

SCUPPER/BRIDGE BYPASS CALCULATIONS

PROJECT: WAR-48-8.63

PID: 117567

Computed by: SRW Date: 5/28/24

Checked by: KGJ Date: 5/29/2024

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Spread and Scupper Bypass

SR 48 over the Little Miami River

Criteria	Reference
Manning's 'n'	Per L&D Vol II, Table 1102-2
Coefficient	Per L&D Vol II, 1101-2
Rainfall Area	Per L&D Vol II, Figure 1101-2
%AEP	Per L&D Vol II, 1103.2
Time of Concentration	Per L&D Vol II, 1103.3
Allowable Spread	Per L&D Vol II, Table 1103-1

Notes

State Route
10' shoulder + 4' into lane

Vertical Curve

PVI Station	18+33.11	PVC Station	12+33.11
PVI Elev.	632.22	PVC Elev.	662.22
VC	1200.00	PVT Station	24+33.11
G1	-5.00%	PVT Elev.	635.22
G2	0.50%	a	0.000023

Station*	Elevation (ft)	Longitudinal Slope S (ft/ft)	Contributing Drainage Width (ft)	Area A (acres)	Intensity** i (in/hr)	Gutter Flow Q (cfs)	Cross Slope S _x (ft/ft)	Spread T (ft)	Grate Width W (ft)	Efficiency E	Bypass Flow Q _b (cfs)
Begin	679.26										
10ft Shoulder											
8+92	679.26										
10+00	673.88	0.05000	23.5	0.058	4.82	0.25	0.0160	3.6	0.5	0.33	0.17
12+00	663.88	0.05000	23.5	0.108	4.82	0.64	0.0160	5.1	0.5	0.24	0.48
14+00	654.51	0.04681	23.5	0.108	4.82	0.95	0.0160	5.9	0.5	0.21	0.75
18+00	641.24	0.03318	23.5	0.216	4.82	1.69	0.0160	7.9	0.5	0.16	1.42
19+26	638.58	0.02114	23.5	0.068	4.82	1.71	0.0160	8.6	0.5	0.15	1.46
End											

Notes:

= input required

* i.e., enter 22+50 as 2250

** see L&D Vol. 2 Fig. 1101-2 & 1101-3

Equations:

$$Q = ciA$$

where c=0.9

$$E = 1 - \left(1 - \frac{W}{T}\right)^{2.67}$$

$$Q_b = Q(1 - E)$$

$$T = \left(\frac{Qn}{0.56 S_x^{1.67} S^{0.5}}\right)^{0.375}$$

where n=0.015

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Criteria	Reference
Manning's 'n'	Per L&D Vol II, Table 1102-2
Coefficient	Per L&D Vol II, 1101-2
Rainfall Area	Per L&D Vol II, Figure 1101-2
%AEP	Per L&D Vol II, 1103.2
Time of Concentration	Per L&D Vol II, 1103.3
Allowable Spread	Per L&D Vol II, Table 1103-1

Notes

State Route
4' shoulder + 4' into lane

Vertical Curve

PVI Station	18+33.11	PVC Station	12+33.11
PVI Elev.	632.22	PVC Elev.	662.22
VC	1200.00	PVT Station	24+33.11
G1	-5.00%	PVT Elev.	635.22
G2	0.50%	a	0.000023

Station*	Elevation (ft)	Longitudinal Slope S (ft/ft)	Contributing Drainage Width (ft)	Area A (acres)	Intensity** i (in/hr)	Gutter Flow Q (cfs)	Cross Slope S _c (ft/ft)	Spread T (ft)	Grate Width W (ft)	Efficiency E	Bypass Flow Q _b (cfs)
Begin	679.26										
10+00	673.88	0.05000	17.5	0.043	4.82	0.19	0.0160	3.2	0.5	0.36	0.12
12+00	663.88	0.05000	17.5	0.080	4.82	0.47	0.0160	4.5	0.5	0.27	0.34
14+00	654.51	0.04681	17.5	0.080	4.82	0.69	0.0160	5.3	0.5	0.23	0.53
18+00	641.24	0.03318	17.5	0.161	4.82	1.23	0.0160	7.0	0.5	0.18	1.01
End	638.58	0.02114	17.5	0.051	4.82	1.22	0.0160	7.6	0.5	0.17	1.02

Notes:

= input required

* i.e.; enter 22+50 as 2250

** see L&D Vol. 2 Fig. 1101-2 & 1101-3

Equations:

$$Q = ciA$$

where c=0.9

$$E = 1 - \left(1 - \frac{W}{T}\right)^{2.67}$$

$$Q_b = Q(1 - E)$$

$$T = \left(\frac{Qn}{0.56 S_c^{1.67} S^{0.5}}\right)^{0.375}$$

where n=0.015