Peak Runoff Calculation

SUB-BASIN #25

Post-Developed

Project 11822

Area (Ac) = 0.82 **Area (Sf) =** 35,760

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	11,000	S.F.	=	0.25	AC.	0.94	0.24
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	6,250	S.F.	=	0.14	AC.	0.98	0.14
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	18,510	S.F.	=	0.42	AC.	0.25	0.11
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)		S.F.	=	0.00	AC.	0.55	0.00
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	35,760			0.82			0.48

Wc = 0.5898

Time of Concentration

Overland Flow

Length, L (max 100ft) = 100 feet — t_o = Overland Flow Tc

Slope, S = 2.00% — t_o = $[0.42*(L^{0.8})*(n^{0.8})]/[P^{0.5})*(S^{0.4})]$

Manning Coefficient, n = 0.011 Pavement — t_o = 1.19 min

$P_{2/24}$ = 3.3

Shallow Flow

Length, L (Paved or Unpaved) Paved = 350 feet — V = 20.3282*(S0.5)

Slope, S = 2.00% — = 2.875 ft/s = 172.49 ft/min

Velocity, V = 2.87 ft/sec — t_s = Shallow Flow Tc

t_s = (L/V) = 2.03 min

Channel Flow

Length, L = feet — V = $(1.49/n)*R^{0.67}*S^{0.5}$

Difference in Elevation = 0 to 0 — = ft/s = ft/min

Slope, S = — t_c = Channel Flow Tc

Manning Coefficient, n = 0.000 — t_c = (L/V) = 0.00 min

Wetted Perimeter, Wp = 0 feet

Area, A = 0 sqft

Hydraulic Radius, R =

Velocity, V = ft/s

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = 5.00 (Min 5 Minutes)

0.08 Hour

Intensity (Vanderburgh Co.)

I_2	5.02	in/hr
I_5	5.90	in/hr
I_{10} =	6.66	in/hr
I_{25}	7.81	in/hr
I_{50} =	8.82	in/hr
I_{100} =	9.95	in/hr

Peak Runoff Rate

$Q_{yr} = CiA$

Q_2	2.43	cfs
Q_5	2.86	cfs
Q_{10} =	3.22	cfs
Q_{25} =	3.78	cfs
Q_{50} =	4.27	cfs
Q_{100} =	4.82	cfs

Peak Runoff Calculation

SUB-BASIN #26

Post-Developed

Project 11822

Area (Ac) = 0.13 **Area (Sf) =** 5,560

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	2,755	S.F.	=	0.06	AC.	0.94	0.06
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)		S.F.	=	0.00	AC.	0.98	0.00
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	2,805	S.F.	=	0.06	AC.	0.25	0.02
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)		S.F.	=	0.00	AC.	0.55	0.00
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	5,560			0.13			0.08

Wc = **0.5919**

Time of Concentration

Overland Flow

Length, L (max 100ft)	=	100	feet	t_o	=	Overland Flow Tc
Slope, S	=	1.00%		t_o	=	$[0.42*(L^{0.8})*(n^{0.8})]/[P^{0.5})*(S^{0.4})]$
Manning Coefficient, n	=	0.011	Pavement	t_o	=	1.57 min
$P_{2/24}$	=	3.3				

Shallow Flow

Length, L (Paved or Unpaved)	Paved	=	15	feet	V	=	20.3282*(S0.5)	
Slope, S		=	1.53%			=	2.514 ft/s = 150.87	ft/min
Velocity, V		=	2.51	ft/sec	t_s	=	Shallow Flow Tc	
					t_s	=	(L/V) = 0.10 min	

Channel Flow

Length, L	=		feet		V	=	$(1.49/n)*R^{0.67}*S^{0.5}$	
Difference in Elevation	=	0	to	0		=	ft/s =	ft/min
Slope, S	=				t_c	=	Channel Flow Tc	
Manning Coefficient, n	=	0.000			t_c	=	(L/V) = 0.00 min	
Wetted Perimeter, Wp	=	0	feet					
Area, A	=	0	sqft					
Hydraulic Radius, R	=							
Velocity, V	=		ft/s					

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = 5.00 (Min 5 Minutes)

0.08 Hour

Intensity (Vanderburgh Co.)

I_2		5.02	in/hr
I_5		5.90	in/hr
I_{10}	=	6.66	in/hr
I_{25}		7.81	in/hr
I_{50}	=	8.82	in/hr
I_{100}	=	9.95	in/hr

Peak Runoff Rate

$Q_{yr} = CiA$

Q_2		0.38	cfs
Q_5		0.45	cfs
Q_{10}	=	0.50	cfs
Q_{25}	=	0.59	cfs
Q_{50}	=	0.67	cfs
Q_{100}	=	0.75	cfs

Peak Runoff Calculation

SUB-BASIN #27

Post-Developed

Project 11822

Area (Ac) = **0.13** **Area (Sf) =** **5,560**

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	2,755	S.F.	=	0.06	AC.	0.94	0.06
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)		S.F.	=	0.00	AC.	0.98	0.00
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	2,805	S.F.	=	0.06	AC.	0.25	0.02
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)		S.F.	=	0.00	AC.	0.55	0.00
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	5,560			0.13			0.08

Wc = **0.5919**

Time of Concentration

Overland Flow

Length, L (max 100ft)		=	100	feet	t_o =	Overland Flow Tc
Slope, S		=	1.00%		t_o =	$[0.42*(L^{0.8})*(n^{0.8})]/[P^{0.5})*(S^{0.4})]$
Manning Coefficient, n		=	0.011	Pavement	t_o =	1.57 min
$P_{2/24}$		=	3.3			

Shallow Flow

Length, L (Paved or Unpaved)	Paved	=	15	feet	V =	20.3282*(S0.5)
Slope, S		=	1.53%		=	2.514 ft/s = 150.87 ft/min
Velocity, V		=	2.51	ft/sec	t_s =	Shallow Flow Tc
					t_s =	(L/V) = 0.10 min

Channel Flow

Length, L		=		feet	V =	$(1.49/n)*R^{0.67}*S^{0.5}$
Difference in Elevation		=	0	to 0	=	ft/s = ft/min
Slope, S		=			t_c =	Channel Flow Tc
Manning Coefficient, n		=	0.000		t_c =	(L/V) = 0.00 min
Wetted Perimeter, Wp		=	0	feet		
Area, A		=	0	sqft		
Hydraulic Radius, R		=				
Velocity, V		=		ft/s		

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = 5.00 (Min 5 Minutes)

0.08 Hour

Intensity (Vanderburgh Co.)

I_2		**5.02 in/hr**
I_5		**5.90 in/hr**
I_{10}	=	**6.66 in/hr**
I_{25}		**7.81 in/hr**
I_{50}	=	**8.82 in/hr**
I_{100}	=	**9.95 in/hr**

Peak Runoff Rate

$Q_{yr} = CiA$

Q_2		**0.38 cfs**
Q_5		**0.45 cfs**
Q_{10}	=	**0.50 cfs**
Q_{25}	=	**0.59 cfs**
Q_{50}	=	**0.67 cfs**
Q_{100}	=	**0.75 cfs**

Peak Runoff Calculation

SUB-BASIN #28

Post-Developed

Project 11822

Area (Ac) = **0.92** **Area (Sf) =** **40,110**

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	3,500	S.F.	=	0.08	AC.	0.94	0.08
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	8,750	S.F.	=	0.20	AC.	0.98	0.20
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	21,080	S.F.	=	0.48	AC.	0.25	0.12
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)	6,780	S.F.	=	0.16	AC.	0.55	0.09
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	40,110			0.92			0.48

Wc = **0.5202**

Time of Concentration

Overland Flow

Length, L (max 100ft)		=	85	feet	t_o =	Overland Flow Tc
Slope, S		=	5.00%		t_o =	$[0.42*(L^{0.8})*(n^{0.5})]/[P^{0.5}*(S^{0.4})]$
Manning Coefficient, n		=	0.240	Grass	t_o =	8.55 min
$P_{2/24}$		=	3.3			

Shallow Flow

Length, L (Paved or Unpaved)	Unpaved	=	0	feet	V =	16.1345*(S0.5)
Slope, S		=	0.00%		=	0.000 ft/s = 0.00 ft/min
Velocity, V		=	0.00	ft/sec	t_s =	Shallow Flow Tc
					t_s =	(L/V) = 0.00 min

Channel Flow

Length, L		=	475	feet	V =	$(1.49/n)*R^{0.67}*S^{0.5}$
Difference in Elevation		=	404.75	to 400	=	3.027 ft/s = 181.59 ft/min
Slope, S		=	1.00%		t_c =	Channel Flow Tc
Manning Coefficient, n		=	0.035		t_c =	(L/V) = 2.62 min
Wetted Perimeter, Wp		=	8.32	feet		
Area, A		=	5	sqft		
Hydraulic Radius, R		=	0.60			
Velocity, V		=	3.03	ft/s		

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = 11.17 (Min 5 Minutes)

0.19 Hour

Intensity (Vanderburgh Co.)

I_2		**3.88 in/hr**
I_5		**4.56 in/hr**
I_{10}	=	**5.15 in/hr**
I_{25}		**6.04 in/hr**
I_{50}	=	**6.82 in/hr**
I_{100}	=	**7.69 in/hr**

Peak Runoff Rate

$Q_{yr} = CiA$

Q_2		**1.86 cfs**
Q_5		**2.18 cfs**
Q_{10}	=	**2.46 cfs**
Q_{25}	=	**2.89 cfs**
Q_{50}	=	**3.26 cfs**
Q_{100}	=	**3.68 cfs**

Peak Runoff Calculation

SUB-BASIN #29

Post-Developed **Project 11822**

Area (Ac) = **0.62** **Area (Sf) = 27,100**

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	7,650	S.F.	=	0.18	AC.	0.94	0.17
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	6,250	S.F.	=	0.14	AC.	0.98	0.14
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	13,200	S.F.	=	0.30	AC.	0.25	0.08
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)		S.F.	=	0.00	AC.	0.55	0.00
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	27,100			0.62			0.38

Wc = **0.6131**

Time of Concentration

Overland Flow

Length, L (max 100ft) = 65 feet — t_o = Overland Flow Tc

Slope, S = 5.00% — t_o = $[0.42*(L^{0.8})*(n^{0.8})]/[P^{0.5})*(S^{0.4})]$

Manning Coefficient, n = 0.240 Grass — t_o = 6.90 min

$P_{2/24}$ = 3.3

Shallow Flow

Length, L (Paved or Unpaved) Paved = 355 feet — V = 20.3282*(S0.5)

Slope, S = 1.00% — = 2.033 ft/s = 121.97 ft/min

Velocity, V = 2.03 ft/sec — t_s = Shallow Flow Tc

t_s = (L/V) = 2.91 min

Channel Flow

Length, L = feet — V = $(1.49/n)*R^{0.67}*S^{0.5}$

Difference in Elevation = 0 to 0 — = ft/s = ft/min

Slope, S = — t_c = Channel Flow Tc

Manning Coefficient, n = 0.000 — t_c = (L/V) = 0.00 min

Wetted Perimeter, Wp = 0 feet

Area, A = 0 sqft

Hydraulic Radius, R =

Velocity, V = ft/s

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = **9.81** **(Min 5 Minutes)**

0.16 **Hour**

Intensity (Vanderburgh Co.)

I_2		**4.10**	**in/hr**
I_5		**4.81**	**in/hr**
I_{10}	=	**5.43**	**in/hr**
I_{25}		**6.37**	**in/hr**
I_{50}	=	**7.19**	**in/hr**
I_{100}	=	**8.11**	**in/hr**

Peak Runoff Rate

Q_{yr} = CiA

Q_2		**1.56**	**cfs**
Q_5		**1.83**	**cfs**
Q_{10}	=	**2.07**	**cfs**
Q_{25}	=	**2.43**	**cfs**
Q_{50}	=	**2.74**	**cfs**
Q_{100}	=	**3.10**	**cfs**

Peak Runoff Calculation

SUB-BASIN #30

Post-Developed

Project 11822

Area (Ac) = **0.75** **Area (Sf) =** **32,815**

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	9,600	S.F.	=	0.22	AC.	0.94	0.21
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	7,500	S.F.	=	0.17	AC.	0.98	0.17
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	15,715	S.F.	=	0.36	AC.	0.25	0.09
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)		S.F.	=	0.00	AC.	0.55	0.00
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	32,815			0.75			0.47

Wc = **0.6187**

Time of Concentration

Overland Flow

Length, L (max 100ft)		=	65	feet	t_o =	Overland Flow Tc
Slope, S		=	5.00%		t_o =	$[0.42*(L^{0.8})*(n^{0.5})]/[P^{0.5})*(S^{0.4})]$
Manning Coefficient, n		=	0.240	Grass	t_o =	6.90 min
$P_{2/24}$		=	3.3			

Shallow Flow

Length, L (Paved or Unpaved)	Paved	=	440	feet	V =	20.3282*(S0.5)
Slope, S		=	1.00%		=	2.033 ft/s = 121.97 ft/min
Velocity, V		=	2.03	ft/sec	t_s =	Shallow Flow Tc
					t_s =	(L/V) = 3.61 min

Channel Flow

Length, L		=		feet	V =	$(1.49/n)*R^{0.67}*S^{0.5}$
Difference in Elevation		=	0	to 0	=	ft/s = ft/min
Slope, S		=			t_c =	Channel Flow Tc
Manning Coefficient, n		=	0.000		t_c =	(L/V) = 0.00 min
Wetted Perimeter, Wp		=	0	feet		
Area, A		=	0	sqft		
Hydraulic Radius, R		=				
Velocity, V		=		ft/s		

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = 10.51 (Min 5 Minutes)

0.18 Hour

Intensity (Vanderburgh Co.)

I_2		**3.99 in/hr**
I_5		**4.68 in/hr**
I_{10}	=	**5.28 in/hr**
I_{25}		**6.20 in/hr**
I_{50}	=	**6.99 in/hr**
I_{100}	=	**7.89 in/hr**

Peak Runoff Rate

$Q_{yr} = CiA$

Q_2		**1.86 cfs**
Q_5		**2.18 cfs**
Q_{10}	=	**2.46 cfs**
Q_{25}	=	**2.89 cfs**
Q_{50}	=	**3.26 cfs**
Q_{100}	=	**3.68 cfs**

Peak Runoff Calculation

SUB-BASIN #31

Post-Developed **Project 11822**

Area (Ac) = **1.67** **Area (Sf) =** **72,800**

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	7,000	S.F.	=	0.16	AC.	0.94	0.15
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	17,500	S.F.	=	0.40	AC.	0.98	0.39
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	42,060	S.F.	=	0.97	AC.	0.25	0.24
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)	6,240	S.F.	=	0.14	AC.	0.55	0.08
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	72,800			1.67			0.86

Wc = **0.5175**

Time of Concentration

Overland Flow

Length, L (max 100ft) = 85 feet — t_o = Overland Flow Tc

Slope, S = 5.00% — t_o = $[0.42*(L^{0.8})*(n^{0.5})]/[P^{0.5})*(S^{0.4})]$

Manning Coefficient, n = 0.240 Grass — t_o = 8.55 min

$P_{2/24}$ = 3.3

Shallow Flow

Length, L (Paved or Unpaved) Unpaved = 0 feet — V = 16.1345*(S0.5)

Slope, S = 0.00% — = 0.000 ft/s = 0.00 ft/min

Velocity, V = 0.00 ft/sec — t_s = Shallow Flow Tc

t_s = (L/V) = 0.00 min

Channel Flow

Length, L = 455 feet — V = $(1.49/n)*R^{0.67}*S^{0.5}$

Difference in Elevation = 404.55 to 400 — = 3.027 ft/s = 181.59 ft/min

Slope, S = 1.00% — t_c = Channel Flow Tc

Manning Coefficient, n = 0.035 — t_c = (L/V) = 2.51 min

Wetted Perimeter, Wp = 8.32 feet

Area, A = 5 sqft

Hydraulic Radius, R = 0.60

Velocity, V = 3.03 ft/s

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = 11.06 (Min 5 Minutes)

0.18 Hour

Intensity (Vanderburgh Co.)

I_2 = 3.90 in/hr

I_5 = 4.58 in/hr

I_{10} = 5.17 in/hr

I_{25} = 6.06 in/hr

I_{50} = 6.84 in/hr

I_{100} = 7.73 in/hr

Peak Runoff Rate

Q_{yr} = CiA

Q_2 = 3.37 cfs

Q_5 = 3.96 cfs

Q_{10} = 4.47 cfs

Q_{25} = 5.25 cfs

Q_{50} = 5.92 cfs

Q_{100} = 6.68 cfs

Peak Runoff Calculation

SUB-BASIN #32

Post-Developed

Project 11822

Area (Ac) = 1.12 **Area (Sf) =** 48,590

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	15,775	S.F.	=	0.36	AC.	0.94	0.34
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	8,750	S.F.	=	0.20	AC.	0.98	0.20
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	24,065	S.F.	=	0.55	AC.	0.25	0.14
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)		S.F.	=	0.00	AC.	0.55	0.00
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	48,590			1.12			0.68

Wc = 0.6055

Time of Concentration

Overland Flow

Length, L (max 100ft)		=	65	feet	t_o =	Overland Flow Tc
Slope, S		=	5.00%		t_o =	$[0.42*(L^{0.5})*(n^{0.5})]/[P^{0.5})*(S^{0.4})]$
Manning Coefficient, n		=	0.240	Grass	t_o =	6.90 min
$P_{2/24}$		=	3.3			

Shallow Flow

Length, L (Paved or Unpaved)	Paved	=	525	feet	V =	20.3282*(S0.5)
Slope, S		=	1.00%		=	2.033 ft/s = 121.97 ft/min
Velocity, V		=	2.03	ft/sec	t_s =	Shallow Flow Tc
					t_s =	(L/V) = 4.30 min

Channel Flow

Length, L		=		feet	V =	$(1.49/n)*R^{0.67}*S^{0.5}$
Difference in Elevation		=	0	to 0	=	ft/s = ft/min
Slope, S		=			t_c =	Channel Flow Tc
Manning Coefficient, n		=	0.000		t_c =	(L/V) = 0.00 min
Wetted Perimeter, Wp		=	0	feet		
Area, A		=	0	sqft		
Hydraulic Radius, R		=				
Velocity, V		=		ft/s		

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = **11.21** **(Min 5 Minutes)**

0.19 **Hour**

Intensity (Vanderburgh Co.)

I_2		**3.88** **in/hr**
I_5		**4.55** **in/hr**
I_{10}	=	**5.14** **in/hr**
I_{25}		**6.03** **in/hr**
I_{50}	=	**6.81** **in/hr**
I_{100}	=	**7.68** **in/hr**

Peak Runoff Rate

$Q_{yr} = CiA$

Q_2		**2.62** **cfs**
Q_5		**3.07** **cfs**
Q_{10}	=	**3.47** **cfs**
Q_{25}	=	**4.07** **cfs**
Q_{50}	=	**4.60** **cfs**
Q_{100}	=	**5.19** **cfs**

Peak Runoff Calculation

SUB-BASIN #33

Post-Developed **Project 11822**

Area (Ac) = **1.01** **Area (Sf) =** **43,900**

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	13,575	S.F.	=	0.31	AC.	0.94	0.29
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	8,750	S.F.	=	0.20	AC.	0.98	0.20
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	21,575	S.F.	=	0.50	AC.	0.25	0.12
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)		S.F.	=	0.00	AC.	0.55	0.00
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	43,900			1.01			0.61

Wc = **0.6089**

Time of Concentration

Overland Flow

Length, L (max 100ft) = 65 feet — t_o = Overland Flow Tc

Slope, S = 5.00% — t_o = $[0.42*(L^{0.8})*(n^{0.6})]/[P^{0.5})*(S^{0.4})]$

Manning Coefficient, n = 0.240 Grass — t_o = 6.90 min

$P_{2/24}$ = 3.3

Shallow Flow

Length, L (Paved or Unpaved) Paved = 525 feet — V = 20.3282*(S0.5)

Slope, S = 1.00% — = 2.033 ft/s = 121.97 ft/min

Velocity, V = 2.03 ft/sec — t_s = Shallow Flow Tc

t_s = (L/V) = 4.30 min

Channel Flow

Length, L = feet — V = $(1.49/n)*R^{0.67}*S^{0.5}$

Difference in Elevation = 0 to 0 — = ft/s = ft/min

Slope, S = — t_c = Channel Flow Tc

Manning Coefficient, n = 0.000 — t_c = (L/V) = 0.00 min

Wetted Perimeter, Wp = 0 feet

Area, A = 0 sqft

Hydraulic Radius, R =

Velocity, V = ft/s

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = **11.21** **(Min 5 Minutes)**

0.19 **Hour**

Intensity (Vanderburgh Co.)

I_2		**3.88**	**in/hr**
I_5		**4.55**	**in/hr**
I_{10}	=	**5.14**	**in/hr**
I_{25}		**6.03**	**in/hr**
I_{50}	=	**6.81**	**in/hr**
I_{100}	=	**7.68**	**in/hr**

Peak Runoff Rate

Q_{yr} = CiA

Q_2		**2.38**	**cfs**
Q_5		**2.79**	**cfs**
Q_{10}	=	**3.15**	**cfs**
Q_{25}	=	**3.70**	**cfs**
Q_{50}	=	**4.18**	**cfs**
Q_{100}	=	**4.71**	**cfs**

Peak Runoff Calculation

SUB-BASIN #34

Post-Developed

Project 11822

Area (Ac) = 1.67 **Area (Sf) =** 72,800

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	7,000	S.F.	=	0.16	AC.	0.94	0.15
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	17,500	S.F.	=	0.40	AC.	0.98	0.39
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	42,060	S.F.	=	0.97	AC.	0.25	0.24
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)	6,240	S.F.	=	0.14	AC.	0.55	0.08
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	72,800			1.67			0.86

Wc = **0.5175**

Time of Concentration

Overland Flow

Length, L (max 100ft) = 85 feet — t_o = Overland Flow Tc

Slope, S = 5.00% — t_o = $[0.42*(L^{0.5})*(n^{0.8})]/[P^{0.5})*(S^{0.4})]$

Manning Coefficient, n = 0.240 Grass — t_o = 8.55 min

$P_{2/24}$ = 3.3

Shallow Flow

Length, L (Paved or Unpaved) Unpaved = 0 feet — V = 16.1345*(S0.5)

Slope, S = 0.00% — = 0.000 ft/s = 0.00 ft/min

Velocity, V = 0.00 ft/sec — t_s = Shallow Flow Tc

t_s = (L/V) = 0.00 min

Channel Flow

Length, L = 455 feet — V = $(1.49/n)*R^{0.67}*S^{0.5}$

Difference in Elevation = 404.55 to 400 — = 3.027 ft/s = 181.59 ft/min

Slope, S = 1.00% — t_c = Channel Flow Tc

Manning Coefficient, n = 0.035 — t_c = (L/V) = 2.51 min

Wetted Perimeter, Wp = 8.32 feet

Area, A = 5 sqft

Hydraulic Radius, R = 0.60

Velocity, V = 3.03 ft/s

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = **11.06** **(Min 5 Minutes)**

0.18 **Hour**

Intensity (Vanderburgh Co.)

I_2	**3.90**	**in/hr**
I_5	**4.58**	**in/hr**
I_{10} =	**5.17**	**in/hr**
I_{25}	**6.06**	**in/hr**
I_{50} =	**6.84**	**in/hr**
I_{100} =	**7.73**	**in/hr**

Peak Runoff Rate

Q_{yr} = CiA

Q_2	**3.37**	**cfs**
Q_5	**3.96**	**cfs**
Q_{10} =	**4.47**	**cfs**
Q_{25} =	**5.25**	**cfs**
Q_{50} =	**5.92**	**cfs**
Q_{100} =	**6.68**	**cfs**

Peak Runoff Calculation

SUB-BASIN #35
Post-Developed

Project 11822

Area (Ac) = 0.10 **Area (Sf) =** 4,570

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	2,175	S.F.	=	0.05	AC.	0.94	0.05
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)		S.F.	=	0.00	AC.	0.98	0.00
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	2,395	S.F.	=	0.05	AC.	0.25	0.01
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)		S.F.	=	0.00	AC.	0.55	0.00
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	4,570			0.10			0.06

Wc = 0.5784

Time of Concentration

Overland Flow

Length, L (max 100ft)		=	100	feet	t_o =	Overland Flow Tc
Slope, S		=	1.00%		t_o =	$[0.42*(L^{0.5})*(n^{0.6})]/[P^{0.5})*(S^{0.4})]$
Manning Coefficient, n		=	0.011	Pavement	t_o =	1.57 min
$P_{2/24}$		=	3.3			

Shallow Flow

Length, L (Paved or Unpaved)	Paved	=	50	feet	V =	20.3282*(S0.5)
Slope, S		=	1.00%		=	2.033 ft/s = 121.97 ft/min
Velocity, V		=	2.03	ft/sec	t_s =	Shallow Flow Tc
					t_s =	(L/V) = 0.41 min

Channel Flow

Length, L		=		feet	V =	$(1.49/n)*R^{0.67}*S^{0.5}$
Difference in Elevation		=	0	to 0	=	ft/s = ft/min
Slope, S		=			t_c =	Channel Flow Tc
Manning Coefficient, n		=	0.000		t_c =	(L/V) = 0.00 min
Wetted Perimeter, Wp		=	0	feet		
Area, A		=	0	sqft		
Hydraulic Radius, R		=				
Velocity, V		=		ft/s		

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = **5.00** **(Min 5 Minutes)**

0.08 **Hour**

Intensity (Vanderburgh Co.)

I_2		**5.02** **in/hr**
I_5		**5.90** **in/hr**
I_{10}	=	**6.66** **in/hr**
I_{25}		**7.81** **in/hr**
I_{50}	=	**8.82** **in/hr**
I_{100}	=	**9.95** **in/hr**

Peak Runoff Rate

$Q_{yr} = CiA$

Q_2		**0.30** **cfs**
Q_5		**0.36** **cfs**
Q_{10}	=	**0.40** **cfs**
Q_{25}	=	**0.47** **cfs**
Q_{50}	=	**0.53** **cfs**
Q_{100}	=	**0.60** **cfs**

Peak Runoff Calculation

SUB-BASIN #36

Post-Developed **Project 11822**

Area (Ac) = **1.04** **Area (Sf) =** **45,220**

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	13,360	S.F.	=	0.31	AC.	0.94	0.29
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	10,625	S.F.	=	0.24	AC.	0.98	0.24
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	21,235	S.F.	=	0.49	AC.	0.25	0.12
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)		S.F.	=	0.00	AC.	0.55	0.00
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	45,220			1.04			0.65

Wc = **0.6254**

Time of Concentration

Overland Flow

Length, L (max 100ft) = 65 feet — t_o = Overland Flow Tc

Slope, S = 5.00% — t_o = $[0.42*(L^{0.8})*(n^{0.8})]/[P^{0.5})*(S^{0.4})]$

Manning Coefficient, n = 0.240 Grass — t_o = 6.90 min

$P_{2/24}$ = 3.3

Shallow Flow

Length, L (Paved or Unpaved) Paved = 600 feet — V = 20.3282*(S0.5)

Slope, S = 1.00% — = 2.033 ft/s = 121.97 ft/min

Velocity, V = 2.03 ft/sec — t_s = Shallow Flow Tc

t_s = (L/V) = 4.92 min

Channel Flow

Length, L = feet — V = $(1.49/n)*R^{0.67}*S^{0.5}$

Difference in Elevation = 0 to 0 — = ft/s = ft/min

Slope, S = — t_c = Channel Flow Tc

Manning Coefficient, n = 0.000 — t_c = (L/V) = 0.00 min

Wetted Perimeter, Wp = 0 feet

Area, A = 0 sqft

Hydraulic Radius, R =

Velocity, V = ft/s

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = **11.82** **(Min 5 Minutes)**

0.20 **Hour**

Intensity (Vanderburgh Co.)

I_2 **3.79 in/hr**

I_5 **4.45 in/hr**

I_{10} = **5.02 in/hr**

I_{25} **5.89 in/hr**

I_{50} = **6.65 in/hr**

I_{100} = **7.50 in/hr**

Peak Runoff Rate

$Q_{yr} = CiA$

Q_2 **2.46 cfs**

Q_5 **2.89 cfs**

Q_{10} = **3.26 cfs**

Q_{25} = **3.82 cfs**

Q_{50} = **4.32 cfs**

Q_{100} = **4.87 cfs**

Peak Runoff Calculation

SUB-BASIN #37

Post-Developed

Project 11822

Area (Ac) = 1.14 **Area (Sf) =** 49,720

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	15,285	S.F.	=	0.35	AC.	0.94	0.33
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	10,000	S.F.	=	0.23	AC.	0.98	0.22
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	24,435	S.F.	=	0.56	AC.	0.25	0.14
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)		S.F.	=	0.00	AC.	0.55	0.00
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	49,720			1.14			0.70

Wc = 0.6089

Time of Concentration

Overland Flow

Length, L (max 100ft)		=	65	feet	t_o =	Overland Flow Tc
Slope, S		=	5.00%		t_o =	$[0.42*(L^{0.8})*(n^{0.8})]/[P^{0.5})*(S^{0.4})]$
Manning Coefficient, n		=	0.240	Grass	t_o =	6.90 min
$P_{2/24}$		=	3.3			

Shallow Flow

Length, L (Paved or Unpaved)	Paved	=	600	feet	V =	20.3282*(S0.5)
Slope, S		=	1.53%		=	2.514 ft/s = 150.87 ft/min
Velocity, V		=	2.51	ft/sec	t_s =	Shallow Flow Tc
					t_s =	(L/V) = 3.98 min

Channel Flow

Length, L		=		feet	V =	$(1.49/n)*R^{0.67}*S^{0.5}$
Difference in Elevation		=	0	to 0	=	ft/s = ft/min
Slope, S		=			t_c =	Channel Flow Tc
Manning Coefficient, n		=	0.000		t_c =	(L/V) = 0.00 min
Wetted Perimeter, Wp		=	0	feet		
Area, A		=	0	sqft		
Hydraulic Radius, R		=				
Velocity, V		=		ft/s		

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = 10.88 (Min 5 Minutes)

0.18 Hour

Intensity (Vanderburgh Co.)

I_2		**3.93 in/hr**
I_5		**4.61 in/hr**
I_{10}	=	**5.20 in/hr**
I_{25}		**6.11 in/hr**
I_{50}	=	**6.89 in/hr**
I_{100}	=	**7.78 in/hr**

Peak Runoff Rate

$Q_{yr} = CiA$

Q_2		**2.73 cfs**
Q_5		**3.20 cfs**
Q_{10}	=	**3.62 cfs**
Q_{25}	=	**4.24 cfs**
Q_{50}	=	**4.79 cfs**
Q_{100}	=	**5.41 cfs**

Peak Runoff Calculation

SUB-BASIN #38

Post-Developed **Project 11822**

Area (Ac) = **0.84** **Area (Sf) =** **36,500**

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	10,900	S.F.	=	0.25	AC.	0.94	0.24
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	6,250	S.F.	=	0.14	AC.	0.98	0.14
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	19,350	S.F.	=	0.44	AC.	0.25	0.11
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)		S.F.	=	0.00	AC.	0.55	0.00
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	36,500			0.84			0.49

Wc = **0.5811**

Time of Concentration

Overland Flow

Length, L (max 100ft) = 100 feet — t_o = Overland Flow Tc

Slope, S = 2.00% — $t_o = [0.42*(L^{0.8})*(n^{0.8})]/[P^{0.5})*(S^{0.4})]$

Manning Coefficient, n = 0.011 Pavement — t_o = 1.19 min

$P_{2/24}$ = 3.3

Shallow Flow

Length, L (Paved or Unpaved) Paved = 350 feet — V = 20.3282*(S0.5)

Slope, S = 2.00% — = 2.875 ft/s = 172.49 ft/min

Velocity, V = 2.87 ft/sec — t_s = Shallow Flow Tc

t_s = (L/V) = 2.03 min

Channel Flow

Length, L = feet — V = $(1.49/n)*R^{0.67}*S^{0.5}$

Difference in Elevation = 0 to 0 — = ft/s = ft/min

Slope, S = — t_c = Channel Flow Tc

Manning Coefficient, n = 0.000 — t_c = (L/V) = 0.00 min

Wetted Perimeter, Wp = 0 feet

Area, A = 0 sqft

Hydraulic Radius, R =

Velocity, V = ft/s

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = 5.00 (Min 5 Minutes)

0.08 Hour

Intensity (Vanderburgh Co.)

I_2 = 5.02 in/hr

I_5 = 5.90 in/hr

I_{10} = 6.66 in/hr

I_{25} = 7.81 in/hr

I_{50} = 8.82 in/hr

I_{100} = 9.95 in/hr

Peak Runoff Rate

$Q_{yr} = CiA$

Q_2 = 2.45 cfs

Q_5 = 2.87 cfs

Q_{10} = 3.24 cfs

Q_{25} = 3.80 cfs

Q_{50} = 4.29 cfs

Q_{100} = 4.85 cfs

Peak Runoff Calculation

SUB-BASIN #39

Post-Developed

Project 11822

Area (Ac) = 0.96 **Area (Sf) =** 41,690

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	4,250	S.F.	=	0.10	AC.	0.94	0.09
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	8,125	S.F.	=	0.19	AC.	0.98	0.18
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	23,915	S.F.	=	0.55	AC.	0.25	0.14
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)	5,400	S.F.	=	0.12	AC.	0.55	0.07
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	41,690			0.96			0.48

Wc = **0.5015**

Time of Concentration

Overland Flow

Length, L (max 100ft)		=	90	feet	t_o =	Overland Flow Tc
Slope, S		=	5.00%		t_o =	$[0.42*(L^{0.8})*(n^{0.5})]/[P^{0.5}*(S^{0.4})]$
Manning Coefficient, n		=	0.240	Grass	t_o =	8.95 min
$P_{2/24}$		=	3.3			

Shallow Flow

Length, L (Paved or Unpaved)	Unpaved	=	0	feet	V =	16.1345*(S0.5)
Slope, S		=	0.00%		=	0.000 ft/s = 0.00 ft/min
Velocity, V		=	0.00	ft/sec	t_s =	Shallow Flow Tc
					t_s =	(L/V) = 0.00 min

Channel Flow

Length, L		=	360	feet	V =	$(1.49/n)*R^{0.67}*S^{0.5}$
Difference in Elevation		=	403.6	to 400	=	3.027 ft/s = 181.59 ft/min
Slope, S		=	1.00%		t_c =	Channel Flow Tc
Manning Coefficient, n		=	0.035		t_c =	(L/V) = 1.98 min
Wetted Perimeter, Wp		=	8.32	feet		
Area, A		=	5	sqft		
Hydraulic Radius, R		=	0.60			
Velocity, V		=	3.03	ft/s		

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = 10.94 (Min 5 Minutes)

0.18 Hour

Intensity (Vanderburgh Co.)

I_2		3.92	in/hr
I_5		4.60	in/hr
I_{10}	=	5.19	in/hr
I_{25}		6.09	in/hr
I_{50}	=	6.88	in/hr
I_{100}	=	7.76	in/hr

Peak Runoff Rate

$Q_{yr} = CiA$

Q_2		1.88	cfs
Q_5		2.21	cfs
Q_{10}	=	2.49	cfs
Q_{25}	=	2.92	cfs
Q_{50}	=	3.30	cfs
Q_{100}	=	3.73	cfs

Peak Runoff Calculation

SUB-BASIN #40 (40A+40B)

Post-Developed **Project 11822**

Area (Ac) = **1.68** **Area (Sf) =** **73,165**

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	7,000	S.F.	=	0.16	AC.	0.94	0.15
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	15,000	S.F.	=	0.34	AC.	0.98	0.34
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	41,265	S.F.	=	0.95	AC.	0.25	0.24
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)	9,900	S.F.	=	0.23	AC.	0.55	0.13
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	73,165			1.68			0.85

Wc = **0.5063**

Time of Concentration

Overland Flow

Length, L (max 100ft)		=	65	feet		t_o =	Overland Flow Tc
Slope, S		=	5.00%			t_o =	$[0.42*(L^{0.8})*(n^{0.8})]/[P^{0.5})*(S^{0.4})]$
Manning Coefficient, n		=	0.240	Grass		t_o =	6.90 min
$P_{2/24}$		=	3.3				

Shallow Flow

Length, L (Paved or Unpaved)	Unpaved	=	0	feet		V =	16.1345*(S0.5)
Slope, S		=	0.00%			=	0.000 ft/s = 0.00 ft/min
Velocity, V		=	0.00	ft/sec		t_s =	Shallow Flow Tc
						t_s =	(L/V) = 0.00 min

Channel Flow

Length, L		=	525	feet		V =	$(1.49/n)*R^{0.67}*S^{0.5}$
Difference in Elevation		=	405.25	to	400	=	3.027 ft/s = 181.59 ft/min
Slope, S		=	1.00%			t_c =	Channel Flow Tc
Manning Coefficient, n		=	0.035			t_c =	(L/V) = 2.89 min
Wetted Perimeter, Wp		=	8.32	feet			
Area, A		=	5	sqft			
Hydraulic Radius, R		=	0.60				
Velocity, V		=	3.03	ft/s			

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = **9.79** **(Min 5 Minutes)**

0.16 **Hour**

Intensity (Vanderburgh Co.)

I_2		**4.10** **in/hr**
I_5		**4.81** **in/hr**
I_{10}	=	**5.43** **in/hr**
I_{25}		**6.37** **in/hr**
I_{50}	=	**7.19** **in/hr**
I_{100}	=	**8.12** **in/hr**

Peak Runoff Rate

$Q_{yr} = CiA$

Q_2		**3.49** **cfs**
Q_5		**4.09** **cfs**
Q_{10}	=	**4.62** **cfs**
Q_{25}	=	**5.42** **cfs**
Q_{50}	=	**6.12** **cfs**
Q_{100}	=	**6.90** **cfs**

Peak Runoff Calculation

SUB-BASIN #40A

Post-Developed

Project 11822

Area (Ac) = 1.31 **Area (Sf) =** 57,069

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	5,460	S.F.	=	0.13	AC.	0.94	0.12
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	11,700	S.F.	=	0.27	AC.	0.98	0.26
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	32,187	S.F.	=	0.74	AC.	0.25	0.18
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)	7,722	S.F.	=	0.18	AC.	0.55	0.10
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	57,069			1.31			0.66

Wc = 0.5063

Time of Concentration

Overland Flow

Length, L (max 100ft)	=	65	feet	t_o = Overland Flow Tc	
Slope, S	=	5.00%		t_o = $[0.42*(L^{0.5})*(n^{0.5})]/[P^{0.5})*(S^{0.4})]$	
Manning Coefficient, n	=	0.240	Grass	t_o = 6.90	min
$P_{2/24}$	=	3.3			

Shallow Flow

Length, L (Paved or Unpaved)	Unpaved	=	0	feet	V = 16.1345*(S0.5)	
Slope, S		=	0.00%		= 0.000 ft/s = 0.00	ft/min
Velocity, V		=	0.00	ft/sec	t_s = Shallow Flow Tc	
					t_s = (L/V) = 0.00	min

Channel Flow

Length, L	=	565	feet		V = $(1.49/n)*R^{0.67}*S^{0.5}$		
Difference in Elevation	=	404.52	to	400	= 2.707 ft/s = 162.42		ft/min
Slope, S	=	0.80%			t_c = Channel Flow Tc		
Manning Coefficient, n	=	0.035			t_c = (L/V) = 3.48		min
Wetted Perimeter, Wp	=	8.32	feet				
Area, A	=	5	sqft				
Hydraulic Radius, R	=	0.60					
Velocity, V	=	2.71	ft/s				

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = 10.38 (Min 5 Minutes)

0.17 Hour

Intensity (Vanderburgh Co.)

I_2		4.01	in/hr
I_5		4.70	in/hr
I_{10}	=	5.31	in/hr
I_{25}		6.23	in/hr
I_{50}	=	7.03	in/hr
I_{100}	=	7.93	in/hr

Peak Runoff Rate

$Q_{yr} = CiA$

Q_2		2.66	cfs
Q_5		3.12	cfs
Q_{10}	=	3.52	cfs
Q_{25}	=	4.13	cfs
Q_{50}	=	4.66	cfs
Q_{100}	=	5.26	cfs

Peak Runoff Calculation

SUB-BASIN #40B

Post-Developed

Project 11822

Area (Ac) = 0.37 **Area (Sf) =** 16,096

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	1,540	S.F.	=	0.04	AC.	0.94	0.03
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	3,300	S.F.	=	0.08	AC.	0.98	0.07
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	9,078	S.F.	=	0.21	AC.	0.25	0.05
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)	2,178	S.F.	=	0.05	AC.	0.55	0.03
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	16,096			0.37			0.19

Wc = **0.5063**

Time of Concentration

Overland Flow

Length, L (max 100ft)		=	60	feet	t_o =	Overland Flow Tc
Slope, S		=	5.00%		t_o =	$[0.42*(L^{0.8})*(n^{0.8})]/[P^{0.5}*(S^{0.4})]$
Manning Coefficient, n		=	0.240	Grass	t_o =	6.47 min
$P_{2/24}$		=	3.3			

Shallow Flow

Length, L (Paved or Unpaved)	Unpaved	=	0	feet	V =	16.1345*(S0.5)
Slope, S		=	0.00%		=	0.000 ft/s = 0.00 ft/min
Velocity, V		=	0.00	ft/sec	t_s =	Shallow Flow Tc
					t_s =	(L/V) = 0.00 min

Channel Flow

Length, L		=	175	feet	V =	$(1.49/n)*R^{0.67}*S^{0.5}$
Difference in Elevation		=	417.9	to 416.5	=	2.707 ft/s = 162.42 ft/min
Slope, S		=	0.80%		t_c =	Channel Flow Tc
Manning Coefficient, n		=	0.035		t_c =	(L/V) = 1.08 min
Wetted Perimeter, Wp		=	8.32	feet		
Area, A		=	5	sqft		
Hydraulic Radius, R		=	0.60			
Velocity, V		=	2.71	ft/s		

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = 7.55 (Min 5 Minutes)

0.13 Hour

Intensity (Vanderburgh Co.)

I_2		**4.49 in/hr**
I_5		**5.28 in/hr**
I_{10}	=	**5.95 in/hr**
I_{25}		**6.99 in/hr**
I_{50}	=	**7.89 in/hr**
I_{100}	=	**8.90 in/hr**

Peak Runoff Rate

$Q_{yr} = CiA$

Q_2		**0.84 cfs**
Q_5		**0.99 cfs**
Q_{10}	=	**1.11 cfs**
Q_{25}	=	**1.31 cfs**
Q_{50}	=	**1.48 cfs**
Q_{100}	=	**1.67 cfs**

Peak Runoff Calculation

SUB-BASIN #41

Post-Developed

Project 11822

Area (Ac) = 0.73 **Area (Sf) =** 31,940

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	8,925	S.F.	=	0.20	AC.	0.94	0.19
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	6,250	S.F.	=	0.14	AC.	0.98	0.14
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	16,765	S.F.	=	0.38	AC.	0.25	0.10
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)		S.F.	=	0.00	AC.	0.55	0.00
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	31,940			0.73			0.43

Wc = 0.5857

Time of Concentration

Overland Flow

Length, L (max 100ft) = 65 feet — t_o = Overland Flow Tc

Slope, S = 5.00% — t_o = $[0.42*(L^{0.8})*(n^{0.8})]/[P^{0.5})*(S^{0.4})]$

Manning Coefficient, n = 0.240 Grass — t_o = 6.90 min

$P_{2/24}$ = 3.3

Shallow Flow

Length, L (Paved or Unpaved) Paved = 180 feet — V = 20.3282*(S0.5)

Slope, S = 2.00% — = 2.875 ft/s = 172.49 ft/min

Velocity, V = 2.87 ft/sec — t_s = Shallow Flow Tc

t_s = (L/V) = 1.04 min

Channel Flow

Length, L = feet — V = $(1.49/n)*R^{0.67}*S^{0.5}$

Difference in Elevation = 0 to 0 — = ft/s = ft/min

Slope, S = — t_c = Channel Flow Tc

Manning Coefficient, n = 0.000 — t_c = (L/V) = 0.00 min

Wetted Perimeter, Wp = 0 feet

Area, A = 0 sqft

Hydraulic Radius, R =

Velocity, V = ft/s

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = **7.94** **(Min 5 Minutes)**

0.13 **Hour**

Intensity (Vanderburgh Co.)

I_2 = **4.42** in/hr

I_5 = **5.19** in/hr

I_{10} = **5.86** in/hr

I_{25} = **6.87** in/hr

I_{50} = **7.76** in/hr

I_{100} = **8.76** in/hr

Peak Runoff Rate

$Q_{yr} = CiA$

Q_2 = **1.90** cfs

Q_5 = **2.23** cfs

Q_{10} = **2.51** cfs

Q_{25} = **2.95** cfs

Q_{50} = **3.33** cfs

Q_{100} = **3.76** cfs

Peak Runoff Calculation

SUB-BASIN #42

Post-Developed

Project 11822

Area (Ac) = 0.28 **Area (Sf) =** 12,015

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	3,280	S.F.	=	0.08	AC.	0.94	0.07
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	2,500	S.F.	=	0.06	AC.	0.98	0.06
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	6,235	S.F.	=	0.14	AC.	0.25	0.04
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)		S.F.	=	0.00	AC.	0.55	0.00
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	12,015			0.28			0.16

Wc = **0.5903**

Time of Concentration

Overland Flow

Length, L (max 100ft)	=	65	feet	t_o = Overland Flow Tc	
Slope, S	=	2.00%		t_o = $[0.42*(L^{0.6})*(n^{0.5})]/[P^{0.5})*(S^{0.4})]$	
Manning Coefficient, n	=	0.240	Grass	t_o = 9.96	min
$P_{2/24}$	=	3.3			

Shallow Flow

Length, L (Paved or Unpaved)	Paved	=	150	feet	V = 20.3282*(S0.5)		
Slope, S		=	2.00%		= 2.875 ft/s =	172.49	ft/min
Velocity, V		=	2.87	ft/sec	t_s = Shallow Flow Tc		
					t_s = (L/V) =	0.87	min

Channel Flow

Length, L	=		feet		V = $(1.49/n)*R^{0.67}*S^{0.5}$		
Difference in Elevation	=	0	to	0	= ft/s =		ft/min
Slope, S	=				t_c = Channel Flow Tc		
Manning Coefficient, n	=	0.000			t_c = (L/V) =	0.00	min
Wetted Perimeter, Wp	=	0	feet				
Area, A	=	0	sqft				
Hydraulic Radius, R	=						
Velocity, V	=		ft/s				

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = 10.83 (Min 5 Minutes)

0.18 Hour

Intensity (Vanderburgh Co.)

I_2		3.94	in/hr
I_5		4.62	in/hr
I_{10}	=	5.21	in/hr
I_{25}		6.12	in/hr
I_{50}	=	6.91	in/hr
I_{100}	=	7.80	in/hr

Peak Runoff Rate

$Q_{yr} = CiA$

Q_2		0.64	cfs
Q_5		0.75	cfs
Q_{10}	=	0.85	cfs
Q_{25}	=	1.00	cfs
Q_{50}	=	1.12	cfs
Q_{100}	=	1.27	cfs

Peak Runoff Calculation

SUB-BASIN #43

Post-Developed

Project 11822

Area (Ac) = 0.10 **Area (Sf) =** 4,445

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	2,135	S.F.	=	0.05	AC.	0.94	0.05
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)		S.F.	=	0.00	AC.	0.98	0.00
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	2,310	S.F.	=	0.05	AC.	0.25	0.01
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)		S.F.	=	0.00	AC.	0.55	0.00
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	4,445			0.10			0.06

Wc = 0.5814

Time of Concentration

Overland Flow

Length, L (max 100ft)		=	100	feet	t_o =	Overland Flow Tc
Slope, S		=	2.00%		t_o =	$[0.42*(L^{0.8})*(n^{0.8})]/[P^{0.5})*(S^{0.4})]$
Manning Coefficient, n		=	0.011	Pavement	t_o =	1.19 min
$P_{2/24}$		=	3.3			

Shallow Flow

Length, L (Paved or Unpaved)	Paved	=	45	feet	V =	20.3282*(S0.5)
Slope, S		=	2.00%		=	2.875 ft/s = 172.49 ft/min
Velocity, V		=	2.87	ft/sec	t_s =	Shallow Flow Tc
					t_s =	(L/V) = 0.26 min

Channel Flow

Length, L		=		feet	V =	$(1.49/n)*R^{0.67}*S^{0.5}$
Difference in Elevation		=	0	to 0	=	ft/s = ft/min
Slope, S		=			t_c =	Channel Flow Tc
Manning Coefficient, n		=	0.000		t_c =	(L/V) = 0.00 min
Wetted Perimeter, Wp		=	0	feet		
Area, A		=	0	sqft		
Hydraulic Radius, R		=				
Velocity, V		=		ft/s		

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = 5.00 (Min 5 Minutes)

0.08 Hour

Intensity (Vanderburgh Co.)

I_2		**5.02 in/hr**
I_5		**5.90 in/hr**
I_{10}	=	**6.66 in/hr**
I_{25}		**7.81 in/hr**
I_{50}	=	**8.82 in/hr**
I_{100}	=	**9.95 in/hr**

Peak Runoff Rate

$Q_{yr} = CiA$

Q_2		**0.30 cfs**
Q_5		**0.35 cfs**
Q_{10}	=	**0.39 cfs**
Q_{25}	=	**0.46 cfs**
Q_{50}	=	**0.52 cfs**
Q_{100}	=	**0.59 cfs**

Peak Runoff Calculation

SUB-BASIN #44
Post-Developed

Project 11822

Area (Ac) = 0.40 **Area (Sf) =** 17,495

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	9,600	S.F.	=	0.22	AC.	0.94	0.21
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	2,500	S.F.	=	0.06	AC.	0.98	0.06
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	5,395	S.F.	=	0.12	AC.	0.25	0.03
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)		S.F.	=	0.00	AC.	0.55	0.00
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	17,495			0.40			0.29

Wc = **0.7329**

Time of Concentration

Overland Flow

Length, L (max 100ft) = 65 feet — t_o = Overland Flow Tc

Slope, S = 5.00% — t_o = $[0.42*(L^{0.8})*(n^{0.8})]/[P^{0.5})*(S^{0.4})]$

Manning Coefficient, n = 0.240 Grass — t_o = 6.90 min

$P_{2/24}$ = 3.3

Shallow Flow

Length, L (Paved or Unpaved) Paved = 240 feet — V = 20.3282*(S0.5)

Slope, S = 2.00% — = 2.875 ft/s = 172.49 ft/min

Velocity, V = 2.87 ft/sec — t_s = Shallow Flow Tc

t_s = (L/V) = 1.39 min

Channel Flow

Length, L = feet — V = $(1.49/n)*R^{0.67}*S^{0.5}$

Difference in Elevation = 0 to 0 — = ft/s = ft/min

Slope, S =

t_c = Channel Flow Tc

Manning Coefficient, n = 0.000

t_c = (L/V) = 0.00 min

Wetted Perimeter, Wp = 0 feet

Area, A = 0 sqft

Hydraulic Radius, R =

Velocity, V = ft/s

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = 8.29 (Min 5 Minutes)

0.14 Hour

Intensity (Vanderburgh Co.)

I_2		4.36 in/hr
I_5		5.11 in/hr
I_{10}	=	5.77 in/hr
I_{25}		6.77 in/hr
I_{50}	=	7.65 in/hr
I_{100}	=	8.63 in/hr

Peak Runoff Rate

Q_{yr} = CiA

Q_2		1.28 cfs
Q_5		1.51 cfs
Q_{10}	=	1.70 cfs
Q_{25}	=	1.99 cfs
Q_{50}	=	2.25 cfs
Q_{100}	=	2.54 cfs

Peak Runoff Calculation

SUB-BASIN #45

Post-Developed

Project 11822

Area (Ac) = 1.51 **Area (Sf) =** 65,770

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	2,500	S.F.	=	0.06	AC.	0.94	0.05
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	6,250	S.F.	=	0.14	AC.	0.98	0.14
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	26,140	S.F.	=	0.60	AC.	0.25	0.15
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)	5,880	S.F.	=	0.13	AC.	0.55	0.07
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water	25,000	S.F.	=	0.57	AC.	1.00	0.57
	65,770			1.51			0.99

Wc = 0.6575

Time of Concentration

Overland Flow

Length, L (max 100ft)		=	65	feet	t_o =	Overland Flow Tc
Slope, S		=	5.00%		t_o =	$[0.42*(L^{0.8})*(n^{0.8})]/[P^{0.5})*(S^{0.4})]$
Manning Coefficient, n		=	0.240	Grass	t_o =	6.90 min
$P_{2/24}$		=	3.3			

Shallow Flow

Length, L (Paved or Unpaved)	Unpaved	=	0	feet	V =	16.1345*(S0.5)
Slope, S		=	0.00%		=	0.000 ft/s = 0.00 ft/min
Velocity, V		=	0.00	ft/sec	t_s =	Shallow Flow Tc
					t_s =	(L/V) = 0.00 min

Channel Flow

Length, L		=	295	feet	V =	$(1.49/n)*R^{0.67}*S^{0.5}$
Difference in Elevation		=	402.95	to 400	=	3.027 ft/s = 181.59 ft/min
Slope, S		=	1.00%		t_c =	Channel Flow Tc
Manning Coefficient, n		=	0.035		t_c =	(L/V) = 1.62 min
Wetted Perimeter, Wp		=	8.32	feet		
Area, A		=	5	sqft		
Hydraulic Radius, R		=	0.60			
Velocity, V		=	3.03	ft/s		

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = 8.53 (Min 5 Minutes)

0.14 Hour

Intensity (Vanderburgh Co.)

I_2		**4.32 in/hr**
I_5		**5.06 in/hr**
I_{10}	=	**5.72 in/hr**
I_{25}		**6.71 in/hr**
I_{50}	=	**7.57 in/hr**
I_{100}	=	**8.55 in/hr**

Peak Runoff Rate

$Q_{yr} = CiA$

Q_2		**4.28 cfs**
Q_5		**5.03 cfs**
Q_{10}	=	**5.68 cfs**
Q_{25}	=	**6.66 cfs**
Q_{50}	=	**7.52 cfs**
Q_{100}	=	**8.49 cfs**

Peak Runoff Calculation

SUB-BASIN #46

Post-Developed

Project 11822

Area (Ac) = 0.48 **Area (Sf) =** 20,975

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	6,225	S.F.	=	0.14	AC.	0.94	0.13
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	4,375	S.F.	=	0.10	AC.	0.98	0.10
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	10,375	S.F.	=	0.24	AC.	0.25	0.06
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)		S.F.	=	0.00	AC.	0.55	0.00
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	20,975			0.48			0.29

Wc = 0.6070

Time of Concentration

Overland Flow

Length, L (max 100ft)		=	65	feet		t_o =	Overland Flow Tc
Slope, S		=	5.00%			t_o =	$[0.42*(L^{0.8})*(n^{0.8})]/[P^{0.5})*(S^{0.4})]$
Manning Coefficient, n		=	0.240	Grass		t_o =	6.90 min
$P_{2/24}$		=	3.3				

Shallow Flow

Length, L (Paved or Unpaved)	Paved	=	305	feet		V =	20.3282*(S0.5)
Slope, S		=	2.00%			=	2.875 ft/s = 172.49 ft/min
Velocity, V		=	2.87	ft/sec		t_s =	Shallow Flow Tc
						t_s =	(L/V) = 1.77 min

Channel Flow

Length, L		=		feet		V =	$(1.49/n)*R^{0.67}*S^{0.5}$
Difference in Elevation		=	0	to	0	=	ft/s = ft/min
Slope, S		=				t_c =	Channel Flow Tc
Manning Coefficient, n		=	0.000			t_c =	(L/V) = 0.00 min
Wetted Perimeter, Wp		=	0	feet			
Area, A		=	0	sqft			
Hydraulic Radius, R		=					
Velocity, V		=		ft/s			

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = 8.67 (Min 5 Minutes)

0.14 Hour

Intensity (Vanderburgh Co.)

I_2		**4.29**	**in/hr**
I_5		**5.04**	**in/hr**
I_{10}	=	**5.68**	**in/hr**
I_{25}		**6.67**	**in/hr**
I_{50}	=	**7.53**	**in/hr**
I_{100}	=	**8.50**	**in/hr**

Peak Runoff Rate

$Q_{yr} = CiA$

Q_2		**1.25**	**cfs**
Q_5		**1.47**	**cfs**
Q_{10}	=	**1.66**	**cfs**
Q_{25}	=	**1.95**	**cfs**
Q_{50}	=	**2.20**	**cfs**
Q_{100}	=	**2.48**	**cfs**

Peak Runoff Calculation

SUB-BASIN #47

Post-Developed

Project 11822

Area (Ac) = **0.57** **Area (Sf) =** **24,815**

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	8,175	S.F.	=	0.19	AC.	0.94	0.18
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	4,375	S.F.	=	0.10	AC.	0.98	0.10
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	12,265	S.F.	=	0.28	AC.	0.25	0.07
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)		S.F.	=	0.00	AC.	0.55	0.00
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	24,815			0.57			0.35

Wc = **0.6060**

Time of Concentration

Overland Flow

Length, L (max 100ft) = 65 feet — t_o = Overland Flow Tc

Slope, S = 5.00% — t_o = $[0.42*(L^{0.6})*(n^{0.6})]/[P^{0.5})*(S^{0.4})]$

Manning Coefficient, n = 0.240 Grass — t_o = 6.90 min

$P_{2/24}$ = 3.3

Shallow Flow

Length, L (Paved or Unpaved) Paved = 235 feet — V = 20.3282*(S0.5)

Slope, S = 2.00% — = 2.875 ft/s = 172.49 ft/min

Velocity, V = 2.87 ft/sec — t_s = Shallow Flow Tc

t_s = (L/V) = 1.36 min

Channel Flow

Length, L = feet — V = $(1.49/n)*R^{0.67}*S^{0.5}$

Difference in Elevation = 0 to 0 — = ft/s = ft/min

Slope, S = — t_c = Channel Flow Tc

Manning Coefficient, n = 0.000 — t_c = (L/V) = 0.00 min

Wetted Perimeter, Wp = 0 feet

Area, A = 0 sqft

Hydraulic Radius, R =

Velocity, V = ft/s

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = 8.26 (Min 5 Minutes)

0.14 Hour

Intensity (Vanderburgh Co.)

I_2 = 4.36 in/hr

I_5 = 5.12 in/hr

I_{10} = 5.78 in/hr

I_{25} = 6.78 in/hr

I_{50} = 7.66 in/hr

I_{100} = 8.64 in/hr

Peak Runoff Rate

$Q_{yr} = CiA$

Q_2 = 1.51 cfs

Q_5 = 1.77 cfs

Q_{10} = 2.00 cfs

Q_{25} = 2.34 cfs

Q_{50} = 2.64 cfs

Q_{100} = 2.98 cfs

Peak Runoff Calculation

SUB-BASIN #48

Post-Developed **Project 11822**

Area (Ac) = **0.82** **Area (Sf) =** **35,935**

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	3,600	S.F.	=	0.08	AC.	0.94	0.08
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	3,750	S.F.	=	0.09	AC.	0.98	0.08
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	21,265	S.F.	=	0.49	AC.	0.25	0.12
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)	7,320	S.F.	=	0.17	AC.	0.55	0.09
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	35,935			0.82			0.38

Wc = **0.4564**

Time of Concentration

Overland Flow

Length, L (max 100ft) = 65 feet — t_o = Overland Flow Tc

Slope, S = 5.00% — t_o = $[0.42*(L^{0.8})*(n^{0.8})]/[P^{0.5}*(S^{0.4})]$

Manning Coefficient, n = 0.240 Grass — t_o = 6.90 min

$P_{2/24}$ = 3.3

Shallow Flow

Length, L (Paved or Unpaved) Unpaved = 0 feet — V = 16.1345*(S0.5)

Slope, S = 0.00% — = 0.000 ft/s = 0.00 ft/min

Velocity, V = 0.00 ft/sec — t_s = Shallow Flow Tc

t_s = (L/V) = 0.00 min

Channel Flow

Length, L = 210 feet — V = $(1.49/n)*R^{0.67}*S^{0.5}$

Difference in Elevation = 402.1 to 400 — = 3.027 ft/s = 181.59 ft/min

Slope, S = 1.00% — t_c = Channel Flow Tc

Manning Coefficient, n = 0.035 — t_c = (L/V) = 1.16 min

Wetted Perimeter, Wp = 8.32 feet

Area, A = 5 sqft

Hydraulic Radius, R = 0.60

Velocity, V = 3.03 ft/s

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = 8.06 (Min 5 Minutes)

0.13 Hour

Intensity (Vanderburgh Co.)

I_2 = 4.40 in/hr

I_5 = 5.16 in/hr

I_{10} = 5.83 in/hr

I_{25} = 6.84 in/hr

I_{50} = 7.72 in/hr

I_{100} = 8.72 in/hr

Peak Runoff Rate

$Q_{yr} = CiA$

Q_2 = 1.66 cfs

Q_5 = 1.94 cfs

Q_{10} = 2.19 cfs

Q_{25} = 2.58 cfs

Q_{50} = 2.91 cfs

Q_{100} = 3.28 cfs

Peak Runoff Calculation

SUB-BASIN #49

Post-Developed

Project 11822

Area (Ac) = **0.61** **Area (Sf) =** **26,380**

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)		S.F.	=	0.00	AC.	0.94	0.00
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)		S.F.	=	0.00	AC.	0.98	0.00
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	15,380	S.F.	=	0.35	AC.	0.25	0.09
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)		S.F.	=	0.00	AC.	0.55	0.00
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water	11,000	S.F.	=	0.25	AC.	1.00	0.25
	26,380			0.61			0.34

Wc = **0.5627**

Time of Concentration

Overland Flow

Length, L (max 100ft) = 80 feet — t_o = Overland Flow Tc

Slope, S = 5.00% — t_o = $[0.42*(L^{0.8})*(n^{0.8})]/[P^{0.5}*(S^{0.4})]$

Manning Coefficient, n = 0.240 Grass — t_o = 8.15 min

$P_{2/24}$ = 3.3

Shallow Flow

Length, L (Paved or Unpaved) Unpaved = 0 feet — V = 16.1345*(S0.5)

Slope, S = 0.00% — = 0.000 ft/s = 0.00 ft/min

Velocity, V = 0.00 ft/sec — t_s = Shallow Flow Tc

t_s = (L/V) = 0.00 min

Channel Flow

Length, L = feet — V = $(1.49/n)*R^{0.67}*S^{0.5}$

Difference in Elevation = 0 to 0 — = ft/s = ft/min

Slope, S = — t_c = Channel Flow Tc

Manning Coefficient, n = 0.000 — t_c = (L/V) = 0.00 min

Wetted Perimeter, Wp = 0 feet

Area, A = 0 sqft

Hydraulic Radius, R =

Velocity, V = ft/s

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = 8.15 (Min 5 Minutes)

0.14 Hour

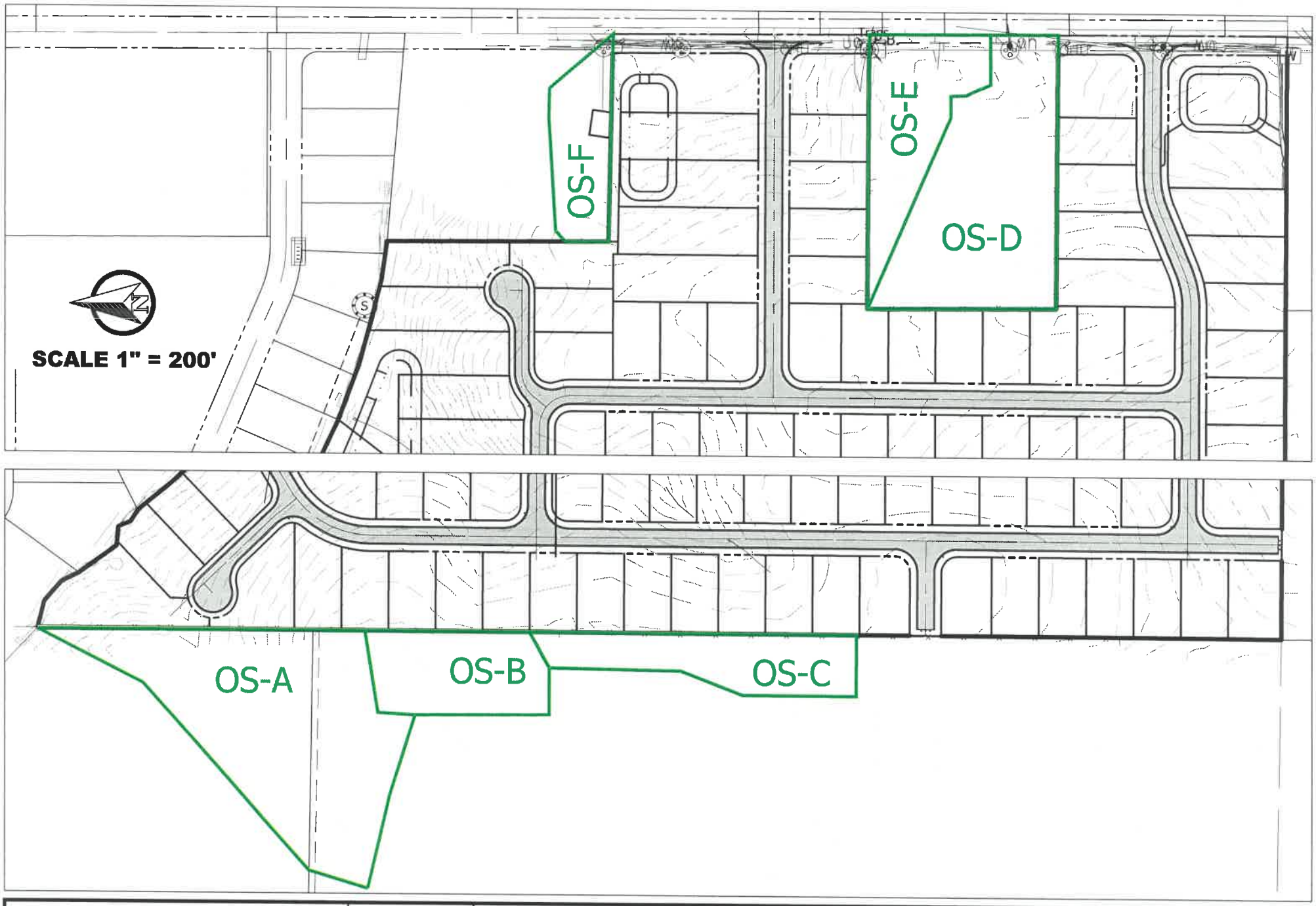
Intensity (Vanderburgh Co.)

I_2		**4.38 in/hr**
I_5		**5.14 in/hr**
I_{10}	=	**5.81 in/hr**
I_{25}		**6.81 in/hr**
I_{50}	=	**7.69 in/hr**
I_{100}	=	**8.68 in/hr**

Peak Runoff Rate

Q_{yr} = CiA

Q_2		**1.49 cfs**
Q_5		**1.75 cfs**
Q_{10}	=	**1.98 cfs**
Q_{25}	=	**2.32 cfs**
Q_{50}	=	**2.62 cfs**
Q_{100}	=	**2.96 cfs**



MORLEY
ARCHITECTS | ENGINEERS | SURVEYORS

4800 Rosebud Ln.
Newburgh, IN 47630
812.464.9585 Phone
812.464.2514 Fax
morleycorp.com

Offsite Subbasins

Eleanor's Place
13800 N Green River Road

Designed By:	Job Number:
JEM	11822
Drawn By:	Date:
CRS	4.26.2022
Filename:	
11822 Civil Base	

Peak Runoff Calculation

OFFSITE SUB-BASIN "A"

Post-Developed **Project 11822**

Area (Ac) = **2.67** **Area (Sf) = 116,500**

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	16,000	S.F.	=	0.37	AC.	0.94	0.35
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	4,500	S.F.	=	0.10	AC.	0.98	0.10
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)		S.F.	=	0.00	AC.	0.25	0.00
Lawn (5-10%)	96,000	S.F.	=	2.20	AC.	0.40	0.88
Lawn (>10%)		S.F.	=	0.00	AC.	0.55	0.00
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	116,500			2.67			1.33

Wc = **0.4966**

Time of Concentration

Overland Flow

Length, L (max 100ft)	=	100	feet	t_o =	Overland Flow Tc
Slope, S	=	4.00%		t_o =	$[0.42*(L^{0.8})*(n^{0.8})]/[P^{0.5})*(S^{0.4})]$
Manning Coefficient, n	=	0.240	Grass	t_o =	10.65 min
$P_{2/24}$	=	3.3			

Shallow Flow

Length, L (Paved or Unpaved)	Unpaved	=	475	feet	V =	16.1345*(S0.5)
Slope, S		=	4.00%		=	3.227 ft/s = 193.61 ft/min
Velocity, V		=	3.23	ft/sec	t_s =	Shallow Flow Tc
					t_s =	(L/V) = 2.45 min

Channel Flow

Length, L	=		feet		V =	$(1.49/n)*R^{0.67}*S^{0.5}$
Difference in Elevation	=	0	to	0	=	ft/s = ft/min
Slope, S	=				t_c =	Channel Flow Tc
Manning Coefficient, n	=	0.000			t_c =	(L/V) = 0.00 min
Wetted Perimeter, Wp	=	0	feet			
Area, A	=	0	sqft			
Hydraulic Radius, R	=					
Velocity, V	=		ft/s			

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = 13.10 (Min 5 Minutes)

0.22 Hour

Intensity (Vanderburgh Co.)

I_2	3.61	in/hr
I_5	4.24	in/hr
I_{10} =	4.78	in/hr
I_{25}	5.61	in/hr
I_{50} =	6.34	in/hr
I_{100} =	7.15	in/hr

Peak Runoff Rate

$Q_{yr} = CiA$

Q_2	4.79	cfs
Q_5	5.63	cfs
Q_{10} =	6.35	cfs
Q_{25} =	7.45	cfs
Q_{50} =	8.41	cfs
Q_{100} =	9.50	cfs

Peak Runoff Calculation

OFFSITE SUB-BASIN "B"

Post-Developed **Project 11822**

Area (Ac) = **0.85** **Area (Sf) =** **36,995**

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	4,655	S.F.	=	0.11	AC.	0.94	0.10
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	8,820	S.F.	=	0.20	AC.	0.98	0.20
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	23,520	S.F.	=	0.54	AC.	0.25	0.13
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)		S.F.	=	0.00	AC.	0.55	0.00
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	36,995			0.85			0.43

Wc = **0.5109**

Time of Concentration

Overland Flow

Length, L (max 100ft)		=	100	feet		t_o =	Overland Flow Tc
Slope, S		=	1.00%			t_o =	$[0.42*(L^{0.8})*(n^{0.6})]/[P^{0.5}*(S^{0.4})]$
Manning Coefficient, n		=	0.240	Grass		t_o =	18.54 min
$P_{2/24}$		=	3.3				

Shallow Flow

Length, L (Paved or Unpaved)	Unpaved	=	35	feet	V	=	16.1345*(S0.5)	
Slope, S		=	1.00%			=	1.613 ft/s = 96.81	ft/min
Velocity, V		=	1.61	ft/sec	t_s	=	Shallow Flow Tc	
					t_s	=	(L/V) = 0.36 min	

Channel Flow

Length, L		=		feet	V	=	$(1.49/n)*R^{0.67}*S^{0.5}$	
Difference in Elevation		=	0	to 0		=	ft/s =	ft/min
Slope, S		=			t_c	=	Channel Flow Tc	
Manning Coefficient, n		=	0.000		t_c	=	(L/V) = 0.00 min	
Wetted Perimeter, Wp		=	0	feet				
Area, A		=	0	sqft				
Hydraulic Radius, R		=						
Velocity, V		=		ft/s				

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = 18.90 (Min 5 Minutes)

0.32 Hour

Intensity (Vanderburgh Co.)

I_2		**2.95 in/hr**
I_5		**3.46 in/hr**
I_{10}	=	**3.91 in/hr**
I_{25}		**4.59 in/hr**
I_{50}	=	**5.18 in/hr**
I_{100}	=	**5.85 in/hr**

Peak Runoff Rate

$Q_{yr} = CiA$

Q_2		**1.28 cfs**
Q_5		**1.50 cfs**
Q_{10}	=	**1.70 cfs**
Q_{25}	=	**1.99 cfs**
Q_{50}	=	**2.25 cfs**
Q_{100}	=	**2.54 cfs**

Peak Runoff Calculation

OFFSITE SUB-BASIN "B"

Post-Developed PT

Project 11822

Area (Ac) = **0.85** **Area (Sf) = 36,995**

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	4,655	S.F.	=	0.11	AC.	0.94	0.10
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	8,820	S.F.	=	0.20	AC.	0.98	0.20
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	23,520	S.F.	=	0.54	AC.	0.25	0.13
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)		S.F.	=	0.00	AC.	0.55	0.00
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	36,995			0.85			0.43

Wc = 0.5109

Time of Concentration

Overland Flow

Length, L (max 100ft)		=	100	feet	t_o =	Overland Flow Tc
Slope, S		=	1.00%		t_o =	$[0.42*(L^{0.8})*(n^{0.8})]/[P^{0.5})*(S^{0.4})]$
Manning Coefficient, n		=	0.240	Grass	t_o =	18.54 min
$P_{2/24}$		=	3.3			

Shallow Flow

Length, L (Paved or Unpaved)	Unpaved	=	835	feet	V =	16.1345*(S0.5)
Slope, S		=	2.50%		=	2.551 ft/s = 153.07 ft/min
Velocity, V		=	2.55	ft/sec	t_s =	Shallow Flow Tc
					t_s =	(L/V) = 5.46 min

Channel Flow

Length, L		=		feet	V =	$(1.49/n)*R^{0.67}*S^{0.5}$
Difference in Elevation		=	0	to 0	=	ft/s = ft/min
Slope, S		=			t_c =	Channel Flow Tc
Manning Coefficient, n		=	0.000		t_c =	(L/V) = 0.00 min
Wetted Perimeter, Wp		=	0	feet		
Area, A		=	0	sqft		
Hydraulic Radius, R		=				
Velocity, V		=		ft/s		

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = 24.00 (Min 5 Minutes)

0.40 Hour

Intensity (Vanderburgh Co.)

I_2		2.52	in/hr
I_5		2.96	in/hr
I_{10}	=	3.34	in/hr
I_{25}		3.92	in/hr
I_{50}	=	4.42	in/hr
I_{100}	=	4.99	in/hr

Peak Runoff Rate

$Q_{yr} = CiA$

Q_2		1.09	cfs
Q_5		1.28	cfs
Q_{10}	=	1.45	cfs
Q_{25}	=	1.70	cfs
Q_{50}	=	1.92	cfs
Q_{100}	=	2.16	cfs

Peak Runoff Calculation

OFFSITE SUB-BASIN "C"

Post-Developed

Project 11822

Area (Ac) = **0.88** **Area (Sf) =** **38,505**

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	4,845	S.F.	=	0.11	AC.	0.94	0.10
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	9,180	S.F.	=	0.21	AC.	0.98	0.21
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	24,480	S.F.	=	0.56	AC.	0.25	0.14
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)		S.F.	=	0.00	AC.	0.55	0.00
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	38,505			0.88			0.45

Wc = **0.5109**

Time of Concentration

Overland Flow

Length, L (max 100ft) = 100 feet — t_o = Overland Flow Tc

Slope, S = 1.00% — t_o = $[0.42*(L^{0.5})*(n^{0.8})]/[P^{0.5})*(S^{0.4})]$

Manning Coefficient, n = 0.240 Grass — t_o = 18.54 min

$P_{2/24}$ = 3.3

Shallow Flow

Length, L (Paved or Unpaved) Unpaved = 0 feet — V = 16.1345*(S0.5)

Slope, S = 0.00% — = 0.000 ft/s = 0.00 ft/min

Velocity, V = 0.00 ft/sec — t_s = Shallow Flow Tc

t_s = (L/V) = 0.00 min

Channel Flow

Length, L = feet — V = $(1.49/n)*R^{0.67}*S^{0.5}$

Difference in Elevation = 0 to 0 — = ft/s = ft/min

Slope, S = — t_c = Channel Flow Tc

Manning Coefficient, n = 0.000 — t_c = (L/V) = 0.00 min

Wetted Perimeter, Wp = 0 feet

Area, A = 0 sqft

Hydraulic Radius, R =

Velocity, V = ft/s

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = **18.54** **(Min 5 Minutes)**

0.31 **Hour**

Intensity (Vanderburgh Co.)

I_2		**2.99**	**in/hr**
I_5		**3.51**	**in/hr**
I_{10}	=	**3.96**	**in/hr**
I_{25}		**4.64**	**in/hr**
I_{50}	=	**5.24**	**in/hr**
I_{100}	=	**5.92**	**in/hr**

Peak Runoff Rate

Q_{yr} = CIA

Q_2		**1.35**	**cfs**
Q_5		**1.58**	**cfs**
Q_{10}	=	**1.79**	**cfs**
Q_{25}	=	**2.10**	**cfs**
Q_{50}	=	**2.37**	**cfs**
Q_{100}	=	**2.67**	**cfs**

Peak Runoff Calculation

OFFSITE SUB-BASIN "C"

Post-Developed PT

Project 11822

Area (Ac) = **0.88** **Area (Sf) =** **38,505**

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	4,845	S.F.	=	0.11	AC.	0.94	0.10
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	9,180	S.F.	=	0.21	AC.	0.98	0.21
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	24,480	S.F.	=	0.56	AC.	0.25	0.14
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)		S.F.	=	0.00	AC.	0.55	0.00
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	38,505			0.88			0.45

Wc = **0.5109**

Time of Concentration

Overland Flow

Length, L (max 100ft) = 100 feet — t_o = Overland Flow Tc

Slope, S = 1.00% — $t_o = [0.42*(L^{0.8})*(n^{0.8})]/[P^{0.5})*(S^{0.4})]$

Manning Coefficient, n = 0.240 Grass — t_o = 18.54 min

$P_{2/24}$ = 3.3

Shallow Flow

Length, L (Paved or Unpaved) Unpaved = 800 feet — V = 16.1345*(S0.5)

Slope, S = 2.50% — = 2.551 ft/s = 153.07 ft/min

Velocity, V = 2.55 ft/sec — t_s = Shallow Flow Tc

t_s = (L/V) = 5.23 min

Channel Flow

Length, L = feet — V = $(1.49/n)*R^{0.67}*S^{0.5}$

Difference in Elevation = 0 to 0 — = ft/s = ft/min

Slope, S = — t_c = Channel Flow Tc

Manning Coefficient, n = 0.000 — t_c = (L/V) = 0.00 min

Wetted Perimeter, Wp = 0 feet

Area, A = 0 sqft

Hydraulic Radius, R =

Velocity, V = ft/s

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = 23.77 (Min 5 Minutes)

0.40 Hour

Intensity (Vanderburgh Co.)

I_2 = 2.54 in/hr

I_5 = 2.98 in/hr

I_{10} = 3.36 in/hr

I_{25} = 3.94 in/hr

I_{50} = 4.45 in/hr

I_{100} = 5.02 in/hr

Peak Runoff Rate

$Q_{yr} = CiA$

Q_2 = 1.15 cfs

Q_5 = 1.34 cfs

Q_{10} = 1.52 cfs

Q_{25} = 1.78 cfs

Q_{50} = 2.01 cfs

Q_{100} = 2.27 cfs

Peak Runoff Calculation

OFFSITE SUB-BASIN "D"

Post-Developed

Project 11822

Area (Ac) = 2.02 **Area (Sf) =** 88,000

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	9,000	S.F.	=	0.21	AC.	0.94	0.19
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	7,500	S.F.	=	0.17	AC.	0.98	0.17
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	71,500	S.F.	=	1.64	AC.	0.25	0.41
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)		S.F.	=	0.00	AC.	0.55	0.00
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	88,000			2.02			0.77

Wc = 0.3828

Time of Concentration

Overland Flow

Length, L (max 100ft)		=	100	feet	t_o =	Overland Flow Tc
Slope, S		=	1.00%		t_o =	$[0.42*(L^{0.8})*(n^{0.6})]/[P^{0.5})*(S^{0.4})]$
Manning Coefficient, n		=	0.240	Grass	t_o =	18.54 min
$P_{2/24}$		=	3.3			

Shallow Flow

Length, L (Paved or Unpaved)	Unpaved	=	250	feet	V =	16.1345*(S0.5)
Slope, S		=	2.00%		=	2.282 ft/s = 136.91 ft/min
Velocity, V		=	2.28	ft/sec	t_s =	Shallow Flow Tc
					t_s =	(L/V) = 1.83 min

Channel Flow

Length, L		=		feet	V =	$(1.49/n)*R^{0.67}*S^{0.5}$
Difference in Elevation		=	0	to 0	=	ft/s = ft/min
Slope, S		=			t_c =	Channel Flow Tc
Manning Coefficient, n		=	0.000		t_c =	(L/V) = 0.00 min
Wetted Perimeter, Wp		=	0	feet		
Area, A		=	0	sqft		
Hydraulic Radius, R		=				
Velocity, V		=		ft/s		

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = **20.37** **(Min 5 Minutes)**

0.34 **Hour**

Intensity (Vanderburgh Co.)

I_2		**2.82** **in/hr**
I_5		**3.30** **in/hr**
I_{10}	=	**3.73** **in/hr**
I_{25}		**4.38** **in/hr**
I_{50}	=	**4.94** **in/hr**
I_{100}	=	**5.58** **in/hr**

Peak Runoff Rate

$Q_{yr} = CiA$

Q_2		**2.18** **cfs**
Q_5		**2.56** **cfs**
Q_{10}	=	**2.88** **cfs**
Q_{25}	=	**3.39** **cfs**
Q_{50}	=	**3.82** **cfs**
Q_{100}	=	**4.31** **cfs**

Peak Runoff Calculation

OFFSITE SUB-BASIN "D"

Post-Developed PT **Project 11822**

Area (Ac) = **2.02** **Area (Sf) =** **88,000**

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	9,000	S.F.	=	0.21	AC.	0.94	0.19
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	7,500	S.F.	=	0.17	AC.	0.98	0.17
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	71,500	S.F.	=	1.64	AC.	0.25	0.41
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)		S.F.	=	0.00	AC.	0.55	0.00
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	88,000			2.02			0.77

Wc = **0.3828**

Time of Concentration

Overland Flow

Length, L (max 100ft) = 100 feet — t_o = Overland Flow Tc

Slope, S = 1.00% — t_o = $[0.42*(L^{0.8})*(n^{0.8})]/[P^{0.5})*(S^{0.4})]$

Manning Coefficient, n = 0.240 Grass — t_o = 18.54 min

$P_{2/24}$ = 3.3

Shallow Flow

Length, L (Paved or Unpaved) Unpaved = 650 feet — V = 16.1345*(S0.5)

Slope, S = 1.40% — = 1.909 ft/s = 114.54 ft/min

Velocity, V = 1.91 ft/sec — t_s = Shallow Flow Tc

t_s = (L/V) = 5.67 min

Channel Flow

Length, L = feet — V = $(1.49/n)*R^{0.67}*S^{0.5}$

Difference in Elevation = 0 to 0 — = ft/s = ft/min

Slope, S = — t_c = Channel Flow Tc

Manning Coefficient, n = 0.000 — t_c = (L/V) = 0.00 min

Wetted Perimeter, Wp = 0 feet

Area, A = 0 sqft

Hydraulic Radius, R =

Velocity, V = ft/s

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = 24.22 (Min 5 Minutes)

0.40 Hour

Intensity (Vanderburgh Co.)

I_2 = 2.50 in/hr

I_5 = 2.94 in/hr

I_{10} = 3.32 in/hr

I_{25} = 3.89 in/hr

I_{50} = 4.39 in/hr

I_{100} = 4.96 in/hr

Peak Runoff Rate

Q_{yr} = CiA

Q_2 = 1.94 cfs

Q_5 = 2.27 cfs

Q_{10} = 2.56 cfs

Q_{25} = 3.01 cfs

Q_{50} = 3.40 cfs

Q_{100} = 3.83 cfs

Peak Runoff Calculation

OFFSITE SUB-BASIN "E"

Post-Developed **Project 11822**

Area (Ac) = **0.99** **Area (Sf) =** **43,000**

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	3,000	S.F.	=	0.07	AC.	0.94	0.06
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	1,000	S.F.	=	0.02	AC.	0.98	0.02
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	39,000	S.F.	=	0.90	AC.	0.25	0.22
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)		S.F.	=	0.00	AC.	0.55	0.00
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	43,000			0.99			0.31

Wc = **0.3151**

Time of Concentration

Overland Flow

Length, L (max 100ft)		=	100	feet	t_o =	Overland Flow Tc
Slope, S		=	2.00%		t_o =	$[0.42*(L^{0.8})*(n^{0.8})]/[P^{0.5})*(S^{0.4})]$
Manning Coefficient, n		=	0.240	Grass	t_o =	14.05 min
$P_{2/24}$		=	3.3			

Shallow Flow

Length, L (Paved or Unpaved)	Unpaved	=	30	feet	V =	16.1345*(S0.5)
Slope, S		=	2.00%		=	2.282 ft/s = 136.91 ft/min
Velocity, V		=	2.28	ft/sec	t_s =	Shallow Flow Tc
					t_s =	(L/V) = 0.22 min

Channel Flow

Length, L		=		feet	V =	$(1.49/n)*R^{0.67}*S^{0.5}$
Difference in Elevation		=	0	to 0	=	ft/s = ft/min
Slope, S		=			t_c =	Channel Flow Tc
Manning Coefficient, n		=	0.000		t_c =	(L/V) = 0.00 min
Wetted Perimeter, Wp		=	0	feet		
Area, A		=	0	sqft		
Hydraulic Radius, R		=				
Velocity, V		=		ft/s		

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = 14.27 (Min 5 Minutes)

0.24 Hour

Intensity (Vanderburgh Co.)

I_2		**3.46 in/hr**
I_5		**4.06 in/hr**
I_{10}	=	**4.58 in/hr**
I_{25}		**5.38 in/hr**
I_{50}	=	**6.07 in/hr**
I_{100}	=	**6.85 in/hr**

Peak Runoff Rate

$Q_{yr} = CiA$

Q_2		**1.08 cfs**
Q_5		**1.26 cfs**
Q_{10}	=	**1.43 cfs**
Q_{25}	=	**1.67 cfs**
Q_{50}	=	**1.89 cfs**
Q_{100}	=	**2.13 cfs**

Peak Runoff Calculation

OFFSITE SUB-BASIN "E"

Post-Developed PT

Project 11822

Area (Ac) = 0.99 **Area (Sf) =** 43,000

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	3,000	S.F.	=	0.07	AC.	0.94	0.06
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	1,000	S.F.	=	0.02	AC.	0.98	0.02
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	39,000	S.F.	=	0.90	AC.	0.25	0.22
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)		S.F.	=	0.00	AC.	0.55	0.00
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	43,000			0.99			0.31

Wc = 0.3151

Time of Concentration

Overland Flow

Length, L (max 100ft)		=	100	feet	t_o =	Overland Flow Tc
Slope, S		=	2.00%		t_o =	$[0.42*(L^{0.8})*(n^{0.8})]/[P^{0.5})*(S^{0.4})]$
Manning Coefficient, n		=	0.240	Grass	t_o =	14.05 min
$P_{2/24}$		=	3.3			

Shallow Flow

Length, L (Paved or Unpaved)	Unpaved	=	420	feet	V =	16.1345*(S0.5)	
Slope, S		=	2.00%		=	2.282 ft/s = 136.91	ft/min
Velocity, V		=	2.28	ft/sec	t_s =	Shallow Flow Tc	
					t_s =	(L/V) = 3.07 min	

Channel Flow

Length, L		=		feet	V =	$(1.49/n)*R^{0.67}*S^{0.5}$	
Difference in Elevation		=	0	to 0	=	ft/s =	ft/min
Slope, S		=			t_c =	Channel Flow Tc	
Manning Coefficient, n		=	0.000		t_c =	(L/V) = 0.00 min	
Wetted Perimeter, Wp		=	0	feet			
Area, A		=	0	sqft			
Hydraulic Radius, R		=					
Velocity, V		=		ft/s			

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = 17.12 (Min 5 Minutes)

0.29 Hour

Intensity (Vanderburgh Co.)

I_2		3.13	in/hr
I_5		3.68	in/hr
I_{10}	=	4.15	in/hr
I_{25}		4.87	in/hr
I_{50}	=	5.50	in/hr
I_{100}	=	6.20	in/hr

Peak Runoff Rate

$Q_{yr} = CiA$

Q_2		0.97	cfs
Q_5		1.14	cfs
Q_{10}	=	1.29	cfs
Q_{25}	=	1.51	cfs
Q_{50}	=	1.71	cfs
Q_{100}	=	1.93	cfs

Peak Runoff Calculation

OFFSITE SUB-BASIN "F"

Post-Developed

Project 11822

Area (Ac) = **0.62** **Area (Sf) =** **26,850**

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	3,500	S.F.	=	0.08	AC.	0.94	0.08
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	3,000	S.F.	=	0.07	AC.	0.98	0.07
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	20,350	S.F.	=	0.47	AC.	0.25	0.12
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)		S.F.	=	0.00	AC.	0.55	0.00
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	26,850			0.62			0.26

Wc = **0.4215**

Time of Concentration

Overland Flow

Length, L (max 100ft) = 100 feet — t_o = Overland Flow Tc

Slope, S = 2.22% — t_o = $[0.42*(L^{0.8})*(n^{0.5})]/[P^{0.5})*(S^{0.4})]$

Manning Coefficient, n = 0.240 Grass — t_o = 13.48 min

$P_{2/24}$ = 3.3

Shallow Flow

Length, L (Paved or Unpaved) Unpaved = 215 feet — V = 16.1345*(S0.5)

Slope, S = 2.22% — = 2.404 ft/s = 144.24 ft/min

Velocity, V = 2.40 ft/sec — t_s = Shallow Flow Tc

t_s = (L/V) = 1.49 min

Channel Flow

Length, L = feet — V = $(1.49/n)*R^{0.67}*S^{0.5}$

Difference in Elevation = 0 to 0 — = ft/s = ft/min

Slope, S = — t_c = Channel Flow Tc

Manning Coefficient, n = 0.000 — t_c = (L/V) = 0.00 min

Wetted Perimeter, Wp = 0 feet

Area, A = 0 sqft

Hydraulic Radius, R =

Velocity, V = ft/s

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = 14.97 (Min 5 Minutes)

0.25 Hour

Intensity (Vanderburgh Co.)

I_2	**3.37**	**in/hr**
I_5	**3.96**	**in/hr**
I_{10} =	**4.47**	**in/hr**
I_{25}	**5.25**	**in/hr**
I_{50} =	**5.92**	**in/hr**
I_{100} =	**6.68**	**in/hr**

Peak Runoff Rate

$Q_{yr} = CiA$

Q_2	**0.88**	**cfs**
Q_5	**1.03**	**cfs**
Q_{10} =	**1.16**	**cfs**
Q_{25} =	**1.36**	**cfs**
Q_{50} =	**1.54**	**cfs**
Q_{100} =	**1.74**	**cfs**

Peak Runoff Calculation

OFFSITE SUB-BASIN "F"

Post-Developed PT

Project 11822

Area (Ac) = 0.62 **Area (Sf) =** 26,850

Weighted Runoff Coefficient

Surface	Area					c	A*c
Structures & Pavement (<2%)		S.F.	=	0.00	AC.	0.92	0.00
Structures & Pavement (2-5%)	3,500	S.F.	=	0.08	AC.	0.94	0.08
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	3,000	S.F.	=	0.07	AC.	0.98	0.07
Gravel (10 yr Storm)		S.F.	=	0.00	AC.	0.50	0.00
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)		S.F.	=	0.00	AC.	0.65	0.00
Lawn (<2%)		S.F.	=	0.00	AC.	0.15	0.00
Lawn (2-5%)	20,350	S.F.	=	0.47	AC.	0.25	0.12
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)		S.F.	=	0.00	AC.	0.55	0.00
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)		S.F.	=	0.00	AC.	0.20	0.00
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
	26,850			0.62			0.26

Wc = 0.4215

Time of Concentration

Overland Flow

Length, L (max 100ft)		=	100	feet	t_o =	Overland Flow Tc
Slope, S		=	2.22%		t_o =	$[0.42*(L^{0.5})*(n^{0.6})]/[P^{0.5})*(S^{0.4})]$
Manning Coefficient, n		=	0.240	Grass	t_o =	13.48 min
$P_{2/24}$		=	3.3			

Shallow Flow

Length, L (Paved or Unpaved)	Unpaved	=	215	feet	V =	16.1345*(S0.5)	
Slope, S		=	2.22%		=	2.404 ft/s = 144.24	ft/min
Velocity, V		=	2.40	ft/sec	t_s =	Shallow Flow Tc	
					t_s =	(L/V) = 1.49 min	

Channel Flow

Length, L		=		feet	V =	$(1.49/n)*R^{0.67}*S^{0.5}$	
Difference in Elevation		=	0	to 0	=	ft/s =	ft/min
Slope, S		=			t_c =	Channel Flow Tc	
Manning Coefficient, n		=	0.000		t_c =	(L/V) = 0.00 min	
Wetted Perimeter, Wp		=	0	feet			
Area, A		=	0	sqft			
Hydraulic Radius, R		=					
Velocity, V		=		ft/s			

t = Total Time of Concentration

t = Σto + Σts + Σtc

t = 14.97 (Min 5 Minutes)

0.25 Hour

Intensity (Vanderburgh Co.)

I_2		3.37 in/hr
I_5		3.96 in/hr
I_{10}	=	4.47 in/hr
I_{25}		5.25 in/hr
I_{50}	=	5.92 in/hr
I_{100}	=	6.68 in/hr

Peak Runoff Rate

$Q_{yr} = CiA$

Q_2		0.88 cfs
Q_5		1.03 cfs
Q_{10}	=	1.16 cfs
Q_{25}	=	1.36 cfs
Q_{50}	=	1.54 cfs
Q_{100}	=	1.74 cfs

VANDERBURGH COUNTY DRAINAGE BOARD
FORM 800 (North Basin)

PROJECT: **Eleanor's Place** 11822
DESIGNER: **JEM**

DETENTION FACILITY DESIGN RETURN PERIOD: 25 YRS
RELEASE RATE RETURN PERIOD: 10 YRS

UNDEVELOPED WATERSHED AREA (Au)	19.97		ACRES
TIME OF CONCENTRATION (UNDEVELOPED WATERSHED)	21.93		MINUTES
RAINFALL INTENSITY (Iu):	3.55		INCHES/HR
UNDEVELOPED RUNOFF COEFFICIENT (Cu):	0.425		
UNDEVELOPED RUNOFF RATE (Q = Cu*Iu*A):		30.15	CFS
DEVELOPED WATERSHED AREA (Ad)	19.30		ACRES
DEVELOPED RUNOFF COEFFICIENT (Cd):	0.57		
UNDETAINED DEVELOPED RUNOFF RATE		6.12	CFS
ALLOWABLE OFF SITE PASS THROUGH RATE		3.48	
ALLOWABLE PIPE RELEASE RATE		27.51	CFS
ACTUAL DISCHARGE PIPE OUTFLOW		18.24	CFS

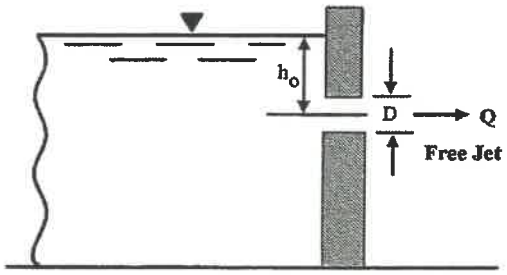
STORM DURATION Td (HRS)	RAINFALL INTENSITY Id (INCH/HR)	INFLOW RATE I(Td) (Cd*Id*Ad) (CFS)	OUTFLOW RATE Q (actual) (CFS)	STORAGE RATE I(Td)-Q (CFS)	REQUIRED STORAGE (I(Td)-Q)*Td/12 (ACRE.FT)
0.08	7.811	85.93	18.24	67.69	0.47
0.17	6.321	69.54	18.24	51.30	0.71
0.25	5.241	57.65	18.24	39.41	0.81
0.50	3.307	36.38	18.24	18.14	0.75
0.67	2.581	28.40	18.24	10.16	0.56
0.75	2.310	25.41	18.24	7.17	0.44
1.00	2.174	23.92	18.24	5.68	0.47
1.50	1.668	18.35	18.24	0.11	0.01
2.00	1.366	15.02	18.24	-3.22	-0.53
2.50	1.163	12.80	18.24	-5.44	-1.12
3.00	1.017	11.19	18.24	-7.05	-1.75
4.00	0.820	9.02	18.24	-9.22	-3.05
5.00	0.691	7.61	18.24	-10.63	-4.39
6.00	0.600	6.61	18.24	-11.63	-5.77
7.00	0.532	5.86	18.24	-12.38	-7.16
8.00	0.480	5.28	18.24	-12.96	-8.57
9.00	0.437	4.81	18.24	-13.43	-9.99
10.00	0.402	4.42	18.24	-13.82	-11.42

PEAK STORAGE (ACRE-FT)	0.81
PEAK STORAGE (CUBIC FT)	35,471

J:\11000s\11800-11899\11822\Civil 3D\Drainage\[11822_Form800_Final.xlsx]N Basin

BASIN DISCHARGE AND STORAGE VOLUME

Orifice: $Q = C_d A_0 \sqrt{2gh_0}$ LTAP 6.3.2



Pipe Dia.	0	(inch)
D (inch)	0.00	Orifice diameter
A_o (s.f.)	0.00	Area of orifice
g (f/s^2)	32.2	Acceleration due to gravity
H (ft)	0.00	Head at Inlet
h_o (ft)	0.00	Head at center of orifice
C_d	0.61	Discharge coefficient

Q= 0.00 CFS

[X] Not used

Pipe Flow:

$$Q = A_P \left(\frac{h_P}{\frac{K_e + K_0}{2g} + \frac{2.87 n^2 L}{D^{4/3}}} \right)^{1/2}$$ LTAP 6.3.5

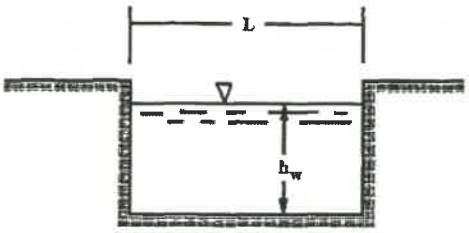
Pipe Dia.	24	(inch)
Ap (s.f.)	3.14	Area of Pipe
n	0.012	Manning roughness coef.
g (f/s^2)	32.2	Acceleration due to gravity
H (ft)	2.25	Head at invert
h_p (ft)	1.25	Head at center of pipe
L (ft)	51	Length of pipe
K_e	0.85	Entrance Loss
K_o	1.00	Outlet Loss

Q= 18.24 CFS @ 25 year water elevation

[ ] Not used

Rectangular Weir:

$$Q = \frac{2}{3} C_d \sqrt{2g} L h_w^{3/2}$$ LTAP 6.3.3



L (ft)	0	Length of the weir
g (f/s^2)	32.2	Acceleration due to gravity
h_w (ft)	0.00	Head above weir
C_d	0.61	Discharge coefficient

Q= 0.00 CFS

[X] Not used

Storage:

Stage	Surface Area (S.F.)	Cum. Storage Vol. (C.F.)	Notes
402.50	16,177		Pool
403.50	18,506	17,342	
404.50	20,936	19,721	
404.75	21,559	5,312	25 Year Water Elev.
405.25			EO Elevation

Available Storage:	42,374	0.97	AC-FT
Required Storage:	35,471	0.81	AC-FT
	84%	Basin Capacity	

VANDERBURGH COUNTY DRAINAGE BOARD
FORM 800 (North Basin)

PROJECT: **Eleanor's Place** 11822
DESIGNER: **JEM**

DETENTION FACILITY DESIGN RETURN PERIOD: 100 YRS
RELEASE RATE RETURN PERIOD: 10 YRS

UNDEVELOPED WATERSHED AREA (Au)	19.97		ACRES
TIME OF CONCENTRATION (UNDEVELOPED WATERSHED)	21.93		MINUTES
RAINFALL INTENSITY (Iu):	3.55		INCHES/HR
UNDEVELOPED RUNOFF COEFFICIENT (Cu):	0.425		
UNDEVELOPED RUNOFF RATE (Q = Cu*Iu*A):		30.15	CFS
DEVELOPED WATERSHED AREA (Ad)	19.30		ACRES
DEVELOPED RUNOFF COEFFICIENT (Cd):	0.57		
UNDETAINED DEVELOPED RUNOFF RATE		6.12	CFS
ALLOWABLE OFF SITE PASS THROUGH RATE		3.48	
ALLOWABLE PIPE RELEASE RATE		27.51	CFS
ACTUAL DISCHARGE PIPE OUTFLOW		18.24	CFS

STORM DURATION Td	RAINFALL INTENSITY Id	INFLOW RATE I(Td)	OUTFLOW RATE Q	STORAGE RATE	REQUIRED STORAGE
		(Cd*Id*Ad)	(actual)	I(Td)-Q	(I(Td)-Q)*Td/12
(HRS)	(INCH/HR)	(CFS)	(CFS)	(CFS)	(ACRE.FT)
0.25	6.677	73.45	18.24	55.21	1.14

J:\11000s\11800-11899\11822\Civil 3D\Drainage\[11822_Form800_Final.xlsx]N Basin

VANDERBURGH COUNTY DRAINAGE BOARD
FORM 800 (Northeast Basin)

PROJECT: **Eleanor's Place** 11822
DESIGNER: **JEM**

DETENTION FACILITY DESIGN RETURN PERIOD: 25 YRS
RELEASE RATE RETURN PERIOD: 10 YRS

UNDEVELOPED WATERSHED AREA (Au)	4.22		ACRES
TIME OF CONCENTRATION (UNDEVELOPED WATERSHED)	19.92		MINUTES
RAINFALL INTENSITY (Iu):	3.78		INCHES/HR
UNDEVELOPED RUNOFF COEFFICIENT (Cu):	0.35		
UNDEVELOPED RUNOFF RATE (Q = Cu*Iu*A):		5.59	CFS
DEVELOPED WATERSHED AREA (Ad)	6.65		ACRES
DEVELOPED RUNOFF COEFFICIENT (Cd):	0.50		
UNDETAINED DEVELOPED RUNOFF RATE		0.00	CFS
ALLOWABLE OFF SITE PASS THROUGH RATE		2.87	
ALLOWABLE PIPE RELEASE RATE		8.46	CFS
ACTUAL DISCHARGE PIPE OUTFLOW		3.33	CFS

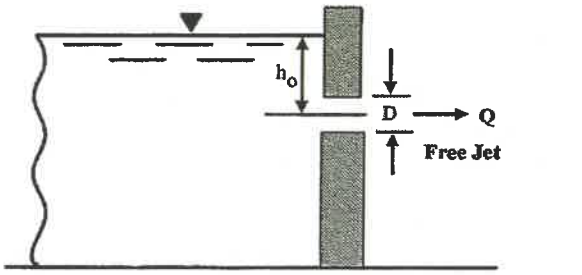
STORM DURATION Td (HRS)	RAINFALL INTENSITY Id (INCH/HR)	INFLOW RATE I(Td) (Cd*Id*Ad) (CFS)	OUTFLOW RATE Q (actual) (CFS)	STORAGE RATE I(Td)-Q (CFS)	REQUIRED STORAGE (I(Td)-Q)*Td/12 (ACRE.FT)
0.08	7.811	25.97	3.33	22.64	0.16
0.17	6.321	21.02	3.33	17.69	0.24
0.25	5.241	17.43	3.33	14.10	0.29
0.50	3.307	11.00	3.33	7.67	0.32
0.67	2.581	8.58	3.33	5.25	0.29
0.75	2.310	7.68	3.33	4.35	0.27
1.00	2.174	7.23	3.33	3.90	0.32
1.50	1.668	5.54	3.33	2.21	0.27
2.00	1.366	4.54	3.33	1.21	0.20
2.50	1.163	3.87	3.33	0.54	0.11
3.00	1.017	3.38	3.33	0.05	0.01
4.00	0.820	2.73	3.33	-0.60	-0.20
5.00	0.691	2.30	3.33	-1.03	-0.43
6.00	0.600	2.00	3.33	-1.33	-0.66
7.00	0.532	1.77	3.33	-1.56	-0.90
8.00	0.480	1.59	3.33	-1.74	-1.15
9.00	0.437	1.45	3.33	-1.88	-1.40
10.00	0.402	1.34	3.33	-1.99	-1.65

PEAK STORAGE (ACRE-FT)	0.32
PEAK STORAGE (CUBIC FT)	14,040

J:\11000s\11800-11899\11822\Civil 3D\Drainage\[11822_Form800_Final.xlsx]N Basin

BASIN DISCHARGE AND STORAGE VOLUME

Orifice: $Q = C_d A_0 \sqrt{2gh_0}$ LTAP 6.3.2



Pipe Dia.	0	(inch)
D (inch)	0.00	Orifice diameter
A_o (s.f.)	0.00	Area of orifice
g (f/s^2)	32.2	Acceleration due to gravity
H (ft)	0.00	Head at Inlet
h_o (ft)	0.00	Head at center of orifice
C_d	0.61	Discharge coefficient

Q= 0.00 CFS

[X] Not used

Pipe Flow:

$$Q = A_P \left(\frac{h_P}{\frac{K_e + K_0}{2g} + \frac{2.87 n^2 L}{D^{4/3}}} \right)^{1/2}$$ LTAP 6.3.5

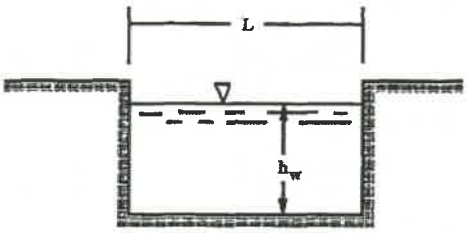
Pipe Dia.	12	(inch)
Ap (s.f.)	0.79	Area of Pipe
n	0.012	Manning roughness coef.
g (f/s^2)	32.2	Acceleration due to gravity
H (ft)	1.50	Head at invert
h_p (ft)	1.00	Head at center of pipe
L (ft)	65	Length of pipe
K_e	0.85	Entrance Loss
K_o	1.00	Outlet Loss

Q= 3.33 CFS @ 25 year water elevation

[ ] Not used

Rectangular Weir:

$$Q = \frac{2}{3} C_d \sqrt{2g} L h_w^{3/2}$$ LTAP 6.3.3



L (ft)	0	Length of the weir
g (f/s^2)	32.2	Acceleration due to gravity
h_w (ft)	0.00	Head above weir
C_d	0.61	Discharge coefficient

Q= 0.00 CFS

[X] Not used

Storage:

Stage	Surface Area (S.F.)	Cum. Storage Vol. (C.F.)	Notes
412.00	11,214		Pool
412.50	12,132	5,837	
413.50	14,043	13,088	25 Year Water Elev.
414.00			EO Elevation

Available Storage:	18,924	0.43	AC-FT
Required Storage:	14,040	0.32	AC-FT
	74%	Basin Capacity	

VANDERBURGH COUNTY DRAINAGE BOARD
FORM 800 (Northeast Basin)

PROJECT: **Eleanor's Place** 11822
DESIGNER: **JEM**

DETENTION FACILITY DESIGN RETURN PERIOD: 100 YRS
RELEASE RATE RETURN PERIOD: 10 YRS

UNDEVELOPED WATERSHED AREA (Au)	4.22		ACRES
TIME OF CONCENTRATION (UNDEVELOPED WATERSHED)	19.92		MINUTES
RAINFALL INTENSITY (Iu):	3.78		INCHES/HR
UNDEVELOPED RUNOFF COEFFICIENT (Cu):	0.35		
UNDEVELOPED RUNOFF RATE (Q = Cu*Iu*A):		5.59	CFS
DEVELOPED WATERSHED AREA (Ad)	6.65		ACRES
DEVELOPED RUNOFF COEFFICIENT (Cd):	0.50		
UNDETAINED DEVELOPED RUNOFF RATE		0.00	CFS
ALLOWABLE OFF SITE PASS THROUGH RATE		2.87	
ALLOWABLE PIPE RELEASE RATE		8.46	CFS
ACTUAL DISCHARGE PIPE OUTFLOW		3.33	CFS

STORM DURATION Td	RAINFALL INTENSITY Id	INFLOW RATE I(Td)	OUTFLOW RATE Q	STORAGE RATE	REQUIRED STORAGE
		(Cd*Id*Ad)	(actual)	I(Td)-Q	(I(Td)-Q)*Td/12
(HRS)	(INCH/HR)	(CFS)	(CFS)	(CFS)	(ACRE.FT)
0.50	4.214	14.01	3.33	10.68	0.44

J:\11000s\11800-11899\11822\Civil 3D\Drainage\[11822_Form800_Final.xlsx]N Basin

VANDERBURGH COUNTY DRAINAGE BOARD
FORM 800 (South Basin)

PROJECT: **Eleanor's Place** 11822
DESIGNER: **JEM**

DETENTION FACILITY DESIGN RETURN PERIOD: 25 YRS
RELEASE RATE RETURN PERIOD: 10 YRS

UNDEVELOPED WATERSHED AREA (Au)	12.93		ACRES
TIME OF CONCENTRATION (UNDEVELOPED WATERSHED)	22.80		MINUTES
RAINFALL INTENSITY (Iu):	3.46		INCHES/HR
UNDEVELOPED RUNOFF COEFFICIENT (Cu):	0.35		
UNDEVELOPED RUNOFF RATE (Q = Cu*Iu*A):		15.65	CFS
DEVELOPED WATERSHED AREA (Ad)	13.07		ACRES
DEVELOPED RUNOFF COEFFICIENT (Cd):	0.59		
UNDETAINED DEVELOPED RUNOFF RATE		0.00	CFS
ALLOWABLE PIPE RELEASE RATE		15.65	CFS
ACTUAL DISCHARGE PIPE OUTFLOW		11.19	CFS

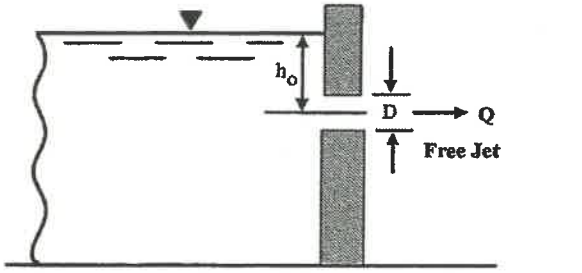
STORM DURATION Td (HRS)	RAINFALL INTENSITY Id (INCH/HR)	INFLOW RATE I(Td) (Cd*Id*Ad) (CFS)	OUTFLOW RATE Q (actual) (CFS)	STORAGE RATE I(Td)-Q (CFS)	REQUIRED STORAGE (I(Td)-Q)*Td/12 (ACRE.FT)
0.08	7.811	60.23	11.19	49.04	0.34
0.17	6.321	48.74	11.19	37.55	0.52
0.25	5.241	40.41	11.19	29.22	0.60
0.50	3.307	25.50	11.19	14.31	0.59
0.67	2.581	19.90	11.19	8.71	0.48
0.75	2.310	17.81	11.19	6.62	0.41
1.00	2.174	16.77	11.19	5.58	0.46
1.50	1.668	12.86	11.19	1.67	0.21
2.00	1.366	10.53	11.19	-0.66	-0.11
2.50	1.163	8.97	11.19	-2.22	-0.46
3.00	1.017	7.84	11.19	-3.35	-0.83
4.00	0.820	6.32	11.19	-4.87	-1.61
5.00	0.691	5.33	11.19	-5.86	-2.42
6.00	0.600	4.63	11.19	-6.56	-3.25
7.00	0.532	4.11	11.19	-7.08	-4.10
8.00	0.480	3.70	11.19	-7.49	-4.95
9.00	0.437	3.37	11.19	-7.82	-5.82
10.00	0.402	3.10	11.19	-8.09	-6.69

PEAK STORAGE (ACRE-FT)	0.60
PEAK STORAGE (CUBIC FT)	26,300

J:\11000s\11800-11899\11822\Civil 3D\Drainage\[11822_Form800_Final.xlsx]N Basin

BASIN DISCHARGE AND STORAGE VOLUME

Orifice: $Q = C_d A_0 \sqrt{2gh_0}$ LTAP 6.3.2



Pipe Dia.	0	(inch)
D (inch)	0.00	Orifice diameter
A_o (s.f.)	0.00	Area of orifice
g (f/s^2)	32.2	Acceleration due to gravity
H (ft)	0.00	Head at Inlet
h_o (ft)	0.00	Head at center of orifice
C_d	0.61	Discharge coefficient

Q= 0.00 CFS

[X] Not used

Pipe Flow:

$$Q = A_P \left(\frac{h_P}{\frac{K_e + K_0}{2g} + \frac{2.87 n^2 L}{D^{4/3}}} \right)^{1/2}$$ LTAP 6.3.5

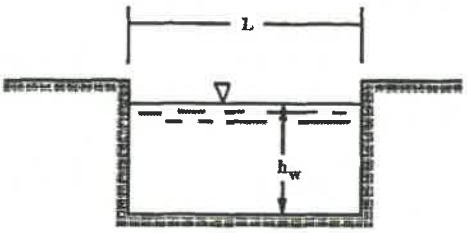
Pipe Dia.	18	(inch)
Ap (s.f.)	1.77	Area of Pipe
n	0.012	Manning roughness coef.
g (f/s^2)	32.2	Acceleration due to gravity
H (ft)	2.25	Head at invert
h_p (ft)	1.50	Head at center of pipe
L (ft)	36	Length of pipe
K_e	0.85	Entrance Loss
K_o	1.00	Outlet Loss

Q= 11.19 CFS @ 25 year water elevation

[ ] Not used

Rectangular Weir:

$$Q = \frac{2}{3} C_d \sqrt{2g} L h_w^{3/2}$$ LTAP 6.3.3



L (ft)	0	Length of the weir
g (f/s^2)	32.2	Acceleration due to gravity
h_w (ft)	0.00	Head above weir
C_d	0.61	Discharge coefficient

Q= 0.00 CFS

[X] Not used

Storage:

Stage	Surface Area (S.F.)	Cum. Storage Vol. (C.F.)	Notes
410.50	11,586		Pool
410.75	12,121	2,963	
411.75	14,325	13,223	
412.75	16,629	15,477	25 Year Water Elev.
413.25			EO Elevation

Available Storage:	31,663	0.73	AC-FT
Required Storage:	26,300	0.60	AC-FT
	83%	Basin Capacity	

VANDERBURGH COUNTY DRAINAGE BOARD
FORM 800 (South Basin)

PROJECT: **Eleanor's Place** 11822
DESIGNER: **JEM**

DETENTION FACILITY DESIGN RETURN PERIOD: 100 YRS
RELEASE RATE RETURN PERIOD: 10 YRS

UNDEVELOPED WATERSHED AREA (Au)	12.93		ACRES
TIME OF CONCENTRATION (UNDEVELOPED WATERSHED)	22.80		MINUTES
RAINFALL INTENSITY (Iu):	3.46		INCHES/HR
UNDEVELOPED RUNOFF COEFFICIENT (Cu):	0.35		
UNDEVELOPED RUNOFF RATE (Q = Cu*Iu*A):		15.65	CFS
DEVELOPED WATERSHED AREA (Ad)	13.07		ACRES
DEVELOPED RUNOFF COEFFICIENT (Cd):	0.59		
UNDETAINED DEVELOPED RUNOFF RATE		0.00	CFS
ALLOWABLE PIPE RELEASE RATE		15.65	CFS
ACTUAL DISCHARGE PIPE OUTFLOW		11.19	CFS

STORM DURATION Td	RAINFALL INTENSITY Id	INFLOW RATE I(Td)	OUTFLOW RATE Q	STORAGE RATE	REQUIRED STORAGE
		(Cd*Id*Ad)	(actual)	I(Td)-Q	(I(Td)-Q)*Td/12
(HRS)	(INCH/HR)	(CFS)	(CFS)	(CFS)	(ACRE.FT)
0.25	6.677	51.49	11.19	40.30	0.83

J:\11000s\11800-11899\11822\Civil 3D\Drainage\[11822_Form800_Final.xlsx]N Basin

VANDERBURGH COUNTY DRAINAGE BOARD
FORM 800 (Southeast Basin)

PROJECT: **Eleanor's Place** 11822
DESIGNER: **JEM**

DETENTION FACILITY DESIGN RETURN PERIOD: 25 YRS
RELEASE RATE RETURN PERIOD: 10 YRS

UNDEVELOPED WATERSHED AREA (Au)	4.15		ACRES
TIME OF CONCENTRATION (UNDEVELOPED WATERSHED)	22.72		MINUTES
RAINFALL INTENSITY (Iu):	3.47		INCHES/HR
UNDEVELOPED RUNOFF COEFFICIENT (Cu):	0.35		
UNDEVELOPED RUNOFF RATE (Q = Cu*Iu*A):		5.03	CFS
DEVELOPED WATERSHED AREA (Ad)	5.61		ACRES
DEVELOPED RUNOFF COEFFICIENT (Cd):	0.49		
UNDETAINED DEVELOPED RUNOFF RATE		2.58	CFS
ALLOWABLE OFF SITE PASS THROUGH RATE		3.01	
ALLOWABLE PIPE RELEASE RATE		5.46	CFS
ACTUAL DISCHARGE PIPE OUTFLOW		1.63	CFS

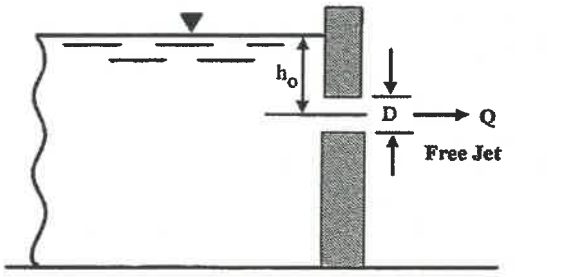
STORM DURATION Td (HRS)	RAINFALL INTENSITY Id (INCH/HR)	INFLOW RATE I(Td) (Cd*Id*Ad) (CFS)	OUTFLOW RATE Q (actual) (CFS)	STORAGE RATE I(Td)-Q (CFS)	REQUIRED STORAGE (I(Td)-Q)*Td/12 (ACRE.FT)
0.08	7.811	21.47	1.63	19.84	0.14
0.17	6.321	17.38	1.63	15.75	0.22
0.25	5.241	14.41	1.63	12.78	0.26
0.50	3.307	9.09	1.63	7.46	0.31
0.67	2.581	7.10	1.63	5.47	0.30
0.75	2.310	6.35	1.63	4.72	0.29
1.00	2.174	5.98	1.63	4.35	0.36
1.50	1.668	4.58	1.63	2.95	0.37
2.00	1.366	3.75	1.63	2.12	0.35
2.50	1.163	3.20	1.63	1.57	0.32
3.00	1.017	2.80	1.63	1.17	0.29
4.00	0.820	2.25	1.63	0.62	0.21
5.00	0.691	1.90	1.63	0.27	0.11
6.00	0.600	1.65	1.63	0.02	0.01
7.00	0.532	1.46	1.63	-0.17	-0.10
8.00	0.480	1.32	1.63	-0.31	-0.21
9.00	0.437	1.20	1.63	-0.43	-0.32
10.00	0.402	1.11	1.63	-0.52	-0.43

PEAK STORAGE (ACRE-FT)	0.37
PEAK STORAGE (CUBIC FT)	15,953

J:\11000s\11800-11899\11822\Civil 3D\Drainage\[11822_Form800_Final.xlsx]N Basin

BASIN DISCHARGE AND STORAGE VOLUME

Orifice: $Q = C_d A_0 \sqrt{2gh_0}$ LTAP 6.3.2



Pipe Dia.	12	(inch)
D (inch)	7.00	Orifice diameter
A_o (s.f.)	0.27	Area of orifice
g (f/s^2)	32.2	Acceleration due to gravity
H (ft)	1.85	Head at Inlet
h_o (ft)	1.56	Head at center of orifice
C_d	0.61	Discharge coefficient

Q= 1.63 CFS

[ ] Not used

Pipe Flow:

$$Q = A_P \left(\frac{h_P}{\frac{K_e + K_0}{2g} + \frac{2.87 n^2 L}{D^{4/3}}} \right)^{1/2}$$ LTAP 6.3.5

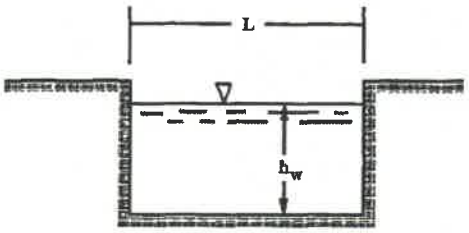
Pipe Dia.	0	(inch)
Ap (s.f.)	0.00	Area of Pipe
n	0.012	Manning roughness coef.
g (f/s^2)	32.2	Acceleration due to gravity
H (ft)	0.00	Head at invert
h_p (ft)	0.00	Head at center of pipe
L (ft)	0	Length of pipe
K_e	0.85	Entrance Loss
K_o	1.00	Outlet Loss

Q= #DIV/0! CFS @ 25 year water elevation

[X] Not used

Rectangular Weir:

$$Q = \frac{2}{3} C_d \sqrt{2g} L h_w^{3/2}$$ LTAP 6.3.3



L (ft)	0	Length of the weir
g (f/s^2)	32.2	Acceleration due to gravity
h_w (ft)	0.00	Head above weir
C_d	0.61	Discharge coefficient

Q= 0.00 CFS

[X] Not used

Storage:

Stage	Surface Area (S.F.)	Cum. Storage Vol. (C.F.)	Notes
412.65	8,405		Pool
413.50	9,629	7,664	
414.50	11,162	10,396	25 Year Water Elev.
415.00			EO Elevation

Available Storage:	18,060	0.41	AC-FT
Required Storage:	15,953	0.37	AC-FT
	88%	Basin Capacity	

J:\11000s\11800-11899\11822\Civil 3D\Drainage\[11822_Form800_Final.xlsx]N Basin

VANDERBURGH COUNTY DRAINAGE BOARD
FORM 800 (Southeast Basin)

PROJECT: **Eleanor's Place** 11822
DESIGNER: **JEM**

DETENTION FACILITY DESIGN RETURN PERIOD: 100 YRS
RELEASE RATE RETURN PERIOD: 10 YRS

UNDEVELOPED WATERSHED AREA (Au)	4.15		ACRES
TIME OF CONCENTRATION (UNDEVELOPED WATERSHED)	22.72		MINUTES
RAINFALL INTENSITY (Iu):	3.47		INCHES/HR
UNDEVELOPED RUNOFF COEFFICIENT (Cu):	0.35		
UNDEVELOPED RUNOFF RATE (Q = Cu*Iu*A):		5.03	CFS
DEVELOPED WATERSHED AREA (Ad)	5.61		ACRES
DEVELOPED RUNOFF COEFFICIENT (Cd):	0.49		
UNDETAINED DEVELOPED RUNOFF RATE		2.58	CFS
ALLOWABLE OFF SITE PASS THROUGH RATE		3.01	
ALLOWABLE PIPE RELEASE RATE		5.46	CFS
ACTUAL DISCHARGE PIPE OUTFLOW		1.63	CFS

STORM DURATION Td (HRS)	RAINFALL INTENSITY Id (INCH/HR)	INFLOW RATE I(Td) (Cd*Id*Ad) (CFS)	OUTFLOW RATE Q (actual) (CFS)	STORAGE RATE I(Td)-Q (CFS)	REQUIRED STORAGE (I(Td)-Q)*Td/12 (ACRE.FT)
0.25	6.677	18.35	1.63	16.72	0.35

J:\11000s\11800-11899\11822\Civil 3D\Drainage\[11822_Form800_Final.xlsx]N Basin

Weir Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Apr 11 2022

North Basin Emergency Overflow

Trapezoidal Weir

Crest	= Sharp
Bottom Length (ft)	= 45.00
Total Depth (ft)	= 1.25
Side Slope (z:1)	= 4.00

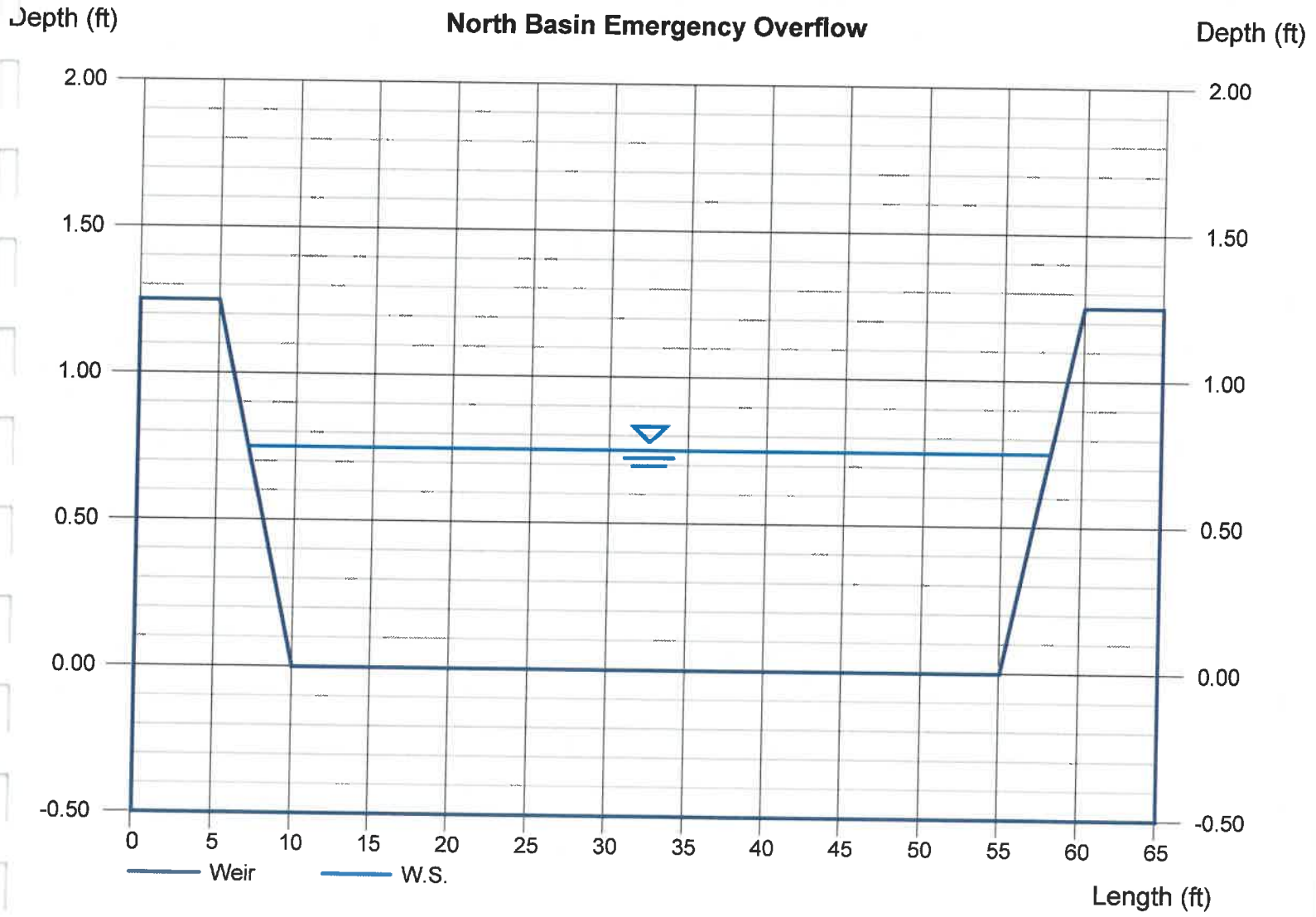
Calculations

Weir Coeff. Cw	= 2.60
Compute by:	Q vs Depth
No. Increments	= 5

Highlighted

Depth (ft)	= 0.75
Q (cfs)	= 80.05
Area (sqft)	= 36.00
Velocity (ft/s)	= 2.22
Top Width (ft)	= 51.00

Q(100) = 73.45 CFS



Weir Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Apr 11 2022

Northeast Basin Emergency Overflow

Trapezoidal Weir

Crest	= Sharp
Bottom Length (ft)	= 15.00
Total Depth (ft)	= 1.00
Side Slope (z:1)	= 4.00

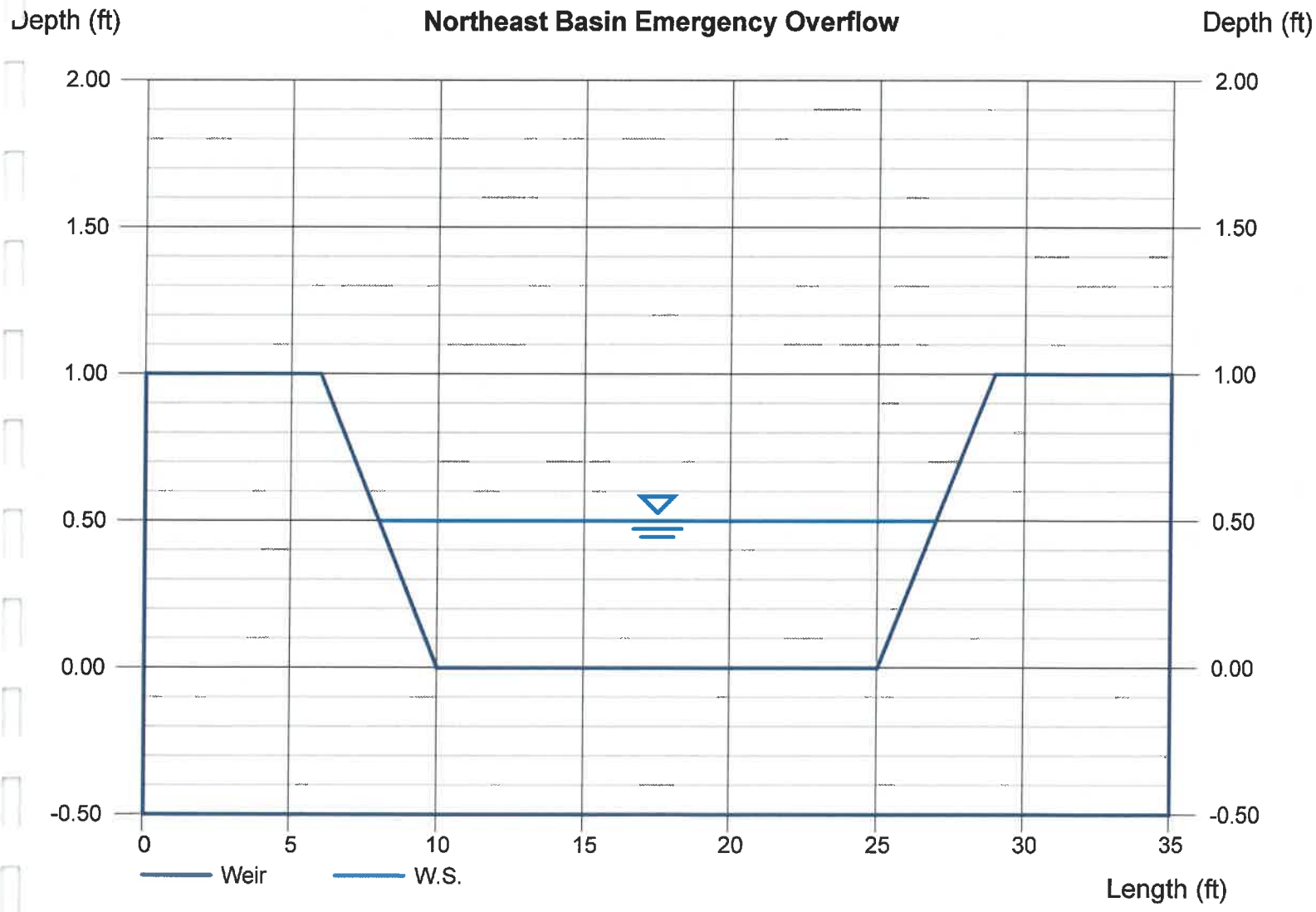
Calculations

Weir Coeff. Cw	= 2.60
Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 0.50
Q (cfs)	= 15.26
Area (sqft)	= 8.50
Velocity (ft/s)	= 1.80
Top Width (ft)	= 19.00

Q(100) = 14.01 CFS



Weir Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Apr 11 2022

South Basin Emergency Overflow

Trapezoidal Weir

Crest	= Sharp
Bottom Length (ft)	= 30.00
Total Depth (ft)	= 1.25
Side Slope (z:1)	= 4.00

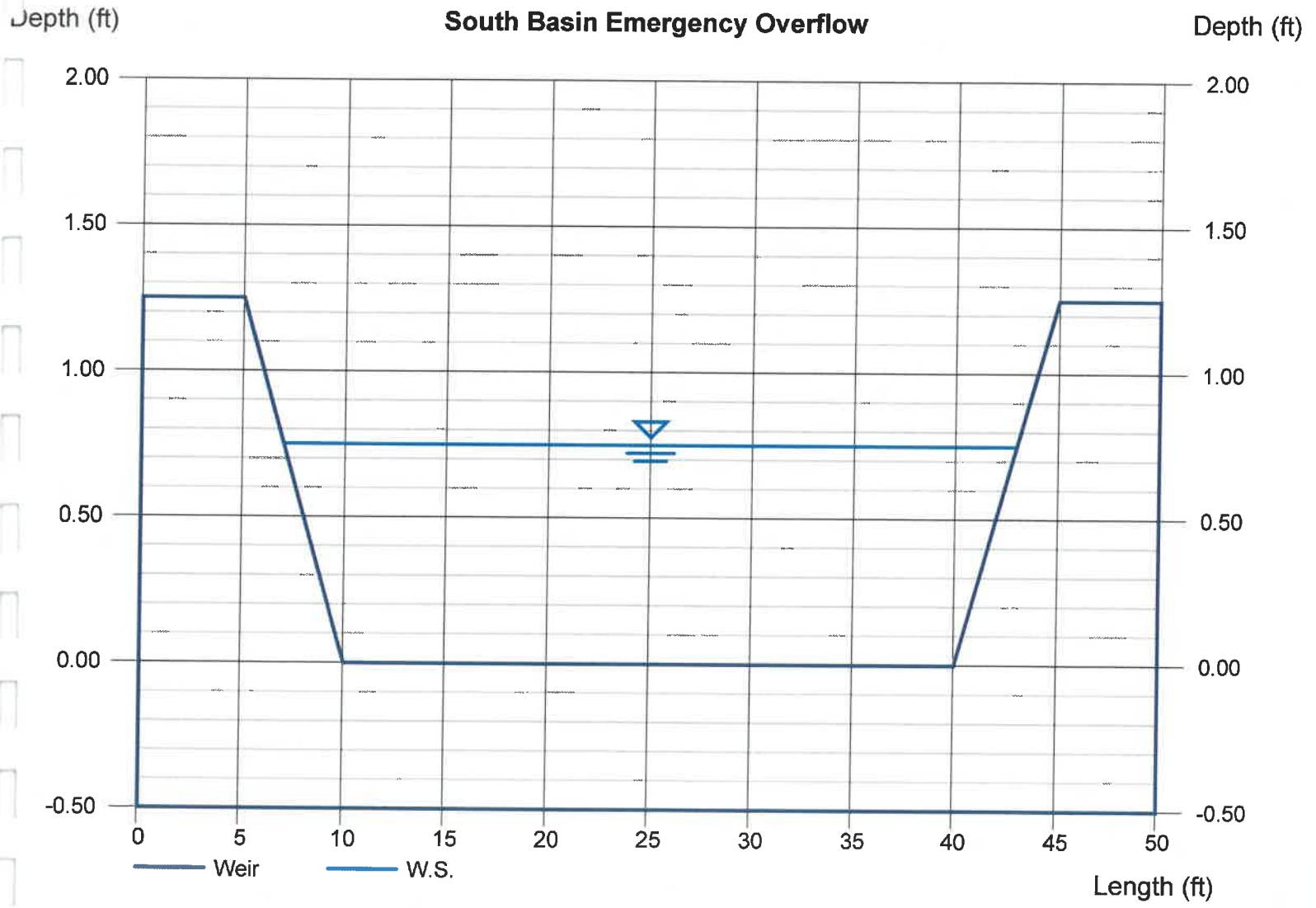
Calculations

Weir Coeff. Cw	= 2.60
Compute by:	Q vs Depth
No. Increments	= 5

Highlighted

Depth (ft)	= 0.75
Q (cfs)	= 54.72
Area (sqft)	= 24.75
Velocity (ft/s)	= 2.21
Top Width (ft)	= 36.00

Q(100) = 51.49 CFS



Weir Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Apr 11 2022

Southeast Basin Emergency Overflow

Trapezoidal Weir

Crest	= Sharp
Bottom Length (ft)	= 20.00
Total Depth (ft)	= 1.00
Side Slope (z:1)	= 4.00

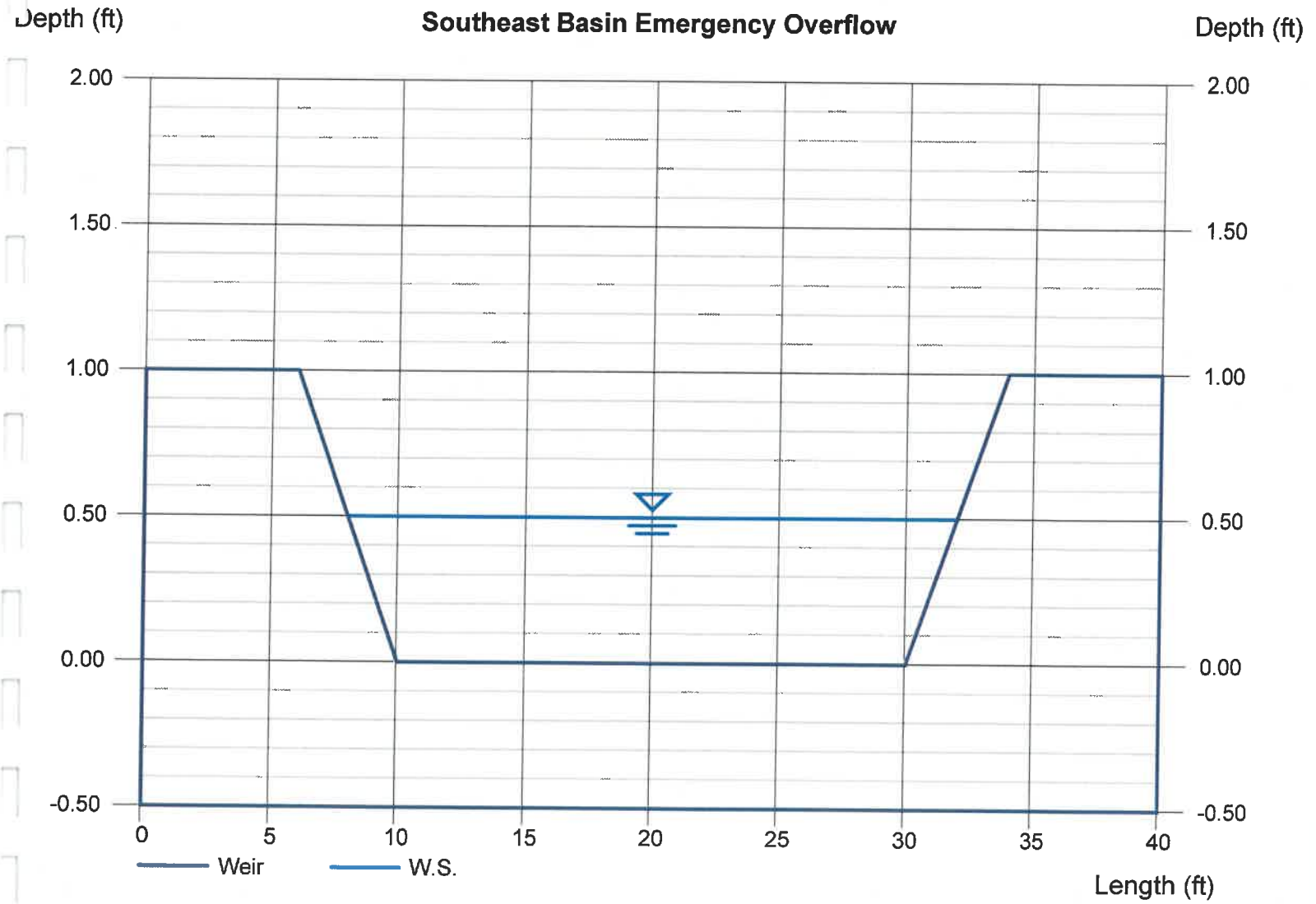
Calculations

Weir Coeff. Cw	= 2.60
Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 0.50
Q (cfs)	= 19.86
Area (sqft)	= 11.00
Velocity (ft/s)	= 1.81
Top Width (ft)	= 24.00

Q(100) = 18.35 CFS



STORM SEWER DESIGN SHEET

Rational Method

MORLEY

ARCHITECTS | ENGINEERS | SURVEYORS

Project	Eleanors Place			County:	Vanderburgh												
Project #	11822			Date:	4/26/2022												
Engineer	JEM			Design Period:	25	Years				Mannings n		0.012	HDPE N-12				
Pipe # or Swale	Length (ft)	Sub-Basin no.	Cj	Aj (ac.)	CjAj	Sum CjAj	Tj (min) (5.0)	Tcum (min) (5.0)	I(25) (in/hr)	Q(25) (cfs)	Pipe Diameter (in) Or Swale Depth (Ft)	Pipe Slope (ft/ft)	Pipe or Swale Cap. (cfs)	Velocity (ft/sec) at Capacity	Travel Time (min)	% Of Capacity	
211	22	4	0.56	0.55	0.31	0.31	6.95	6.95	7.17	2.21	12	1.00%	3.86	4.92	0.07	0.57	
209	87	2A	0.57	0.47	0.27	0.58	7.39	7.39	7.03	4.09	12	1.50%	4.73	6.02	0.24	0.87	
207	178	-	-	-	-	0.58	-	7.63	6.96	4.05	12	2.47%	6.06	7.72	0.38	0.67	
205	27	2B	0.57	0.12	0.07	0.65	5.00	8.02	6.85	4.45	12	2.00%	5.46	6.95	0.06	0.82	
203	153	5	0.65	0.51	0.33	0.98	7.86	8.08	6.83	6.68	15	2.85%	11.81	9.63	0.26	0.57	
221	100	10B	0.57	1.05	0.60	0.60	10.31	10.31	6.24	3.74	12	7.49%	10.56	13.45	0.12	0.35	
201	102	10A	0.57	0.39	0.22	1.80	11.80	11.80	5.89	10.60	24	0.98%	24.25	7.72	0.22	0.44	
-	-	OS-B	0.51	0.85	0.43	0.43	18.90	18.90	4.59	1.99	-	-	-	-	-	-	
-	-	OS-C	0.51	0.88	0.45	0.89	18.54	18.54	4.64	4.11	-	-	-	-	-	-	
319	114	7	0.52	1.48	0.78	2.10	11.55	37.45	2.74	5.75	18	5.27%	26.11	14.79	0.13	0.22	
317	51	8	0.61	1.45	0.89	2.98	11.08	37.57	2.73	8.15	24	0.97%	24.13	7.68	0.11	0.34	
361	42	9	0.60	0.42	0.25	0.25	8.73	8.73	6.65	1.68	12	1.18%	4.19	5.34	0.13	0.40	
315	118	15	0.60	0.95	0.57	3.81	10.92	37.69	2.72	10.37	24	2.81%	41.07	13.08	0.15	0.25	
351	24	16	0.52	1.43	0.74	0.74	10.67	10.67	6.16	4.56	12	8.84%	11.47	14.61	0.03	0.40	
313	115	-	-	-	-	4.55	-	37.84	2.72	12.35	24	1.56%	30.60	9.74	0.20	0.40	
311	57	17	0.61	0.97	0.59	5.14	10.63	38.03	2.70	13.90	30	0.70%	37.16	7.57	0.13	0.37	
343	38	11	0.59	0.64	0.38	0.38	8.19	8.19	6.80	2.58	12	1.31%	4.42	5.63	0.11	0.58	
341	45	12A	0.56	0.41	0.23	0.60	6.66	8.30	6.77	4.10	15	1.11%	7.37	6.01	0.12	0.56	
309	78	18	0.61	0.78	0.48	6.23	10.63	38.16	2.69	16.78	30	0.71%	37.43	7.63	0.17	0.45	
333	31	20	0.52	1.43	0.74	0.74	10.67	10.67	6.16	4.56	12	8.94%	11.54	14.70	0.04	0.40	
331	45	21	0.60	0.69	0.41	1.15	11.08	11.08	6.06	6.99	15	2.22%	10.42	8.50	0.09	0.67	
307	27	19	0.58	0.10	0.06	7.44	5.00	38.33	2.68	19.96	30	0.93%	42.84	8.73	0.05	0.47	
303	132	12B	0.56	0.27	0.15	8.33	5.00	38.38	2.68	22.33	30	2.66%	72.45	14.77	0.15	0.31	
301	50	13	0.61	1.72	1.05	9.38	10.06	38.53	2.67	25.06	30	2.64%	72.17	14.71	0.06	0.35	
403	62	22B	0.58	0.83	0.48	0.48	8.96	8.96	6.59	3.14	12	0.97%	3.80	4.84	0.21	0.83	
401	148	22A	0.58	0.55	0.32	0.79	12.78	12.78	5.68	4.51	12	3.38%	7.09	9.04	0.27	0.64	

STORM SEWER DESIGN SHEET
Rational Method

MORLEY
ARCHITECTS | ENGINEERS | SURVEYORS

Project	Eleanors Place			County:	Vanderburgh												
Project #	11822			Date:	4/26/2022												
Engineer	JEM			Design Period:	25	Years					Mannings n		0.012	HDPE N-12			

Pipe # or Swale	Length (ft)	Sub-Basin no.	Cj	Aj (ac.)	CjAj	Sum CjAj	Tj (min) (5.0)	Tcum (min) (5.0)	I(25) (in/hr)	Q(25) (cfs)	Pipe Diameter (in) Or Swale Depth (Ft)	Pipe Slope (ft/ft)	Pipe or Swale Cap. (cfs)	Velocity (ft/sec) at Capacity	Travel Time (min)	% Of Capacity
-	-	OS-E	0.32	0.99	0.31	0.31	14.27	14.27	5.38	1.67	-	-	-	-	-	-
507	125	39	0.50	0.96	0.48	0.79	10.94	14.27	5.38	4.25	18	4.32%	23.64	13.39	0.16	0.18
505	35	38	0.58	0.84	0.49	1.28	5.00	14.43	5.35	6.84	24	0.20%	10.96	3.49	0.17	0.62
503	127	25	0.59	0.82	0.48	1.76	5.00	14.59	5.32	9.37	24	0.20%	10.96	3.49	0.61	0.86
501	46	-	-	-	-	1.76	-	15.20	5.20	9.17	24	0.20%	10.96	3.49	0.22	0.84
-	-	OS-D	0.38	2.02	0.77	0.77	20.37	20.37	4.38	3.39	-	-	-	-	-	-
907	115	40	0.51	1.68	0.85	1.62	9.79	20.37	4.38	7.11	18	2.42%	17.70	10.02	0.19	0.40
905	27	41	0.59	0.73	0.43	2.05	7.94	20.56	4.35	8.93	24	0.50%	17.32	5.52	0.08	0.52
903	75	47	0.61	0.57	0.35	2.40	8.26	20.64	4.34	10.41	24	0.75%	21.22	6.76	0.18	0.49
901	37	-	-	-	-	2.40	-	20.83	4.31	10.35	24	0.95%	23.88	7.60	0.08	0.43
807	57	37	0.61	1.14	0.70	0.70	10.88	10.88	6.11	4.24	15	0.74%	6.02	4.91	0.19	0.71
805	117	36	0.63	1.04	0.65	1.34	11.82	11.82	5.89	7.92	18	0.71%	9.59	5.43	0.36	0.83
811	31	34	0.52	1.67	0.86	0.86	11.06	12.18	5.81	5.03	12	6.38%	9.75	12.41	0.04	0.52
803	27	35	0.58	0.10	0.06	2.27	5.00	12.22	5.80	13.17	24	1.00%	24.50	7.80	0.06	0.54
801	31	46	0.61	0.48	0.29	2.56	8.67	12.28	5.79	14.83	24	3.11%	43.20	13.76	0.04	0.34
709	44	29	0.61	0.62	0.38	0.38	9.81	9.81	6.37	2.43	12	0.92%	3.70	4.71	0.16	0.66
707	117	30	0.62	0.75	0.47	0.85	10.51	10.51	6.20	5.25	15	1.96%	9.79	7.98	0.24	0.54
731	24	31	0.52	1.67	0.86	0.86	11.06	11.06	6.06	5.25	15	1.23%	7.76	6.33	0.06	0.68
705	115	-	-	-	-	1.71	-	11.12	6.05	10.36	18	1.90%	15.68	8.88	0.22	0.66
721.	44	33	0.61	1.01	0.61	0.61	11.21	11.21	6.03	3.70	12	3.72%	7.44	9.48	0.08	0.50
703	44	32	0.61	1.12	0.68	3.00	11.21	11.34	6.00	18.01	30	0.30%	24.33	4.96	0.15	0.74
701	33	44	0.73	0.40	0.29	3.30	8.29	11.49	5.97	19.66	30	0.30%	24.33	4.96	0.11	0.81
605	44	27	0.59	0.13	0.08	0.08	5.00	5.00	7.81	0.59	12	0.50%	2.73	3.48	0.21	0.22
603	42	26	0.59	0.13	0.08	0.15	5.00	5.21	7.74	1.17	12	0.50%	2.73	3.48	0.20	0.43
601	126	-	-	-	-	0.15	-	5.41	7.67	1.16	12	0.71%	3.25	4.14	0.51	0.36

STORM SEWER DESIGN SHEET

Rational Method

MORLEY

ARCHITECTS | ENGINEERS | SURVEYORS

Project	**Eleanors Place**	County:	**Vanderburgh**		
Project #	**11822**	Date:	**4/26/2022**		
Engineer	**JEM**	Design Period:	**25**	Years	Mannings n **0.012** HDPE N-12

Pipe # or Swale	Length (ft)	Sub-Basin no.	Cj	Aj (ac.)	CjAj	Sum CjAj	Tj (min) (5.0)	Tcum (min) (5.0)	I(25) (in/hr)	Q(25) (cfs)	Pipe Diameter (in) Or Swale Depth (Ft)	Pipe Slope (ft/ft)	Pipe or Swale Cap. (cfs)	Velocity (ft/sec) at Capacity	Travel Time (min)	% Of Capacity
1005	6	**28**	0.52	0.92	0.48	0.48	11.17	11.17	6.04	2.89	12	0.80%	3.45	4.40	0.02	0.84
1003	27	**42**	0.59	0.28	0.16	0.64	10.83	11.19	6.03	3.87	15	0.80%	6.26	5.10	0.09	0.62
1001	6	**43**	0.58	0.10	0.06	0.70	5.00	11.28	6.01	4.22	15	0.80%	6.26	5.10	0.02	0.67

LTAP Chapter 5.3 Flow in Inlets

Equation 5.3.1 LTAP (Continuous Grade)

$Q = K d^{5/3}$ Where Q = Inlet Capacity
K = Capacity Coefficient
d = depth of flow

$K = 16$ for $S_L = 1\ \%$
$S_T = 2.6\ \%$

$d = 0.34'$ @ 10' upstream of inlet
0.25' per Vanderburgh County Code
0.02' from gutter grade to F/G
0.07' for 10' @ 0.7%

$Q = 16(0.34)^{5/3}$

$Q = 2.65$ CFS

Equation 5.3.2 LTAP (Single Inlet Sump Condition)

$Q = 3.0(P)(d_w)^{1.5}$ Where Q = Inlet Capacity
P = Perimeter of grate
d_w = depth of water

$P = 17\ 5/8" + 17\ 5/8" + 35\ 1/2"$ → EJIW 7030
$= 70.75"$
$= 5.90'$

$d = 0.29'$ @ 10' upstream of inlet

0.25' per Vanderburgh County Code
0.02' from gutter grade to F/G
0.02' for 10' upstream of inlet per profile

$Q = 3.0(5.90)(0.29')^{1.5}$

$Q = 2.76$ CFS

Equation 5.3.2 LTAP (Double Inlet Sump Condition)

$Q = 3.0(P)(d_w)^{1.5}$ Where Q = inlet capacity
P = Perimeter of grate
d_w = depth of water

$P = 17\frac{5}{8}" + 17\frac{5}{8}" + 35\frac{1}{2}" + 35\frac{1}{2}"$
$= 106.25"$
$= 8.85'$

$d = 0.29'$ @ 10' upstream of inlet

0.25' per Vanderburgh County Code
0.02' from gutter grade to F/G
0.02' for 10' upstream of inlet per profile

$Q = 3.0(8.85)(0.29)^{1.5}$

$Q = 4.15$ CFS

Equation 5.3.8 LTAP (curb opening sump condition)
- conservative (not accounting for inlet depression)

$Q = C_w L d^{1.5}$

Where C_w = Weir coefficient
L = Length of opening
d = depth of flow

$C_w = 2.3$ (LTAP)

$L = 35.5" \rightarrow$ EJIW 7030
$= 2.96'$

$d = 0.29'$ @ 10' upstream of inlet
0.25' per Vanderburgh County Code
0.02' from gutter grade to F/G
0.02' for 10' upstream of inlet per profile

$Q = 2.3(2.96)(0.29)^{1.5}$

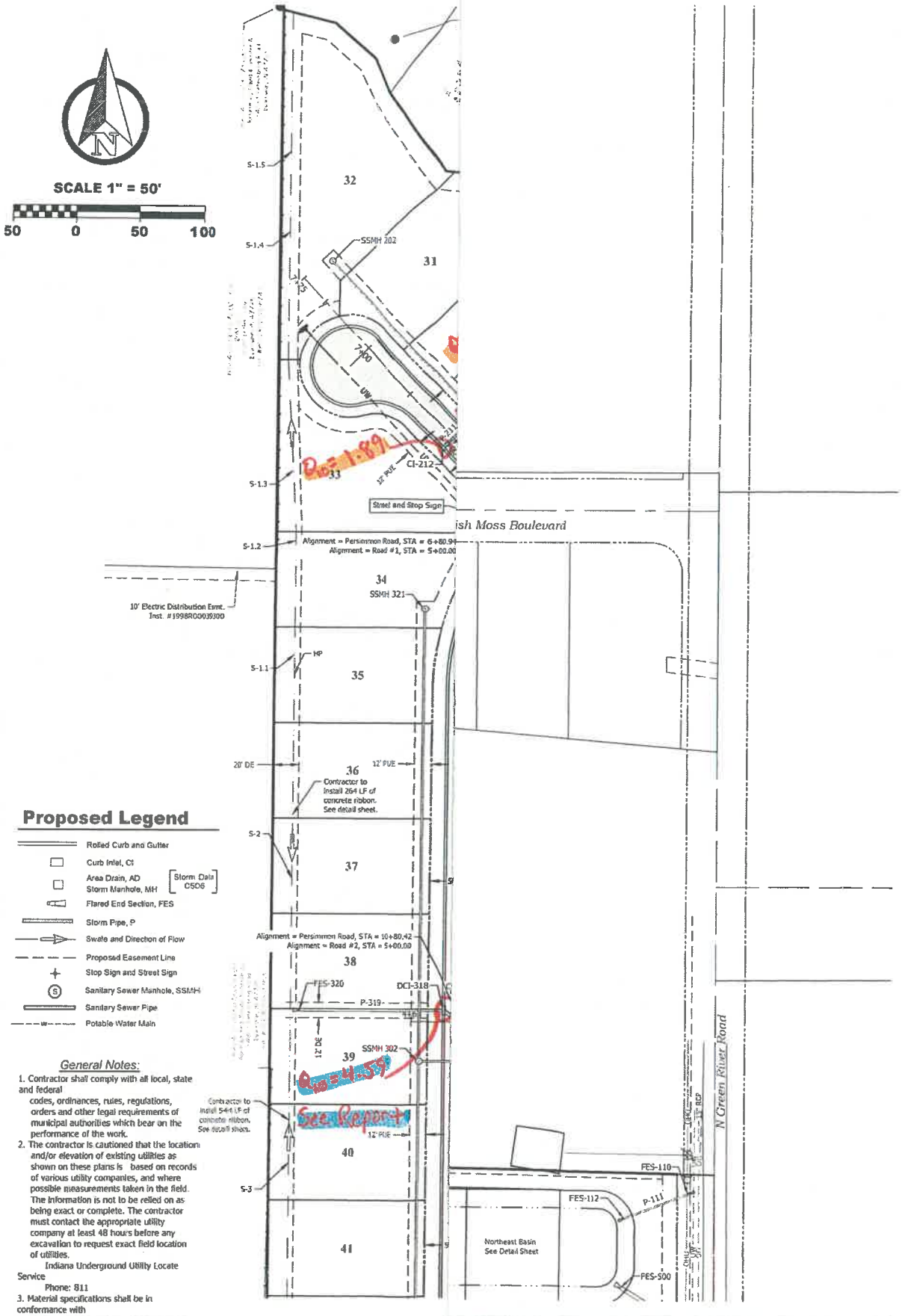
$Q = 1.06$ CFS

Use same equation for double inlet in sump condition

$L = 35.5" + 35.5" = 71" = 5.92'$

$Q = 2.3(5.92)(0.29)^{1.5}$

$Q = 2.13$ CFS



Proposed Legend

- Rolled Curb and Gutter
- Curb Inlet, CI
- Area Drain, AD / Storm Manhole, MH [Storm Data CSD6]
- Flared End Section, FES
- Storm Pipe, P
- Swale and Direction of Flow
- Proposed Easement Line
- Stop Sign and Street Sign
- Sanitary Sewer Manhole, SSMH
- Sanitary Sewer Pipe
- Potable Water Main

General Notes:

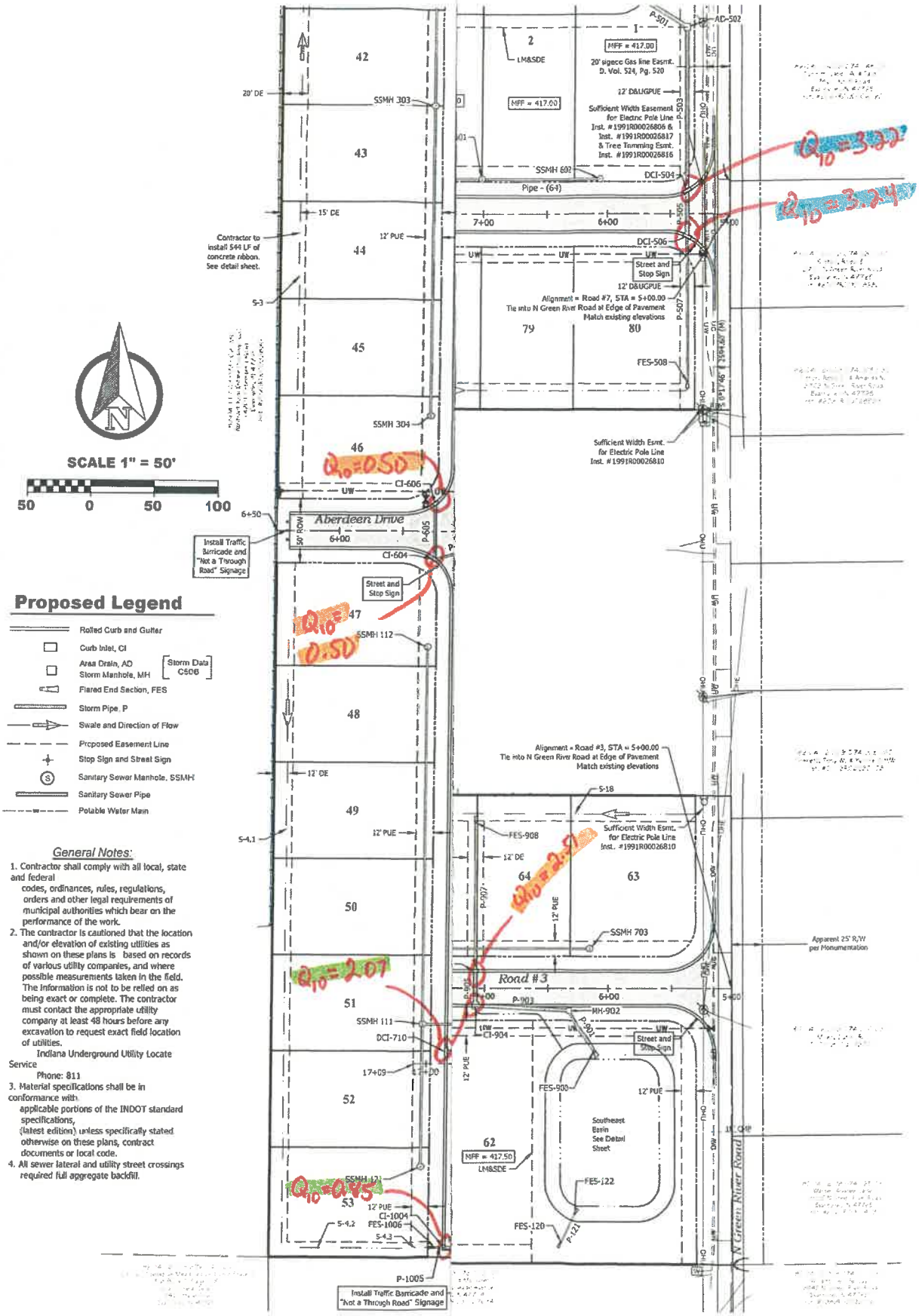
1. Contractor shall comply with all local, state and federal codes, ordinances, rules, regulations, orders and other legal requirements of municipal authorities which bear on the performance of the work.
2. The contractor is cautioned that the location and/or elevation of existing utilities as shown on these plans is based on records of various utility companies, and where possible measurements taken in the field. The information is not to be relied on as being exact or complete. The contractor must contact the appropriate utility company at least 48 hours before any excavation to request exact field location of utilities.
   Indiana Underground Utility Locate Service
   Phone: 811
3. Material specifications shall be in conformance with applicable portions of the INDOT standard specifications, (latest edition) unless specifically stated otherwise on these plans, contract documents or local code.
4. All sewer lateral and utility street crossings required full aggregate backfill.

Eleanor's Place

nfrastructure Plan - 1

Vanderburgh County, IN

Scale: 1" = 50'	
Designed By: JEM	Job Number: 11822.4.001-B
Drawn By: CRS	Date: 4.20.2022
Filename: 11822 Civil Base	
Sheet Number: **C100**	



Proposed Legend

- Rolled Curb and Gutter
- Curb Inlet, CI
- Area Drain, AD / Storm Manhole, MH [Storm Data CSV6]
- Flared End Section, FES
- Storm Pipe, P
- Swale and Direction of Flow
- Proposed Easement Line
- Stop Sign and Street Sign
- Sanitary Sewer Manhole, SSMH
- Sanitary Sewer Pipe
- Potable Water Main

General Notes:

1. Contractor shall comply with all local, state and federal codes, ordinances, rules, regulations, orders and other legal requirements of municipal authorities which bear on the performance of the work.
2. The contractor is cautioned that the location and/or elevation of existing utilities as shown on these plans is based on records of various utility companies, and where possible measurements taken in the field. The information is not to be relied on as being exact or complete. The contractor must contact the appropriate utility company at least 48 hours before any excavation to request exact field location of utilities.
   Indiana Underground Utility Locate Service
   Phone: 811
3. Material specifications shall be in conformance with applicable portions of the INDOT standard specifications, (latest edition) unless specifically stated otherwise on these plans, contract documents or local code.
4. All sewer lateral and utility street crossings required full aggregate backfill.

Eleanor's Place	Scale: 1" = 50'
Infrastructure Plan - 2 Vanderburgh County, IN	Designed By: JEM Job Number: 11822 4.001-B Drawn By: CRS Date: 4.20.2022 Filename: 11822 Civil Base Sheet Number: **C101**

Swale Capacity Table

Side slope = 3
Manning's Coefficient = 0.035

Swale	Subbasin no.	Q(25) cfs	Channel Capacity (cfs)	Full Depth Velocity (ft/s)	% of Capacity	Slope (ft/ft)	Slope (%)	Length (ft)	Channel Depth (ft)	Bottom Width (ft)	Wetted Perimeter (ft)	Area (ft^2)	Hydraulic Radius (ft)	Hydraulic Depth (ft)	Travel Time (min)	US Elev.	DS Elev.
1.5	(OS-A)+3	9.15	24.44	4.89	0.37	0.0260	2.60	127.24	1.00	2.00	8.32	5.00	0.60	0.63	0.43	414.98	411.67
1.4	(OS-A)+3	9.15	13.53	2.71	0.68	0.0080	0.80	127.90	1.00	2.00	8.32	5.00	0.60	0.63	0.79	416.00	414.98
1.3	(OS-A)+3	9.15	22.57	4.51	0.41	0.0222	2.22	135.24	1.00	2.00	8.32	5.00	0.60	0.63	0.50	419.00	416.00
1.2	(OS-A)+3	9.15	33.75	6.75	0.27	0.0496	4.96	75.00	1.00	2.00	8.32	5.00	0.60	0.63	0.19	422.72	419.00
1.1	(OS-A)+3	9.15	14.85	2.97	0.62	0.0096	0.96	37.50	1.00	2.00	8.32	5.00	0.60	0.63	0.21	423.08	422.72
2	(OS-B)+7A	3.43	10.97	2.19	0.31	0.0052	0.52	263.50	1.00	2.00	8.32	5.00	0.60	0.63	2.00	423.08	421.70
3	(OS-C)+7B	5.05	8.27	1.65	0.61	0.0030	0.30	544.00	1.00	2.00	8.32	5.00	0.60	0.63	5.48	423.32	421.70
4.3	28	2.89	47.56	9.51	0.06	0.0985	9.85	24.87	1.00	2.00	8.32	5.00	0.60	0.63	0.04	417.11	414.66
4.2	28	2.89	13.52	2.70	0.21	0.0080	0.80	86.63	1.00	2.00	8.32	5.00	0.60	0.63	0.53	417.80	417.11
4.1	28	2.89	16.61	3.32	0.17	0.0120	1.20	474.23	1.00	2.00	8.32	5.00	0.60	0.63	2.38	423.50	417.80
5	10B	3.74	13.57	2.71	0.28	0.0080	0.80	284.50	1.00	2.00	8.32	5.00	0.60	0.63	1.75	412.28	410.00
6.2	10A	1.31	73.24	14.65	0.02	0.2336	23.36	22.73	1.00	2.00	8.32	5.00	0.60	0.63	0.03	411.81	406.50
6.1	10A	1.31	21.41	4.28	0.06	0.0200	2.00	72.62	1.00	2.00	8.32	5.00	0.60	0.63	0.28	413.26	411.81
7.2	16	4.56	18.72	3.74	0.24	0.0153	1.53	378.75	1.00	2.00	8.32	5.00	0.60	0.63	1.69	419.28	413.50
7.1	16	4.56	17.69	3.54	0.26	0.0136	1.36	126.25	1.00	2.00	8.32	5.00	0.60	0.63	0.59	421.00	419.28
8.2	31	5.25	18.00	3.60	0.29	0.0141	1.41	214.75	1.00	2.00	8.32	5.00	0.60	0.63	0.99	418.53	415.50
8.1	31	5.25	16.23	3.25	0.32	0.0115	1.15	215.25	1.00	2.00	8.32	5.00	0.60	0.63	1.11	421.00	418.53
9	45	6.66	13.53	2.71	0.49	0.0080	0.80	189.31	1.00	2.00	8.32	5.00	0.60	0.63	1.17	414.26	412.75
10.2	20	4.56	18.72	3.74	0.24	0.0153	1.53	378.75	1.00	2.00	8.32	5.00	0.60	0.63	1.69	419.28	413.50
10.1	20	4.56	17.69	3.54	0.26	0.0136	1.36	126.25	1.00	2.00	8.32	5.00	0.60	0.63	0.59	421.00	419.28
11.2	34	5.25	18.00	3.60	0.29	0.0141	1.41	214.75	1.00	2.00	8.32	5.00	0.60	0.63	0.99	418.53	415.50
11.1	34	5.25	16.23	3.25	0.32	0.0115	1.15	215.25	1.00	2.00	8.32	5.00	0.60	0.63	1.11	421.00	418.53
12	14	1.41	13.55	2.71	0.10	0.0080	0.80	112.62	1.00	2.00	8.32	5.00	0.60	0.63	0.69	406.40	405.50
13	23	3.76	13.55	2.71	0.28	0.0080	0.80	65.00	1.00	2.00	8.32	5.00	0.60	0.63	0.40	417.67	417.15
14.2	23	3.76	13.56	2.71	0.28	0.0080	0.80	89.86	1.00	2.00	8.32	5.00	0.60	0.63	0.55	417.12	416.40
14.1	3	2.03	20.86	4.17	0.10	0.0190	1.90	168.85	1.00	2.00	8.32	5.00	0.60	0.63	0.67	420.32	417.12
15	(OS-E)+39	4.59	13.55	2.71	0.34	0.0080	0.80	438.85	1.00	2.00	8.32	5.00	0.60	0.63	2.70	420.76	417.25
16.2	(OS-D)+40A	7.52	13.57	2.71	0.55	0.0080	0.80	234.40	1.00	2.00	8.32	5.00	0.60	0.63	1.44	418.38	416.50
16.1	(OS-D)+40A	7.52	13.56	2.71	0.55	0.0080	0.80	296.12	1.00	2.00	8.32	5.00	0.60	0.63	1.82	422.00	419.63
17	(OS-D)+40A	7.52	13.58	2.72	0.55	0.0080	0.80	108.27	1.00	2.00	8.32	5.00	0.60	0.63	0.66	419.17	418.30
18	(OS-D)+40B	4.70	13.56	2.71	0.35	0.0080	0.80	176.00	1.00	2.00	8.32	5.00	0.60	0.63	1.08	417.91	416.50
19	45	6.66	17.27	3.45	0.39	0.0130	1.30	269.47	1.00	2.00	8.32	5.00	0.60	0.63	1.30	417.00	413.50
20	48	2.58	17.50	3.50	0.15	0.0133	1.33	224.94	1.00	2.00	8.32	5.00	0.60	0.63	1.07	417.00	414.00

Hydrologic Analysis for Upstream Offsite Watershed
Vanderburgh County, Indiana

MORLEY
April 25, 2020

A hydrologic analysis was performed for the upstream offsite watershed which exceeds 50-acres. The assessment uses the NRCS TR-55 methodology within the U.S. Army Corps of Engineers HEC-HMS ver 4.6.1 software and NOAA Atlas 14- rainfall data.

Subwatersheds were delineated using 2020 Vanderburgh County LIDAR as were time of concentrations and flow paths; TR-55 worksheets are also enclosed for each subwatershed. Land use boundaries were estimated from 2019 aerial photos and supplemented with Google Street View imagery. Hydrologic soil groups (HSG) by soil series were obtained from the NRCS SSURGO soils database (Web Soil Survey) for the county. For soil series with published dual drained / undrained condition designations, fields in agricultural production were assumed to have tile drainage and areas not in agricultural production were assumed to be undrained. The datasets for soils, subwatersheds, and landuse were combined using GIS techniques to intersect the three data layers. NRCS curve numbers (CN) were assigned using published TR-55 definitions; row crops were assumed to have crop residue (CR factor) given the prevalence of no-till farming in the present time. The final lumped CN for each subwatershed was calculated by importing the data into a Microsoft Excel Pivot Table. Attachments are enclosed depicting these inputs and resulting curve numbers; the runoff curve number assignments are as follows:

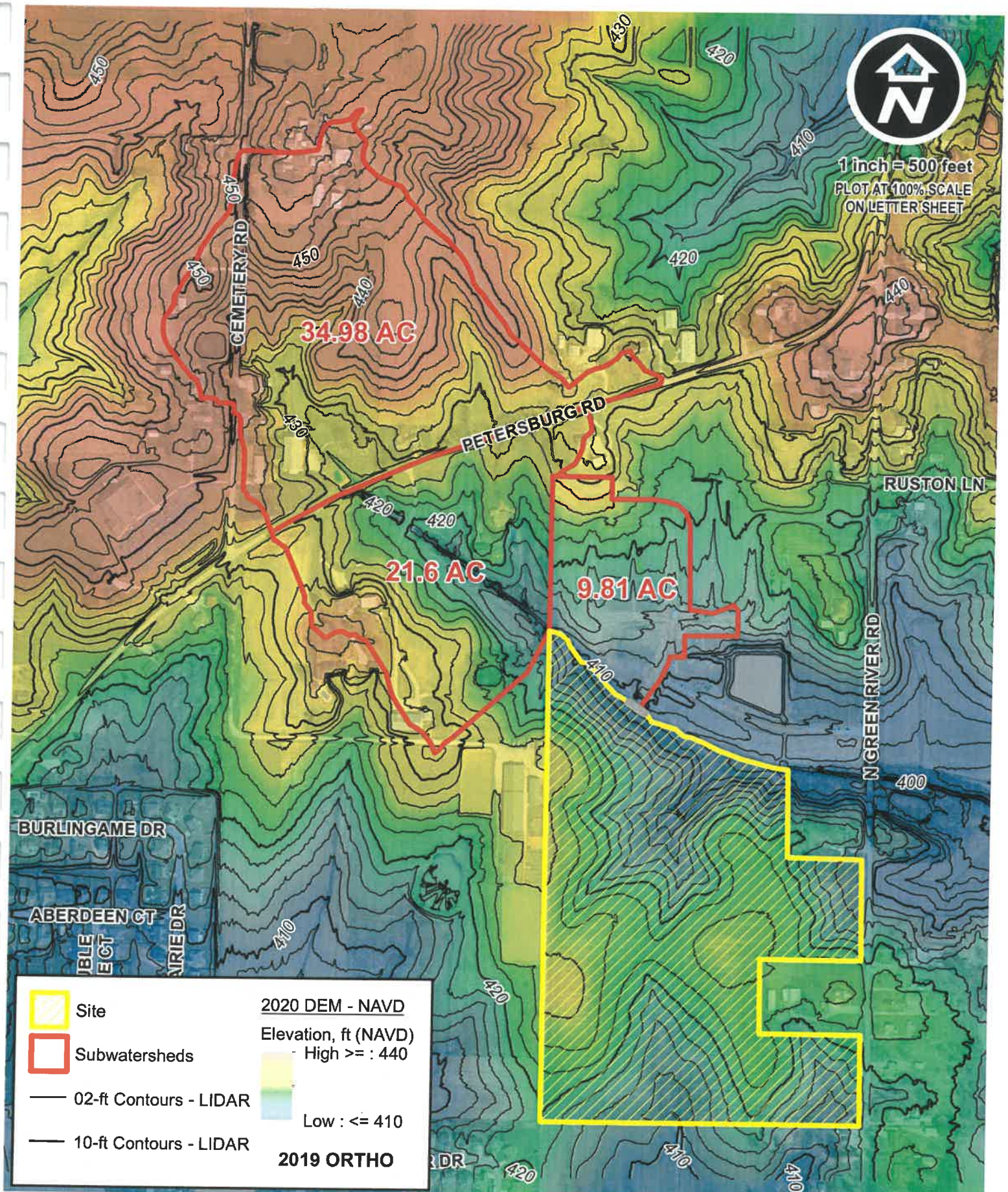
Land Use	HSG	Condition	CN
DEVELOPED MED	D	¼-AC RES	87
IMPERVIOUS	ALL	N / A	98
LAWN	B	GOOD	61
LAWN	C	GOOD	74
LAWN	D	GOOD	80
ROW CROPS	B/D	SR + CR GOOD	75

Land Use	HSG	Condition	CN
ROW CROPS	C	SR + CR GOOD	82
ROW CROPS	C/D	SR + CR GOOD	82
ROW CROPS	D	SR + CR GOOD	85
WATER	ALL	N / A	100
WOODS	C	GOOD	70
WOODS	D	GOOD	77

NOAA Atlas 14 rainfall data was used for a 50-year return period. The county 6-hour precipitation event depth is 4.55-inches. The rainfall distribution pattern follows the 50th percentile pattern in the family of curves published by NOAA for a first quartile storm—please refer to the attachments.

Channel routings were estimated using the lag method based on cross sections and subsequent Manning velocities derived from the LIDAR elevation surface; no attenuation was considered at any road crossing or pond.

Output from HEC-HMS is attached depicting the peak rates of runoff generated for the proposed project site.

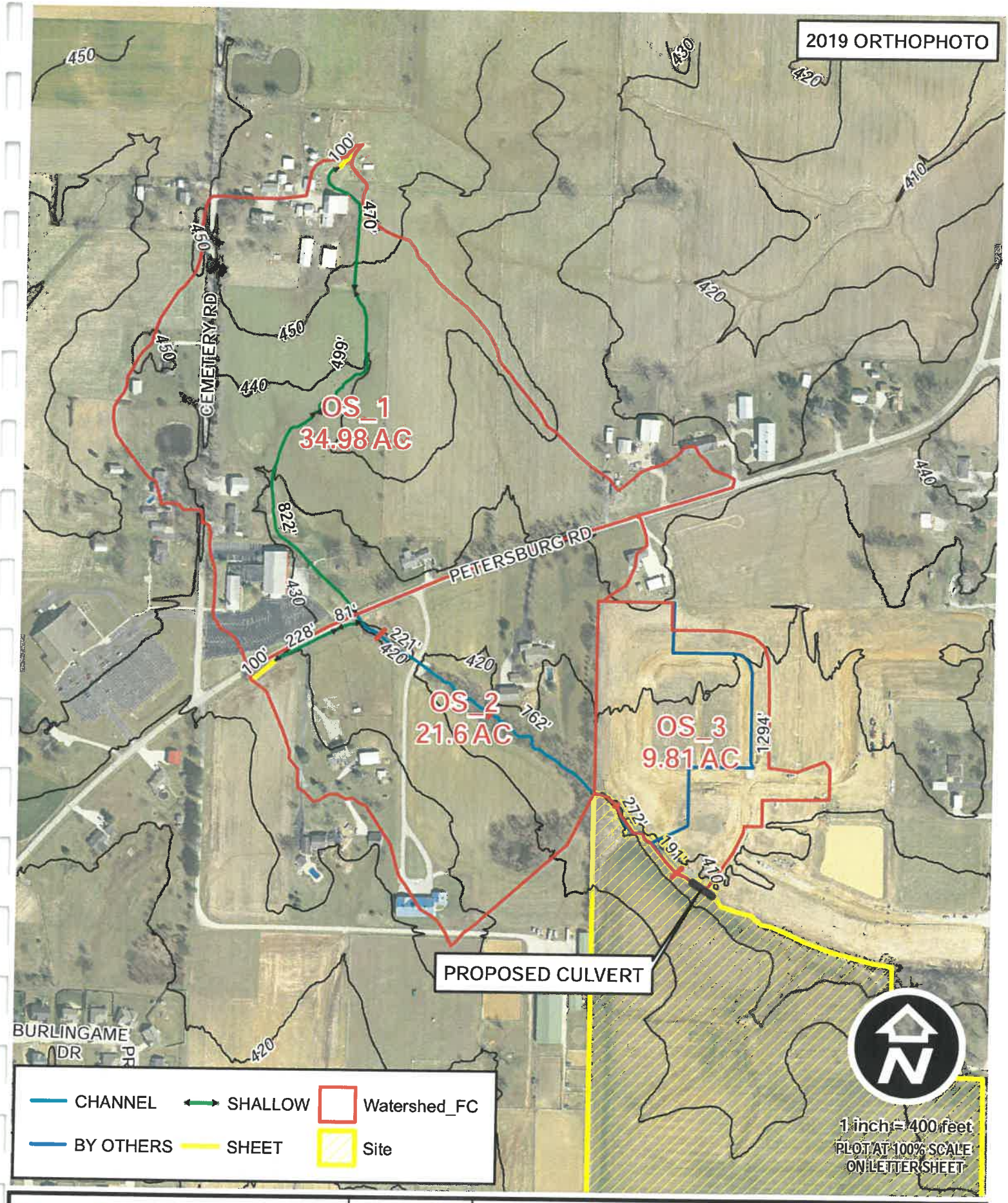


MORLEY
ARCHITECTS | ENGINEERS | SURVEYORS

4800 Rosebud Ln.
Newburgh, IN 47630
812.464.9585 Phone
812.464.2514 Fax
morleycorp.com

OFFSITE DRAINAGE AREAS
ELEANOR'S PLACE SUBDIVISION
DRAINAGE PLAN
VANDERBURGH COUNTY, IN

Designed By: JEM	Job Number: 11822.4.001-B
Drawn By: MJS	Date: 20APR2022
Filename: 11822 OFFS WSHD.mxd	



MORLEY
ARCHITECTS | ENGINEERS | SURVEYORS

4800 Rosebud Ln.
Newburgh, IN 47630
812.464.9585 Phone
812.464.2514 Fax
morleycorp.com

ELEANOR'S PLACE
TIME OF CONCENTRATION
FROM 2019 ORTHOPHOTO
VANDERBURGH COUNTY, IN

Designed By:	Job Number:
JEM	11890
Drawn By:	Date:
MJS	20APR2020
Filename:	
11822 TC.mxd	

TR-55 Methodology: Time of Concentration (Tc) for Subwatershed

MJS

Project: Eleanor's Place Subdivision

Sub-Basin Designation / Location: OS 01

Sheet Flow:

		Segment	Segment	Segment	Segment	Segment
Surface description		Paved	Grass, short	Woods, Dense	Woods, Light	Ag >20% Res
Manning's n for Sheet Flow		0.011	0.15	0.80	0.40	0.17
Flow length, L (100' max)	ft		100.0			
Two-yr 24-hr rainfall, P_2 (Atlas 14)	in	**3.30**	3.30	3.30	3.30	3.30
U/S LIDAR Elevation, ft			459.6			
D/S LIDAR Elevation, ft			458.7			
Land slope, s (2013 LIDAR)	ft/ft	#DIV/0!	0.0090	#DIV/0!	#DIV/0!	#DIV/0!

$T_t = [0.007(nL)^{0.8}] / (P2)^{0.5} (s)^{0.4}$ hr + 0.221 + + + = 0.221 or 13.3 min

Shallow Concentrated Flow:

		Segment	Segment	Segment	Segment	Segment
Surface description		Paved	Unpaved	Unpaved	Unpaved	Unpaved
Flow length, L	ft		470	499	822	
U/S LIDAR Elevation, ft			458.7	447.8	434.2	
D/S LIDAR Elevation, ft			447.8	434.2	423.7	
Slope, s (LIDAR)	ft/ft	#DIV/0!	0.0232	0.0273	0.0128	#DIV/0!
Average velocity, V	ft/sec	#DIV/0!	2.46	2.66	1.82	#DIV/0!

$T_t = L/3600V$ hr + 0.053 + 0.052 + 0.125 + = 0.230 or 13.8 min

Manning Channel Flow - Velocity $V = (1.486\, r^{2/3} s^{1/2}) / n$

		Segment 1	Segment 2	Segment 3	Segment 4	Segment 5
Description	N / A					
XS Type		4 Point Ditch	4 Point Ditch	4 Point Ditch	4 Point Ditch	Other
Note						
Cross sectional area, a	ft^2	167.5	155.0			
Wetted perimeter, p_w	ft	56.8	45.5			
Hydraulic radius, $r = a/p_w$	ft	2.95	3.41			
U/S LIDAR Elevation, ft						
D/S LIDAR Elevation, ft						
Channel slope, s	ft/ft	#DIV/0!	#DIV/0!			
Manning's roughness coefficient, n		0.0650	0.0650			
Manning Velocity	ft/sec	#DIV/0!	#DIV/0!			
Flow length, L	ft	#DIV/0!	#DIV/0!			
$T_t = L/3600V$	hr	+				
	min	0.0	0.0			

N / A = 0.000 or 0 min

Travel from U/S watershed to this Tc path is @ chnl vel or #DIV/0! min

Lake Flow #DIV/0!

Ignore travel time though any subdivision retention ponds per INDOT guidance in 2013 Design Manual,Part 2 - Hydrology and Hydraulics, Section 202-2.05(04) which states that storage should not be considered in the determination of the time of concentration unless the water body is a government regulated (flood control) facility.

Therefore, Watershed Total T_c = **27 min** **or** **0.452 hours**

Worksheet recreated from the NRCS TR-55 manual

and Watershed Lag (0.6 x T_c) = 16 min or 0.271 hours

TR-55 Methodology: Time of Concentration (Tc) for Subwatershed

MJS

Project: Eleanor's Place Subdivision

Sub-Basin Designation / Location: OS 02

Sheet Flow:

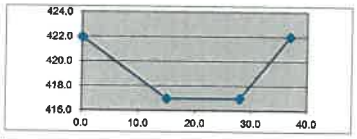
		Segment	Segment	Segment	Segment	Segment
Surface description		Paved	Grass, short	Woods, Dense	Woods, Light	Ag >20% Res
Manning's n for Sheet Flow		0.011	0.15	0.80	0.40	0.17
Flow length, L (100' max)	ft		100.0			
Two-yr 24-hr rainfall, P_2 (Atlas 14)	in	**3.30**	3.30	3.30	3.30	3.30
U/S LIDAR Elevation, ft			433.5			
D/S LIDAR Elevation, ft			430.1			
Land slope, s (2013 LIDAR)	ft/ft	#DIV/0!	0.0340	#DIV/0!	#DIV/0!	#DIV/0!
$T_t = [0.007(nL)^{0.8}] / (P2)^{0.5} (s)^{0.4}$	hr		+ 0.130 +	+	+	= 0.130
						or 7.8 min

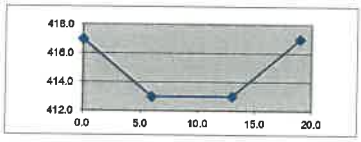
Shallow Concentrated Flow:

		Segment	Segment	Segment	Segment	Segment
Surface description		Paved	Unpaved	Unpaved	Unpaved	Unpaved
Flow length, L	ft		228	81		
U/S LIDAR Elevation, ft			430.1	426.3		
D/S LIDAR Elevation, ft			426.3	420.0		
Slope, s (LIDAR)	ft/ft	#DIV/0!	0.0167	0.0778	#DIV/0!	#DIV/0!
Average velocity, V	ft/sec	#DIV/0!	2.08	4.50	#DIV/0!	#DIV/0!
$T_t = L/3600V$	hr		+ 0.030 +	0.005 +	+	= 0.035
						or 2.1 min

Manning Channel Flow - Velocity $V = (1.486\, r^{2/3}\, s^{1/2}) / n$

		Segment 1	Segment 2	Segment 3	Segment 4	Segment 5
Description						
XS Type		4 Point Ditch	4 Point Ditch	4 Point Ditch	4 Point Ditch	Other
Note		D/S Pbrg Rd	D/S Drive			
Cross sectional area, a	ft^2	125.0	52.0			
Wetted perimeter, p_w	ft	39.1	21.4			
Hydraulic radius, $r = a/p_w$	ft	3.20	2.43			
U/S LIDAR Elevation, ft		420.00	414.90			
D/S LIDAR Elevation, ft		414.90	409.50			
Channel slope, s	ft/ft	0.0231	0.0071			
Manning's roughness coefficient, n		0.0650	0.0650			
Manning Velocity	ft/sec	7.54	3.48			
Flow length, L	ft	221	762			
$T_t = L/3600V$	hr	0.008 +	0.061			N/A
	min	0.5	3.7			= 0.069
						or 4.1 min





Travel from U/S watershed to this Tc path is 0 *@ chnl vel* 4.5 *or* 0.0 *min* N/A

Lake Flow 4

Ignore travel time though any subdivision retention ponds per INDOT guidance in 2013 Design Manual,Part 2 - Hydrology and Hydraulics, Section 202-2.05(04) which states that storage should not be considered in the determination of the time of concentration unless the water body is a government regulated (flood control) facility.

Therefore, Watershed Total T_c = **14** ***min*** ***or*** **0.234** ***hours***

Worksheet recreated from the NRCS TR-55 manual

and Watershed Lag (0.6 x T_c) = **8** *min* *or* **0.141** *hours*

TR-55 Methodology: Time of Concentration (Tc) for Subwatershed

MJS

Project: Eleanor's Place Subdivision

Sub-Basin Designation / Location: OS 03 - Magnolia Ridge Drainage Plan Gives T = 21.5 min along 1294 ft.

0.358 or 21.5 min

Sheet Flow:

		Segment Paved	Segment Grass, short	Segment Woods, Dense	Segment Woods, Light	Segment Ag >20% Res
Surface description						
Manning's n for Sheet Flow		0.011	0.15	0.80	0.40	0.17
Flow length, L (100' max)	ft					
Two-yr 24-hr rainfall, P_2 (Atlas 14)	in	**3.30**	3.30	3.30	3.30	3.30
U/S LIDAR Elevation, ft						
D/S LIDAR Elevation, ft						
Land slope, s (2013 LIDAR)	ft/ft	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
$T_t = [0.007(nL)^{0.8}] / (P2)^{0.5} (s)^{0.4}$	hr		+	+	+	+

= 0.000 or 0 min

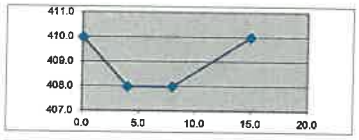
Shallow Concentrated Flow:

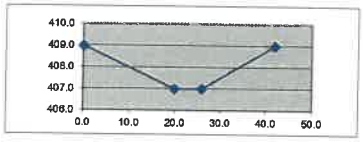
		Segment Paved	Segment Unpaved	Segment Unpaved	Segment Unpaved	Segment Unpaved
Surface description						
Flow length, L	ft					
U/S LIDAR Elevation, ft						
D/S LIDAR Elevation, ft						
Slope, s (LIDAR)	ft/ft	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average velocity, V	ft/sec	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
$T_t = L/3600V$	hr		+	+	+	+

= 0.000 or 0 min

Manning Channel Flow - Velocity $V = (1.486\, r^{2/3} s^{1/2}) / n$

		Segment 1	Segment 2	Segment 3	Segment 4	Segment 5
Description						
XS Type		4 Point Ditch	4 Point Ditch	4 Point Ditch	4 Point Ditch	Other
Note		D/S Pbrg Rd	D/S Drive			
Cross sectional area, a	ft^2	19.0	48.0			
Wetted perimeter, p_w	ft	15.8	42.2			
Hydraulic radius, $r = a/p_w$	ft	1.21	1.14			
U/S LIDAR Elevation, ft		409.50	407.00			
D/S LIDAR Elevation, ft		407.00	406.00			
Channel slope, s	ft/ft	0.0092	0.0052			
Manning's roughness coefficient, n		0.0650	0.0650			
Manning Velocity	ft/sec	2.48	1.80			
Flow length, L	ft	272	191			





$T_t = L/3600V$	hr	0.030	+	0.029	= 0.029
	min	1.8		1.8	or 1.8 min

Travel from U/S watershed to this Tc path: 272 @ chnl vel of 2.5 or 1.8 min

Lake Flow

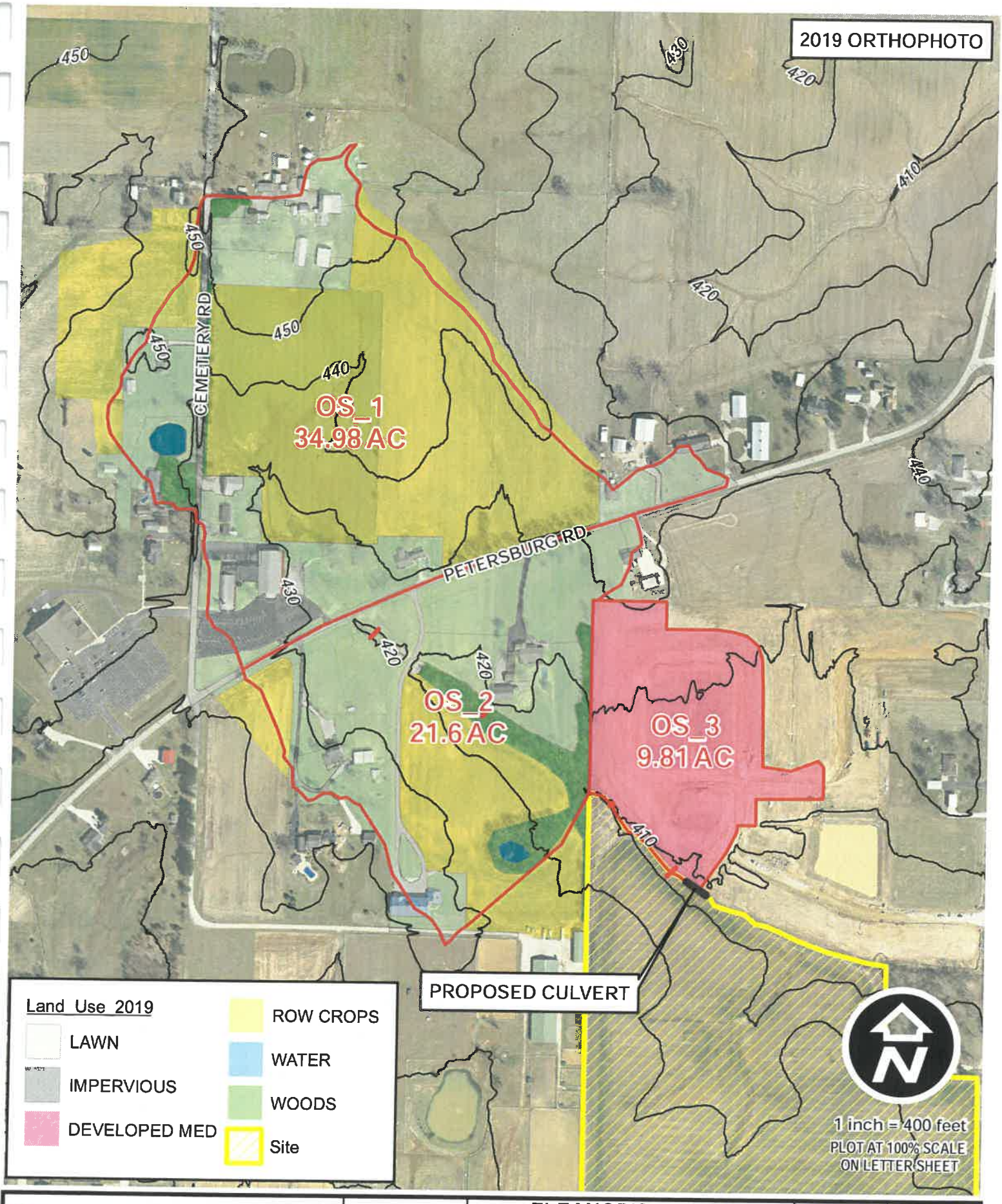
N / A

Ignore travel time though any subdivision retention ponds per INDOT guidance in 2013 Design Manual,Part 2 - Hydrology and Hydraulics, Section 202-2.05(04) which states that storage should not be considered in the determination of the time of concentration unless the water body is a government regulated (flood control) facility.

Worksheet recreated from the NRCS TR-55 manual

Therefore, Watershed Total T_c = 23 min or 0.388 hours

and Watershed Lag (0.6 x T_c) = 14 min or 0.233 hours

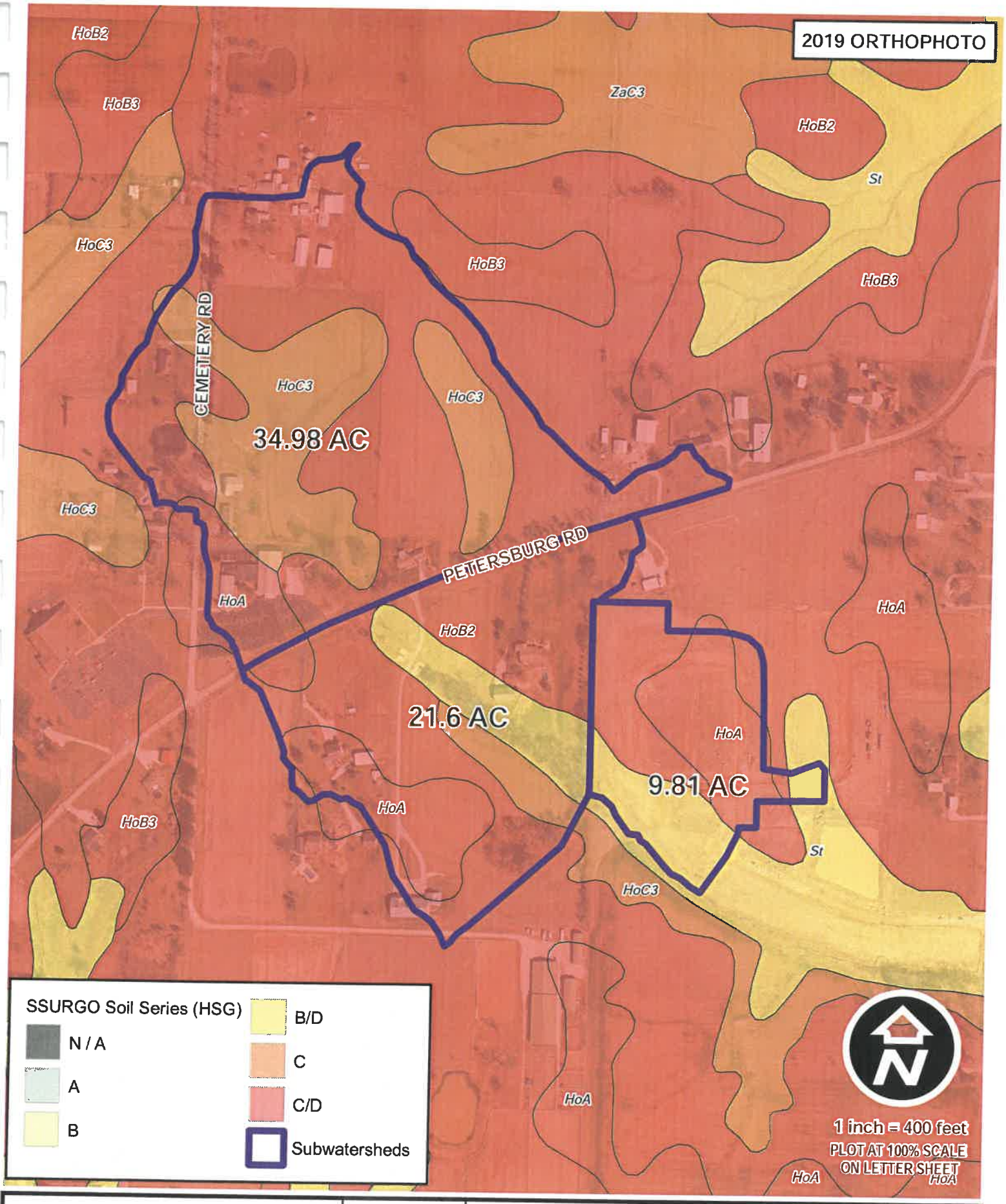


MORLEY
ARCHITECTS | ENGINEERS | SURVEYORS

4800 Rosebud Ln.
Newburgh, IN 47630
812.464.9585 Phone
812.464.2514 Fax
morleycorp.com

ELEANOR'S PLACE
LAND USE ASSIGNMENTS FROM 2019 ORTHOPHOTO
VANDERBURGH COUNTY, IN

Designed By: JEM	Job Number: 11822
Drawn By: MJS	Date: 20APR2020
Filename: 11822 LANDUSE_.mxd	

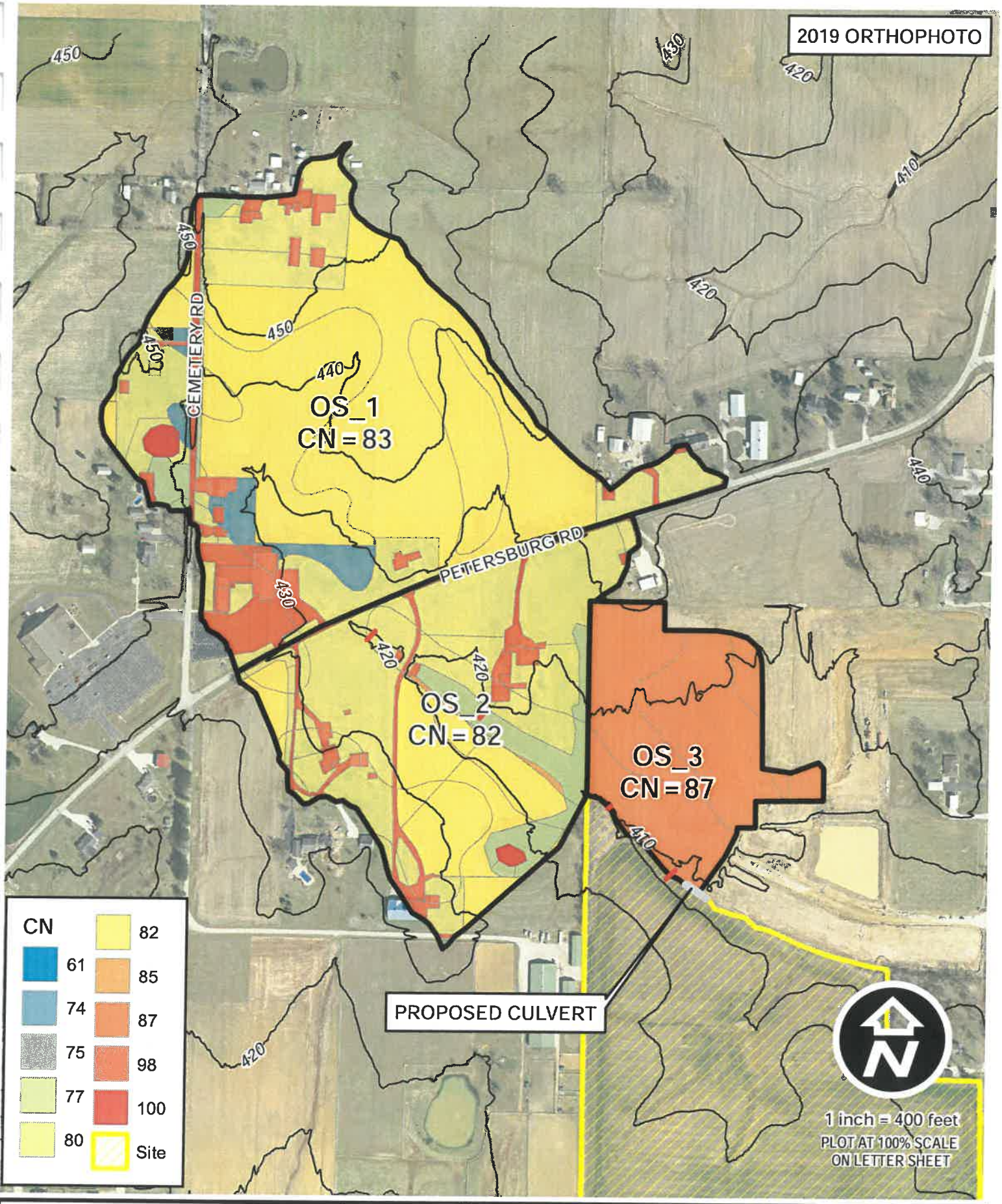


MORLEY
ARCHITECTS | ENGINEERS | SURVEYORS

4800 Rosebud Ln.
Newburgh, IN 47630
812.464.9585 Phone
812.464.2514 Fax
morleycorp.com

ELEANOR'S PLACE
USDA NRCS SSURGO
HYDROLOGIC SOIL GROUPS
VANDERBURGH COUNTY, IN

Designed By:	Job Number:
JEM	11890
Drawn By:	Date:
MJS	20APR2020
Filename:	
11822 SSURGO.mxd	



MORLEY
ARCHITECTS | ENGINEERS | SURVEYORS

4800 Rosebud Ln.
Newburgh, IN 47630
812.464.9585 Phone
812.464.2514 Fax
morleycorp.com

ELEANOR'S PLACE
NRCS CURVE NUMBERS
FROM 2019 ORTHOPHOTO
VANDERBURGH COUNTY, IN

Designed By:	Job Number:
JEM	11822
Drawn By:	Date:
MJS	25APR2020
Filename:	
11822 CN CALC REV.mxd	

4/20/2022

MJS

NRCS Runoff Curve Number Designations

WFK Blue River - Subwatershed ID = 1

Watershed Area (Acres) = 35.6

Watershed Area (Sq Miles) = 0.0556

Calculated NRCS Runoff Curve Number = 83.35

Selected NRCS Runoff Curve Number = 83

SUB_NUM	1	
	=	
Row Labels	**Sum of SHAPE_Area**	**Sum of CN_Product**
C	**981548.7184**	**80004832.01**
LAWN	60932.57734	4509009
ROW CROPS	920321.4903	75466357.91
WATER	294.6508301	29465.1
D	**567446.6408**	**49098998.17**
IMPERVIOUS	199576.9948	19558546.67
LAWN	326297.0519	26103767.5
WATER	10243.23777	1024320
WOODS	31329.35634	2412364
Grand Total	**1548995.359**	**129103830.2**

4/20/2022

MJS

NRCS Runoff Curve Number Designations

WFK Blue River - Subwatershed ID = 2

Watershed Area (Acres) = 22

Watershed Area (Sq Miles) = 0.0337

Calculated NRCS Runoff Curve Number = 82.08

Selected NRCS Runoff Curve Number = 82

SUB_NUM 2

=

Row Labels	Sum of SHAPE_Area	Sum of CN_Product
C	**242870.8097**	**19915407.8**
ROW CROPS	242870.8097	19915407.8
D	**696870.3075**	**57218299.03**
DEVELOPED MED	0.090030442	7.83265
IMPERVIOUS	91120.76792	8929833.668
LAWN	494632.4979	39570604.6
ROW CROPS	5583.587564	474605
WATER	5094.489816	509449
WOODS	100438.8742	7733798.932
Grand Total	**939741.1172**	**77133706.83**

4/20/2022

MJS

NRCS Runoff Curve Number Designations

WFK Blue River - Subwatershed ID = 3

Watershed Area (Acres) = 10

Watershed Area (Sq Miles) = 0.0153

Calculated NRCS Runoff Curve Number = 86.99

Selected NRCS Runoff Curve Number = 87

SUB_NUM	3	
	=	
Row Labels	**Sum of SHAPE_Area**	**Sum of CN_Product**
D	**427502.2341**	**37190343.76**
DEVELOPED MED	427267.8213	37172293.93
WOODS	234.4128411	18049.83234
Grand Total	**427502.2341**	**37190343.76**

Vanderburgh County, Indiana

NOAA Atlas 14 - Volume II - Ohio River Basin

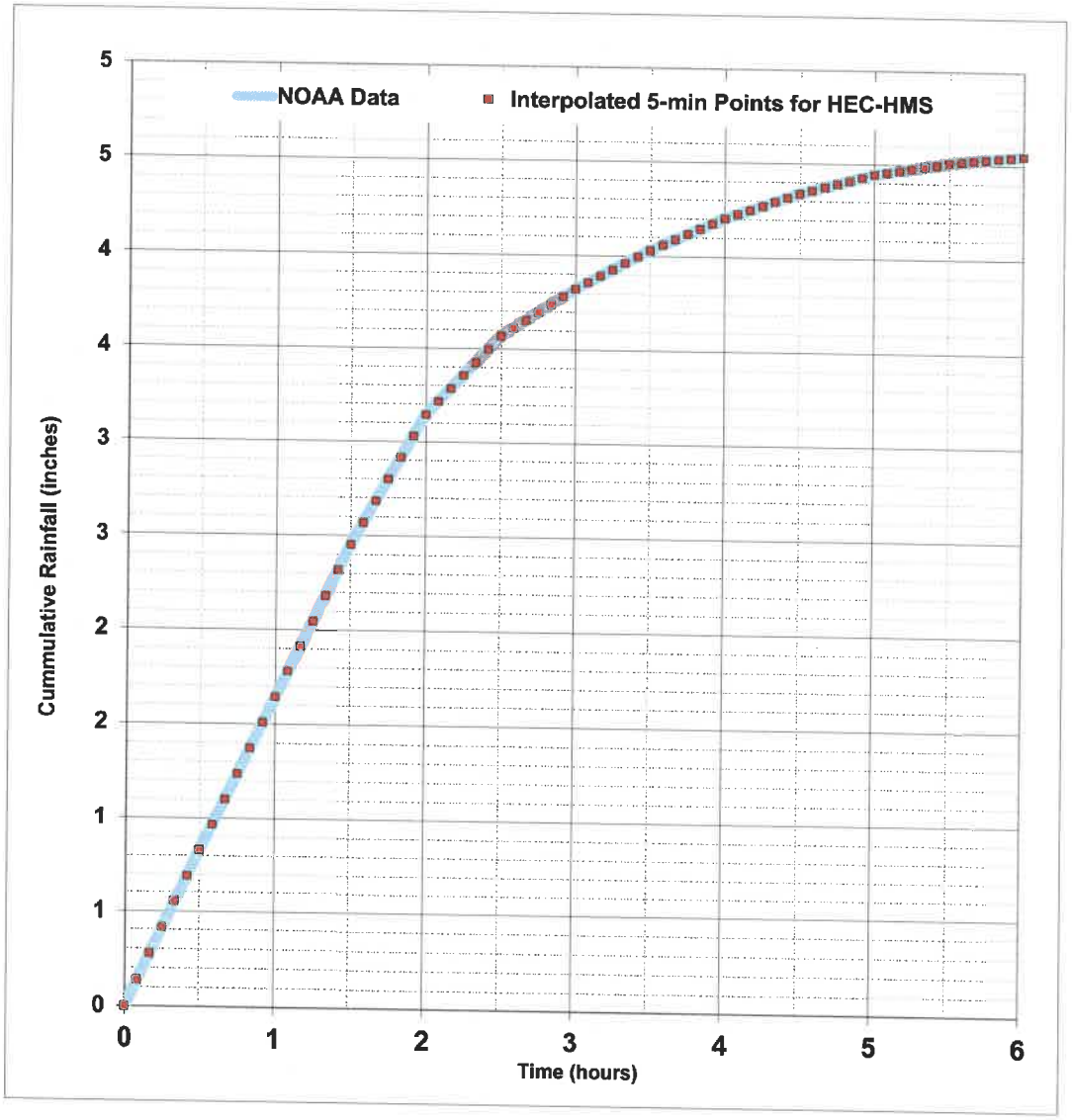
Based upon distribution obtained from *http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_temporal.html*

Storm Description =	50 year
Storm Duration (hrs) =	6.0
Storm Depth (in) =	4.55

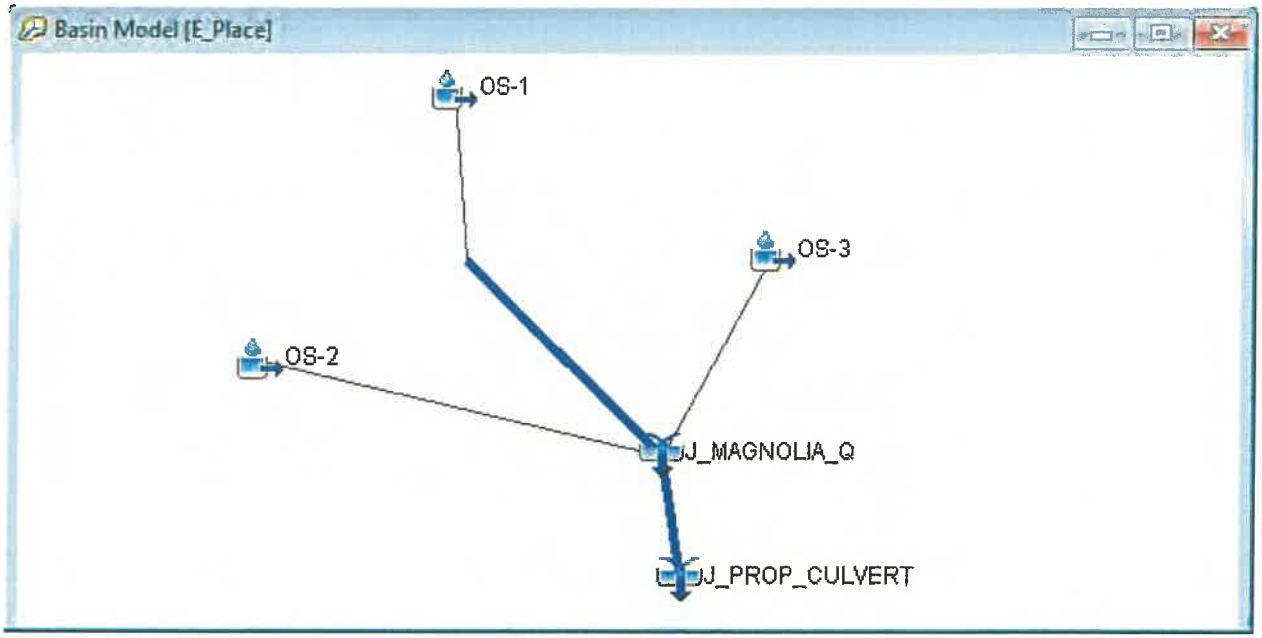
1st	Quartile
50%	Selected Duration From Curve Family

Mjs
4/22/2022

Time (%)	Rainfall (%)	Time (min)	Time (hr)	Incremental Rainfall (in)	Cummulative Rainfall (in)
0.000	0.000	0	0.000	0.000	0.000
0.083	0.182	30	0.50	0.828	0.828
0.167	0.361	60	1.00	0.814	1.643
0.250	0.539	90	1.50	0.810	2.452
0.333	0.691	120	2.00	0.692	3.144
0.417	0.784	150	2.50	0.423	3.567
0.500	0.840	180	3.00	0.255	3.822
0.583	0.886	210	3.50	0.209	4.031
0.667	0.924	240	4.00	0.173	4.204
0.750	0.954	270	4.50	0.137	4.341
0.833	0.977	300	5.00	0.105	4.445
0.917	0.991	330	5.50	0.064	4.509
1.000	1.000	360	6.00	0.041	4.550



HEC-HMS 4.6.1 RESULTS FOR 50-YEAR NOAA FIRST QUARTILE 6-HOUR EVENT



Global Summary Results for Run "EP VC A14 06 HR 50 YR"

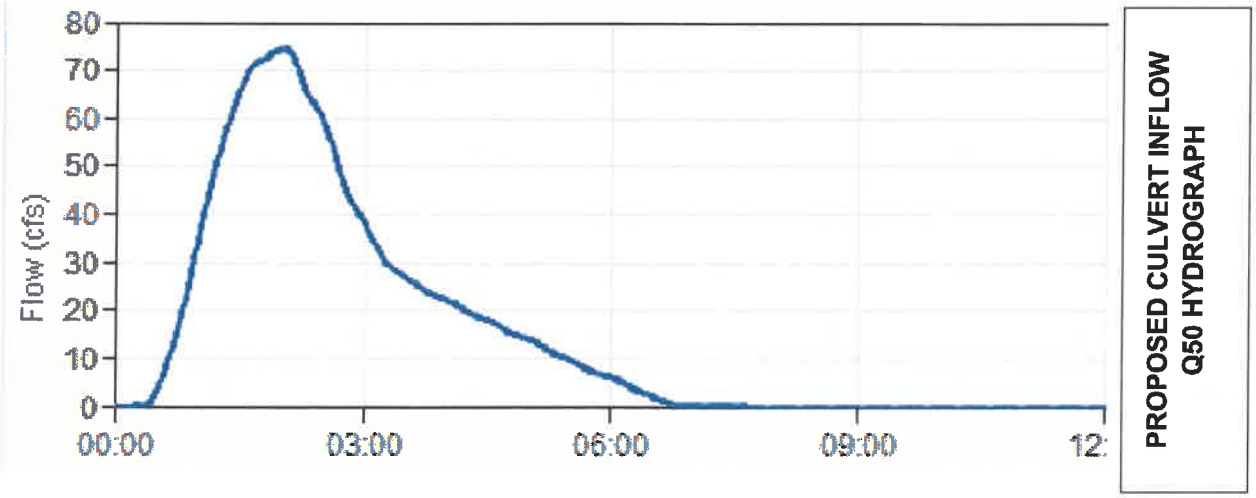
Project: E_PLaceRev Simulation Run: EP VC A14 06 HR 50 YR

Start of Run: 01Jan2000, 00:00
End of Run: 02Jan2000, 00:00
Compute Time: 25Apr2022, 15:07:46

Basin Model: E_Place
Meteorologic Model: VC_A14_050YR_06HR_Q1_50pt
Control Specifications: 100YR_06HR_24hrSim

Show Elements: All Elements Volume Units: (•) IN ( ) ACRE-FT Sorting: Hydrologic

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
OS-1	0.0547	39.4	01Jan2000, 01:41	2.7700
R_THRU_2	0.0547	39.4	01Jan2000, 01:57	2.7700
OS-2	0.0337	24.2	01Jan2000, 01:35	2.6800
OS-3	0.0153	12.6	01Jan2000, 01:37	3.1455
J_MAGNOLIA_Q	0.1037	74.5	01Jan2000, 01:59	2.7962
R_2_TO_CULVERT	0.1037	74.5	01Jan2000, 02:01	2.7962
J_PROP_CULVERT	0.1037	74.5	01Jan2000, 02:01	2.7962



PROPOSED CULVERT INFLOW Q50 HYDROGRAPH

Vanderburgh County, Indiana

NOAA Atlas 14 - Volume II - Ohio River Basin

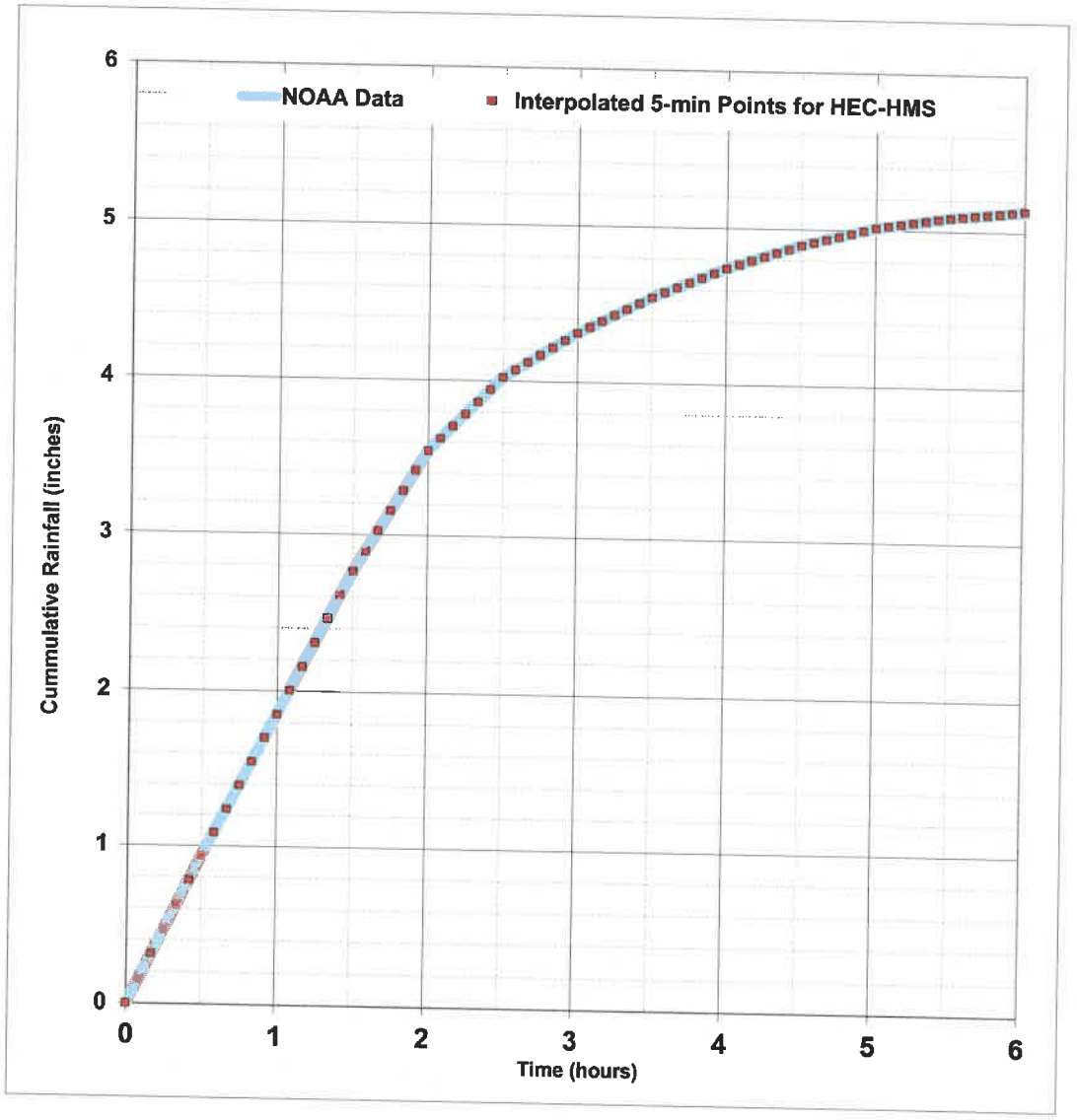
Based upon distribution obtained from *http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_temporal.html*

Storm Description = 100 year
Storm Duration (hrs) = 6.0
Storm Depth (in) = 5.13

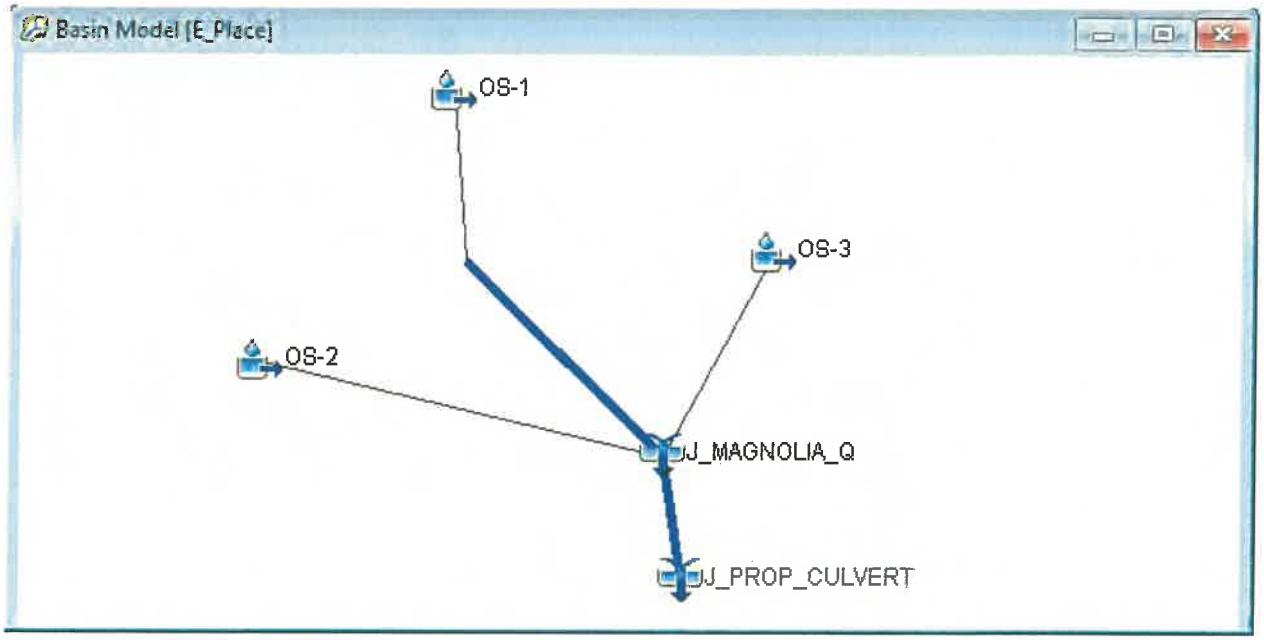
1st Quartile
50% Selected Duration
From Curve Family

Mjs
4/25/2022

Time (%)	Rainfall (%)	Time (min)	Time (hr)	Incremental Rainfall (in)	Cummulative Rainfall (in)
0.000	0.000	0	0.000	0.000	0.000
0.083	0.182	30	0.50	0.934	0.934
0.167	0.361	60	1.00	0.918	1.852
0.250	0.539	90	1.50	0.913	2.765
0.333	0.691	120	2.00	0.780	3.545
0.417	0.784	150	2.50	0.477	4.022
0.500	0.840	180	3.00	0.287	4.309
0.583	0.886	210	3.50	0.236	4.545
0.667	0.924	240	4.00	0.195	4.740
0.750	0.954	270	4.50	0.154	4.894
0.833	0.977	300	5.00	0.118	5.012
0.917	0.991	330	5.50	0.072	5.084
1.000	1.000	360	6.00	0.046	5.130



HEC-HMS 4.6.1 RESULTS FOR 100-YEAR NOAA FIRST QUARTILE 6-HOUR EVENT



Global Summary Results for Run "EP VC A14 06 HR 100 YR"

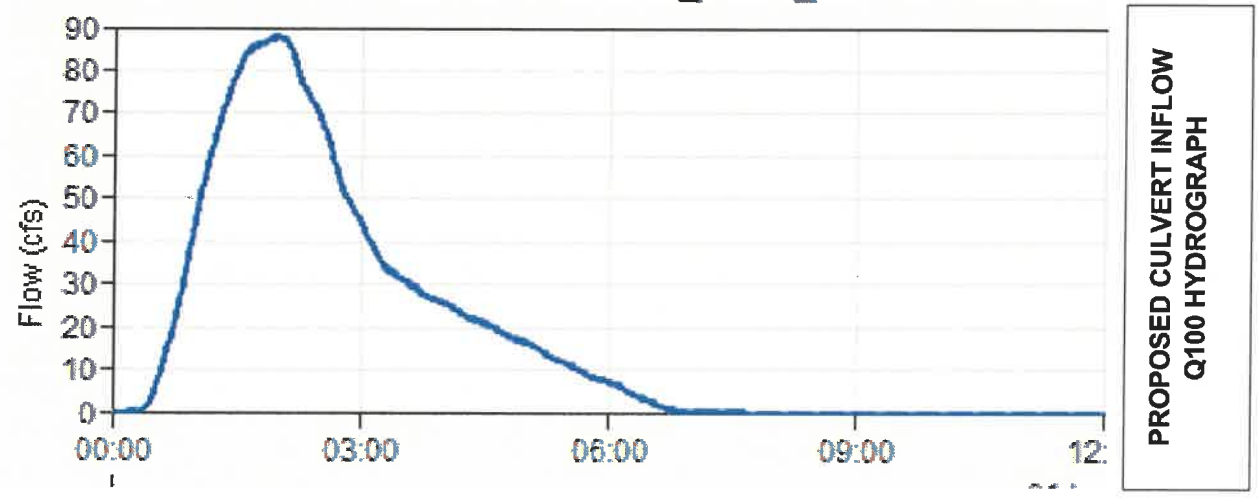
Project: E_PLaceRev Simulation Run: EP VC A14 06 HR 100 YR

Start of Run: 01Jan2000, 00:00
End of Run: 02Jan2000, 00:00
Compute Time: 25Apr2022, 15:10:53

Basin Model: E_Place
Meteorologic Model: VC_A14_100YR_06HR_Q1_50pt
Control Specifications: 100YR_06HR_24hrSim

Show Elements: All Elements Volume Units: (•) IN ( ) ACRE-FT Sorting: Hydrologic

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
OS-1	0.0547	46.8	01Jan2000, 01:40	3.2920
R_THRU_2	0.0547	46.8	01Jan2000, 01:56	3.2920
OS-2	0.0337	28.8	01Jan2000, 01:35	3.1956
OS-3	0.0153	14.7	01Jan2000, 01:37	3.6899
J_MAGNOLIA_Q	0.1037	87.8	01Jan2000, 01:57	3.3194
R_2_TO_CULVERT	0.1037	87.8	01Jan2000, 01:59	3.3194
J_PROP_CULVERT	0.1037	87.8	01Jan2000, 01:59	3.3194



PROPOSED CULVERT INFLOW Q100 HYDROGRAPH

HY-8 Culvert Analysis Report

Table 1 - Summary of Culvert Flows at Crossing: P-141

Headwater Elevation (ft)	Total Discharge (cfs)	P-141 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
406.71	1.00	1.00	0.00	1
406.73	9.80	9.80	0.00	1
406.78	18.60	18.60	0.00	1
406.86	27.40	27.40	0.00	1
406.95	36.20	36.20	0.00	1
407.07	45.00	45.00	0.00	1
407.20	53.80	53.80	0.00	1
407.36	62.60	62.60	0.00	1
407.52	71.40	71.40	0.00	1
407.68	80.20	80.20	0.00	1
407.86	89.00	89.00	0.00	1
413.00	286.04	286.04	0.00	Overtopping

Rating Curve Plot for Crossing: P-141

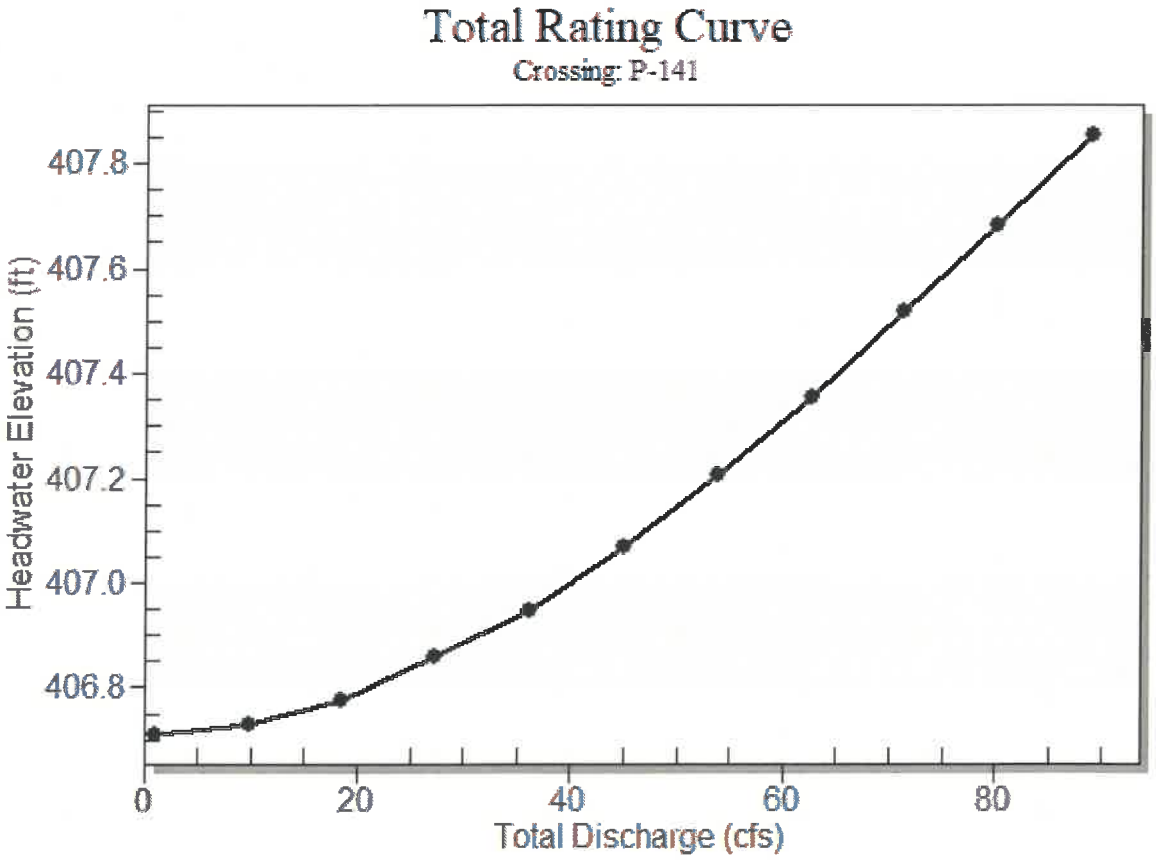


Table 2 - Culvert Summary Table: P-141

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)
1.00	1.00	406.71	0.062	1.832	3-M1t	0.100	0.039	2.110	2.110	0.059	0.000
9.80	9.80	406.73	0.587	1.850	3-M1t	0.630	0.354	2.110	2.110	0.581	0.000
18.60	18.60	406.78	0.828	1.897	3-M1t	0.930	0.541	2.110	2.110	1.102	0.000
27.40	27.40	406.86	1.072	1.978	3-M1t	1.175	0.708	2.110	2.110	1.623	0.000
36.20	36.20	406.95	1.291	2.067	3-M1t	1.393	0.853	2.110	2.110	2.145	0.000
45.00	45.00	407.07	1.492	2.187	3-M1t	1.593	0.992	2.110	2.110	2.666	0.000
53.80	53.80	407.20	1.689	2.324	3-M1t	1.769	1.114	2.110	2.110	3.187	0.000
62.60	62.60	407.36	1.892	2.475	3-M1t	1.941	1.236	2.110	2.110	3.709	0.000
71.40	71.40	407.52	2.094	2.637	3-M1t	2.098	1.349	2.110	2.110	4.230	0.000
80.20	80.20	407.68	2.297	2.804	3-M2t	2.253	1.457	2.110	2.110	4.751	0.000
89.00	89.00	407.86	2.500	2.976	3-M2t	2.395	1.565	2.110	2.110	5.273	0.000

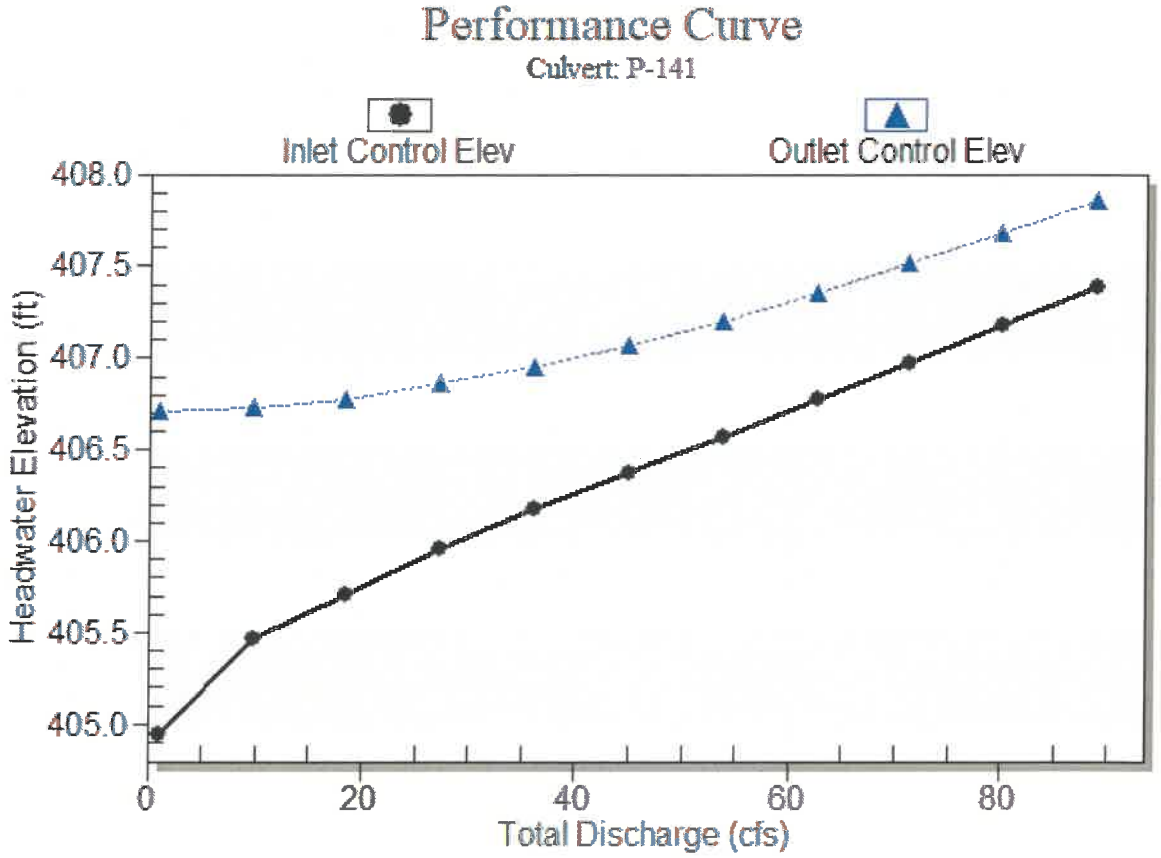
****

Inlet Elevation (invert): 404.88 ft, Outlet Elevation (invert): 404.60 ft

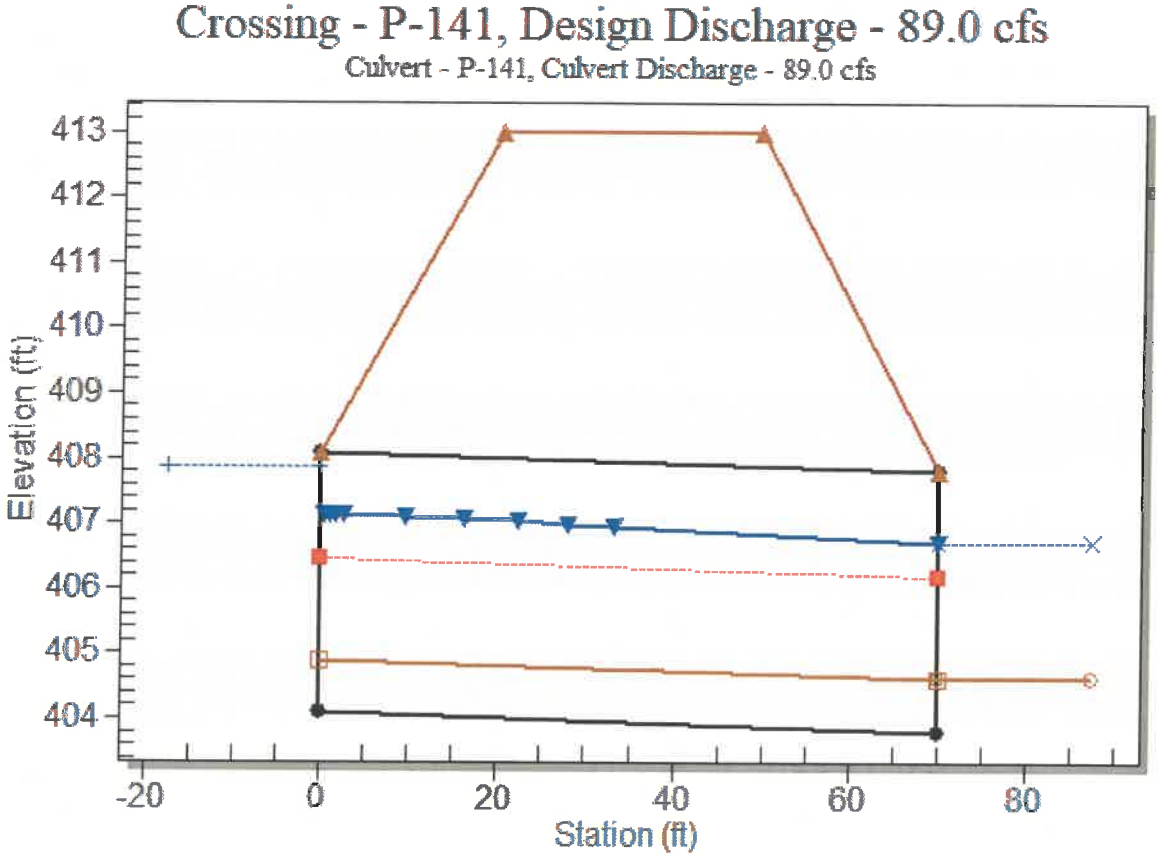
Culvert Length: 70.00 ft, Culvert Slope: 0.0040

****

Culvert Performance Curve Plot: P-141



Water Surface Profile Plot for Culvert: P-141



Site Data - P-141

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 404.08 ft

Outlet Station: 70.00 ft

Outlet Elevation: 403.80 ft

Number of Barrels: 1

Culvert Data Summary - P-141

Barrel Shape: Concrete Box

Barrel Span: 8.00 ft

Barrel Rise: 4.00 ft

Barrel Material: Concrete

Embedment: 9.60 in

Barrel Manning's n: 0.0120 (top and sides)

Manning's n: 0.0350 (bottom)

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: NONE

Tailwater Channel Data - P-141

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 406.71 ft

Roadway Data for Crossing: P-141

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 50.00 ft

Crest Elevation: 413.00 ft

Roadway Surface: Paved

Roadway Top Width: 29.00 ft

100-Year Peak Flow Elevation Upstream of P141

Offsite Peak Runoff = 88 CFS (HEC-HMS)
Offsite Sub-basin "A" = 9.5 CFS
Post Sub-basin 1 = 3.9 CFS
Post Sub-basin 3 = 2.2 CFS

Total Peak Flow = 103.6 CFS

Average Cross Section Upstream of P141

P = 21.985

A = 27.75 @ 10' either side of property line (within drainage easement)

n = 0.040

S = 0.98%

$$Q = A\left(\frac{1.486}{n}\right)\left(\frac{A}{P}\right)^{2/3}(S)^{1/2}$$

$$Q = A\left(\frac{1.486}{0.040}\right)\left(\frac{A}{21.985}\right)^{2/3}(0.0098)^{1/2}$$

$$Q = A^{5/3}(0.4686)$$

$$Q = 103.6 \text{ CFS}$$

$$A^{5/3}(0.4686) = 103.6 \text{ CFS}$$

$$A^{5/3} = 221.084$$

$$A = 25.51 < 27.75$$

$\Rightarrow$ 100-year Peak Flow Elevation = TOB

$\Rightarrow$ Use 2' above TOB as MFF

100-Year Peak Flow Elevation Downstream of P141

Offsite Peak Runoff Upstream of P141 = 88 CFS (HEC-HMS)

Offsite Sub-basin "A" = 9.5 CFS

Post Sub-basin 1 = 3.9 CFS

Post Sub-basin 3 = 2.2 CFS

Post Sub-basin 6 = 1.5 CFS

North Basin Discharge = 18.24 CFS

Basin 1 Discharge (Magnolia) = 3.70 CFS

Post Sub-basin 16 (Magnolia) = 3.64 CFS

Post Sub-basin 17 (Magnolia) = 1.29 CFS

Post Sub-basin 22 (Magnolia) = 8.88 CFS

Total Peak Flow = 140.85 CFS

Arerage Cross-Section Downstream of P141

P = 22.195

A = 20.83 @ 10' either side of property line (within drainage easement)

n = 0.040

S = 0.45 %

$$Q = A\left(\frac{1.486}{n}\right)\left(\frac{A}{P}\right)^{2/3}(S)^{1/2}$$

$$Q = A\left(\frac{1.486}{0.040}\right)\left(\frac{A}{22.195}\right)^{2/3}(0.0045)^{1/2}$$

$$Q = A^{5/3}(0.3155)$$

$$Q = 140.85 \text{ CFS}$$

$$A^{5/3}(0.3155) = 140.85$$

$$A^{5/3} = 446.434$$

$$A = 38.89$$

$A = 20.83 + 20y$ where y = depth above TOB

$38.89 = 20.83 + 20y$

$20y = 18.06$

$y = 0.9$

=> 100-Year Peak Flow Elevation = 0.9' above TOB

=> Use 2.9' above TOB as MFF

Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Apr 26 2022

Ex. Culvert @ N Green River Rd

Invert Elev Dn (ft)	= 399.01
Pipe Length (ft)	= 31.00
Slope (%)	= -2.03
Invert Elev Up (ft)	= 398.38
Rise (in)	= 63.6
Shape	= Box
Span (in)	= 72.0
No. Barrels	= 1
n-Value	= 0.012
Culvert Type	= Rectagular Concrete
Culvert Entrance	= Tapered inlet throat
Coeff. K,M,c,Y,k	= 0.475, 0.667, 0.0179, 0.97, 0.2

Embankment

Top Elevation (ft)	= 406.25
Top Width (ft)	= 20.00
Crest Width (ft)	= 50.00

Calculations

Qmin (cfs)	= 100.00
Qmax (cfs)	= 200.00
Tailwater Elev (ft)	= (dc+D)/2

Highlighted

Qtotal (cfs)	= 140.85
Qpipe (cfs)	= 140.85
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 5.96
Veloc Up (ft/s)	= 4.92
HGL Dn (ft)	= 402.95
HGL Up (ft)	= 403.15
Hw Elev (ft)	= 403.60
Hw/D (ft)	= 0.99
Flow Regime	= Outlet Control