11	0.16	15.64

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 178+00 TO STA. 185+00, LHS

Designer : MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
178+00	182+50	L	450.00	10.00	3.00	1.00	0.0324	2.71	2.71	0.73	1.98	Seed	3.69	5	0.030	17.32	3.15	0.45	7.29	0.22	10.89
												Jute Mat	3.64	5	0.040	17.78	2.62	0.53	7.20	0.26	11.04
												Temp. Mat	3.64	5	0.040	17.78	2.62	0.53	7.20	0.26	11.04
												Temp. Mat	4.28	10	0.040	17.62	2.79	0.58	8.46	0.29	11.15
182+50	185+00	L	250.00	12.00	2.00	2.00	0.2216 *	1.70	4.41	0.72	3.20	Seed	3.58	5	0.030	18.43	6.36	2.03	11.46	0.15	12.59
												Jute Mat	3.57	5	0.040	18.56	5.33	2.40	11.42	0.17	12.69
												Temp. Mat	3.57	5	0.040	18.56	5.33	2.40	11.42	0.17	12.69
												Perm, Type 1	3.57	5	0.040	18.56	5.33	2.40	11.42	0.17	12.69
												Perm, Type 2	3.57	5	0.040	18.56	5.33	2.40	11.42	0.17	12.69
												Perm, Type 2	4.20	10	0.040	18.35	5.67	2.65	13.44	0.19	12.77

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 226+00 TO STA. 209+00, LHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
226+00	224+00	L	200.00	10.00	3.00	0.50	0.0310	0.46	0.46	0.77	0.35	Seed	3.72	5	0.030	17.03	1.61	0.16	1.31	0.08	10.28
												Seed	4.32	10	0.040	17.27	1.43	0.20	1.53	0.10	10.37
224+00	219+00	L	500.00	10.00	3.00	0.50	0.0310	2.03	2.49	0.79	1.95	Seed	3.46	5	0.030	19.70	3.03	0.42	6.77	0.22	10.75
												Jute Mat	3.42	5	0.040	20.23	2.52	0.49	6.68	0.25	10.89
												Temp. Mat	3.42	5	0.040	20.23	2.52	0.49	6.68	0.25	10.89
												Temp. Mat	3.99	10	0.040	20.30	2.67	0.54	7.80	0.28	10.98
219+00	214+00	L	500.00	10.00	3.00	0.50	0.0310	1.88	4.36	0.80	3.46	Seed	3.24	5	0.030	22.46	3.66	0.56	11.19	0.29	11.02
												Jute Mat	3.21	5	0.040	22.91	3.04	0.66	11.08	0.34	11.20
												Temp. Mat	3.21	5	0.040	22.91	3.04	0.66	11.08	0.34	11.20
												Temp. Mat	3.76	10	0.040	22.83	3.23	0.73	12.99	0.38	11.32
14+00	213+50	L	50.00	10.00	2.00	2.00	0.0300	0.62	4.98	0.88	4.00	Seed	3.19	5	0.030	23.13	3.80	0.59	12.75	0.32	11.26
												Jute Mat	3.19	5	0.040	23.17	3.16	0.70	12.74	0.37	11.50
												Temp. Mat	3.19	5	0.040	23.17	3.16	0.70	12.74	0.37	11.50

DITCH ANALYSIS

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
213+50	213+00	L	165.00	10.00	2.00	2.00	0.2891 *	6.42	11.40	0.70	8.50	Temp. Mat	3.74	10	0.040	23.07	3.35	0.77	14.94	0.41	11.65
												Seed	3.17	5	0.030	23.44	10.20	4.53	26.90	0.25	11.00
												Jute Mat	3.16	5	0.040	23.49	8.52	5.37	26.87	0.30	11.19
												Temp. Mat	3.16	5	0.040	23.49	8.52	5.37	26.87	0.30	11.19
												Perm, Type 1	3.16	5	0.040	23.49	8.52	5.37	26.87	0.30	11.19
												Perm, Type 2	3.16	5	0.040	23.49	8.52	5.37	26.87	0.30	11.19
												Perm, Type 3	3.16	5	0.040	23.49	8.52	5.37	26.87	0.30	11.19
													3.16	5	0.060	23.59	6.59		26.81	0.38	11.51

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 236+50 TO STA. 230+00, LHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
236+50	232+50	L	400.00	10.00	4.00	4.00	0.0775	4.16	4.16	0.71	2.96	Seed	3.78	5	0.030	16.39	4.73	1.05	11.18	0.22	11.74
												Jute Mat	3.75	5	0.040	16.67	3.92	1.24	11.09	0.26	12.05
												Temp. Mat	3.75	5	0.040	16.67	3.92	1.24	11.09	0.26	12.05
												Perm, Type 1	3.75	5	0.040	16.67	3.92	1.24	11.09	0.26	12.05
												Perm, Type 1	4.40	10	0.040	16.58	4.15	1.36	13.01	0.28	12.25
232+50	230+00	L	250.00	12.00	4.00	4.00	0.3296 *	4.31	8.47	0.71	6.01	Seed	3.71	5	0.030	17.13	9.08	3.95	22.28	0.19	13.54
												Jute Mat	3.70	5	0.040	17.22	7.57	4.68	22.23	0.23	13.82
												Temp. Mat	3.70	5	0.040	17.22	7.57	4.68	22.23	0.23	13.82
												Perm, Type 1	3.70	5	0.040	17.22	7.57	4.68	22.23	0.23	13.82
												Perm, Type 2	3.70	5	0.040	17.22	7.57	4.68	22.23	0.23	13.82
												Perm, Type 3	3.70	5	0.040	17.22	7.57	4.68	22.23	0.23	13.82
												Perm, Type 3	4.34	10	0.040	17.10	8.03	5.14	26.10	0.25	14.00

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 258+00 TO STA. 284+00, LHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
258+00	284+00	L	2600.0	10.00	3.00	1.00	0.0223	12.73	12.73	0.71	9.04	Seed	3.15	5	0.030	23.70	4.61	0.77	28.45	0.56	12.22
												Jute Mat	3.02	5	0.040	25.50	3.77	0.89	27.32	0.64	12.57
												Temp. Mat	3.02	5	0.040	25.50	3.77	0.89	27.32	0.64	12.57
												Temp. Mat	3.58	10	0.040	24.96	4.00	0.99	32.36	0.71	12.84

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 288+50 TO STA. 291+00, LHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
288+50	291+00	L	250.00	15.00	2.00	3.00	0.0060	5.16	5.16	0.71	3.66	Seed	3.72	5	0.030	17.00	2.04	0.16	13.62	0.42	17.08
												Seed	4.32	10	0.040	17.27	1.79	0.20	15.82	0.54	17.70

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 295+00 TO STA. 291+00, LHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
295+00	293+00	L	200.00	10.00	4.00	0.50	0.0650	2.68	2.68	0.71	1.90	Seed	3.84	5	0.030	15.85	3.89	0.73	7.30	0.18	10.81
												Jute Mat	3.82	5	0.040	16.01	3.25	0.87	7.27	0.21	10.96
												Temp. Mat	3.82	5	0.040	16.01	3.25	0.87	7.27	0.21	10.96
												Temp. Mat	4.48	10	0.040	15.96	3.45	0.95	8.52	0.23	11.06
293+00	291+00	L	200.00	15.00	4.00	2.00	0.3100*	3.42	6.10	0.71	4.33	Seed	3.77	5	0.030	16.46	7.39	2.77	16.33	0.14	15.86
												Jute Mat	3.76	5	0.040	16.55	6.19	3.28	16.29	0.17	16.02
												Temp. Mat	3.76	5	0.040	16.55	6.19	3.28	16.29	0.17	16.02
												Perm, Type 1	3.76	5	0.040	16.55	6.19	3.28	16.29	0.17	16.02
												Perm, Type 2	3.76	5	0.040	16.55	6.19	3.28	16.29	0.17	16.02
												Perm, Type 3	3.76	5	0.040	16.55	6.19	3.28	16.29	0.17	16.02
												Perm, Type 3	4.42	10	0.040	16.46	6.58	3.61	19.12	0.19	16.12

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 295+00 TO STA. 298+00, LHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
295+00	298+00	L	300.00	15.00	4.00	2.00	0.2817*	4.02	4.02	0.71	2.86	Seed	3.84	5	0.030	15.81	6.16	2.04	10.98	0.12	15.70
												Jute Mat	3.83	5	0.040	15.96	5.15	2.42	10.93	0.14	15.83
												Temp. Mat	3.83	5	0.040	15.96	5.15	2.42	10.93	0.14	15.83
												Perm, Type 1	3.83	5	0.040	15.96	5.15	2.42	10.93	0.14	15.83
												Perm, Type 2	3.83	5	0.040	15.96	5.15	2.42	10.93	0.14	15.83
												Perm, Type 2	4.49	10	0.040	15.90	5.48	2.66	12.82	0.15	15.91

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 306+00 TO STA. 298+50, LHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
306+00	303+00	L	400.00	10.00	4.00	2.00	0.0775	4.34	4.34	0.71	3.08	Seed	3.79	5	0.030	16.35	4.87	1.09	11.66	0.22	11.35
												Jute Mat	3.76	5	0.040	16.62	4.05	1.28	11.57	0.26	11.59
												Temp. Mat	3.76	5	0.040	16.62	4.05	1.28	11.57	0.26	11.59
												Perm, Type 1	3.76	5	0.040	16.62	4.05	1.28	11.57	0.26	11.59
												Perm, Type 1	4.41	10	0.040	16.53	4.29	1.41	13.58	0.29	11.75
303+00	298+50	L	450.00	10.00	4.00	2.00	0.3411 *	5.37	9.70	0.73	7.00	Seed	3.68	5	0.030	17.34	10.41	4.93	25.78	0.23	11.39
												Jute Mat	3.67	5	0.040	17.48	8.66	5.83	25.69	0.27	11.64
												Temp. Mat	3.67	5	0.040	17.48	8.66	5.83	25.69	0.27	11.64
												Perm, Type 1	3.67	5	0.040	17.48	8.66	5.83	25.69	0.27	11.64
												Perm, Type 2	3.67	5	0.040	17.48	8.66	5.83	25.69	0.27	11.64
												Perm, Type 3	3.67	5	0.040	17.48	8.66	5.83	25.69	0.27	11.64
													3.65	5	0.060	17.73	6.67		25.51	0.35	12.08

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 306+00 TO STA. 312+50, LHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
306+00	309+00	L	300.00	10.00	3.00	0.50	0.0300	0.88	0.88	0.75	0.66	Seed	3.68	5	0.030	17.41	2.03	0.22	2.43	0.12	10.41
												Seed	4.27	10	0.040	17.70	1.80	0.29	2.82	0.15	10.54
309+00	312+50	L	350.00	12.00	4.00	3.00	0.3971 *	3.68	4.56	0.71	3.27	Seed	3.60	5	0.030	18.17	7.60	3.09	11.79	0.12	12.87
												Jute Mat	3.59	5	0.040	18.32	6.35	3.66	11.75	0.15	13.03
												Temp. Mat	3.59	5	0.040	18.32	6.35	3.66	11.75	0.15	13.03
												Perm, Type 1	3.59	5	0.040	18.32	6.35	3.66	11.75	0.15	13.03
												Perm, Type 2	3.59	5	0.040	18.32	6.35	3.66	11.75	0.15	13.03
												Perm, Type 3	3.59	5	0.040	18.32	6.35	3.66	11.75	0.15	13.03
												Perm, Type 3	4.17	10	0.040	18.56	6.73	4.01	13.66	0.16	13.13

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 318+50 TO STA. 319+00, LHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
318+50	319+00	L	50.00	15.00	2.00	2.00	0.2720 *	0.46	0.46	0.72	0.33	Seed	3.90	5	0.030	15.32	2.63	0.55	1.29	0.03	15.13
												Jute Mat	3.89	5	0.040	15.38	2.21	0.66	1.29	0.04	15.15
												Temp. Mat	3.89	5	0.040	15.38	2.21	0.66	1.29	0.04	15.15
												Temp. Mat	4.56	10	0.040	15.35	2.35	0.72	1.51	0.04	15.17

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description :SR823, STA. 323+50 TO STA. 320+50, LHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
323+50	320+50	L	300.00	10.00	4.00	2.00	0.1067 *	3.30	3.30	0.71	2.34	Seed	3.82	5	0.030	16.02	4.87	1.16	8.95	0.17	11.05
												Jute Mat	3.80	5	0.040	16.21	4.06	1.37	8.90	0.21	11.24
												Temp. Mat	3.80	5	0.040	16.21	4.06	1.37	8.90	0.21	11.24
												Perm, Type 1	3.80	5	0.040	16.21	4.06	1.37	8.90	0.21	11.24
												Perm, Type 1	4.46	10	0.040	16.15	4.31	1.51	10.44	0.23	11.36

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 323+50 TO STA. 328+00, LHS

Designer : MDC

Rainfall Area : D

		Seed:	0.40		
Permanent Mat		**Type 1:**	2.00		
RCP		**Type B:**	6.00		

Allowable Shears

Jute Mat:	0.45	**Temporary Mat:**	1.00
Type 2:	3.00	**Type 3:**	5.00

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
323+50	327+50	L	400.00	10.00	3.00	0.50	0.0180	2.18	2.18	0.73	1.59	Seed	3.65	5	0.030	17.69	2.42	0.26	5.80	0.23	10.81
												Seed	4.23	10	0.040	18.03	2.13	0.34	6.73	0.30	11.05
327+50	328+00	L	50.00	15.00	3.00	1.00	0.2180 *	0.40	2.58	0.72	1.88	Seed	3.63	5	0.030	17.86	4.75	1.29	6.83	0.09	15.38
												Jute Mat	3.63	5	0.040	17.90	3.99	1.53	6.82	0.11	15.45
												Temp. Mat	3.63	5	0.040	17.90	3.99	1.53	6.82	0.11	15.45
												Perm, Type 1	3.63	5	0.040	17.90	3.99	1.53	6.82	0.11	15.45
												Perm, Type 1	4.21	10	0.040	18.23	4.22	1.67	7.91	0.12	15.49

DITCH ANALYSIS

PID : 79977 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 329+00 TO STA. 328+50, LHS

Designer : mdc

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
329+00	328+50	L	50.00	15.00	2.00	2.00	0.1320 *	0.32	0.32	0.72	0.23	Seed	3.88	5	0.030	15.45	1.83	0.27	0.90	0.03	15.13
												Seed	4.54	10	0.040	15.51	1.64	0.35	1.05	0.04	15.17

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 329+00 TO STA. 345+00, LHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
329+00	333+00	L	400.00	10.00	3.00	0.50	0.0243	3.01	3.01	0.72	2.17	Seed	3.70	5	0.030	17.18	2.99	0.39	8.01	0.26	10.90
												Seed	4.30	10	0.040	17.46	2.64	0.50	9.30	0.33	11.17
333+00	340+00	L	700.00	10.00	3.00	0.50	0.0429	9.23	12.24	0.73	8.90	Seed	3.52	5	0.030	19.12	5.91	1.30	31.31	0.49	11.71
												Jute Mat	3.48	5	0.040	19.51	4.90	1.54	30.99	0.58	12.01
												Temp. Mat	3.48	5	0.040	19.51	4.90	1.54	30.99	0.58	12.01
												Perm, Type 1	3.48	5	0.040	19.51	4.90	1.54	30.99	0.58	12.01
												Perm, Type 1	4.06	10	0.040	19.68	5.17	1.68	36.12	0.63	12.20
340+00	343+50	L	350.00	10.00	3.00	0.50	0.0440	2.14	14.38	0.79	10.59	Seed	3.40	5	0.030	20.43	6.27	1.44	36.03	0.53	11.84
												Jute Mat	3.39	5	0.040	20.62	5.20	1.71	35.87	0.62	12.18
												Temp. Mat	3.39	5	0.040	20.62	5.20	1.71	35.87	0.62	12.18
												Perm, Type 1	3.39	5	0.040	20.62	5.20	1.71	35.87	0.62	12.18
												Perm, Type 1	3.95	10	0.040	20.73	5.49	1.87	41.85	0.68	12.39
343+50	345+00	L	150.00	15.00	3.00	2.00	0.3019*	1.74	16.12	0.71	11.83	Seed	3.37	5	0.030	20.86	10.37	4.63	39.82	0.25	16.23

DITCH ANALYSIS

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
												Jute Mat	3.36	5	0.040	20.91	8.67	5.49	39.77	0.29	16.46
												Temp. Mat	3.36	5	0.040	20.91	8.67	5.49	39.77	0.29	16.46
												Perm, Type 1	3.36	5	0.040	20.91	8.67	5.49	39.77	0.29	16.46
												Perm, Type 2	3.36	5	0.040	20.91	8.67	5.49	39.77	0.29	16.46
												Perm, Type 3	3.36	5	0.040	20.91	8.67	5.49	39.77	0.29	16.46
													3.36	5	0.060	20.99	6.72		39.69	0.37	16.85

DITCH ANALYSIS

PID : 77366 **Date :** 07/02/2007 **Project :** SCI-823-0.00 **Location :** PORTSMOUTH, SCIOTO COUNTY

Description : SR823, STA. 349+50 TO STA. 352+00, LHS **Designer :** MDC

Rainfall Area : D

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
349+50	350+50	L	100.00	10.00	3.00	2.00	0.0060	1.47	1.47	0.80	1.17	Seed	3.81	5	0.030	16.07	1.54	0.10	4.47	0.27	11.36
												Seed	4.45	10	0.040	16.21	1.36	0.13	5.21	0.35	11.77
350+50	352+00	L	150.00	10.00	3.00	2.00	0.0060	0.96	2.42	0.72	1.86	Seed	3.67	5	0.030	17.44	1.79	0.13	6.84	0.35	11.75
												Seed	4.26	10	0.040	17.78	1.58	0.17	7.93	0.45	12.26

APPENDIX F

BMP CALCULATIONS

Re...

TranSystems

Made By: MHT **Date:** 1/30/2007
Checked: DL, RN **Date:** 3/13/2007
Job No.: PID 77366 **Sheet No.:** 1 of 5
Description Exfiltration Trench (ExT) at Median for SR823 - Phase 3 (SCI-823-0.00)

Calculation to Determine Length of Exfiltration Trench - Lt for the equation Lt = T(A*Cq)/689 (where Cq = 0.858i^3-0.78i^2+0.774i+0.04 and i = impervious area divided by the total area)

* Area values are from Phase 3 median inlet spacing calculations.

Inlet Station	Side	T Treatment Percent	Impervious Area (acres)*	Impervious Area (SF)*	A Total Area (SF)*	i	Cq	Lt	Lt Rounded	Notes
56+00	Left	1.0	0.144	6,275	6,275	1.0	0.9	8.1238	**12**	
	Right	1.0	0.064	2,809	2,809	1.0	0.9	3.6369	**4**	
59+00	Left	1.0	0.052	2,250	2,250	1.0	0.9	2.9129	**4**	
	Right	1.0	0.052	2,250	2,250	1.0	0.9	2.9129	**4**	
59+95.45 (low point)	Left	1.0	0.016	716	716	1.0	0.9	0.9268		Sump inlet area less than
	Right	1.0	0.016	716	716	1.0	0.9	0.9268		
	Left	1.0	0.018	784	784	1.0	0.9	1.0152		
	Right	1.0	0.018	784	784	1.0	0.9	1.0152		0.25 acres, no ExT needed
61+00	Left	1.0	0.043	1,875	1,875	1.0	0.9	2.4274	**4**	
	Right	1.0	0.043	1,875	1,875	1.0	0.9	2.4274	**4**	
63+50	Left	1.0	0.043	1,875	1,875	1.0	0.9	2.4274	**4**	
	Right	1.0	0.043	1,875	1,875	1.0	0.9	2.4274	**4**	
66+00	Left	1.0	0.086	3,750	3,750	1.0	0.9	4.8549	**8**	
	Right	1.0	0.086	3,750	3,750	1.0	0.9	4.8549	**8**	
71+00	Left	1.0	0.086	3,750	3,750	1.0	0.9	4.8549	**8**	
	Right	1.0	0.086	3,750	3,750	1.0	0.9	4.8549	**8**	
76+00	Left	1.0	0.172	7,500	7,500	1.0	0.9	9.7097	**12**	
	Right	1.0	0.172	7,500	7,500	1.0	0.9	9.7097	**12**	
86+00	Left	1.0	0.175	7,603	7,603	1.0	0.9	9.8431	**12**	
	Right	1.0	0.175	7,603	7,603	1.0	0.9	9.8431	**12**	
SR823, 61+00	Left	1	0.115	5012	5012	1.0	0.9	6.4886	**8**	6" curb w/o Gutter: Type C ExT, Not provided (ExT. extending into the bridge)
SR140, 13+60	Right	1	0.131	5716	5716	1.0	0.9	7.3997	**8**	Curb & Gutter: Type A ExT
US52 RAMP A, 29+61	Right	1	0.490	21344	21344	1.0	0.9	27.6331	**28**	Barrier: Type B ExT. Ext. Not provided (Taper of shoulder)
US52 RAMP A, 37+25	Right	1	0.290	12632	12632	1.0	0.9	16.3543	**20**	Barrier: Type B ExT
US52 RAMP B, 29+25	Left	1	0.200	8712	8712	1.0	0.9	11.2788	**12**	Barrier: Type B ExT
US52 RAMP B, 32+25	Right	1	0.620	27007	27007	1.0	0.9	34.9643	**36**	Barrier: Type B ExT
CR503, 24+00	Right	1	0.070	3049	3049	1.0	0.9	3.9476	**4**	Barrier: Type B ExT
CR503, 25+27	Right	1	0.010	436	436	1.0	0.9	0.5639	**4**	Barrier: Type B ExT

Made By: MHT Date: 1/30/2007
Checked: DL, RN Date: 3/13/2007
Job No.: PID 77366 Sheet No.: 2 of 5
Descriptio Exfiltration Trench (ExT) at Median for SR823 - Phase 3 (SCI-823-0.00)

Calculation to Determine Length of Exfiltration Trench - Lt for the equation Lt = T(A*Cq)/689 (where Cq = 0.858i^3-0.78i^2+0.774i+0.04 and i = impervious area divided by the total area)

* Area values are from Phase 3 median inlet spacing calculations.

Inlet Station	Side	T Treatment Percent	Impervious Area (acres)*	Impervious Area (SF)*	A Total Area (SF)*	i	Cq	Lt	Lt Rounded	Notes
106+00	Left	1.0	0.170	7,397	7,397	1.0	0.9	9.5763	**12**	
	Right	1.0	0.170	7,397	7,397	1.0	0.9	9.5763	**12**	
112+00	Left	1.0	0.103	4,500	4,500	1.0	0.9	5.8258	**8**	
	Right	1.0	0.103	4,500	4,500	1.0	0.9	5.8258	**8**	
120+00	Left	1.0	0.138	6,000	6,000	1.0	0.9	7.7678	**8**	
	Right	1.0	0.138	6,000	6,000	1.0	0.9	7.7678	**8**	
126+00	Left	1.0	0.103	4,500	4,500	1.0	0.9	5.8258	**8**	
	Right	1.0	0.103	4,500	4,500	1.0	0.9	5.8258	**8**	
128+50	Left	1.0	0.128	5,583	5,583	1.0	0.9	7.2276	**8**	
	Right	1.0	0.043	1,875	1,875	1.0	0.9	2.4274	**4**	
129+50	Left	1.0	0.072	3,150	3,150	1.0	0.9	4.0781	**8**	
	Right	1.0	0.014	616	616	1.0	0.9	0.7975	**4**	
130+15.93 (low point)	Left	1.0	0.048	2,077	2,077	1.0	0.9	2.6887		Sump inlet area less than 0.25 acres, no ExT needed
	Right	1.0	0.008	363	363	1.0	0.9	0.4695		
	Left	1.0	0.116	5,034	5,034	1.0	0.9	6.5177		
	Right	1.0	0.019	814	814	1.0	0.9	1.0543		
141+00	Left	1.0	0.039	1,700	1,700	1.0	0.9	2.2009	**4**	
	Right	1.0	0.006	275	275	1.0	0.9	0.3560	**4**	
141+50	Left	1.0	0.039	1,700	1,700	1.0	0.9	2.2009	**4**	
	Right	1.0	0.006	275	275	1.0	0.9	0.3560	**4**	
142+00	Left	1.0	0.312	13,600	13,600	1.0	0.9	17.6070	**20**	
	Right	1.0	0.051	2,200	2,200	1.0	0.9	2.8482	**4**	
146+00	Left	1.0	0.312	13,600	13,600	1.0	0.9	17.6070	**20**	
	Right	1.0	0.051	2,200	2,200	1.0	0.9	2.8482	**4**	
150+00	Left	1.0	0.390	17,000	17,000	1.0	0.9	22.0087	**24**	
	Right	1.0	0.063	2,750	2,750	1.0	0.9	3.5602	**4**	
155+00	Left	1.0	0.468	20,400	20,400	1.0	0.9	26.4104	**28**	
	Right	1.0	0.076	3,300	3,300	1.0	0.9	4.2723	**8**	
161+00	Left	1.0	0.490	21,345	21,345	1.0	0.9	27.6333	**28**	
	Right	1.0	0.085	3,704	3,704	1.0	0.9	4.7952	**8**	

TranSystems

Made By: MHT **Date:** 1/30/2007
Checked: DL, RN **Date:** 3/13/2007
Job No.: PID 77366 **Sheet No.:** 2 of 5
Descriptio Exfiltration Trench (ExT) at Median for SR823 - Phase 3 (SCI-823-0.00)

Calculation to Determine Length of Exfiltration Trench - Lt for the equation Lt = T(A*Cq)/689 (where Cq = 0.858i^3-0.78i^2+0.774i+0.04 and i = impervious area divided by the total area)

* Area values are from Phase 3 median inlet spacing calculations.

I-3D										
Inlet Station	Side	T Treatment Percent	Impervious Area (acres)*	Impervious Area (SF)*	A Total Area (SF)*	i	Cq	Lt	Lt Rounded	Notes
112+00	Right	1	0.165	7,200	7,200	1	0.9	9.4049	**12**	
120+00	Right	1	0.661	28,800	28,800	1	0.9	37.6197	**40**	
128+50	Right	1	0.702	30,600	30,600	1	0.9	39.9710	**40**	
129+50	Right	1	0.087	3,800	3,800	1	0.9	4.9637	**8**	

CB-3A										
118+00	Left	1	0.047	2,065	2,065	1	0.9	2.6974	**4**	
126+00	Left	1	0.411	17,906	17,906	1	0.9	23.3896	**24**	

Made By: MHT Date: 1/30/2007
Checked: DL, RN Date: 3/13/2007
Job No.: PID 77366 Sheet No.: 4 of 5
Descriptio Exfiltration Trench (ExT) at Median for SR823 - Phase 3 (SCI-823-0.00)

Calculation to Determine Length of Exfiltration Trench - Lt for the equation Lt = T(A*Cq)/689 (where Cq = 0.858i^3-0.78i^2+0.774i+0.04 and i = impervious area divided by the total area)

* Area values are from Phase 3 median inlet spacing calculations.

Inlet Station	Side	T Treatment Percent	Impervious Area (acres)*	Impervious Area (SF)*	A Total Area (SF)*	i	Cq	Lt	Lt Rounded	Notes
177+00	Left	1.0	0.176	7,686	7,686	1.0	0.9	9.9505	12	
	Right	1.0	0.776	33,784	33,784	1.0	0.9	43.7378	44	
180+00	Left	1.0	0.069	2,994	2,994	1.0	0.9	3.8761	4	
	Right	1.0	0.307	13,381	13,381	1.0	0.9	17.3234	20	
183+00	Left	1.0	0.068	2,973	2,973	1.0	0.9	3.8489	4	
	Right	1.0	0.293	12,781	12,781	1.0	0.9	16.5467	20	
185+00	Left	1.0	0.044	1,916	1,916	1.0	0.9	2.4805	4	
	Right	1.0	0.175	7,637	7,637	1.0	0.9	9.8871	12	
186+32.39 (low point)	Left	1.0	0.026	1,122	1,122	1.0	0.9	1.4526		Sump inlet area less than 0.25 acres, no ExT needed
	Right	1.0	0.108	4,720	4,720	1.0	0.9	6.1107		
	Left	1.0	0.017	744	744	1.0	0.9	0.9628		
	Right	1.0	0.017	744	744	1.0	0.9	0.9628		
187+00	Left	1.0	0.051	2,200	2,200	1.0	0.9	2.8482	4	
	Right	1.0	0.051	2,200	2,200	1.0	0.9	2.8482	4	
189+00	Left	1.0	0.253	11,000	11,000	1.0	0.9	14.2409	16	
	Right	1.0	0.253	11,000	11,000	1.0	0.9	14.2409	16	
199+00	Left	1.0	0.126	5,500	5,500	1.0	0.9	7.1205	8	
	Right	1.0	0.154	6,689	6,689	1.0	0.9	8.6600	12	
204+00	Left	1.0	0.126	5,500	5,500	1.0	0.9	7.1205	8	
	Right	1.0	0.402	17,500	17,500	1.0	0.9	22.6560	24	
209+00	Left	1.0	0.126	5,500	5,500	1.0	0.9	7.1205	8	
	Right	1.0	0.402	17,500	17,500	1.0	0.9	22.6560	24	
214+00	Left	1.0	0.126	5,500	5,500	1.0	0.9	7.1205	8	
	Right	1.0	0.402	17,500	17,500	1.0	0.9	22.6560	24	
219+00	Left	1.0	0.126	5,500	5,500	1.0	0.9	7.1205	8	
	Right	1.0	0.402	17,500	17,500	1.0	0.9	22.6560	24	
224+00	Left	1.0	0.126	5,500	5,500	1.0	0.9	7.1205	8	
	Right	1.0	0.402	17,500	17,500	1.0	0.9	22.6560	24	
229+00	Left	1.0	0.152	6,600	6,600	1.0	0.9	8.5446	12	
	Right	1.0	0.482	21,000	21,000	1.0	0.9	27.1872	28	
235+00	Left	1.0	0.202	8,800	8,800	1.0	0.9	11.3927	12	
	Right	1.0	0.643	28,000	28,000	1.0	0.9	36.2496	40	
243+00	Left	1.0	0.253	11,041	11,041	1.0	0.9	14.2936	16	
	Right	1.0	0.313	13,645	13,645	1.0	0.9	17.6658	20	

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TranSystems

Made By: MHT **Date:** 1/30/2007
Checked: DL, RN **Date:** 3/13/2007
Job No.: PID 77366 **Sheet No.:** 5 of 5
Descriptio Exfiltration Trench (ExT) at Median for SR823 - Phase 3 (SCI-823-0.00)

Calculation to Determine Length of Exfiltration Trench - Lt for the equation Lt = T(A*Cq)/689 (where Cq = 0.858i^3-0.78i^2+0.774i+0.04 and i = impervious area divided by the total area)

* Area values are from Phase 3 median inlet spacing calculations.

Inlet Station	Side	T Treatment Percent	Impervious Area (acres)*	Impervious Area (SF)*	A Total Area (SF)*	i	Cq	Lt	Lt Rounded	Notes
263+00	Left	1.0	0.435	18,931	18,931	1.0	0.9	24.5080	**28**	
	Right	1.0	0.244	10,632	10,632	1.0	0.9	13.7643	**16**	
273+00	Left	1.0	0.861	37,500	37,500	1.0	0.9	48.5486	**52**	
	Right	1.0	0.195	8,500	8,500	1.0	0.9	11.0044	**12**	
283+00	Left	1.0	0.861	37,500	37,500	1.0	0.9	48.5486	**52**	
	Right	1.0	0.195	8,500	8,500	1.0	0.9	11.0044	**12**	
293+00	Left	1.0	0.622	27,106	27,106	1.0	0.9	35.0918	**36**	
	Right	1.0	0.225	9,791	9,791	1.0	0.9	12.6758	**16**	
303+00	Left	1.0	0.253	11,000	11,000	1.0	0.9	14.2409	**16**	
	Right	1.0	0.253	11,000	11,000	1.0	0.9	14.2409	**16**	
313+00	Left	1.0	0.253	11,000	11,000	1.0	0.9	14.2409	**16**	
	Right	1.0	0.253	11,000	11,000	1.0	0.9	14.2409	**16**	
323+00	Left	1.0	0.253	11,000	11,000	1.0	0.9	14.2409	**16**	
	Right	1.0	0.700	30,478	30,478	1.0	0.9	39.4576	**40**	
333+00	Left	1.0	0.253	11,000	11,000	1.0	0.9	14.2409	**16**	
	Right	1.0	0.803	35,000	35,000	1.0	0.9	45.3120	**48**	
340+00	Left	1.0	0.177	7,700	7,700	1.0	0.9	9.9687	**12**	
	Right	1.0	0.562	24,500	24,500	1.0	0.9	31.7184	**32**	
346+00	Left	1.0	0.152	6,600	6,600	1.0	0.9	8.5446	**12**	
	Right	1.0	0.482	21,000	21,000	1.0	0.9	27.1872	**28**	
349+00	Left	1.0	0.076	3,300	3,300	1.0	0.9	4.2723	**8**	
	Right	1.0	0.241	10,500	10,500	1.0	0.9	13.5936	**16**	
350+00	Left	1.0	0.025	1,100	1,100	1.0	0.9	1.4241	**4**	
	Right	1.0	0.080	3,500	3,500	1.0	0.9	4.5312	**8**	
350+59.68 (low point)	Left	1.0	0.015	657	657	1.0	0.9	0.8499		Sump inlet area less than 0.25 acres, no ExT needed
	Right	1.0	0.048	2,089	2,089	1.0	0.9	2.7042		
	Left	1.0	0.023	994	994	1.0	0.9	1.2862		
	Right	1.0	0.073	3,161	3,161	1.0	0.9	4.0926		
351+50	Left	1.0	0.088	3,850	3,850	1.0	0.9	4.9843	**8**	
	Right	1.0	0.281	12,250	12,250	1.0	0.9	15.8592	**16**	

R1

SCI 823-0.00 PID 77366 PHASE 3

BMP CALS FOR DITCHES - SR823, RIGHT HAND SIDE
VEGETATED DITCH DESIGN - 1118.3.1, L & D VOL-2

DATE: 07/12/07 | DONE BY: MDC | CHECKED BY: RN

EBW = ENCHANCED BANKFULL WIDTH - $(5.4*A^{.358})$ FT
AREA (A) = TOTAL DRAINAGE AREA TO THE DITCH IN ACRES

STATION FROM	STATION TO	DITCH WIDTH PROVIDED (FT)	AREA (AC)	EBW (FT)	DITCH WIDTH REQUIRED > 10FT	COMMENTS
044+50	040+00	10	1.11	5.606		US52 A
044+50	061+00	10	6.81	10.693	10.693	US52 A, Cut Section, Use 10' maximum ditch width
061+00	062+50	10	0.34	3.689		SR823
068+50	064+00	10	1.58	6.349		SR140 A
068+50	069+00	10	0.12	2.554		SR140 A
096+00	076+00	10	11.34	12.817	12.817	Cut Section, Use 10' maximum ditch width
076+00	069+50	10	3.90	8.765		
096+00	105+00	10	3.06	8.037		
105+50	106+00	10	13.27	13.556	13.556	Fill Section, coordinate with ODOT and establish the ditch width in Stage 2
106+00	107+00	10	0.99	5.375		
118+50	120+50	10	0.93	5.260		
124+50	127+50	10	1.59	6.372		
127+50	128+50	15	0.68	4.702		
131+50	130+00	10	0.63	4.581		
130+00	129+50	10	0.31	3.551		
129+50	129+00	15	0.40	3.897		
166+00	161+00	10	2.14	7.076		
161+00	155+00	10	2.04	6.965		
155+00	150+00	10	2.46	7.435		
150+00	146+00	10	2.09	7.023		
146+00	143+00	10	0.81	5.016		
143+00	142+00	10	4.36	9.122		
142+00	141+00	10	0.53	4.299		
141+00	140+00	10	0.70	4.763		

R1

SCI 823-0.00 PID 77366 PHASE 3

BMP CALS FOR DITCHES - SR823, RIGHT HAND SIDE
VEGETATED DITCH DESIGN - 1118.3.1, L & D VOL-2

DATE: 07/12/07	DONE BY: MDC	CHECKED BY: RN

EBW = ENCHANCED BANKFULL WIDTH - $(5.4*A^{.356})$ FT
AREA (A) = TOTAL DRAINAGE AREA TO THE DITCH IN ACRES

STATION FROM	STATION TO	DITCH WIDTH PROVIDED (FT)	AREA (AC)	EBW (FT)	DITCH WIDTH REQUIRED > 10FT	COMMENTS
166+00	166+50	10	0.29	3.454		
166+50	168+50	10	1.24	5.831		
169+50	173+00	10	0.78	4.938		
177+00	179+00	10	2.36	7.327		
179+00	182+00	10	3.45	8.388		
207+00	186+50	10	20.50	15.826	15.826	Cut Section, Use 10' maximum ditch width, Fill Section, coordinate
186+50	185+00	10	0.82	5.034		with ODOT and establish the ditch width in Stage 2
185+00	183+50	10	1.06	5.508		
183+50	182+00	10	16.30	14.585	14.585	Fill Section, coordinate with ODOT and establish the ditch width in Stage 2
207+00	209+00	10	13.69	13.708	13.708	Fill Section, coordinate with ODOT and establish the ditch width in Stage 2
209+00	209+50	10	0.30	3.518		
209+50	210+00	15	0.30	3.518		
229+00	212+50	10	3.89	8.757		
212+50	211+00	10	0.78	4.952		
211+00	210+50	15	0.34	3.682		
258+00	244+50	10	10.90	12.638	12.638	Fill Section, coordinate with ODOT and establish the ditch width in Stage 2
244+50	240+00	10	4.44	14.273	14.273	Fill Section, coordinate with ODOT and establish the ditch width in Stage 2
244+50	239+00	15	1.12	5.628		
264+00	268+50	10	1.12	5.615		
268+50	270+50	15	1.18	5.735		
270+50	271+50	15	0.75	4.872		
274+00	283+00	10	2.83	7.821		
283+00	290+00	10	3.08	8.059		
290+00	291+00	10	1.68	6.501		
291+00	293+00	10	3.70	8.602		
293+00	297+00	10	4.99	9.570		
297+00	299+50	10	3.87	8.740		
299+50	301+50	10	2.68	7.671		

SCI 823-0.00 PID 77366 PHASE 3

BMP CALS FOR DITCHES - SR823, RIGHT HAND SIDE
VEGETATED DITCH DESIGN - 1118.3.1, L & D VOL-2

DATE: 07/12/07	DONE BY: MDC	CHECKED BY: RN

EBW = ENCHANCED BANKFULL WIDTH - $(5.4*A^{.356})$ FT
AREA (A) = TOTAL DRAINAGE AREA TO THE DITCH IN ACRES

STATION FROM	STATION TO	DITCH WIDTH PROVIDED (FT)	AREA (AC)	EBW (FT)	DITCH WIDTH REQUIRED > 10FT	COMMENTS
314+50	313+00	10	1.77	6.615		
313+00	311+50	10	2.18	7.124		
311+50	311+00	10	0.53	4.308		
314+50	319+00	10	2.87	7.855		
319+00	321+50	10	3.23	8.197		
321+50	322+00	15	0.42	3.965		
325+00	327+50	10	0.46	4.096		
327+50	328+00	10	0.12	2.561		
328+00	328+50	10	0.16	2.812		
328+50	329+00	10	0.19	2.967		
330+50	333+50	10	0.59	4.473		
334+00	343+00	10	2.08	7.004		
343+00	344+50	15	1.37	6.036		
348+00	346+00	10	1.03	5.459		
348+00	352+00	10	0.69	4.724		

SCI 823-0.00 PID 77366 PHASE 3

BMP CALS FOR DITCHES - SR823, LEFT HAND SIDE
VEGETATED DITCH DESIGN - 1118.3.1, L & D VOL-2

DATE: 07/12/07	DONE BY: MDC	CHECKED BY: RN

EBW = ENCHANCED BANKFULL WIDTH - $(5.4*A^{.356})$ FT
AREA (A) = TOTAL DRAINAGE AREA TO THE DITCH IN ACRES

STATION FROM	STATION TO	DITCH WIDTH PROVIDED (FT)	AREA (AC)	EBW (FT)	DITCH WIDTH REQUIRED > 10FT	COMMENTS
044+00	044+50	10	1.14	5.653		US52 B
045+00	044+50	10	0.80	4.992		US52 B
045+00	047+00	10	0.50	4.210		US52 B
047+00	056+00	10	3.54	8.472		US52 B
056+00	059+50	10	0.87	5.147		SR823
059+50	060+00	10	0.08	2.188		SR823
060+00	060+50	10	0.10	2.396		SR823
068+00	061+00	10	3.94	8.794		SR140 B
068+00	068+50	10	0.13	2.633		SR140 B
096+00	086+00	10	2.93	7.915		SR823
086+00	075+00	10	4.13	8.944		SR823
075+00	074+50	10	0.09	2.291		SR140 B
074+50	073+50	15	0.20	3.030		SR140 B
073+00	073+50	15	0.29	3.488		
073+00	068+50	10	1.29	5.909		
096+00	106+00	10	4.82	9.453		
106+00	108+50	10	2.80	7.794		
108+50	109+50	10	0.85	5.096		
109+50	110+00	15	0.50	4.231		
110+00	110+50	15	0.55	4.359		
111+50	110+50	15	0.87	5.130		
118+00	119+00	10	0.69	4.739		

SCI 823-0.00 PID 77366 PHASE 3

BMP CALS FOR DITCHES - SR823, LEFT HAND SIDE
VEGETATED DITCH DESIGN - 1118.3.1, L & D VOL-2

DATE: 07/12/07	DONE BY: MDC	CHECKED BY: RN

EBW = ENCHANCED BANKFULL WIDTH - $(5.4*A^{.356})$ FT
AREA (A) = TOTAL DRAINAGE AREA TO THE DITCH IN ACRES

STATION FROM	STATION TO	DITCH WIDTH PROVIDED (FT)	AREA (AC)	EBW (FT)	DITCH WIDTH REQUIRED > 10FT	COMMENTS
125+50	125+00	10	0.31	3.567		
125+50	126+00	10	0.21	3.077		
126+00	128+00	10	1.23	5.810		
128+00	128+50	10	0.36	3.739		
128+50	129+00	15	0.37	3.790		
166+00	142+00	10	11.61	12.926	12.9	Cut Section, Use 10' maximum ditch width
142+00	141+00	10	0.95	5.298		
141+00	139+50	10	1.40	6.083		
166+00	166+50	10	0.87	5.141		
167+50	173+50	10	2.74	7.735		
173+50	174+50	10	2.77	7.761		
174+50	175+00	15	0.30	3.522		
178+00	177+50	10	0.13	2.583		
177+50	177+00	10	0.98	5.355		
177+00	176+00	10	1.17	5.705		
176+00	175+50	15	1.49	6.228		
178+00	182+50	10	2.71	7.700		
182+50	184+50	10	1.44	6.152		
184+50	185+00	15	0.26	3.334		
207+00	204+00	10	0.88	5.168		
204+00	189+00	10	9.54	12.053	12.1	Cut Section, Use 10' maximum ditch width
189+00	187+00	10	0.88	5.151		
187+00	186+00	10	0.78	4.952		
186+00	185+50	15	0.27	3.393		

SCI 823-0.00 PID 77366 PHASE 3

BMP CALS FOR DITCHES - SR823, LEFT HAND SIDE
VEGETATED DITCH DESIGN - 1118.3.1, L & D VOL-2

DATE: 07/12/07	DONE BY: MDC	CHECKED BY: RN

EBW = ENCHANCED BANKFULL WIDTH - $(5.4*A^{.356})$ FT
AREA (A) = TOTAL DRAINAGE AREA TO THE DITCH IN ACRES

STATION FROM	STATION TO	DITCH WIDTH PROVIDED (FT)	AREA (AC)	EBW (FT)	DITCH WIDTH REQUIRED > 10FT	COMMENTS
226+00	224+00	10	0.46	4.093		
224+00	219+00	10	1.50	6.233		
219+00	214+00	10	1.35	6.004		
214+00	213+50	10	0.09	2.264		
213+50	213+00	10	6.42	10.471	10.5	Cut Section, Use 10' maximum ditch width
213+00	209+50	10	3.28	8.241		
209+50	209+00	15	0.33	3.635		
236+50	232+50	10	4.16	8.972		
232+50	230+00	10	4.31	9.081		
258+00	284+00	10	12.73	13.356	13.4	Cut Section, Use 10' maximum ditch width
288+50	291+00	15	5.16	9.684		
295+00	293+00	10	3.82	8.704		
293+00	291+00	10	1.18	5.729		
295+00	297+00	10	2.81	7.805		
297+00	298+00	15	1.22	5.800		
306+00	309+00	10	0.88	5.162		
309+00	312+00	10	3.24	8.207		
312+00	312+50	15	0.44	4.022		
318+50	319+00	10	0.46	4.096		
323+50	320+50	10	3.30	8.259		
323+50	327+50	10	2.18	7.124		
327+50	328+00	10	0.40	3.904		

L1

SCI 823-0.00 PID 77366 PHASE 3

BMP CALS FOR DITCHES - SR823, LEFT HAND SIDE
VEGETATED DITCH DESIGN - 1118.3.1, L & D VOL-2

DATE: 07/12/07	DONE BY: MDC	CHECKED BY: RN

EBW = ENCHANCED BANKFULL WIDTH - $(5.4*A^{.356})$ FT
AREA (A) = TOTAL DRAINAGE AREA TO THE DITCH IN ACRES

STATION FROM	STATION TO	DITCH WIDTH PROVIDED (FT)	AREA (AC)	EBW (FT)	DITCH WIDTH REQUIRED > 10FT	COMMENTS
329+00	328+50	10	0.32	3.607		
329+00	333+00	10	3.01	7.991		
333+00	340+00	10	8.17	11.406	11.4	Cut Section, Use 10' maximum ditch width
340+00	343+50	10	1.40	6.086		
343+50	344+50	10	1.42	6.113		
344+50	345+00	15	0.33	3.619		
349+50	349+00	10	0.30	3.501		
349+00	348+00	10	0.33	3.647		
348+00	346+50	10	2.03	6.950		
346+50	345+50	15	0.70	4.744		
349+50	350+50	10	0.84	5.064		
350+50	352+00	10	0.96	5.318		

APPENDIX G

LD-33 Form

FORM LD-33
REV. 12-82

OHIO DEPARTMENT OF TRANSPORTATION
COUNTY ENGINEER
APPROVAL FORM

DATE SUBMITTED TO DISTRICT DEPUTY DIRECTOR: December 10, 2007

DATE SUBMITTED TO COUNTY ENGINEER: December 10, 2007

COUNTY: SCIOTO ROUTE: 823 SECTION: 0.00

CULVERT DATA

STATION	SIZE & TYPE	ELEVATION OF CULVERT INVERT		ELEVATION OF EXISTING CHANNEL AT		SKEW
		INLET	OUTLET	INLET	OUTLET	
68+64.0 SR 823	72" Type A, 707.03	576.67	566.58	576.67	◊	26.0° RF
110+02.0 SR 823	60" Type A,707.03	559.81	556.62	◊	-	6.0° LF
128+98.0 SR 823	60" Type A, 707.03	523.90	512.54	*	512.54	7.0° LF
166+50.0 SR 823	36" Type A	711.74	710.12	◊	◊	90.0° ⊥
175+57.0 SR 823	60" Type A, 707.03	649.20	602.79	649.20	-	12.0° RF
176+31.4 TO 181+91.8 SR 823, RHS	78" Type A, 707.03	618.75	601.28	-	-	PARALLE TO SR823
184+29.0 SR 823	78" Type A, 707.03	628.12	624.80	-	◊	21.5° LF
209+30.0 SR 823	72" Type A, 707.03	675.75	658.59	675.75	658.59	21.5° RF
233+87.4 SR 823	8' X 8' Box Culv	683.82	639.44	683.82	-	48.3° RF
239+18.1 SR 823	8' x 8' Box Culv.	652.20	639.44	652.20	-	5.5° LF
297+33.6 SR 823	8' X 8' Box Culv.	576.26	554.27	*	-	51.6° RF
300+96.5 SR 823	8' X 8' Box Culv.	566.54	554.27	*	◊	28.0° RF
311+81.0 SR 823	8' X 8' Box Culv.	601.97	570.86	*	*	17.0° LF
320+42.8 SR 823	72" Type A, 707.03	660.56	616.59	◊	*	34.8° RF
344+82.0 SR 823	8' X 8' Box Culv.	572.79	561.92	572.79	*	5.3° LF

I have reviewed and hereby approve the drainage proposed for the highway designated heron in accordance with the provisions of Section 6131.631 of the Revised Code of the State of Ohio.

COUNTY ENGINEER SCIOTO COUNTY

(SIGNATURE)

DATE

COMMENTS:

* Relocated Channel
◊ New Ditch Location

OHIO DEPARTMENT OF TRANSPORTATION
COUNTY ENGINEER
APPROVAL FORM

FORM LD-33

REV. 12-82

DATE SUBMITTED TO DISTRICT DEPUTY DIRECTOR December 10, 2007

DATE SUBMITTED TO COUNTY ENGINEER December 10, 2007

COUNTY SCIOTO ROUTE 823 SECTION 0.00

CULVERT DATA

STATION		SIZE & TYPE	ELEVATION OF CULVERT INVERT		ELEVATION OF EXISTING CHANNEL AT		SKEW	
			INLET	OUTLET	INLET	OUTLET		
64+00.0	SR140 RAMP A	24" Type A	555.91	554.02	◊	◊	90°	⊥
68+50.0	SR140 RAMP B	36" Type A	572.85	570.00	◊	◊	90°	⊥
73+12.6	SR140 RAMP B	30" Type A	606.50	603.18	◊	◊	43.5	LF
11+17.0	US52	48" TYPE A, 706.02	520.31	520.20	◊	◊	Exist.	
20+14.0	US52	84" TYPE A, 706.02	519.41	516.74	◊	◊	Exist.	
21+50.0	CR503	78" TYPE A, 706.02	549.25	546.63	◊	◊	90°	⊥
6+89.33	SR140	30" Type A	548.15	546.91	◊	-	90°	⊥
12+00.00	SR140	36" Type A	553.72	552.80	◊	◊	90°	⊥
16+50.00	SR140	42" Type A	566.94	566.16	◊	◊	90°	⊥
22+16.57	CR251	36" Type A	555.24	553.50	-	-	17.4°	LF
18+00.00	PERSHING AVE, SOUTH	24" Type A	547.15	544.51	◊	-	90°	⊥
0+70.00	DRIVE @ PERSHING AVE, SOUTH	24" Type A	543.46	540.86	◊	-	26.8°	RF
15+66.10	SR335	42" Type A	528.22	527.56	◊	-	90°	⊥

I have reviewed and hereby approve the drainage proposed for the highway designated heron in accordance with the provisions of Section 6131.631 of the Revised Code of the State of Ohio.

COUNTY ENGINEER SCIOTO COUNTY

(SIGNATURE)

DATE

COMMENTS:

* Relocated Channel
◊ New Ditch Location