

WEIGHTED "C"

Calculated by: CSN Date: 1/28/2026
 Checked by: PGH Date: 1/28/2026

Project Name: Ironwood
 Project #: 250228

						10 Year	100 Year		
						Pavement: c = 0.95	0.98		
						Gravel: c = 0.85	0.91		
						Green Space / Lawn (HSG-D): c = 0.50	0.67		
						Water: c = 1.00	1.00		
	Hard	Gravel	Water						
Structure	Area	Surface	Surface	Surface	RIM	10 Year	10 Year	100 Year	100 Year
	(acres)	(acres)	(acres)	(acres)	(feet)	CALC "C"	C X A	CALC "C"	C X A
FE-1	0.00	0.00	0.00	0.00	N/A	0.00	0.00	0.00	0.00
OS-2	0.29	0.00	0.00	0.00	710.50	0.50	0.14	0.67	0.19
FE-3	0.00	0.00	0.00	0.00	N/A	0.00	0.00	0.00	0.00
CB-4	0.38	0.38	0.00	0.00	713.30	0.95	0.36	0.98	0.37
CB-5	0.56	0.56	0.00	0.00	713.30	0.95	0.53	0.98	0.55
CB-6	0.37	0.33	0.00	0.00	713.30	0.90	0.34	0.94	0.35
FE-7	0.22	0.15	0.00	0.00	N/A	0.81	0.18	0.88	0.19
CB-8	0.17	0.12	0.00	0.00	713.84	0.82	0.14	0.89	0.15
Dev Totals =	1.99	1.54	0.00	0.00			1.69		1.81
						Weighted C _w =	0.85	0.91	

Rainfall

Location: Tallmadge Township
 State: MI
 Source: OCDC

Calculated by: CSN
 Date: 1/28/2026

Return Period: 10 year

Time	Hours	Mins	Rainfall (in)	Intensity (in/hr)
5 mins	0.083	5	0.54	6.48
10 mins	0.167	10	0.79	4.74
15 mins	0.25	15	0.96	3.84
30 mins	0.5	30	1.36	2.72
1 hrs	1	60	1.78	1.78
2 hrs	2	120	2.19	1.10
3 hrs	3	180	2.45	0.82
6 hrs	6	360	2.93	0.49
12 hrs	12	720	3.44	0.29
24 hrs	24	1440	3.91	0.16

Return Period: 100 year

Time	Hours	Mins	Rainfall (in)	Intensity (in/hr)
5 mins	0.083	5	0.88	10.56
10 mins	0.167	10	1.28	7.68
15 mins	0.25	15	1.57	6.28
30 mins	0.5	30	2.22	4.44
1 hrs	1	60	2.94	2.94
2 hrs	2	120	3.66	1.83
3 hrs	3	180	4.16	1.39
6 hrs	6	360	5.07	0.85
12 hrs	12	720	6.03	0.50
24 hrs	24	1440	6.90	0.29

STORM SEWER COMPUTATION SHEET

Pipe Design Storm 10 Yr. Frequency



Calculated by: CSN Date: January 28, 2026
Checked by: PGH Date: January 28, 2026

Project Name: Ironwood
Project # 250228

Minimum Time of Concentration 15 minutes
Minimum Cover: 2.5 feet
Pipe elev change at structures: 0.0 feet
Pipe Material Used: RCP
Manning "n" value: 0.013

Gravity Pipe Flow: $Q = 1.486/n \cdot A \cdot R^{2/3} \cdot S^{1/2}$

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Notes:			Area (INPUT @ 2) (ACRES)	C For Input @ Col. 2	C x A	SUM OF C x A	Time of Conc. Tc (min)	Rainfall Intensity "I" (in/hr)	Design Flow Σ CxA x I (cfs)	Pipe Diameter (in)	Slope of Energy Grade Line (%)	Actual Pipe Slope (%)	Gravity Full Flow Discharge (cfs)	Gravity Full Flow Velocity (fps)	Pipe Length (ft)	Travel Time (min)	Pipe Invert Elevation		Rim Elevation	
	Structure ID																Upper End	Lower End	Upper End	Lower End
	From	To																		
	FE-7	CB-6	0.22	0.81	0.18	0.18	15.00	3.84	0.68	12	0.04%	0.64%	2.85	3.63	171	0.79	710.900	709.803	N/A	713.30
	CB-8	CB-6	0.17	0.82	0.14	0.14	15.00	3.84	0.53	12	0.03%	0.69%	2.96	3.77	78	0.35	710.340	709.801	713.84	713.30
	CB-6	CB-5	0.37	0.90	0.34	0.65	15.79	3.78	2.46	12	0.48%	0.48%	2.47	3.14	84	0.45	709.803	709.398	713.30	713.30
	CB-5	CB-4	0.56	0.95	0.53	1.18	16.23	3.75	4.43	15	0.48%	0.48%	4.48	3.65	98	0.45	709.300	708.828	713.30	713.30
	CB-4	FE-3	0.38	0.95	0.36	1.55	16.68	3.71	5.74	15	0.80%	1.00%	6.46	5.26	57	0.18	708.828	708.260	713.30	N/A
	OS-2	FE-1	0.29	0.50	0.14	0.14	15.00	3.84	0.55	12	0.03%	0.32%	2.02	2.57	52	0.34	705.500	705.334	710.50	N/A

Required Storm Water Management Volume Calculation

Project Name:	Ironwood
Project Number:	250228
Date:	January 28, 2026
Subcatchment:	Detention Basin

Required Water Quality:

Rainfall:	1.0 in
Runoff Coefficient (C):	0.81
Proposed Developed Area:	1.99 acres
Required Water Quality Volume:	5,816 cft
Required Pretreatment Volume:	872 cft (15% of sediment control volume)
Max. Release Rate:	0.07 cfs (for a 24hr drawdown time)

Required Channel Protection:

2 year, 24 hour rainfall:	2.53 inches
Pre-Devel Drainage Area:	1.99 acres
Proposed Drainage Area:	1.99 acres
Existing Runoff Coefficient (C):	0.53 (took 10 year C and reduced to 2-year)
Proposed Runoff Coefficient (C):	0.67 (took 10 year C and reduced to 2-year)
Existing Runoff Volume:	9,662 cft
Proposed Runoff Volume:	12,246 cft
Required Bank Protection Volume:	2,584 cft
Max. Release Rate:	0.01 cfs (for a 72hr drawdown time)

Required Flood Control:

Rainfall Interval:	100-year storm
Proposed Drainage Area:	1.99 acres
Runoff Coefficient (C):	0.91
Max. Allowable Discharge:	0.26 cfs (0.13 cfs per acre)

Time Duration		Rainfall Intensity		Qin (cfs)	Qout (cfs)	Required Storage (cft)
Minutes	Time (hr)	I (in/hr)	R (in)			
5	0.08	7.68	0.64	13.91	0.26	4,095
10	0.17	5.58	0.93	10.11	0.26	5,908
15	0.25	4.56	1.14	8.26	0.26	7,200
30	0.50	3.40	1.70	6.16	0.26	10,618
60	1.0	2.24	2.24	4.06	0.26	13,674
120	2.0	1.390	2.78	2.52	0.26	16,263
180	3.0	1.027	3.08	1.86	0.26	17,288
360	6.0	0.600	3.60	1.09	0.26	17,886
720	12.0	0.344	4.13	0.62	0.26	15,757
1440	24.0	0.194	4.66	0.35	0.26	8,042

Required Flood Control Volume: **22,358 cft (with 1.25x factor of safety)**

Storm Water Management Volume and Outlet Calculations

Project Name: Ironwood
 Project Number: 250228

Date: January 28, 2026
 Subcatchment: Detention Basin

Storage Provided - Total

	Elevation	Area (sft)	Volume (cft)	Cumulative Volume (cft)	Req Volume (cft)
Basin Bottom	705.5	1	0	0	
	706.0	4,061	1,016	1,016	
Channel Prot.	706.4	4,389	1,690	2,705	2,584
	707.0	4,880	4,471	5,486	
Water Quality	707.1	4,968	492	5,978	5,816
	708.0	5,764	5,322	10,808	
	709.0	6,715	6,240	17,048	
Flood Control	709.8	7,529	5,697	22,745	22,358
	710.0	7,732	7,224	24,271	
Outlet Structure Rim	710.5	8,273	4,001	28,272	
Spillway Crest	711.0	8,814	8,273	32,544	
Total Storage Provided =				28,272 cft	
Total Storage Required =				22,358 cft	

Storage Provided - Sediment Forebay

	Elevation	Area (sft)	Volume (cft)	Cumulative Volume (cft)
Forebay Bottom	703.0	454	0	0
	704.0	760	607	607
Forebay Top	705.0	1,122	941	1,548
Total Storage Provided =				1,548 cft
Total Storage Required =				872 cft

Basin Elevations

Basin Bottom	705.50
Water Quality	707.10
Channel Prot.	706.40
Flood Volume	709.80
Outlet Structure Rim	710.50
Spillway Crest	711.00

Maximum Allowed Flows

Water Quality	0.07	cfs (24 hr drain time)
Bank Protection:	0.01	cfs (0.05 cfs per acre)
Flood Control:	0.26	cfs (0.13 cfs per acre)

Outlet Design

$$Q = C * A_h * (2 * g * H)^{1/2}$$

	Water Quality	Channel Prot.	Flood Control
C=		0.60	
Outlet Dia. (in)=	1.00	0.00	2.00
Area / hole (sft)=	0.0055	0.0000	0.0218
# of Holes=	1	0	1
g (ft / s^2)=		32.2	

Stage	Water Quality		Channel Prot.		Flood Control		Total Max Flow (cfs)
	Head (ft)	Flow (cfs)	Head (ft)	Flow (cfs)	Head (ft)	Flow (cfs)	
Water Quality	1.60	0.03					0.03
Channel Prot.	0.90	0.02	0.70	0.00			0.02
Flood Control	4.30	0.05	2.70	0.00	2.62	0.17	0.22

Proposed Spillway:

$$Q \text{ (proposed): } Q = C ((a+b)/2 - 0.2H) H^{3/2}$$

Q (design):		C =	3.0
Runoff Coeff (C) =	0.82	Width (at base; ft) =	5.00
110 (in / hr) =	3.84	Width (at top; ft) =	9.00 (assumes 1/4 sides)
Area (ac) =	1.99	H (ft) =	0.50
Q (design) =	6.35 cfs	Q (cfs) =	7.32

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