DRAINAGE CALCULATIONS

PROJECT: **Ironwood Drive Commercial**
DATE: July 20, 2026

Drainage Basin Analysis

Existing Condition

Class	*Area (ac.)*	*HSG Grade*	*Unit*	*CN No.*
Open Spaces (fair)	3.96	C	acre	79
Open Spaces (fair)	5.6	D	acre	84
Impervious	0.17	D	acre	98
Total Area	**9.73**	**Average CN**		**82.2**

Proposed Condition

Class	*Area (ac.)*	*HSG Grade*	*Unit*	*CN No.*
Open Spaces (good)	2.18	C	acre	74
Open Spaces (good)	1.33	D	acre	80
Impervious	1.78	C	acre	98
Impervious	4.44	D	acre	98
Total Area	**9.73**	**Average CN**		**90.2**

Time of Concentration

Existing Condition

Time of Concentration Segment 1 (T_c)

$V=K*S^{1/2}$

K=	0.48	(Sheet Flow)
S=	3.2	Slope
V=	0.8586501	Velocity
$T_c=L/(60V)$		
L=	300	length (ft)
T_c=	5.8	

Time of Concentration Segment 2 (T_c)

$V=K*S^{1/2}$

K=	1.2	(waterway)
S=	1.8	Slope
V=	1.61	Velocity
$T_c=L/(60V)$		
L=	693	length (ft)
T_c=	7.2	

Total **13.0 minutes** **0.22 hrs**

Proposed Condition

Time of Concentration Segment 1 (T_c)

$V=K*S^{1/2}$

K=	0.48	(Sheet Flow)
S=	1.4	Slope
V=	0.5679437	Velocity
$T_c=L/(60V)$		
L=	160	length (ft)
T_c=	4.7	min

Time of Concentration Segment 2 (T_c)

$V=(1.49r^{2/3}s^{1/2})/n$

r (12" pipe)=	0.25	(pipe, open channel)
S=	0.5	Slope
V=	3.48	Velocity
$T_c=L/(60V)$		
L=	250	length (ft)
T_c=	1.2	min

Time of Concentration Segment 3 (T_c)

$V= (1.49R^{2/3} s^{1/2})/n$

r (18" pipe) =	0.75	(pipe, open channel)
R =	0.38	Hydraulic radius
n =	0.012	Smooth pipe
S=	0.5	Slope
V=	4.6062314	Velocity

$T_c = L/(60V)$

L=	440	length (ft)
T_c=	1.6	min

Total	**7.5**	**minutes**	**0.13 hrs**

Calculate Conditions: Existing

The TR-55 method was used to calculate peak discharge for the proposed and existing conditions.
The following site conditions were used:

Q = $\frac{(P-0.2(1000/CN-10))^2}{(P+0.8(1000/CN-10))}$ inches (runoff)

	100 year	50 year	10 year	2 year	
CN =	82.2	82.2	82.2	82.2	Curve Number = 76
P =	6.63	5.72	3.9	2.6	inches (24 hour rainfall NOAA)
Q =	4.5922076	3.7506799	2.1340015	1.0838201	inches (runoff)

$q_p = q_u * A_m * Q * F_p$ peak discharge (cfs)

q_u =	790	780	760	750	unit peak discharge (csm/in)
A_m =	0.01520	0.01520	0.01520	0.01520	square miles (0.873 Acres)
F_p =	1.00	1.00	1.00	1.00	pond and swamp adjustment factor
I_a =	0.43	0.43	0.43	0.43	initial abstraction (0.2(1000/CN-10))
I_a/P=	0.07	0.08	0.11	0.17	
T_c =	0.22	0.22	0.22	0.22	hours (see calculations next page)
q_p =	**55.15**	**44.48**	**24.66**	**12.36**	peak discharge (cfs)

$V_r = 53.33 * Q * A_m * 43560$ cubic ft (runoff volume)

V_r =	**162186**	**132465**	**75368**	**38278**	cubic ft (runoff volume)

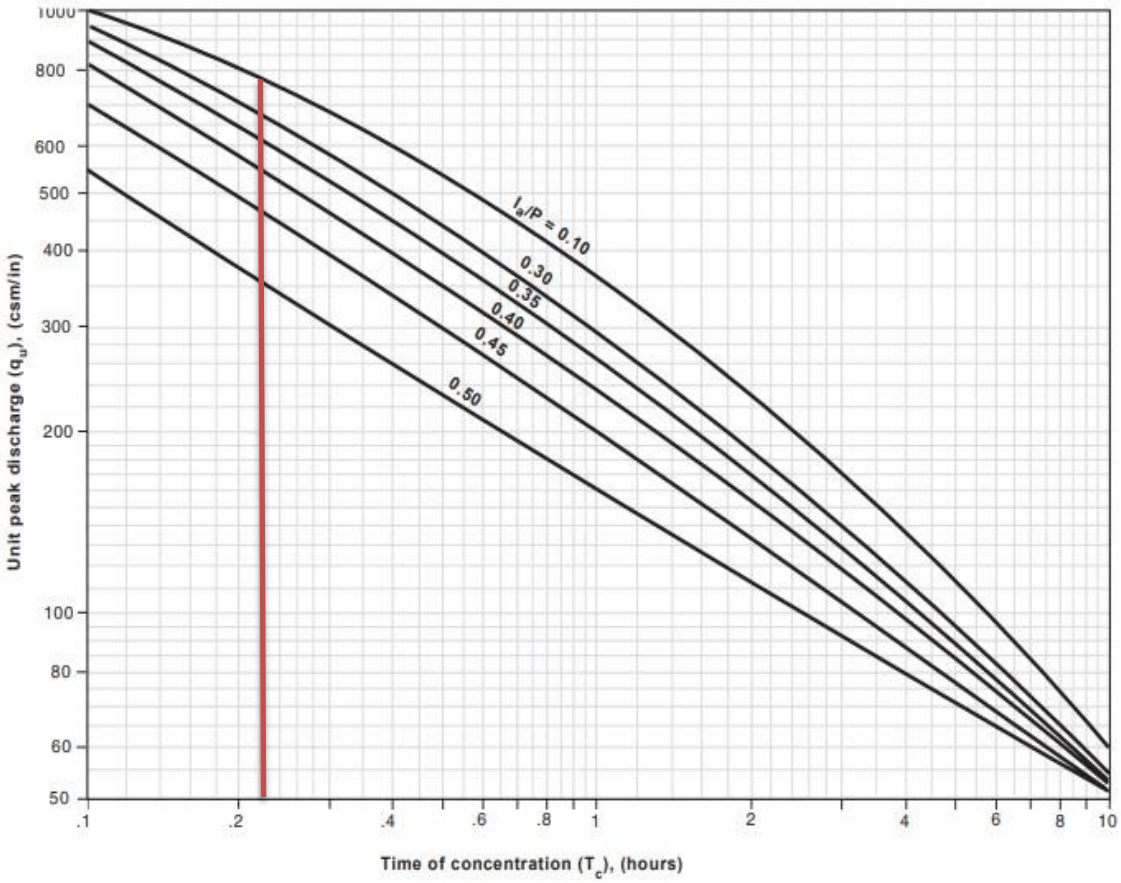

Exhibit 4-II (q_u) for NRCS (SCS) type II rainfall distribution (210-VI-TR-55, Second Ed., June 1986)

Calculate Conditions: Subcatchment 2

The following site conditions were used

Q = *(P-0.2(1000/CN-10))^2 / (P+0.8(1000/CN-10))* inches (runoff)

	100 year	50 year	10 year	2 year	
CN =	90.2	90.2	90.2	90.2	Curve Number = 90.2
P =	6.63	5.72	3.9	2.6	inches (24 hour rainfall NOAA)
Q =	5.484	4.595	2.844	1.636	inches (runoff)

q_p = $q_u * A_m * Q * F_p$ peak discharge (cfs)

q_u =	950	940	935	930	unit peak discharge (csm/in)
A_m =	0.01520	0.01520	0.01520	0.01520	square miles (0.51 Acres)
F_p =	1.00	1.00	1.00	1.00	pond and swamp adjustment factor
I_a =	0.22	0.22	0.22	0.22	initial abstraction (0.2(1000/CN-10))
I_a/P=	0.03	0.04	0.06	0.08	
T_c =	0.17	0.17	0.17	0.17	hours (see previous sheet)
q_p =	**79.20**	**65.67**	**40.42**	**23.14**	peak discharge (cfs)

V_r = $53.33 * Q * A_m * 43560$ cubic ft (runoff volume)

V_r =	**193669**	**162298**	**100434**	**57797**	cubic ft (runoff volume)

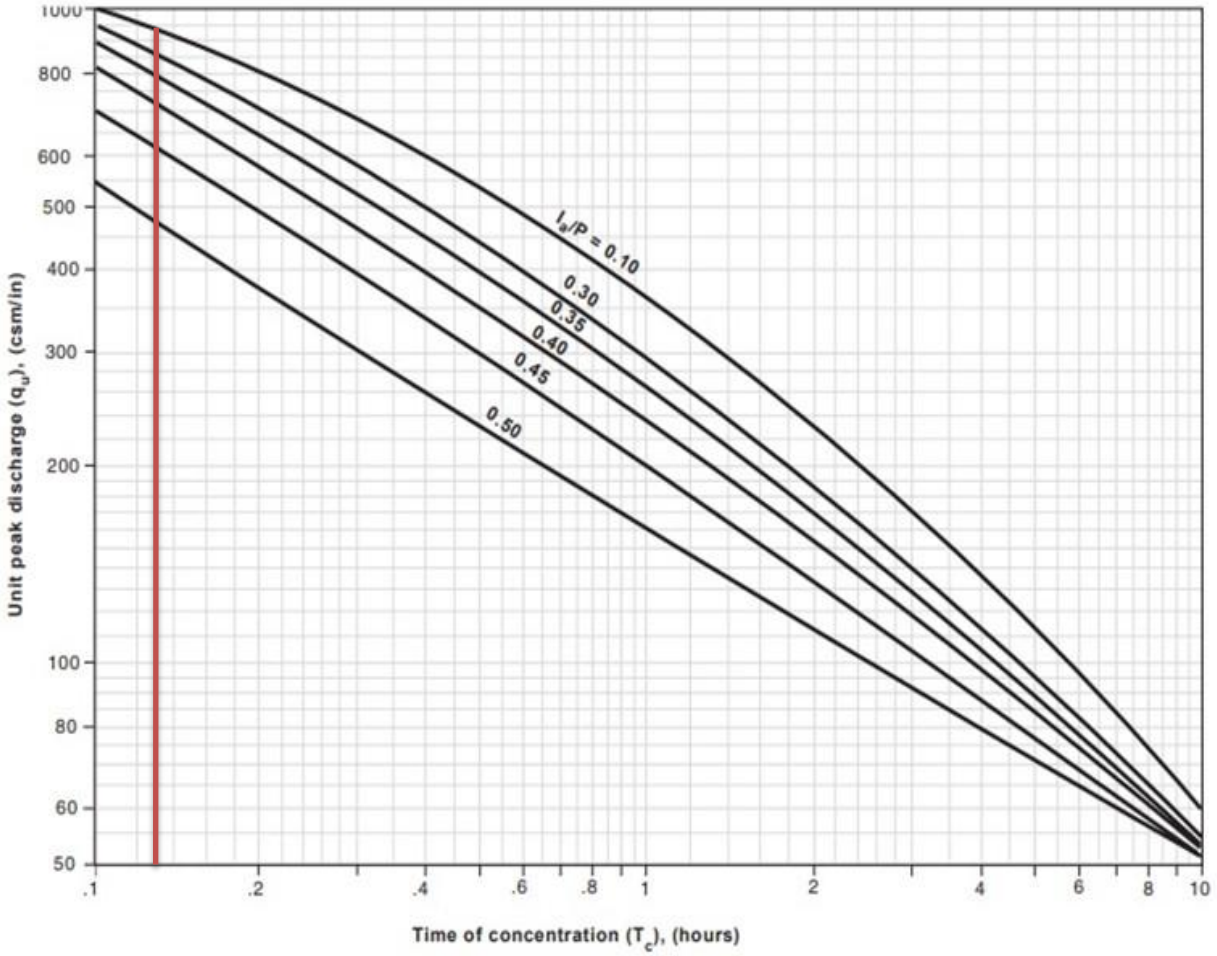

Exhibit 4-II (q_u) for NRCS (SCS) type II rainfall distribution (210-VI-TR-55, Second Ed., June 1986)

Velocity of 30" Outlet pipe

Q = 1.26 cfs (LGROW)

V = Q/A

$A = \pi r^2$	1.77 ft^2
V =	2.53 ft/s