Stormwater Drainage Technical Report

Primary Plat <u>I-65 South Commerce Park</u>

December 4 2023

Prepared by:
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1.0. PROJECT SUMMARY

Purpose: Master Drainage Report – Primary PLAT

Project Name: I-65 South Commerce Park

Location: East and adjacent Jim Black Road / North and adjacent SR-44

Regulatory Jurisdiction: City of Franklin

Water Quality Treatment: Wet Pond BMPs Receiving Body: Amity Ditch

2.0. INTRODUCTION

Studio A of Indianapolis, Inc. has completed a Primary PLAT to establish 9 lots across approximately 543 acres for the development of general warehouse use with associated parking, drives, and stormwater management.

Amity Ditch runs through the site for approximately 7,800 feet providing a convenient outlet for the various wet ponds which will serve the 9 lots. A substantial hurdle associated with the site is the presence of large areas of regulatory floodplain in the southeastern portion of the site. Prior to the development of these portions of the site, a letter of map revision will be obtained from the FEMA upon concurrence of the IDNR of proposed changes to Amity Ditch. Details of the proposed widening of the Ditch were performed by Christopher B. Burke Engineering and are included as Appendix 'C'.

The purpose of this reporting is to demonstrate that the development plan for the SITE is in compliance with the General Drainage Standards for the City of Franklin. The aerial photograph shown on Figure 1 illustrates the SITE location of all 543 acres, along with the Ditch location, and provides land use and context for the development.

Existing conditions are discussed in Section 3.0, while a discussion of the proposed conditions and stormwater design are discussed in Section 4.0.

3.0. EXISTING CONDITIONS

The existing site covers 543 acres as depicted on Figure 1. As shown on the Figure, the site consists nearly exclusively of row crops. The west and east sides of the site drain overland via natural topography towards Amity Ditch. The Owen Tile Legal Drain also helps the southwestern areas of the site drain to the Ditch. Also identified on Figure 1 is an approximately 44 acre offsite watershed at the headwaters of Amity Ditch which drain onto the northwest corner of the site by culvert beneath Jim Black Road.

As provided on Figure 2, FEMA identifies substantial portions of the Amity Ditch overbank to be considered Zone 'A' floodplain. Additionally, any activity in the lower 1,900 feet of the Ditch is regulated by the IDNR.

As provided on Figure 3, the USDA identifies a typical anticipated mix of Brookston, Crosby, and Miami silt loams. These soils behave as poorly drained 'C' and 'D' type soils in an undrained condition, but demonstrate higher initial abstractions once established in a drained condition.

Hydrograph methods based upon TR-20 have been used to develop peak discharges from the site. The HydroCAD has been loaded with storm depths and distributions as prescribed by the City of Franklin Stormwater Management Ordinance. Details of the hydrologic input and output can be viewed in Appendix 'B'. A summary of peak rates is provided in Table 1, below:

Table 1: Existing Peak Flow Matrix

EX	Runoff (cfs)		
2YR1HR	241.34		
2YR2HR	197.30		
2YR30MIN	196.30		
10YR1HR	516.16		
10YR2HR	436.17		
10YR30MIN	463.62		
100YR1HR	917.34		
100YR2HR	786.80		
100YR30MIN	851.00		

4.0. PROPOSED SYSTEM DESIGN

Storm Routing and Detention

Figure 4 provides the overall conceptual layout of the warehouse buildings, parking, and detention ponds across the 9 platted lots. The flow arrows indicate that via interconnected wet ponds, each developed area will be routed generally by storm sewer to its respective wet pond in route to discharge into the Amity Ditch.

First, in order to determine adequate pond storage regarding a conceptual layout, it is necessary to prescribe a maximum allowable imperviousness of each lot. For the I-65 South Commerce Park, the **maximum allowable imperviousness shall be 85%**. For runoff curve numbers, a CN of 94 will be used in hydrologic computations.

Second, the available area for detention must be aggregated. For modeling purposes, this is partitioned into two main areas; lots westerly of Amity Ditch, and those easterly of Amity Ditch.

The Lots 1,2,3,4, and PR COMM, totaling 279.7 acres (including contributing right-of-way) will be served by 5 wet ponds totaling 17.7 acres at normal pool, with a top of bank footprint totaling 26.5 acres. Due to the requirement of substantial overbank fill in the lower reaches of Amity Ditch, more wet pond area will be created in the easterly Lots 5,6,7,8,9 and 10. Specifically, this 263.4 acre section (including right-of-way) will be served by a total of 24.8 acres at normal pool, with a top of bank footprint totaling 39.3 acres.

As detailed in Appendix 'B', attenuating runoff beyond those allowed by Standard results in an average staging depth of only 3.9 feet for the westerly ponds and 3.0 feet for the easterly ponds during the most demanding 100 year event. Actual results may vary as the detailed outlets and designs are finished, but the goal of this master drainage report is to demonstrate adequate storage available. Proposed pond dynamics for this sample run executed with the HydroCAD model are summarized in Table 2, below:

Table 2: Proposed Detention Capability

				•	
	Allowable	Modeled	Average	Average East	
	Release Rate	Release Rate	West Pond	Pond Stage	
	(cfs)	(cfs)	Stage (ft)	(ft)	
10 YR	241.34	74.68	2.7	2.1	
100 YR	516.16	106.01	3.9	3.0	

As seen above, constricting the release rate far below that allowed requires moderate pond staging. Therefore, the platted layout and pond distribution is adequate for stormwater detention requirements.

Existing FEMA SFHA

The substantial Flood Hazard Area identified by FEMA must be addressed prior to a feasible development of Lots 4,6,7, and 8. As viewable in Appendix 'C', it is proposed to transform the Amity Ditch cross-section into a wider two-stage ditch cross-section. Preliminary modeling indicates that the improved cross-section will allow the infill of existing overbank areas and result in a reduction in regulatory 100 year flood elevations. The construction of the two-stage ditch will also generate much needed fill to achieve a developable pad elevation on the noted lots.

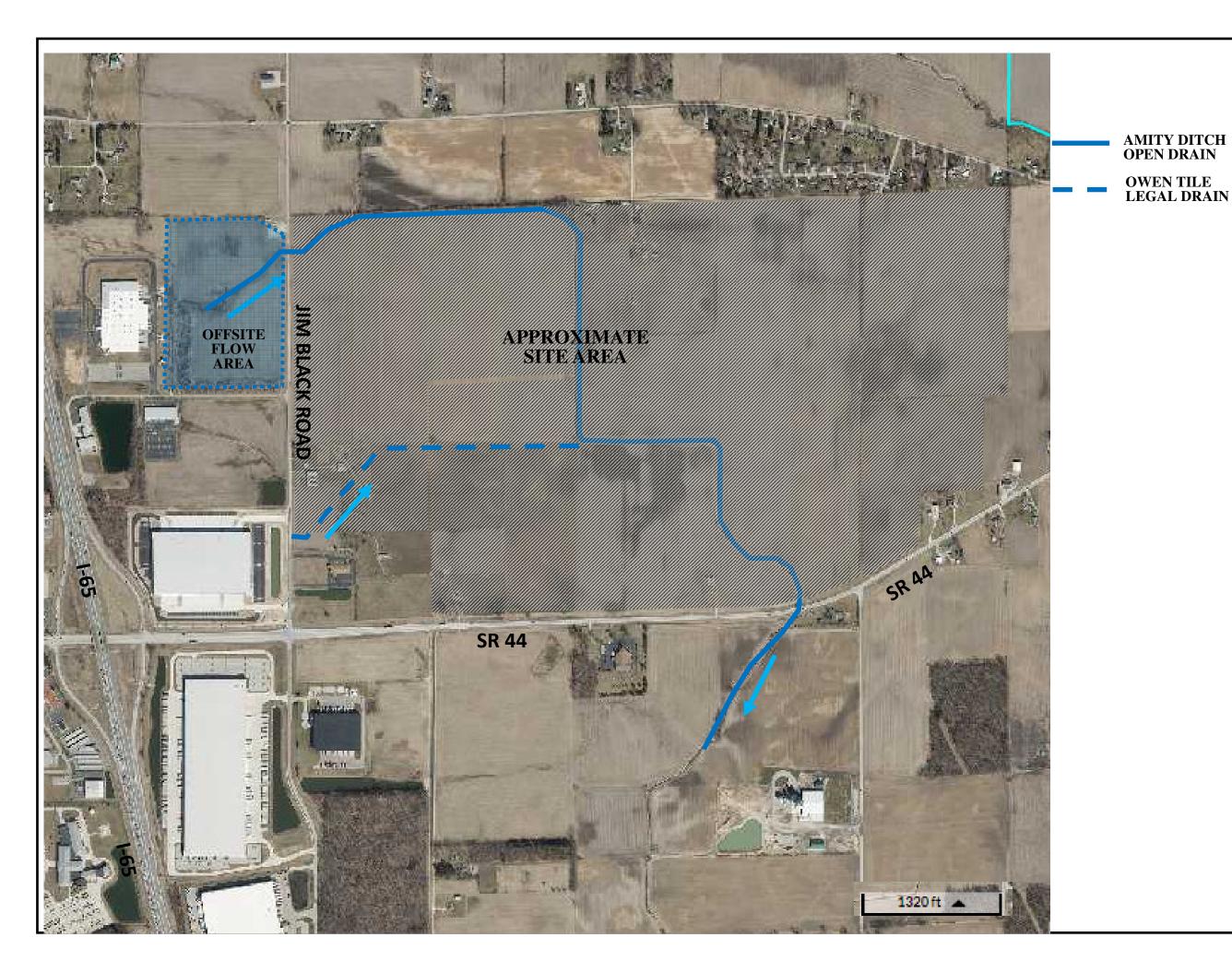
Offsite Flow

As shown on Figure 1, approximately 44 acres are discharged onto the site from the west under Jim Black Road. This flow will not be routed through the site detention system. Rather, the proposed Amity Ditch will be formerly extended west so that the offsite flow can bypass the development and discharge directly to the proposed two-stage ditch. This ditch extension is proposed with the development of Lots 1 and 2; forecast to be the first developed Lots.

Water Quality

As noted in the Introduction, water quality treatment for the site will be accomplished through the use of wet detention pond BMPs. Given the magnitude of wet pond area proposed, and the fill necessary for site development, the aggregate pond volume beneath normal pool is expected to far exceed that necessary per Standard.

The other primary requirement for the water quality volume is that it be discharged in an extended fashion. Given the limited staging values computed above, this requirement is expected to be attainable without compromising required storage volume.



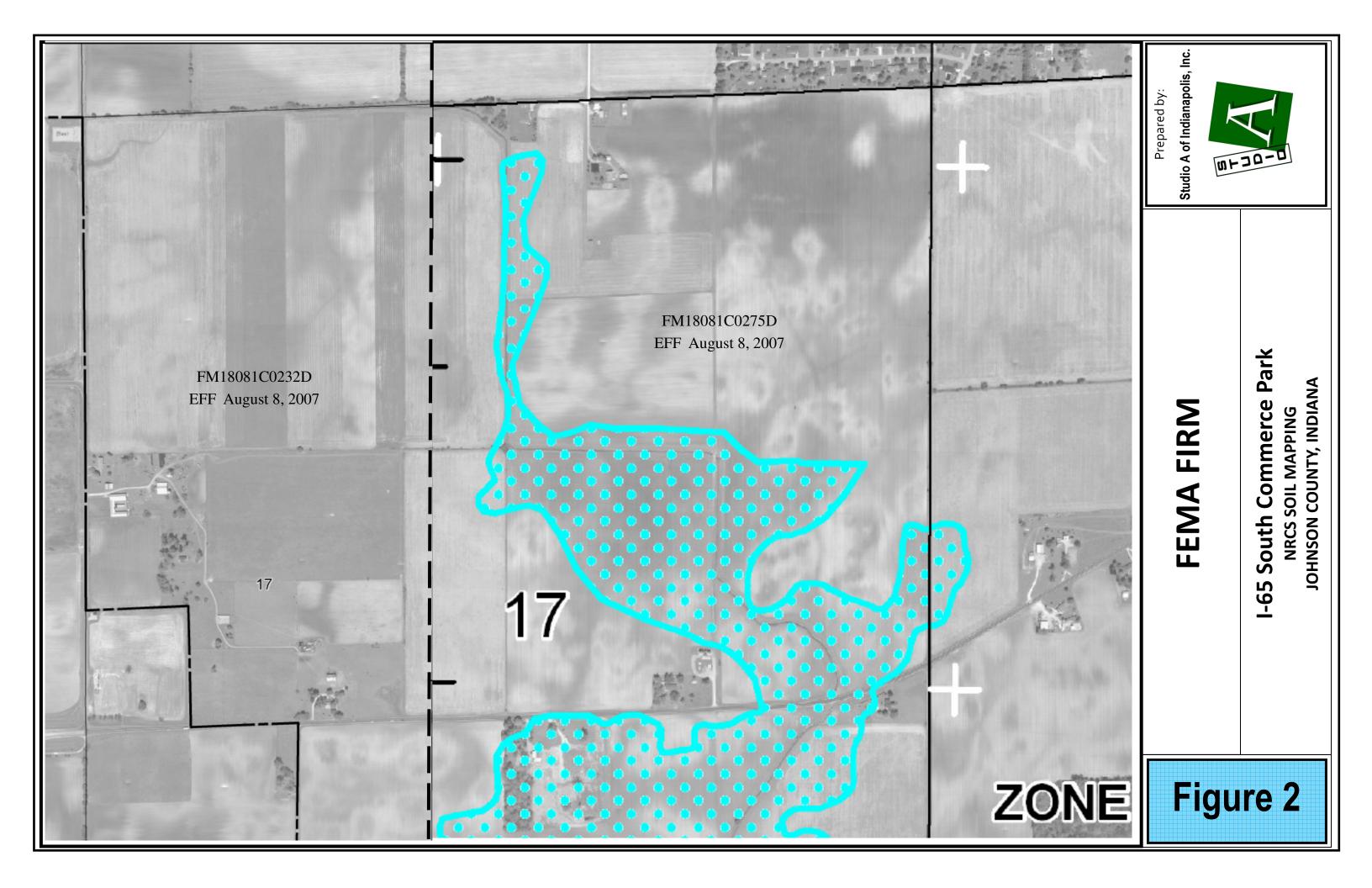
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LOCATION SITE OVERALL

Aerial Mapping and Property Boundary JOHNSON COUNTY, INDIANA **I-65 South Commerce Park**

Figure 1



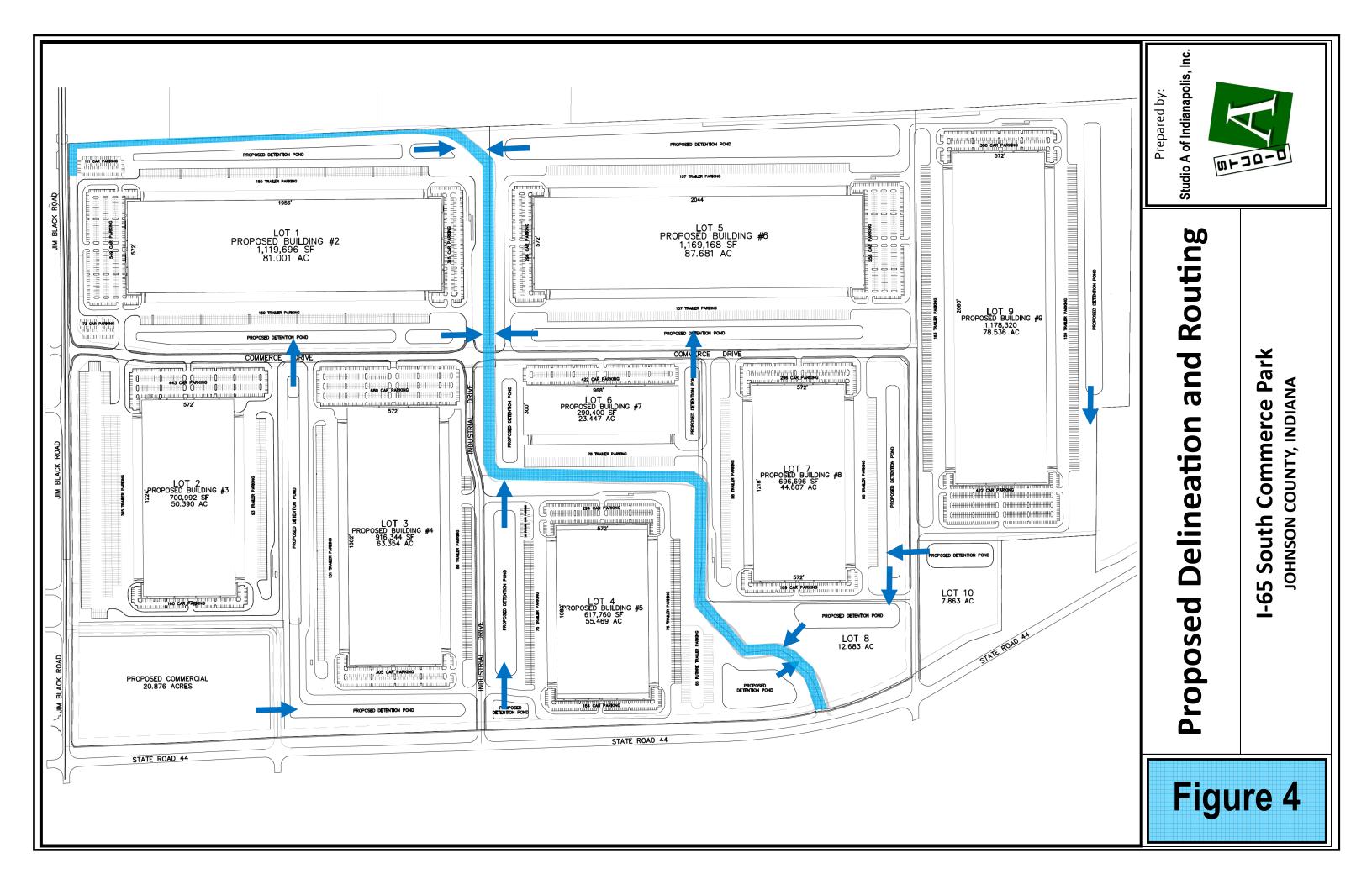


USDA Soil Mapping

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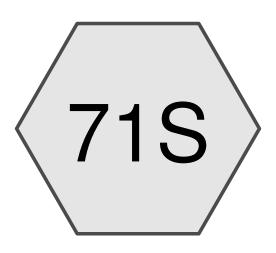
I-65 South Commerce Park NRCS SOIL MAPPING JOHNSON COUNTY, INDIANA

Figure 3



Appendix A

I-65 Commerce Park PLAT Lots 1-1010 YR and 100 YR Existing ConditionRelease Rate Analysis



DA EX









I-65 Master Draiange

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Area Listing (selected nodes)

Area	CN	Description
(acres)		(subcatchment-numbers)
47.249	85	Row crops, straight row, Good, HSG C (71S)
495.844	89	Row crops, straight row, Good, HSG D (71S)

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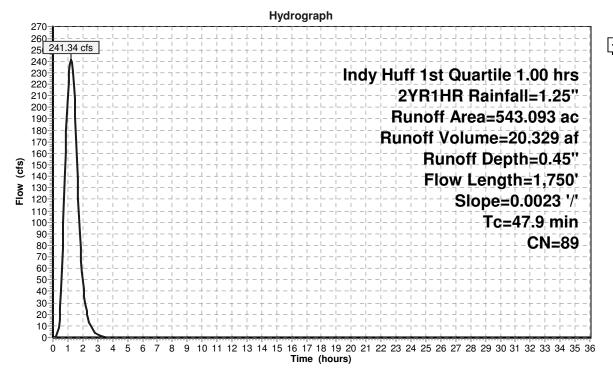
Summary for Subcatchment 71S: DA EX

20.329 af, Depth= 0.45" Runoff 241.34 cfs @ 1.23 hrs, Volume=

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Indy Huff 1st Quartile 1.00 hrs 2YR1HR Rainfall=1.25"

_	Area	(ac) C	N Desci	escription								
	47.	249 8	5 Row	Row crops, straight row, Good, HSG C								
_	495.	844 8	9 Row	crops, stra	ight row, G	ood, HSG D						
	543.093 89 Weighted Average											
	543.	093	100.0	00% Pervio	us Area							
	Tc	Length	Slope	Velocity	Capacity	Description						
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)							
	12.3	100	0.0023	0.14		Sheet Flow, Sheet Component						
						Cultivated: Residue<=20% n= 0.060 P2= 2.64"						
	35.6	1,650	0.0023	0.77		Shallow Concentrated Flow, Shallow						
_						Unpaved Kv= 16.1 fps						
	47 9	1 750	Total									

Subcatchment 71S: DA EX



Runoff

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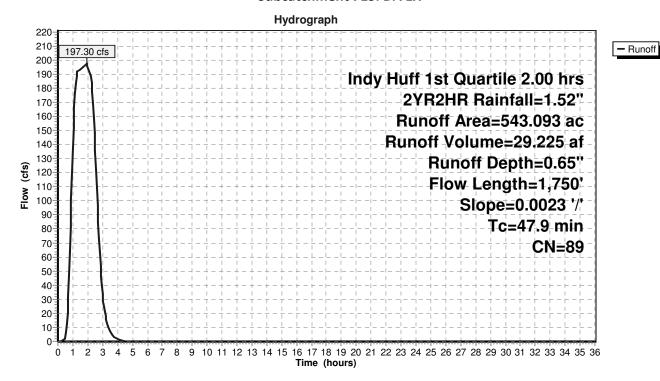
Summary for Subcatchment 71S: DA EX

Runoff 29.225 af, Depth= 0.65" 197.30 cfs @ 1.93 hrs, Volume=

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Indy Huff 1st Quartile 2.00 hrs 2YR2HR Rainfall=1.52"

_	Area	(ac) C	N Desci	scription							
	47.	249 8	5 Row	Row crops, straight row, Good, HSG C							
	495.	844 8	9 Row	crops, stra	ight row, G	ood, HSG D					
	543.093 89 Weighted Average										
	543.	093	100.0	00% Pervio	us Area						
	Tc	Length	Slope	Velocity	Capacity	Description					
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)						
	12.3	100	0.0023	0.14		Sheet Flow, Sheet Component					
						Cultivated: Residue<=20% n= 0.060 P2= 2.64"					
	35.6	1,650	0.0023	0.77		Shallow Concentrated Flow, Shallow					
_						Unpaved Kv= 16.1 fps					
	/7 Q	1 750	Total								

Subcatchment 71S: DA EX



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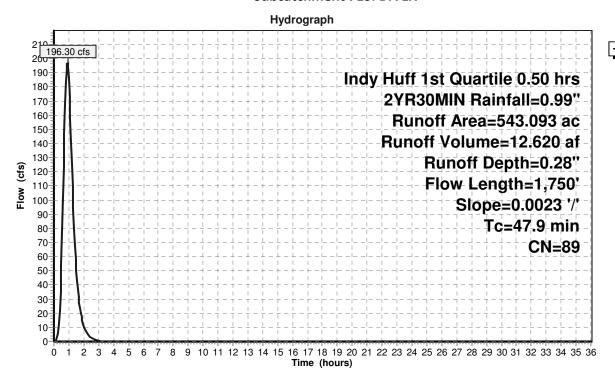
Summary for Subcatchment 71S: DA EX

Runoff 12.620 af, Depth= 0.28" 196.30 cfs @ 0.91 hrs, Volume=

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Indy Huff 1st Quartile 0.50 hrs 2YR30MIN Rainfall=0.99"

_	Area	(ac) C	N Desci	ription						
	47.	249 8	85 Row crops, straight row, Good, HSG C							
	495.844 89 Row crops, straight row, Good, HSG D									
	543.093 89 Weighted Average									
	543.	093	100.0	00% Pervio	us Area					
	Tc	Length	Slope	Velocity	Capacity	Description				
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)					
	12.3	100	0.0023	0.14		Sheet Flow, Sheet Component				
						Cultivated: Residue<=20% n= 0.060 P2= 2.64"				
	35.6	1,650	0.0023	0.77		Shallow Concentrated Flow, Shallow				
_						Unpaved Kv= 16.1 fps				
	47 9	1 750	Total							

Subcatchment 71S: DA EX



Runoff

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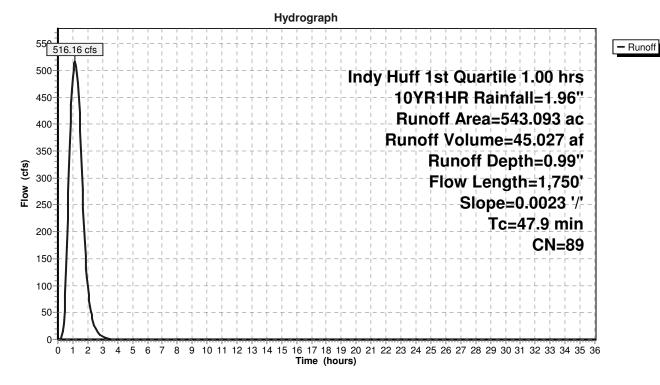
Summary for Subcatchment 71S: DA EX

Runoff 45.027 af, Depth= 0.99" 516.16 cfs @ 1.16 hrs, Volume=

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Indy Huff 1st Quartile 1.00 hrs 10YR1HR Rainfall=1.96"

_	Area	(ac) C	N Desci	escription								
	47.	249 8	5 Row	Row crops, straight row, Good, HSG C								
_	495.	844 8	9 Row	crops, stra	ight row, G	ood, HSG D						
	543.093 89 Weighted Average											
	543.	093	100.0	00% Pervio	us Area							
	Tc	Length	Slope	Velocity	Capacity	Description						
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)							
	12.3	100	0.0023	0.14		Sheet Flow, Sheet Component						
						Cultivated: Residue<=20% n= 0.060 P2= 2.64"						
	35.6	1,650	0.0023	0.77		Shallow Concentrated Flow, Shallow						
_						Unpaved Kv= 16.1 fps						
	47 9	1 750	Total									

Subcatchment 71S: DA EX



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Summary for Subcatchment 71S: DA EX

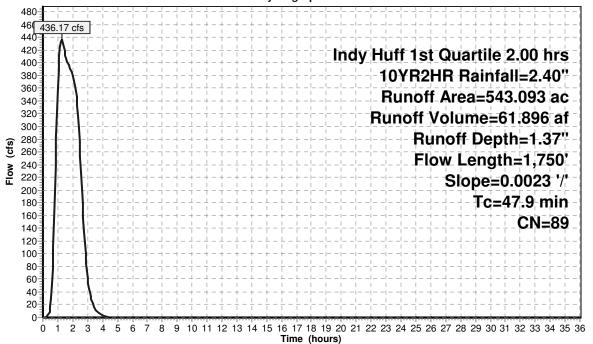
Runoff 61.896 af, Depth= 1.37" 436.17 cfs @ 1.25 hrs, Volume=

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Indy Huff 1st Quartile 2.00 hrs 10YR2HR Rainfall=2.40"

_	Area	(ac) C	N Desci	escription								
	47.	249 8	5 Row	Row crops, straight row, Good, HSG C								
_	495.	844 8	9 Row	crops, stra	ight row, G	ood, HSG D						
	543.093 89 Weighted Average											
	543.	093	100.0	00% Pervio	us Area							
	Tc	Length	Slope	Velocity	Capacity	Description						
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)							
	12.3	100	0.0023	0.14		Sheet Flow, Sheet Component						
						Cultivated: Residue<=20% n= 0.060 P2= 2.64"						
	35.6	1,650	0.0023	0.77		Shallow Concentrated Flow, Shallow						
_						Unpaved Kv= 16.1 fps						
	47 9	1 750	Total									

Subcatchment 71S: DA EX

Hydrograph



Runoff

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Summary for Subcatchment 71S: DA EX

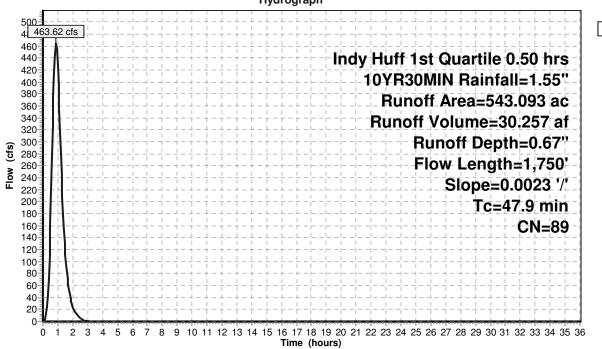
30.257 af, Depth= 0.67" Runoff 463.62 cfs @ 0.88 hrs, Volume=

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Indy Huff 1st Quartile 0.50 hrs 10YR30MIN Rainfall=1.55"

_	Area	(ac) C	N Desci	escription								
	47.	249 8	5 Row	Row crops, straight row, Good, HSG C								
_	495.	844 8	9 Row	crops, stra	ight row, G	ood, HSG D						
	543.093 89 Weighted Average											
	543.	093	100.0	00% Pervio	us Area							
	Tc	Length	Slope	Velocity	Capacity	Description						
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)							
	12.3	100	0.0023	0.14		Sheet Flow, Sheet Component						
						Cultivated: Residue<=20% n= 0.060 P2= 2.64"						
	35.6	1,650	0.0023	0.77		Shallow Concentrated Flow, Shallow						
_						Unpaved Kv= 16.1 fps						
	47 9	1 750	Total									

Subcatchment 71S: DA EX

Hydrograph



- Runoff

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Runoff

Summary for Subcatchment 71S: DA EX

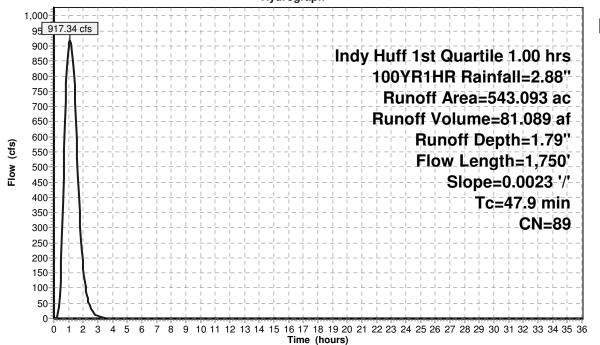
Runoff 81.089 af, Depth= 1.79" 917.34 cfs @ 1.10 hrs, Volume=

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Indy Huff 1st Quartile 1.00 hrs 100YR1HR Rainfall=2.88"

_	Area	(ac) C	N Desci	escription								
	47.	249 8	5 Row	Row crops, straight row, Good, HSG C								
_	495.	844 8	9 Row	crops, stra	ight row, G	ood, HSG D						
	543.093 89 Weighted Average											
	543.	093	100.0	00% Pervio	us Area							
	Tc	Length	Slope	Velocity	Capacity	Description						
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)							
	12.3	100	0.0023	0.14		Sheet Flow, Sheet Component						
						Cultivated: Residue<=20% n= 0.060 P2= 2.64"						
	35.6	1,650	0.0023	0.77		Shallow Concentrated Flow, Shallow						
_						Unpaved Kv= 16.1 fps						
	47 9	1 750	Total									

Subcatchment 71S: DA EX

Hydrograph



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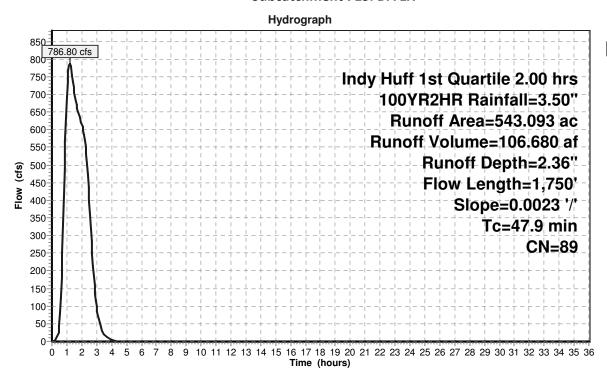
Summary for Subcatchment 71S: DA EX

Runoff 106.680 af, Depth= 2.36" 786.80 cfs @ 1.20 hrs, Volume=

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Indy Huff 1st Quartile 2.00 hrs 100YR2HR Rainfall=3.50"

_	Area	(ac) C	N Desci	escription								
	47.	249 8	5 Row	Row crops, straight row, Good, HSG C								
_	495.	844 8	9 Row	crops, stra	ight row, G	ood, HSG D						
	543.093 89 Weighted Average											
	543.	093	100.0	00% Pervio	us Area							
	Tc	Length	Slope	Velocity	Capacity	Description						
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)							
	12.3	100	0.0023	0.14		Sheet Flow, Sheet Component						
						Cultivated: Residue<=20% n= 0.060 P2= 2.64"						
	35.6	1,650	0.0023	0.77		Shallow Concentrated Flow, Shallow						
_						Unpaved Kv= 16.1 fps						
	47 9	1 750	Total									

Subcatchment 71S: DA EX



- Runoff

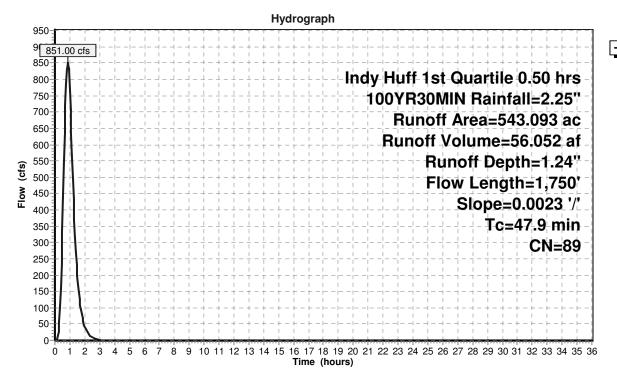
Summary for Subcatchment 71S: DA EX

Runoff = 851.00 cfs @ 0.87 hrs, Volume= 56.052 af, Depth= 1.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Indy Huff 1st Quartile 0.50 hrs 100YR30MIN Rainfall=2.25"

	Area	(ac) C	N Desci	ription											
	47.	249 8	5 Row	ow crops, straight row, Good, HSG C											
	495.	844 8	9 Row	ow crops, straight row, Good, HSG D											
	543.	093 89 Weighted Average													
	543.	093	100.0	00% Pervio	us Area										
	Tc	Length	Slope	Velocity	Capacity	Description									
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)										
	12.3	100	0.0023	0.14		Sheet Flow, Sheet Component									
						Cultivated: Residue<=20% n= 0.060 P2= 2.64"									
	35.6	1,650	0.0023	0.77		Shallow Concentrated Flow, Shallow									
_						Unpaved Kv= 16.1 fps									
	/17 Q	1 750	Total	•	·										

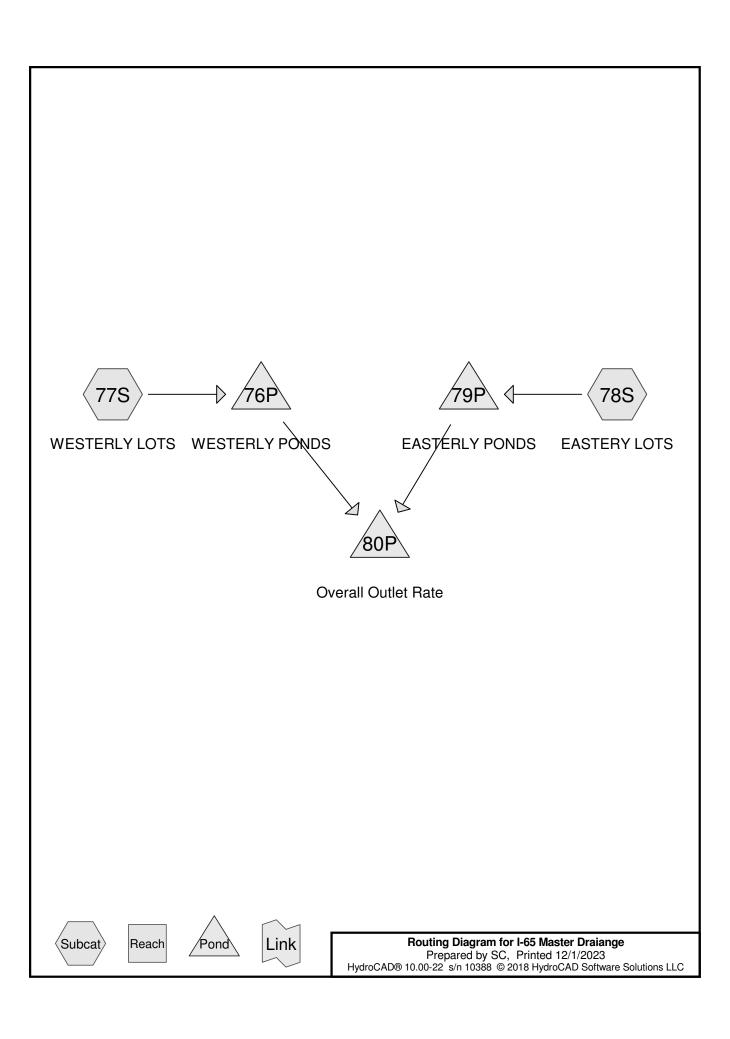
Subcatchment 71S: DA EX



- Runoff

Appendix B

I-65 Commerce Park PLAT Lots 1-10
Proposed Condition Aggregate Staging and
Release Rate



I-65 Master Draiange

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Area Listing (selected nodes)

Area	CN	Description
(acres)		(subcatchment-numbers)
81.001	94	LOT1 (77S)
7.863	94	LOT10 (78S)
50.390	94	LOT2 (77S)
63.354	94	LOT3 (77S)
55.469	94	LOT4 (77S)
87.681	94	LOT5 (78S)
23.447	94	LOT6 (78S)
44.607	94	LOT7 (78S)
12.683	94	LOT8 (78S)
78.536	94	LOT9 (78S)
20.876	94	PR COMM (77S)
17.186	94	ROW (77S, 78S)

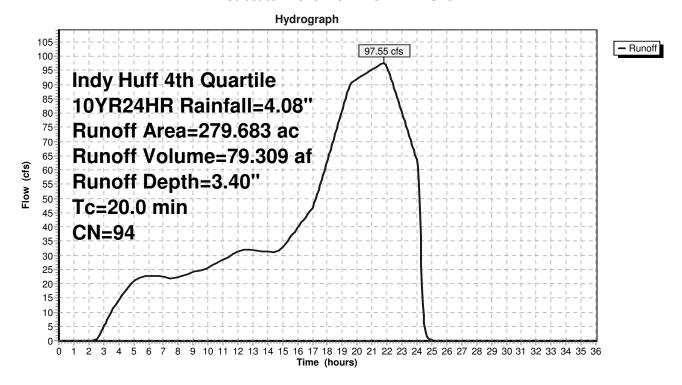
Summary for Subcatchment 77S: WESTERLY LOTS

Runoff = 97.55 cfs @ 21.77 hrs, Volume= 79.309 af, Depth= 3.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Indy Huff 4th Quartile 10YR24HR Rainfall=4.08"

	Area (ac)	CN	Descr	ription			
*	81.001	94	LOT1				
*	50.390	94	LOT2				
*	63.354	94	LOT3				
*	55.469	94	LOT4				
*	20.876	94	PR CC	MMC			
*	8.593	94	ROW				
	279.683 94 Weighted Average				ige		
	279.683		100.00% Pervious Area				
	Tc Leng	ngth Slope		Velocity	Capacity	Description	
	(min) (feet)		(ft/ft)	(ft/sec)	(cfs)		
	20.0					Direct Entry,	

Subcatchment 77S: WESTERLY LOTS



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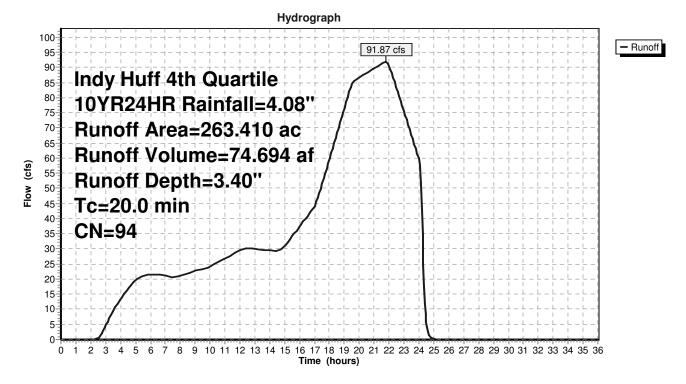
Summary for Subcatchment 78S: EASTERY LOTS

Runoff = 91.87 cfs @ 21.77 hrs, Volume= 74.694 af, Depth= 3.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Indy Huff 4th Quartile 10YR24HR Rainfall=4.08"

	Area (ac)	CN	Description	1			
*	87.681	94	LOT5				
*	23.447	94	LOT6				
*	44.607	94	LOT7				
*	12.683	94	LOT8				
*	78.536	94	LOT9				
*	7.863	94	LOT10				
*	8.593	94	ROW				
	263.410 94 Weighted Average						
	263.410	100.00% Pe	ervious Ar	ea			
	Tc Leng	gth	Slope Velocity Capacity			Description	
_	(min) (fe	et)	(ft/ft) (ft/s	sec)	(cfs)		
	20.0					Direct Entry.	

Subcatchment 78S: EASTERY LOTS



I-65 Master Draiange

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Summary for Pond 76P: WESTERLY PONDS

Inflow Area = 279.683 ac, 0.00% Impervious, Inflow Depth = 3.40" for 10YR24HR event

Inflow = 97.55 cfs @ 21.77 hrs, Volume= 79.309 af

Outflow = 41.52 cfs @ 25.05 hrs, Volume= 53.748 af, Atten= 57%, Lag= 196.6 min

Primary = 41.52 cfs @ 25.05 hrs, Volume= 53.748 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Peak Elev= 718.69' @ 24.23 hrs Surf.Area= 22.432 ac Storage= 53.978 af

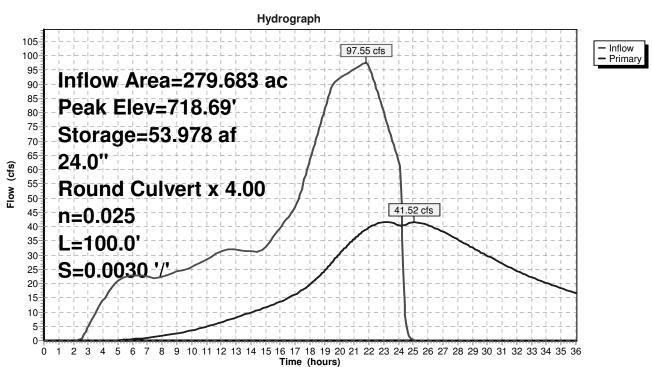
Plug-Flow detention time= 611.6 min calculated for 53.674 af (68% of inflow)

Center-of-Mass det. time= 460.1 min (1,480.2 - 1,020.1)

Volume	Inv	ert <i>A</i>	Avail.Stora	ige S	Storage Description				
#1	716.	00'	110.530	af (Custom Stage Data (Pri	smatic) List	ed below (Re	calc)	
Elevatio		ırf.Area (acres)							
716.0	00	17.748		0.00	0.000				
721.0	00	26.464		10.53	0 110.530				
Device	Routing		Invert	Outle	t Devices				
#1	#1 Primary		716.00'	Inlet ,	Round Culvert X 4.00 / Outlet Invert= 716.00 025, Flow Area= 3.14 s	/ 715.70'	-	_	Ke= 0.500

Primary OutFlow Max=41.52 cfs @ 25.05 hrs HW=718.59' TW=0.00' (Dynamic Tailwater) 1=Culvert (Barrel Controls 41.52 cfs @ 3.33 fps)

Pond 76P: WESTERLY PONDS



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Summary for Pond 79P: EASTERLY PONDS

Inflow Area = 263.410 ac, 0.00% Impervious, Inflow Depth = 3.40" for 10YR24HR event

Inflow = 91.87 cfs @ 21.77 hrs, Volume= 74.694 af

Outflow = 34.07 cfs @ 24.25 hrs, Volume= 39.593 af, Atten= 63%, Lag= 148.9 min

Primary = 34.07 cfs @ 24.25 hrs, Volume= 39.593 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Peak Elev= 718.08' @ 24.25 hrs Surf.Area= 30.863 ac Storage= 58.034 af

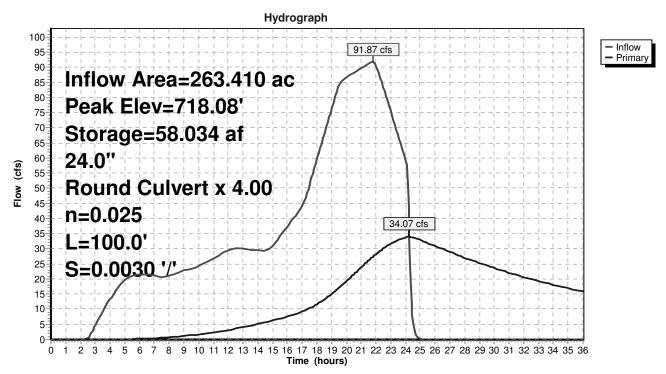
Plug-Flow detention time= 753.4 min calculated for 39.593 af (53% of inflow)

Center-of-Mass det. time= 511.1 min (1,531.2 - 1,020.1)

Volume		Invert	Avail.Stor	age	Storage Description			
#1	7	'16.00'	160.34	0 af	Custom Stage Data (Pris	smatic) List	ted below (Recalc)	
Elevatio		Surf.Are (acre		nc.Stor				
716.0	00	24.82	25	0.00	0.000			
721.0	00	39.311		160.34	160.340			
Device	Rout	ing	Invert	Outle	et Devices			
#1	Prim	ary	716.00' 2		" Round Culvert X 4.00	L= 100.0'	RCP, square edge headwall, Ke= 0.500	
				Inlet	/ Outlet Invert= 716.00'	/ 715.70'	S= 0.0030 '/' Cc= 0.900	
				n= 0.	.025, Flow Area= 3.14 st	f		

Primary OutFlow Max=34.07 cfs @ 24.25 hrs HW=718.08' TW=0.00' (Dynamic Tailwater) 1=Culvert (Barrel Controls 34.07 cfs @ 3.23 fps)

Pond 79P: EASTERLY PONDS



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Summary for Pond 80P: Overall Outlet Rate

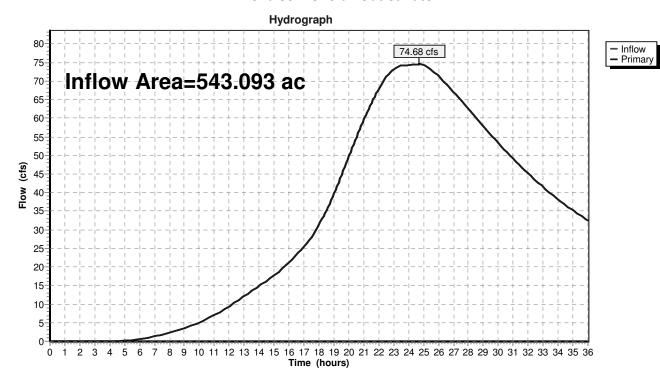
Inflow Area = 543.093 ac, 0.00% Impervious, Inflow Depth > 2.06" for 10YR24HR event

Inflow = 74.68 cfs @ 24.71 hrs, Volume= 93.342 af

Primary = 74.68 cfs @ 24.71 hrs, Volume= 93.342 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Pond 80P: Overall Outlet Rate



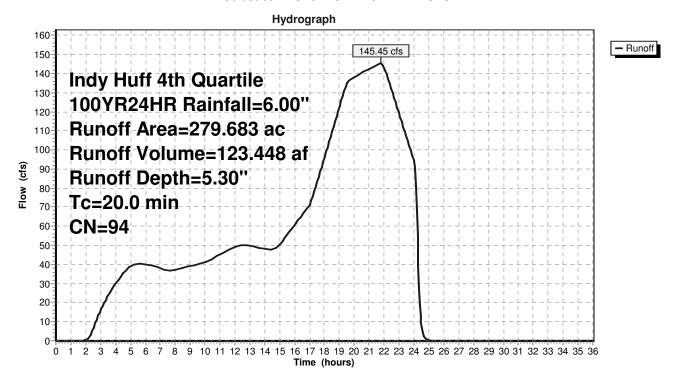
Summary for Subcatchment 77S: WESTERLY LOTS

Runoff = 145.45 cfs @ 21.76 hrs, Volume= 123.448 af, Depth= 5.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Indy Huff 4th Quartile 100YR24HR Rainfall=6.00"

_	Area (ac)	CN	Descr	ription							
*	81.001	94	LOT1								
*	50.390	94	LOT2								
*	63.354	94	LOT3								
*	55.469	94	LOT4								
*	20.876	94	PR CC	MMC							
*	8.593	94	ROW	ROW							
	279.683	94	Weig	hted Avera	age						
	279.683		100.00% Pervious Area								
	Tc Leng	gth	Slope	Velocity	Capacity	Description					
_	(min) (fe	et)	(ft/ft)	(ft/sec)	(cfs)						
	20.0					Direct Entry,					

Subcatchment 77S: WESTERLY LOTS



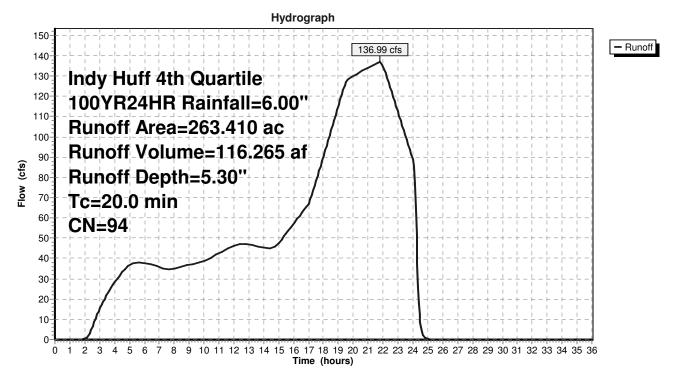
Summary for Subcatchment 78S: EASTERY LOTS

Runoff = 136.99 cfs @ 21.76 hrs, Volume= 116.265 af, Depth= 5.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Indy Huff 4th Quartile 100YR24HR Rainfall=6.00"

_	Area (ac)	CN	Descr	ription						
*	87.681	94	LOT5							
*	23.447	94	LOT6							
*	44.607	94	LOT7							
*	12.683	94	LOT8							
*	78.536	94	LOT9	ОТ9						
*	7.863	94	LOT1	LOT10						
*	8.593	94	ROW							
	263.410	94	Weig	hted Avera	ige					
	263.410		100.0	00% Pervio	us Area					
	Tc Leng	ength Slope		Velocity	Capacity	Description				
_	(min) (fe	et)	(ft/ft) (ft/sec) (d		(cfs)					
	20.0					Direct Entry,				

Subcatchment 78S: EASTERY LOTS



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Summary for Pond 76P: WESTERLY PONDS

Inflow Area = 279.683 ac, 0.00% Impervious, Inflow Depth = 5.30" for 100YR24HR event

Inflow = 145.45 cfs @ 21.76 hrs, Volume= 123.448 af

Outflow = 59.92 cfs @ 24.23 hrs, Volume= 85.234 af, Atten= 59%, Lag= 148.0 min

Primary = 59.92 cfs @ 24.23 hrs, Volume= 85.234 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Peak Elev= 719.86' @ 24.23 hrs Surf.Area= 24.472 ac Storage= 81.421 af

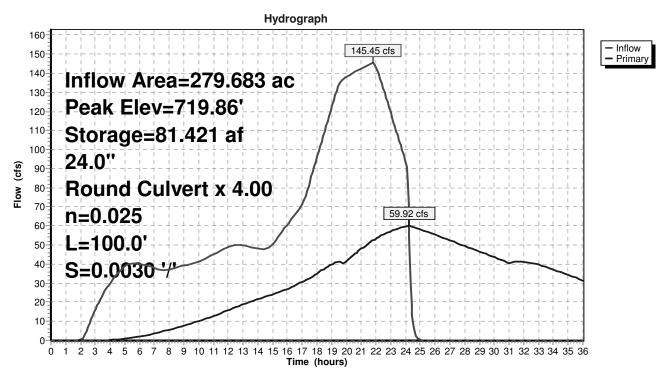
Plug-Flow detention time= 606.2 min calculated for 85.234 af (69% of inflow)

Center-of-Mass det. time= 452.8 min (1,449.7 - 996.9)

Volume	ln۱	vert A	Avail.Stor	age S	Storage Description				
#1	716	.00'	110.530	0 af (Custom Stage Data (Pri	smatic) List	ed below (Re	calc)	
Elevatio		urf.Area (acres)		nc.Store					
716.0	00	17.748		0.000	0.000				
721.0	00	26.464	1	L10.530	0 110.530				
Device	Routing		Invert	Outle	t Devices				
#1	#1 Primary		nary 716.00'		Round Culvert X 4.00 Outlet Invert= 716.00 O25, Flow Area= 3.14 s	' / 715.70'	· · · · · · · · · · · · · · · · · · ·	_	Ke= 0.500

Primary OutFlow Max=59.92 cfs @ 24.23 hrs HW=719.86' TW=0.00' (Dynamic Tailwater) 1=Culvert (Barrel Controls 59.92 cfs @ 4.77 fps)

Pond 76P: WESTERLY PONDS



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Summary for Pond 79P: EASTERLY PONDS

Inflow Area = 263.410 ac, 0.00% Impervious, Inflow Depth = 5.30" for 100YR24HR event

Inflow = 136.99 cfs @ 21.76 hrs, Volume= 116.265 af

Outflow = 46.09 cfs @ 24.27 hrs, Volume= 65.943 af, Atten= 66%, Lag= 150.2 min

Primary = 46.09 cfs @ 24.27 hrs, Volume= 65.943 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Peak Elev= 718.98' @ 24.27 hrs Surf.Area= 33.448 ac Storage= 86.717 af

Plug-Flow detention time= 735.1 min calculated for 65.943 af (57% of inflow)

Center-of-Mass det. time= 504.5 min (1,501.5 - 996.9)

Volume	lı	nvert	Avail.Stor	age S	torage Description	
#1	71	6.00'	160.340) af C	Custom Stage Data	(Prismatic) Listed below (Recalc)
Elevatio		Surf.Area (acres		nc.Store		
716.0	00	24.825	5	0.000	0.000	
721.0	00	39.311	. 1	160.340	160.340	
Device	Routin	ıg	Invert	Outle	t Devices	
#1	Primai	ſy	716.00'			.00 L= 100.0' RCP, square edge headwall, Ke= 0.500 .00' / 715.70' S= 0.0030 '/' Cc= 0.900

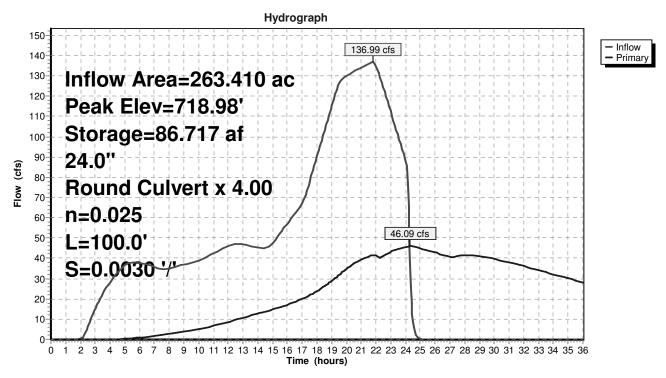
Primary OutFlow Max=46.09 cfs @ 24.27 hrs HW=718.98' TW=0.00' (Dynamic Tailwater) 1=Culvert (Barrel Controls 46.09 cfs @ 3.67 fps)

n= 0.025, Flow Area= 3.14 sf

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Pond 79P: EASTERLY PONDS



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Summary for Pond 80P: Overall Outlet Rate

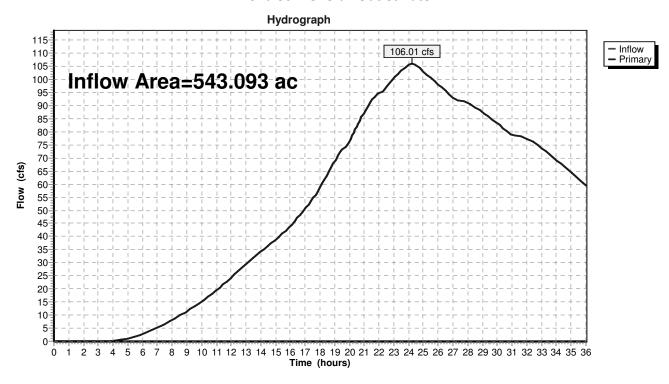
Inflow Area = 543.093 ac, 0.00% Impervious, Inflow Depth > 3.34" for 100YR24HR event

Inflow = 106.01 cfs @ 24.25 hrs, Volume= 151.178 af

Primary = 106.01 cfs @ 24.25 hrs, Volume= 151.178 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Pond 80P: Overall Outlet Rate



Appendix C

CBBEL Proposed Amity Ditch Study
I-65 Commerce Park PLAT Lots 1-9



To: Max Mouser, Studio A of Indianapolis

From: Ian Hahus, E.I.

Subject: Amity Ditch

Date: March 26, 2021

Project Name: Amity Ditch Floodplain Reduction Feasibility Study

Project No.: 19.R200396.00000

CC: Jenny Leshney, P.E., Matt Mead, P.E.

INTRODUCTION

This memorandum presents the findings of the Christopher B. Burke Engineering, LLC (Burke) floodplain analysis and feasibility study for modifications to Amity Ditch related to a proposed commerce park north of State Road 44 near Franklin, Indiana. A project location map is provided as **Exhibit 1**.

The purpose of this study was to perform hydrologic and hydraulic analyses to determine whether the current flow values used in the IDNR approximate model are reasonable, and if flow reduction or channel modifications to Amity Ditch could potentially reduce the floodplain and floodway within the footprint of the proposed development.

The proposed I-65 South Commerce Park lies adjacent to Amity Ditch, a tributary of Young's Creek. The ditch currently has a mapped Federal Emergency Management Agency (FEMA) Zone A floodplain that overlaps a portion of the eastern half of the proposed Commerce Park. The Indiana Department of Natural Resources (IDNR) also maintains a database of floodplains that have not yet been incorporated into the FEMA flood maps. This "Best Available" database shows the proposed park to be within the revised floodplain/floodway at throughout the southern portion of the site. Since the stream drainage area at the outlet of the subdivision is greater than one square mile, the stream falls under IDNR jurisdiction. Therefore, proposed development in the stream's approximate mapped floodway and existing Zone A floodplain would require an IDNR Construction in a Floodway Permit prior to building.

Burke performed the following tasks as part of this analysis:

- Reviewed the approximate model from IDNR as well as modeling, site survey, and conceptual site layout provided by the Client
- Performed a hydrologic analysis to produce revised flow values for the hydraulic model of Amity Ditch
- Updated the existing IDNR approximate model with the new flow values and additional survey and structure data near the site
- Analyzed potential ditch modifications and crossing structures to reduce the extent of the 1-Percent Annual Chance floodplain and associated floodway

HYDROLOGIC AND HYDRAULIC ANALYSIS

Burke developed hydrologic and hydraulic models using standard software from the U.S. Army Corps of Engineers Hydrologic Engineering Center (HEC).

The hydrologic model was used to determine the flow values along Amity Ditch corresponding to the 100-year (1% Annual Exceedance Probability) storm. The model was completed using the HEC Hydrologic Modeling System (HEC-HMS, version 4.2.1) and included the entire drainage area of Amity Ditch to the confluence with Young's Creek. A summary of the hydrologic parameters for the drainage area are listed in **Table 1** and a basin map and computation sheets are provided in **Appendix 1**.

Subbasin	Area (ac)	Curve Number	Time of Concentration (hr)	Storage Coefficient (hr)
1	285	82	1.87	3.47
2	585	84	2.53	4.70
3	672	75	3.29	6.11
4	1068	81	2.99	5.55
5	1092	69	2.69	5.00
6	1012	76	4.65	8.64

Table 1 – Summary of Hydrologic Parameters

The hydraulic model was used to calculate water surface elevations corresponding to the 100-year event in the existing and proposed conditions at the site. The model was completed using the HEC River Analysis System (HEC-RAS, version 4.1.0) and included information from the 2017 Johnson County Digital Elevation Model (DEM) as well as site survey data collected by others. The following is a summary of data and methodologies utilized for the hydrologic and hydraulic analysis:

- Topographic data: 2017 IndianaMap Digital Elevation Model (from LiDAR)
 - Supplemented with site survey by Coor Consulting and Land Services Corporation in June 2020 and February 2021
- Soils data: NRCS Soil Survey for Johnson County, Indiana
- Rainfall data: NOAA Atlas 14
- Rainfall distribution: NOAA 10% All Cases Distribution
- Land use: 2016 National Land Cover Database, updated based on 2016 aerial photography
- Time of concentration: NRCS Technical Release 55 (TR-55)
- Runoff: SCS Curve Number
- Transform: Clark R Method

The current IDNR approximate model ends approximately 1,900 ft upstream of SR 44, just downstream of an existing farm crossing. To complete the hydraulic analysis for the existing condition, the IDNR model was extended approximately 4,750 ft to the upstream end of the existing channel and hydraulic structure data were added for the SR 44 bridge and the culvert at the farm crossing. Channel bed elevations near and upstream of SR 44 were updated based on site survey data.

To complete the hydraulic analysis of the proposed condition, several 2-stage ditch designs were tested to reduce the 100-yr floodplain extents and elevations throughout the proposed project site. All configurations assumed that the bottom two feet of the channel would remain undisturbed. It was assumed that this would restrict modifications to taking place above the ordinary high water mark (OHWM) and perhaps eliminate the

need for a Section 404 permit from the U.S. Army Corps of Engineers (USACE). The proposed 2-stage "shelves" extended out in both directions from the channel and kept a 0.01 ft/ft slope towards the channel to maintain positive drainage. The shelves were tied into existing grade using a 3:1 horizontal:vertical slope. Several sizes of prefabricated conspan structures were tested at the three proposed crossing sites to determine the required flow area.

In addition to channel and structure sizing, the proposed condition model also includes modifications to the overbank terrain to represent fill for the proposed development. The starting locations for the overbank fill were incrementally moved towards the channel to approximate the potential fill/development limits that would maximize developable area without causing an increase in the 100-yr elevations relative to the existing condition model. These approximate limits are overlain on an aerial image of the site in **Exhibit 2**.

The final proposed design consisted of a 60-ft total shelf width for the entire reach of Amity Ditch upstream of SR 44 and three identical 36-ft span x 8-ft rise conspan arch culverts at the three proposed crossing locations. Model results for the existing and proposed scenarios are provided in **Appendix 2** and summarized below in **Table 2.** A map showing the extents of the effective and proposed floodplains is included in **Exhibit 3.**

Table 2: Modeling Summary for Existing Conditions

Model Cross Section	Description	100-yr WSE, IDNR Model (ft¹)	100-yr WSE, Existing Condition (ft¹)	100-yr WSE, Proposed Condition (ft¹)
27672	Upstream of SR 44	718.51	718.08	718.15
29402	Limit of IDNR model ²	719.37	719.34	718.71
29590	Upstream of farm crossing	-	719.34	718.80
30952	Upstream of proposed crossings	-	719.67	719.51
32337	Near existing home (5599 E 100 N)	-	720.93	720.37
34146	Upstream limit of existing ditch	-	721.89	720.96

Notes:

- 1. All elevations reference the NAVD88 vertical datum.
- 2. Effective IDNR model ends at location of approximately 1 mi² drainage area

CONCLUSIONS

The proposed alterations to the geometry of Amity Ditch reduce the 100-yr flood elevations relative to the existing condition model developed for this study. Reductions are generally on the order of 0.5 ft and range from 0.04 ft near the upstream-most proposed crossing to more than 0.9 ft at the upstream end of the model.

A Construction in a Floodway permit application will need to be filed with IDNR prior to completing any channel or site modifications that will include placing fill within the regulatory floodway. Because the Effective floodplain is mapped as "Zone A" on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM), this area is considered floodway for regulatory purposes. For the application, completed grading plans will be required for each structure being permitted in addition to the corresponding hydraulic modeling. Construction in a Floodway permits are active for up to two years. After the first year, an extension request would need to be filed with IDNR requesting an additional year to complete the work. Extensions beyond the two year limit are currently not permitted.

Because the proposed site conditions do not result in an increase of the 100-yr flood elevation, a Conditional Letter of Map Revision (CLOMR) may not be necessary from FEMA prior to construction. However, local authorities may request or require a CLOMR be obtained to assure the viability of the project. Early coordination with City of Franklin and Johnson County Drainage Board staff should occur prior to plan development to determine the preferred process.

A Letter of Map Revision (LOMR) will need to be filed after construction to remove any structures from the regulatory floodplain. Final grading and as-built construction documents would be required to update the modeling to complete the application.

Based on the proposed site layout provided by the Client, it may be possible to complete construction of proposed building #3, and potentially building #2, without obtaining an IDNR Construction in a Floodway permit if the final building footprints are outside of the regulatory floodplain extents. Indiana Department of Environmental Management 401 and Rule 5 as well as the US Army Corp of Engineers (USACE) 404 permits may still be required for the development.

Early coordination with local development and drainage authorities for Franklin and Johnson County is strongly recommended. It is possible that the Johnson County drainage board will require permits for modifications to Amity Ditch (a regulated drain) independent of those required by IDNR or USACE. As mentioned above, the City of Franklin may request that a CLOMR be filed before construction even if not legally required by FEMA.

EXHIBITS

Exhibit 1 – Project Location Map

Exhibit 2 – Approximate Developable Area

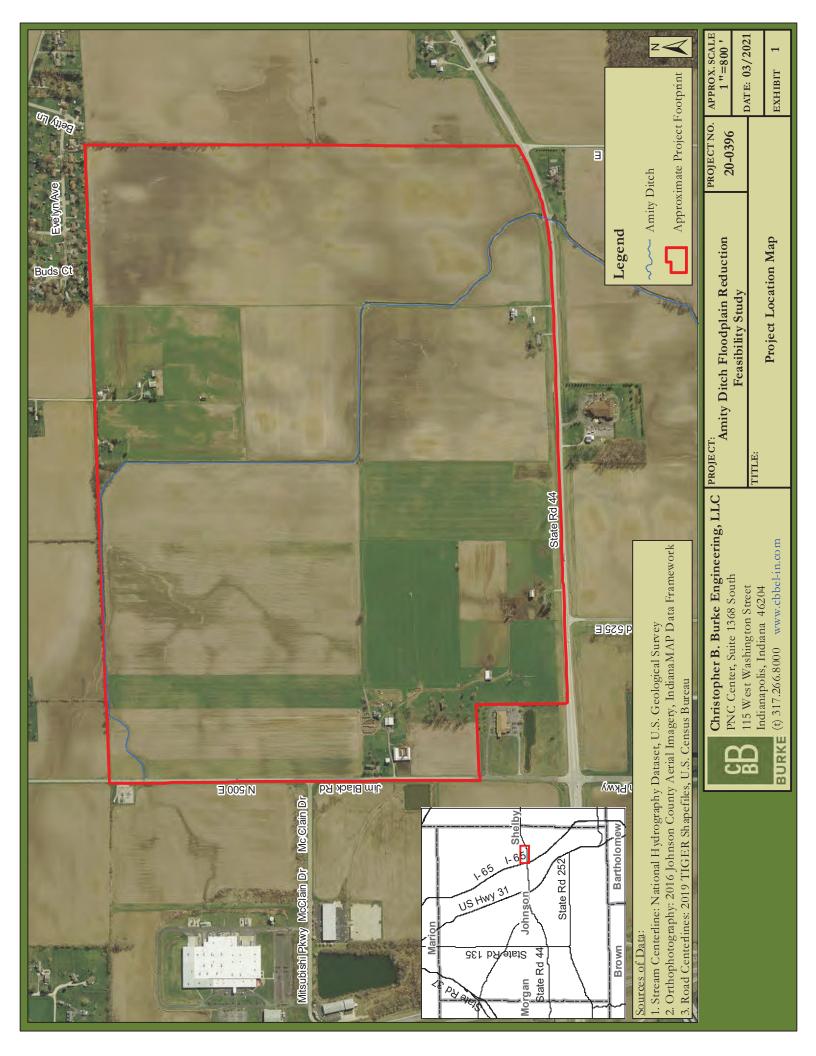
Exhibit 3 – Effective and Proposed Floodplain Extents

APPENDICES

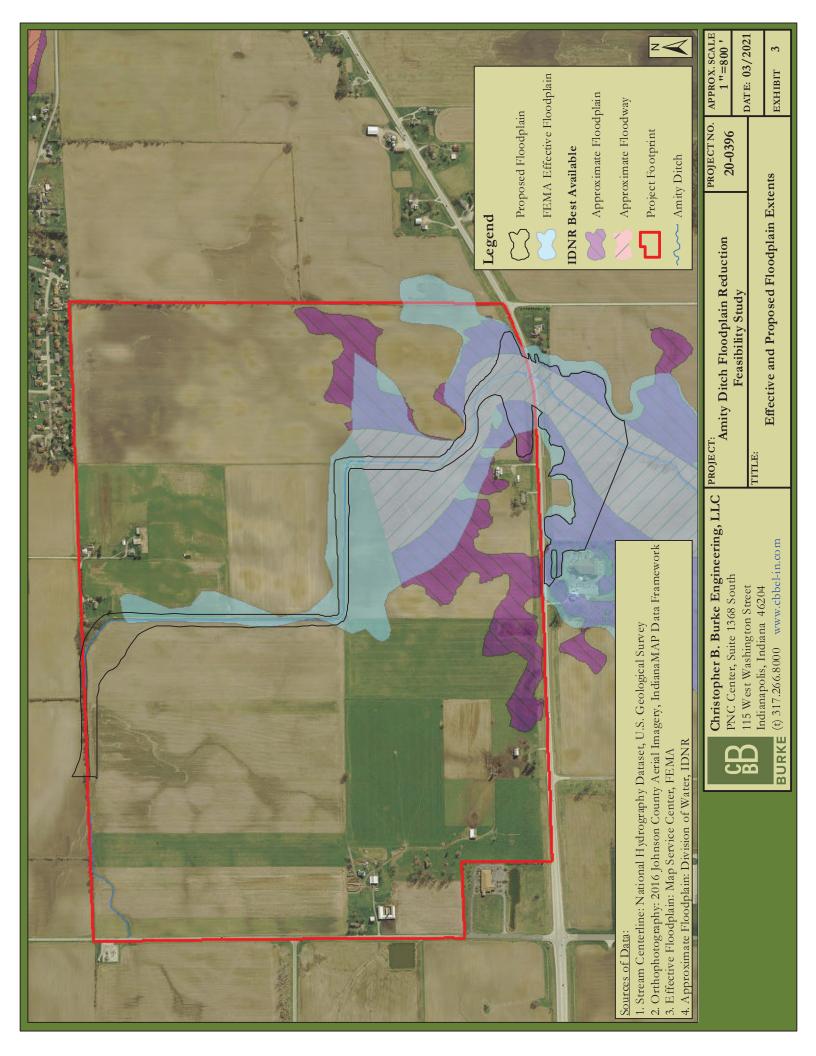
Appendix 1 – Hydrologic Analysis Data

Appendix 2 – Hydraulic Model Results

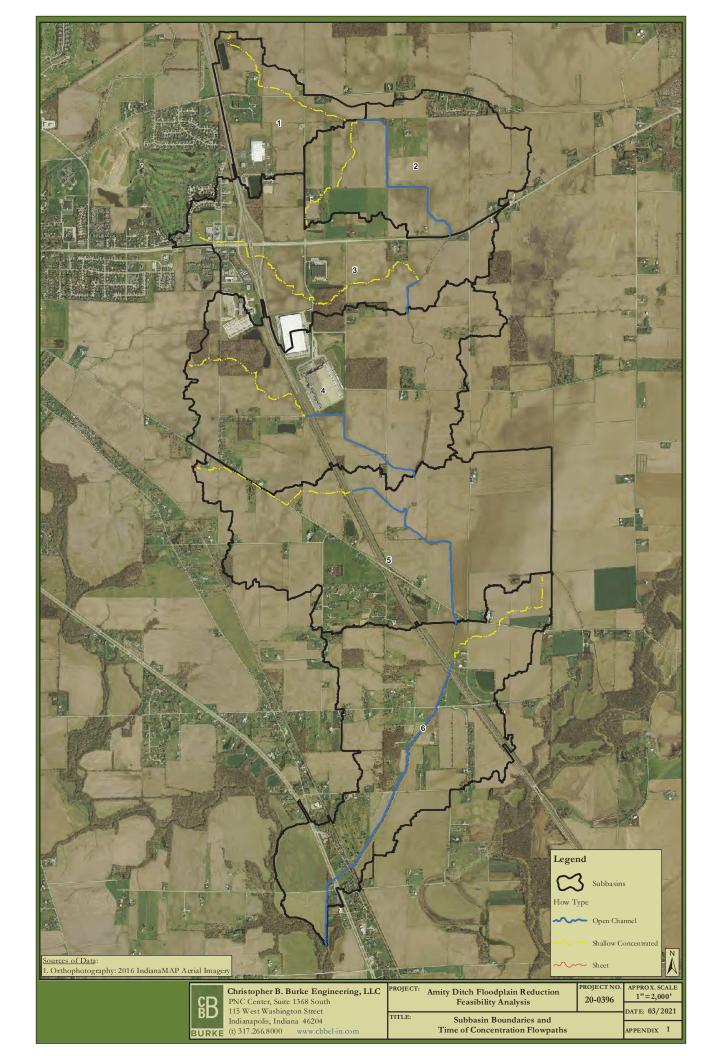
EXHIBITS







APPENDIX 1:	HYDROLOGIC ANALYSIS DATA

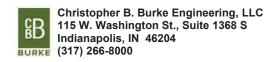




Project Name: Amity Ditch Floodplain Reduction Feasibility Study
Calcs. By: IKH Date: 2/17/21
Check By: MWM Date: 2/18/21

Time of Concentration 1 Basin:

SHEE	T FLOW					Tt(hr) = (0.007(r)	n L)^0.8)/	(P2^0.5 s^0	0.4)
(ft)	(ft)	(ft)		(in)		Surface Desc	ription	n-value	
Length	U/S Elev	D/S Elev	Slope	P2	n	Smooth surfac	res	0.011	Tt (hr)
100	736.2	735.6	0.006	2.91	0.06	Fallow (no res	idue)	0.05	0.13
						Cultivated soil.			
						Residue cove		0.06	
						Residue cove	er>20%	0.17	
						Average		0.15	TOTAL T _t (hr) 0.13
						Grass:			
						Short grass		0.15	
						Lawn grasses		0.24	
						Bermudagras		0.41 0.13	
						Range (natura Woods:	<i>')</i>	0.13	
						Light underbr	ush	0.4	
						Dense under		0.8	
		NCENTR	ATED I	FLOW		Tt(hr) = L/(3600	V)		= 20.3282 S^0.5 ed) = 16.1345 S^0.5
(ft) Length	(ft) U/S Elev	(ft) D/S Flev	Slone	Pave(y/n))	Coef.	Velocity		ed) = 16.1345 S ² 0.5 Tt (hr)
5477.8	735.6	719.5	0.0029	N	y =	20.33 16.135		<u>/</u>	1.74
3477.0	755.0	713.5	0.0023	IN	y – n =	16.13	0.07		1.74
									TOTAL T _t (hr) 1.74
OPEN	CHANNI	EL/PIPE	FLOW						
	CHANNI ing a veloc		FLOW			Tt(hr) = L/(3600	V)		
(assum	ing a veloc (ft/s)		FLOW			Tt(hr) = L/(3600	V)		
(assum	ing a velo		FLOW			Tt(hr) = L/(3600	V)		Tt (hr)
(assum	ing a veloc (ft/s)		FLOW			Tt(hr) = L/(3600	V)		Tt (hr)
(assum	ing a veloc (ft/s)		FLOW			Tt(hr) = L/(3600	V)		Tt (hr)
(assum	ing a veloc (ft/s)		FLOW			Tt(hr) = L/(3600	V)		Tt (hr)
(assum	ing a veloc (ft/s)		FLOW			Tt(hr) = L/(3600	V)		Tt (hr)
(assum	ing a veloc (ft/s)		FLOW			Tt(hr) = L/(3600	V)		
(assum	ing a veloc (ft/s)		FLOW			Tt(hr) = L/(3600	V)		Tt (hr) TOTAL T _t (hr) 0.00
(assum (ft) Length	ing a veloc (ft/s) Velocity	city)	FLOW					V(ft/s) = (TOTAL T _t (hr) 0.00
(assum (ft) Length	ing a veloc (ft/s)	city)	FLOW		(ft)	Tt(hr) = L/(3600		V(ft/s) = (
(assum (ft) Length	ing a veloc (ft/s) Velocity	city)	FLOW		(ft) en Chai	Tt(hr) = L/(3600 (ft) (ft)		V(ft/s) = (TOTAL T _t (hr) 0.00
(assum (ft) Length	ing a veloc (ft/s) Velocity	city) velocity)		<u>Op</u> o	en Chai	Tt(hr) = L/(3600 (ft) (ft)	V)	V(ft/s) = (TOTAL T _t (hr) 0.00
(assum (ft) Length	ing a veloc (ft/s) Velocity suming a v	city) velocity)			en Chai	Tt(hr) = L/(3600 (ft) (ft) nnel Pipe	V) (ft)		TOTAL T _t (hr) 0.00
(assum (ft) Length	ing a veloc (ft/s) Velocity suming a v	city) velocity)			en Chai	Tt(hr) = L/(3600 (ft) (ft) nnel Pipe	V) (ft)		TOTAL T _t (hr) 0.00
(assum (ft) Length	ing a veloc (ft/s) Velocity suming a v	city) velocity)			en Chai	Tt(hr) = L/(3600 (ft) (ft) nnel Pipe	V) (ft)		TOTAL T _t (hr) 0.00
(assum (ft) Length	ing a veloc (ft/s) Velocity suming a v	city) velocity)			en Chai	Tt(hr) = L/(3600 (ft) (ft) nnel Pipe	V) (ft)		TOTAL T _t (hr) 0.00 1.49 R^2/3 S^1/2)/n R Velocity Tt (hr)
(assum (ft) Length	ing a veloc (ft/s) Velocity suming a v	city) velocity)			en Chai	Tt(hr) = L/(3600 (ft) (ft) nnel Pipe	V) (ft)		TOTAL T _t (hr) 0.00
(assum (ft) Length (w/o ass (ft) Length	ing a veloc (ft/s) Velocity suming a v	velocity) (ft) D/S Elev	Slope	n-value	en Chai Bottom	Tt(hr) = L/(3600 (ft) (ft) nnel Pipe SS DIA	V) (ft) Depth	Area	TOTAL T _t (hr) 0.00 1.49 R^2/3 S^1/2)/n R Velocity Tt (hr) TOTAL T _t (hr) 0.00
(assum (ft) Length (w/o ass (ft) Length	ing a veloc (ft/s) Velocity suming a v	velocity) (ft) D/S Elev	Slope		en Chai Bottom	Tt(hr) = L/(3600 (ft) (ft) nnel Pipe SS DIA	V) (ft) Depth	Area	TOTAL T _t (hr) 0.00 1.49 R^2/3 S^1/2)/n R Velocity Tt (hr)
(assum (ft) Length (w/o ass (ft) Length	otal T _c =	velocity) (ft) D/S Elev	Slope	n-value	Bottom Bottom	Tt(hr) = L/(3600 (ft) (ft) (ft) nnel Pipe SS DIA	V) (ft) Depth	Area hours =	TOTAL T _t (hr) 0.00 1.49 R^2/3 S^1/2)/n R Velocity Tt (hr) TOTAL T _t (hr) 0.00 67.4 minutes
(assum (ft) Length (w/o ass (ft) Length	otal T _c =	velocity) (ft) D/S Elev	Slope	n-value	Bottom Bottom	Tt(hr) = L/(3600 (ft) (ft) nnel Pipe SS DIA	V) (ft) Depth	Area	TOTAL T _t (hr) 0.00 1.49 R^2/3 S^1/2)/n R Velocity Tt (hr) TOTAL T _t (hr) 0.00 67.4 minutes



Project Name: Amity Ditch Floodplain Reduction Feasibility Study
Calcs. By: IKH Date: 2/17/21
Check By: MWM Date: 2/18/21

Time of Concentration 2 Basin:

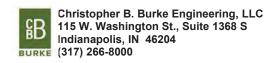
Tt(hr) = (0.007(n L)^0.8)/(P2^0.5 s^0.4)
Length U/S Elev D/S Elev Slope P2 n Smooth surfaces 0.011 Tt (hr 100 732.9 731.9 0.01 2.91 0.24 Fallow (no residue) 0.05 Cultivated soils: Residue cover>20% 0.06 0.17 Average 0.15 TOTAL T _t (hr) 0.33 Average 0.15 TOTAL T _t (hr) 0.33 0.15 0.13 0.15 0.15 0.15 0.13 0.14 0.14 0.14 0.14<
Length U/S Elev D/S Elev Slope P2 n Smooth surfaces 0.011 Tt (hr) 100 732.9 731.9 0.01 2.91 0.24 Fallow (no residue) 0.05 0.05 Cultivated soils: Residue cover<20% 0.06 0.17 Average 0.15 TOTAL T _t (hr) 0.33 Grass: Short grass 0.15 Lawn grasses 0.24 Bermudagrass 0.41 Range (natural) 0.13 Woods: Light underbrush 0.4 0.8 SHALLOW CONCENTRATED FLOW Tt(hr) = L/(3600 V) V(paved) = 20.3282 S^0.5 V(unpaved) = 16.1345 S^0.5 Tt (hr) 1.62 SHALLOW CONCENTRATED FLOW N y = 20.33 16.135 0.79 0.79 N Tt (hr) Tt (hr) 1.62
100
Residue cover<20% 0.06 Residue cover>20% 0.17 Average 0.15 TOTAL T _t (hr) O.33 Grass: Short grass 0.15 Lawn grasses 0.24 Bermudagrass 0.41 Range (natural) 0.13 Woods: Light underbrush 0.8 SHALLOW CONCENTRATED FLOW (ft) (ft) (ft) Length U/S Elev D/S Elev Slope Pave(y/n) Total T _t (hr) Coef. Velocity Total T _t (hr)
Residue cover>20% 0.17
Average
Crass: Short grass 0.15 Lawn grasses 0.24 Bermudagrass 0.41 Range (natural) 0.13 Woods: Light underbrush 0.8
Short grass 0.15 Lawn grasses 0.24 Bermudagrass 0.41 Range (natural) 0.13 Woods: Light underbrush 0.4 Dense underbrush 0.8 SHALLOW CONCENTRATED FLOW (ft) (ft) (ft) (ft) (ft) (ft) Length U/S Elev D/S Elev Slope Pave(y/n) Coef. Velocity V(paved) = 20.3282 S^0.5 V(unpaved) = 16.1345 S^0.5 Length U/S Elev D/S Elev Slope Pave(y/n) Coef. Velocity Tt (hr) 1.62 OPEN CHANNEL/PIPE FLOW Total T _t (hr) 1.62 Total T _t (hr
Lawn grasses 0.24 Bermudagrass 0.41 Range (natural) 0.13 Woods: Light underbrush 0.4 Dense underbrush 0.8 SHALLOW CONCENTRATED FLOW (ft) (ft) (ft) (ft) Length U/S Elev D/S Elev Slope Pave(y/n) 4628.7 731.9 720.7 0.0024 N y = 20.33 16.135 0.79 n = 16.13 OPEN CHANNEL/PIPE FLOW
Bermudagrass 0.41
Range (natural) 0.13 Woods: Light underbrush 0.4 Dense underbrush 0.8
Woods: Light underbrush 0.4 0.8
Light underbrush
Dense underbrush 0.8
SHALLOW CONCENTRATED FLOW (ft) (ft) (ft) (ft) Length U/S Elev D/S Elev Slope Pave(y/n) 4628.7 731.9 720.7 0.0024 N y = 20.33 16.135 0.79 n = 16.13 Total T _t (hr) Total T _t (hr) Total T _t (hr) 1.62
(ft) (ft) (ft) (ft) (ft) (ft) (ft) (ft)
Length U/S Elev D/S Elev Slope Pave(y/n) Coef. Velocity 4628.7 731.9 720.7 0.0024 N y = 20.33 16.135 0.79 n = 16.13 16.13 TOTAL T _t (hr) 1.62
4628.7 731.9 720.7 0.0024 N y = 20.33 16.135 0.79 n = 16.13 TOTAL T _t (hr) 1.62
n = 16.13 TOTAL T _t (hr) 1.62 OPEN CHANNEL/PIPE FLOW
TOTAL T _t (hr) 1.62 OPEN CHANNEL/PIPE FLOW
OPEN CHANNEL/PIPE FLOW
OPEN CHANNEL/PIPE FLOW
OPEN CHANNEL/PIPE FLOW
(documing a voicoity)
(ft) (ft/s)
Length Velocity Tt (hr
6234.6 3 0.58
TOTAL T _t (hr) 0.58
Tyle 1/2000 N
(w/o assuming a velocity) $Tt(hr) = L/(3600 \text{ V})$ $V(ft/s) = (1.49 \text{ R}^2/3 \text{ S}^1/2)/n$
(ft) (ft) (ft) Open Channel Bire (ft)
• (#) (#) (#) UNON L.NANNOL PINO (#)
(ft) (ft) (ft) Open Channel Pipe (ft) Length LVS Fley D/S Fley Slope n-value Rottom SS DIA Depth Area R Velocity Tt /hr
Length U/S Elev D/S Elev Slope n-value Bottom SS DIA Depth Area R Velocity Tt (hr
Length U/S Elev D/S Elev Slope n-value Bottom SS DIA Depth Area R Velocity Tt (hr
Length U/S Elev D/S Elev Slope n-value Bottom SS DIA Depth Area R Velocity Tt (hr
Length U/S Elev D/S Elev Slope n-value Bottom SS DIA Depth Area R Velocity Tt (hr
Length U/S Elev D/S Elev Slope n-value Bottom SS DIA Depth Area R Velocity Tt (hr



Project Name: Amity Ditch Floodplain Reduction Feasibility Study
Calcs. By: IKH Date: 2/17/21
Check By: MWM Date: 2/18/21

Time of Concentration 3 Basin:

LOWERT ELOWA											
SHEET FLOW					Tt(hr) =	(0.007(n	L)^0.8)/((P2^0.5 s^0	.4)		
(ft) (ft)	(ft)		(in)		Surfac	e Descr	<u>iption</u>	n-value			
Length U/S Elev	D/S Elev	Slope	P2	n	Smoo	th surface	es	0.011			Tt (hr)
100 752.3	751.1	0.012	2.91	0.15		v (no resid ated soils	,	0.05			0.21
					Resi	due cover	<20%	0.06			
					Resi	due cover	>20%	0.17			
					Ave	erage		0.15	TO	TAL T _t (hr)	0.21
					Grass	s:				_	
						t grass		0.15			
						n grasses		0.24			
						nudagrass		0.41 0.13			
					Wood	e (natural) Is:	,	0.13			
						underbru	sh	0.4			
						se underb		0.8			
								-			
SHALLOW CO	(ft)				Tt(hr) =	L/(3600 '	V)			3282 S^0.5 16.1345 S^0	.5
Length U/S Elev	D/S Elev	Slope	Pave(y/n))		Coef.	Velocity	<u>/</u>			Tt (hr)
10362 751.1	713.5	0.0036	N	y =	20.33	16.135	0.97				2.96
				n =	16.13						
									то:	TAL T /b-\	0.00
									10	TAL T _t (hr)	2.96
OPEN CHANN	EI /DIDE										
(assuming a veloc		LOW			Tt(hr) =	L/(3600 '	V)				
(ft) (ft/s)	,,,				1 ((111)	L/(0000	•)				
Length Velocity											Tt (hr)
1261.7 3	,										0.12
									то-	TAL T (b)	0.10
									10	TAL T _t (hr)	0.12
(w/o assuming a v	velocity)				Tt(hr) =	L/(3600 '	(/)	\/(ft/s) = (1 49 [R^2/3 S^1/2)/n
(m/o accaming a	, 0.00.0,			(ft)	(ft)	(ft)	• /	(120) (1 2/0 0 1/2	<i>,,</i>
			Ope	en Char		<u>Pipe</u>	(ft)				
(ft) (ft)	(ft)					DIA					T. /I \
(ft) (ft) Length U/S Elev	. ,	Slope	n-value	Bottom	SS	DIA	Depth	Area	R	Velocity	Tt (hr)
. ,	. ,	Slope	n-value	Bottom	SS	DIA	Depth	Area	R	Velocity	It (hr)
. ,	. ,	Slope	n-value	Bottom	SS	DIA	Depth	Area	R	Velocity	It (hr)
. ,	. ,	Slope	n-value	Bottom	SS	DIA	Depth	Area	R	Velocity	It (hr)
. ,	. ,	Slope	n-value	Bottom	SS	DIA	Depth	Area		·	,
. ,	. ,	Slope	n-value	Bottom	SS	DIA	Depth	Area		Velocity TAL T_t (hr)	0.00
Length U/S Elev	D/S Elev						·		TO	TAL T _t (hr)	, ,
. ,	D/S Elev	Slope hours =				T _{lag} =	1.97		TO	·	, ,
Length U/S Elev Total $T_c =$	D/S Elev	hours =	197	minute		T _{lag} =	·		то [.]	TAL T _t (hr)	, ,



Project Name: Amity Ditch Floodplain Reduction Feasibility Study
Calcs. By: IKH Date: 2/17/21
Check By: MWM Date: 2/18/21

Time of Concentration Basin: 4

SHEE	T FLOW					$Tt(hr) = (0.007(n L)^0.8)/($	P2^0.5 s^0	.4)
(ft)	(ft)	(ft)		(in)		Surface Description	n-value	
Length	U/S Elev	D/S Elev	Slope	P2	n	Smooth surfaces	0.011	Tt (hr)
100	730.9	730.6	0.003	2.91	0.15	Fallow (no residue)	0.05	0.37
						Cultivated soils:		
						Residue cover<20%	0.06	
						Residue cover>20%	0.17	
						Average	0.15	TOTAL T _t (hr) 0.37
						Grass:		-
						Short grass	0.15	
						Lawn grasses	0.24	
						Bermudagrass	0.41	
						Range (natural)	0.13	
						Woods:		
						Light underbrush	0.4	
						Dense underbrush	8.0	
SHALI	LOW CO	NCENTR	RATED	FLOW		Tt(hr) = L/(3600 V)	V(paved)	= 20.3282 S^0.5
(ft)	(ft)	(ft)				()		ed) = 16.1345 S^0.5
	U/S Elev		Slope	Pave(y/n))	Coef. Velocity		Tt (hr)
5513.9	730.6	720.2	0.0019	N	y =	20.33 16.135 0.70	_	2.19
					n =	16.13		
								TOTAL T _t (hr) 2.19
								-
		EL /DIDE						
		EL/PIPE	FLOW			Tr/l> - 1 //2000 \ \		
(assum	ing a velo		FLOW			Tt(hr) = L/(3600 V)		
(assum	ing a veloc (ft/s)		FLOW			Tt(hr) = L/(3600 V)		Tt /hr)
(assum (ft) Length	ing a veloc (ft/s) Velocity		FLOW			Tt(hr) = L/(3600 V)		Tt (hr)
(assum	ing a veloc (ft/s)		FLOW			Tt(hr) = L/(3600 V)		Tt (hr) 0.44
(assum (ft) Length	ing a veloc (ft/s) Velocity		FLOW			Tt(hr) = L/(3600 V)		
(assum (ft) Length	ing a veloc (ft/s) Velocity		FLOW			Tt(hr) = L/(3600 V)		
(assum (ft) Length	ing a veloc (ft/s) Velocity		FLOW			Tt(hr) = L/(3600 V)		
(assum (ft) Length	ing a veloc (ft/s) Velocity		FLOW			Tt(hr) = L/(3600 V)		0.44
(assum (ft) Length	ing a veloc (ft/s) Velocity		FLOW			Tt(hr) = L/(3600 V)		
(assum (ft) Length 4714.1	ing a veloc (ft/s) Velocity	city)	FLOW			Tt(hr) = L/(3600 V) Tt(hr) = L/(3600 V)	V(ft/s) = (0.44
(assum (ft) Length 4714.1	ing a veloc (ft/s) Velocity 3	city)velocity)	FLOW		(ft)	Tt(hr) = L/(3600 V) (ft) (ft)	V(ft/s) = (TOTAL T _t (hr) 0.44
(assum (ft) Length 4714.1	ing a veloc (ft/s) Velocity 3	city) /elocity)			en Chai	Tt(hr) = L/(3600 V) (ft) (ft) nnel Pipe (ft)	, , ,	TOTAL T _t (hr) 0.44 1.49 R^2/3 S^1/2)/n
(assum (ft) Length 4714.1	ing a veloc (ft/s) Velocity 3	city) /elocity)		<u>Ope</u> n-value	en Chai	Tt(hr) = L/(3600 V) (ft) (ft)	V(ft/s) = (TOTAL T _t (hr) 0.44
(assum (ft) Length 4714.1	ing a veloc (ft/s) Velocity 3	city) /elocity)			en Chai	Tt(hr) = L/(3600 V) (ft) (ft) nnel Pipe (ft)	, , ,	TOTAL T _t (hr) 0.44 1.49 R^2/3 S^1/2)/n
(assum (ft) Length 4714.1	ing a veloc (ft/s) Velocity 3	city) /elocity)			en Chai	Tt(hr) = L/(3600 V) (ft) (ft) nnel Pipe (ft)	, , ,	TOTAL T _t (hr) 0.44 1.49 R^2/3 S^1/2)/n
(assum (ft) Length 4714.1	ing a veloc (ft/s) Velocity 3	city) /elocity)			en Chai	Tt(hr) = L/(3600 V) (ft) (ft) nnel Pipe (ft)	, , ,	TOTAL T _t (hr) 0.44 1.49 R^2/3 S^1/2)/n
(assum (ft) Length 4714.1	ing a veloc (ft/s) Velocity 3	city) /elocity)			en Chai	Tt(hr) = L/(3600 V) (ft) (ft) nnel Pipe (ft)	, , ,	TOTAL T _t (hr) 0.44 1.49 R^2/3 S^1/2)/n R Velocity Tt (hr)
(assum (ft) Length 4714.1	ing a veloc (ft/s) Velocity 3	city) /elocity)			en Chai	Tt(hr) = L/(3600 V) (ft) (ft) nnel Pipe (ft)	, , ,	TOTAL T _t (hr) 0.44 1.49 R^2/3 S^1/2)/n
(assum (ft) Length 4714.1	ing a veloc (ft/s) Velocity 3 suming a velocity U/S Elev	velocity) (ft) D/S Elev	Slope	n-value	en Chai Bottom	Tt(hr) = L/(3600 V) (ft) (ft) nnel Pipe (ft) SS DIA Depth	Area	TOTAL T _t (hr) 0.44 1.49 R^2/3 S^1/2)/n R Velocity Tt (hr) TOTAL T _t (hr) 0.00
(mt) Length 4714.1 (w/o ass (ft) Length	ing a veloc (ft/s) Velocity 3	velocity) (ft) D/S Elev		n-value	en Chai	Tt(hr) = L/(3600 V) (ft) (ft) nnel Pipe (ft) SS DIA Depth	Area	TOTAL T _t (hr) 0.44 1.49 R^2/3 S^1/2)/n R Velocity Tt (hr)
(assum (ft) Length 4714.1	ing a veloc (ft/s) Velocity 3 suming a veloc (ft) U/S Elev otal T _c =	velocity) (ft) D/S Elev	Slope	n-value	en Chai Bottom	Tt(hr) = L/(3600 V) (ft) (ft) nnel Pipe (ft) SS DIA Depth	Area	TOTAL T _t (hr) 0.44 1.49 R^2/3 S^1/2)/n R Velocity Tt (hr) TOTAL T _t (hr) 0.00 108 minutes



Project Name: Amity Ditch Floodplain Reduction Feasibility Study
Calcs. By: IKH Date: 2/17/21
Check By: MWM Date: 2/18/21

Time of Concentration 5 Basin:

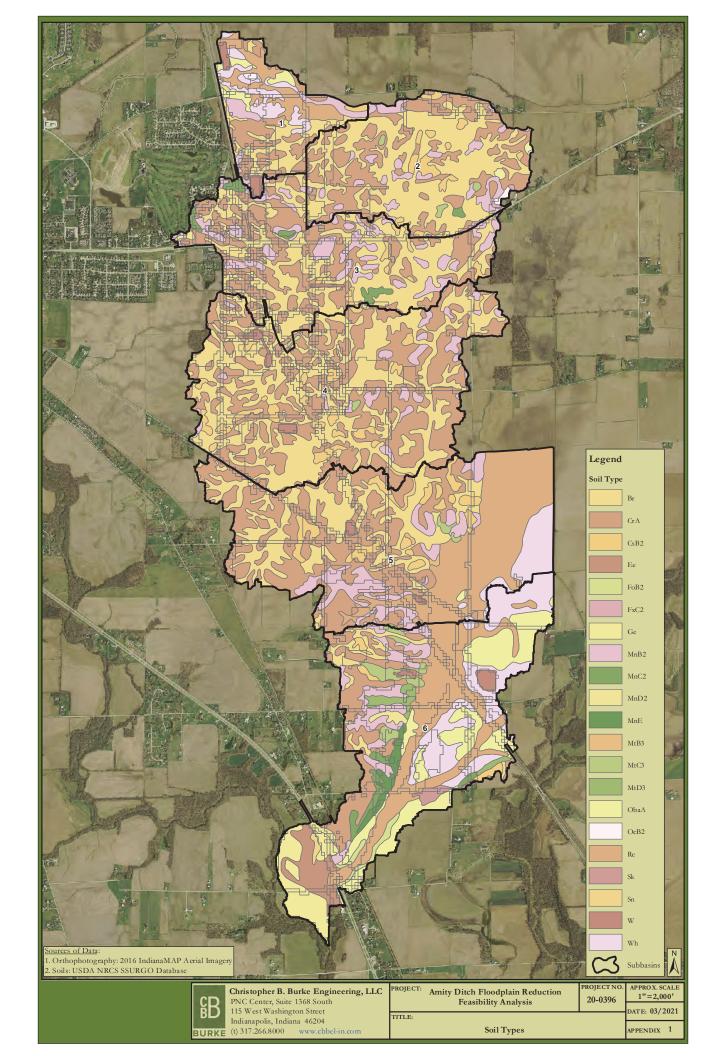
SHEE	T FLOW					Tt(hr) =	(0.007(n	L)^0.8)/(P2^0.5 s^0	.4)		
(ft)	(ft)	(ft)		(in)		Surfac	e Descr	<u>iption</u>	n-value			
Length	U/S Elev	D/S Elev		P2	n	Smoo	th surface	es	0.011			Tt (hr)
99.996	731.4	731	0.004	2.91	0.15		v (no resid ated soils	,	0.05			0.33
						Resi	due covei	r<20%	0.06			
						Resi	due covei	r>20%	0.17			
						Ave	erage		0.15	TO	TAL T _t (hr)	0.33
						Grass	S.:				'	
						Shor	t grass		0.15			
							n grasses		0.24			
							nudagrass		0.41			
						-	e (natural))	0.13			
						Wood	<i>is:</i> t underbru	ıch	0.4			
						-	se underb		0.4			
						Delik	JC GIIGEID		0.0			
SHALI	LOW CO	NCENTF (ft)	RATEDI	FLOW		Tt(hr) =	L/(3600	V)			3282 S^0.5 16.1345 S^(
	U/S Elev	. ,	Slope	Pave(y/n))		Coef.	Velocity		,		Tt (hr)
5821.9	731	711.1	0.0034	N	y =	20.33	16.135	0.94	_			1.71
					n =	16.13						
										то	TAL T _t (hr)	1.71
ODEN	OLIANINI	TI (DIDE	EL 0\4/									
	CHANNI		FLOW			T.//>	. //2000					
(assum (ft)	ing a veloc (ft/s)	city)				1 t(nr) =	L/(3600	V)				
	Velocity											Tt (hr)
6984	3	i										0.65
												0.00
										TO	TAL T _t (hr)	0.65
//s -						T./L. \	1 //2000		\ /(fe/ \ /	1 40	DAO/0 OA4/0) /
(w/o ass	suming a v	elocity)			(ft)		L/(3600	V)	V(tt/s) = (1.49	R^2/3 S^1/2	!)/n
(ft)	(ft)	(ft)		One	(ft) en Char	(ft) nnel	(ft) Pipe	(ft)				
. ,	U/S Elev	. ,	Slope	n-value		ss	DIA	Depth	Area	R	Velocity	Tt (hr)
	2. 2 2. 2 (3-0		>				
										TO	TAL T _t (hr)	0.00
I To	otal T _c =	2.69	hours =	161	minute	es	T _{lag} =	1.61	hours =	96.7	minutes	
•							iag					
	•											
-	•	Adjusted In			4.48	hours =	269	minutes	(If applica			

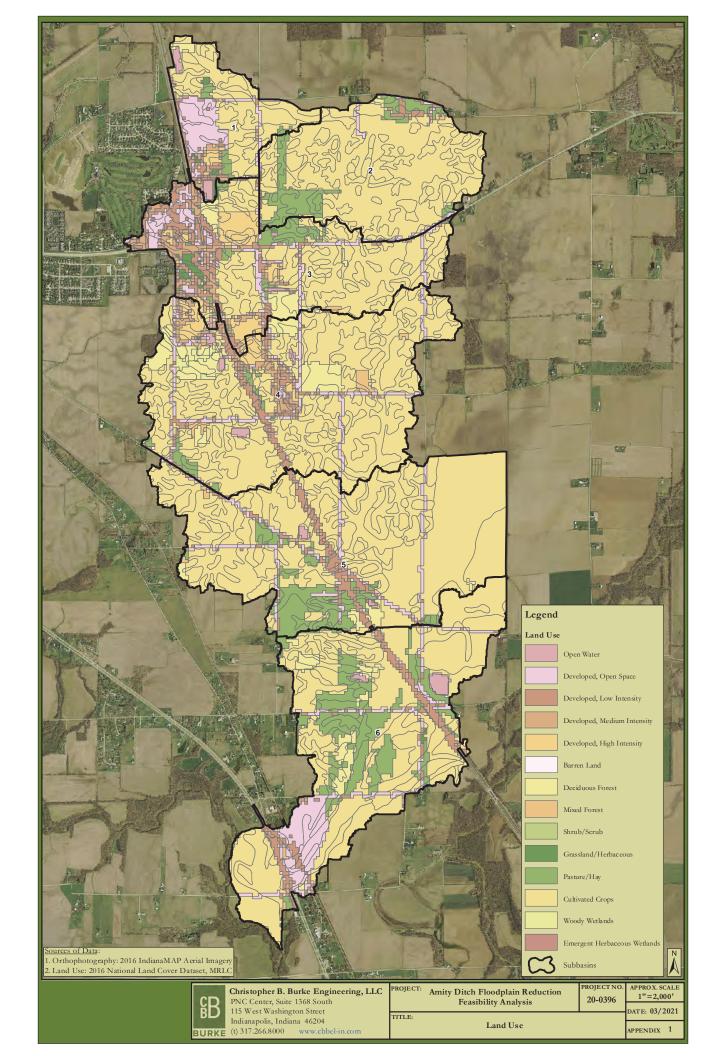


Project Name: Amity Ditch Floodplain Reduction Feasibility Study
Calcs. By: IKH Date: 2/17/21
Check By: MWM Date: 2/18/21

Time of Concentration 6 Basin:

SHEET FLOW											
	1				Tt(hr) =	(0.007(n	L)^0.8)/(P2^0.5 s^0	.4)		
(ft) (ft)	(ft)		(in)		Surfac	e Descr	<u>iption</u>	n-value			
Length U/S Elev	D/S Elev	Slope	P2	n	Smoo	oth surface	95	0.011		Tt	(hr)
100 700.4	699.2	0.012	2.91	0.15		v (no resi ated soils	,	0.05		C).21
					Resi	due cove	r<20%	0.06			
					Resi	due cove	r>20%	0.17			
					Ave	erage		0.15	TO	TAL T _t (hr)).21
					Grass	5 <i>:</i>					
						t grass		0.15			
						n grasses		0.24			
						nudagras		0.41			
					Rang Wood	e (natural))	0.13			
						<i>is:</i> t underbru	ıeh	0.4			
						se underb		0.4			
					DOIN		. 3011				
SHALLOW CO	ONCENTF (ft)	RATED	FLOW		Tt(hr) =	L/(3600	V)			3282 S^0.5 16.1345 S^0.5	
Length U/S Elev	D/S Elev	Slope	Pave(y/n))		Coef.	Velocity		ŕ		(hr)
5389.9 699.2	695.3	0.0007	N	y =	20.33	16.135	0.43	_		3	3.45
				n =	16.13						
									10	TAL T _t (hr)	3.45
	IEI /DIDE	EL OW									
OPEN CHANN		FLOW			T.(1.)	1 //0000					
(assuming a velo		FLOW			Tt(hr) =	L/(3600	V)				
(assuming a velo	city)	FLOW			Tt(hr) =	L/(3600	V)				(hr)
(assuming a velo (ft) (ft/s) Length Velocity	city)	FLOW			Tt(hr) =	L/(3600	V)				(hr)
(assuming a velo	city)	FLOW			Tt(hr) =	L/(3600	V)				(hr)
(assuming a velo (ft) (ft/s) Length Velocity	city)	FLOW			Tt(hr) =	L/(3600	V)				
(assuming a velo (ft) (ft/s) Length Velocity	city)	FLOW			Tt(hr) =	L/(3600	V)				
(assuming a velo (ft) (ft/s) Length Velocity	city)	FLOW			Tt(hr) =	L/(3600	V)			C	
(assuming a velo (ft) (ft/s) Length Velocity	city)	FLOW			Tt(hr) =	L/(3600	V)		тот	C	
(assuming a velo (ft) (ft/s) Length Velocity 10703 3	ocity)	FLOW								TAL T _t (hr)).99
(assuming a velo (ft) (ft/s) Length Velocity	ocity)	FLOW			Tt(hr) =	L/(3600		V(ft/s) = (C).99
(assuming a velo (ft) (ft/s) Length Velocity 10703 3	velocity)	FLOW			Tt(hr) = (ft)	L/(3600 (ft)		V(ft/s) = (TAL T _t (hr)).99
(assuming a velo (ft) (ft/s) Length Velocity 10703 3	velocity)			en Chai	Tt(hr) = (ft) nnel	L/(3600 (ft) <u>Pipe</u>	V) (ft)	. , ,	1.49 F	TAL T _t (hr) C	0.99
(assuming a velo (ft) (ft/s) Length Velocity 10703 3	velocity)		<u>Opi</u> n-value	en Chai	Tt(hr) = (ft)	L/(3600 (ft)		V(ft/s) = (TAL T _t (hr) C).99
(assuming a velo (ft) (ft/s) Length Velocity 10703 3	velocity)			en Chai	Tt(hr) = (ft) nnel	L/(3600 (ft) <u>Pipe</u>	V) (ft)	. , ,	1.49 F	TAL T _t (hr) C	0.99
(assuming a velo (ft) (ft/s) Length Velocity 10703 3	velocity)			en Chai	Tt(hr) = (ft) nnel	L/(3600 (ft) <u>Pipe</u>	V) (ft)	. , ,	1.49 F	TAL T _t (hr) C	0.99
(assuming a velo (ft) (ft/s) Length Velocity 10703 3	velocity)			en Chai	Tt(hr) = (ft) nnel	L/(3600 (ft) <u>Pipe</u>	V) (ft)	. , ,	1.49 F	TAL T _t (hr) C	0.99
(assuming a velo (ft) (ft/s) Length Velocity 10703 3	velocity)			en Chai	Tt(hr) = (ft) nnel	L/(3600 (ft) <u>Pipe</u>	V) (ft)	. , ,	1.49 F	TAL T _t (hr) C	0.99
(assuming a velo (ft) (ft/s) Length Velocity 10703 3	velocity)			en Chai	Tt(hr) = (ft) nnel	L/(3600 (ft) <u>Pipe</u>	V) (ft)	. , ,	1.49 F	TAL T _t (hr) CR^2/3 S^1/2)/n Velocity Tt	0.99 0.99
(assuming a velo (ft) (ft/s) Length Velocity 10703 3 (w/o assuming a (ft) (ft) Length U/S Elev	velocity) (ft) D/S Elev	Slope	n-value	en Chai Bottom	Tt(hr) = (ft) nnel SS	L/(3600 (ft) Pipe DIA	V) (ft) Depth	Area	1.49 F R TO	TAL T _t (hr) R^2/3 S^1/2)/n Velocity TAL T _t (hr)	0.99 0.99
(assuming a velo (ft) (ft/s) Length Velocity 10703 3	velocity) / D/S Elev	Slope	n-value	en Chai Bottom	Tt(hr) = (ft) nnel SS	L/(3600 (ft) <u>Pipe</u>	V) (ft) Depth	Area hours =	1.49 F	TAL T _t (hr) C	0.99 0.99
(assuming a velo (ft) (ft/s) Length Velocity 10703 3 (w/o assuming a (ft) (ft) Length U/S Elev	velocity) (ft) D/S Elev	Slope	n-value	Bottom Bottom	Tt(hr) = (ft) nnel SS	L/(3600 (ft) Pipe DIA	V) (ft) Depth	Area	1.49 F	TAL T _t (hr) R^2/3 S^1/2)/n Velocity TAL T _t (hr)	0.99 0.99





Calcs. By

IKH

Date

2/17/2021

Burke Project No.

Burke Project Name Basin Name	Amity Ditch	Floodplain Reduction Feasibility Study	Calcs. By Check By	MWM	Date Date	2/17/2021 2/18/2021
	1	,	,			
	% Area for			% Land Use		
Soil Name and	Each Soil			Area per Soil		
Hydrologic Group	Type	Cover Description	CN	Type	% Total Area	CN X % Total Area
Α		Open Water	100			
		Developed, Open Space	51			
		Developed, Low Intensity	61			
		Developed, Medium Intensity	75			
		Developed, High Intensity	89			
		Barren Land (Rock / Sand / Clay)	77			
		Deciduous Forest	25			
		Evergreen Forest	25			
		Mixed Forest	25			
		Shrub / Scrub	39			
		Grasslands / Herbaceous	30			
		Pasture / Hay	39			
		Cultivated Crops	64			
		Small Grains	39			
		Urban/Recreational Grasses	39			
		Woody Wetlands	30			
		Emergent Herbaceous Wetlands	49			
		Efficigent Herbaceous Wetlands	Total =			
В	6.9	Open Weter		1	0.0	2.6
D	0.9	Open Water	100 68	22	0.0 1.6	3.6 105.7
	1	Developed, Open Space Developed, Low Intensity	1			
	1		75 94	11	0.8	57.0
	1	Developed, Medium Intensity	84	1	0.1	4.4
	1	Developed, High Intensity	92			
	1	Barren Land (Rock / Sand / Clay)	86			
		Deciduous Forest	55			
	1	Evergreen Forest	55			
	1	Mixed Forest	55			
	1	Shrub / Scrub	61	0	0.0	1.8
	1	Grasslands / Herbaceous	58	5	0.4	21.7
		Pasture / Hay	61	1	0.1	3.8
		Cultivated Crops	75	59	4.1	305.9
		Small Grains	61			
		Urban/Recreational Grasses	61			
		Woody Wetlands	55			
		Emergent Herbaceous Wetlands	69			
			Total =	100		
С	9.3	Open Water	100	1	0.1	6.9
		Developed, Open Space	79	41	3.8	302.7
		Developed, Low Intensity	83	8	0.8	64.8
		Developed, Medium Intensity	89	6	0.5	47.2
		Developed, High Intensity	94	1	0.1	7.9
		Barren Land (Rock / Sand / Clay)	91			
		Deciduous Forest	70	1	0.1	4.8
		Evergreen Forest	70			-
		Mixed Forest	70			
		Shrub / Scrub	74			
		Grasslands / Herbaceous	71	3	0.3	19.2
		Pasture / Hay	74	1	0.1	4.1
		Cultivated Crops	82	39	3.6	296.9
		Small Grains	74	00	0.0	200.0
	1	Urban/Recreational Grasses	74			
	1	Woody Wetlands	70			
	1	Emergent Herbaceous Wetlands	70			
			Total =	100		
	80.0	Open Water	100	0	0.2	16.4
ח			100	U	0.2	
D	00.0	Developed Open Space	8/	18	14.6	
D	80.0	Developed, Open Space Developed, Low Intensity	84 87	18 6	14.6 4 9	1225.6 423.5
D	80.0	Developed, Low Intensity	87	6	4.9	423.5
D	80.0	Developed, Low Intensity Developed, Medium Intensity	87 91	6 3	4.9 2.5	423.5 223.0
D	60.0	Developed, Low Intensity Developed, Medium Intensity Developed, High Intensity	87 91 95	6	4.9	423.5
D	60.0	Developed, Low Intensity Developed, Medium Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay)	87 91 95 94	6 3 3	4.9 2.5 2.2	423.5 223.0 213.5
D	80.0	Developed, Low Intensity Developed, Medium Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest	87 91 95 94 77	6 3	4.9 2.5	423.5 223.0
D	80.0	Developed, Low Intensity Developed, Medium Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest	87 91 95 94 77	6 3 3	4.9 2.5 2.2 1.2	423.5 223.0 213.5 91.6
D	80.0	Developed, Low Intensity Developed, Medium Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest	87 91 95 94 77 77	6 3 3	4.9 2.5 2.2	423.5 223.0 213.5
D	60.0	Developed, Low Intensity Developed, Medium Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub	87 91 95 94 77 77 77 80	6 3 3 1	4.9 2.5 2.2 1.2	423.5 223.0 213.5 91.6 2.1
D	60.0	Developed, Low Intensity Developed, Medium Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous	87 91 95 94 77 77 77 80 78	6 3 3 1 0	4.9 2.5 2.2 1.2 0.0	423.5 223.0 213.5 91.6 2.1 56.2
D	60.0	Developed, Low Intensity Developed, Medium Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay	87 91 95 94 77 77 77 80 78 80	6 3 3 1 0	4.9 2.5 2.2 1.2 0.0 0.7 3.9	423.5 223.0 213.5 91.6 2.1 56.2 309.8
D	60.0	Developed, Low Intensity Developed, Medium Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops	87 91 95 94 77 77 77 80 78 80 85	6 3 3 1 0	4.9 2.5 2.2 1.2 0.0	423.5 223.0 213.5 91.6 2.1 56.2
D	60.0	Developed, Low Intensity Developed, Medium Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains	87 91 95 94 77 77 77 80 78 80 85 80	6 3 3 1 0	4.9 2.5 2.2 1.2 0.0 0.7 3.9	423.5 223.0 213.5 91.6 2.1 56.2 309.8
D	60.0	Developed, Low Intensity Developed, Medium Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses	87 91 95 94 77 77 77 80 78 80 85 80 80	6 3 3 1 0	4.9 2.5 2.2 1.2 0.0 0.7 3.9	423.5 223.0 213.5 91.6 2.1 56.2 309.8
D	60.0	Developed, Low Intensity Developed, Medium Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses Woody Wetlands	87 91 95 94 77 77 77 80 78 80 85 80 85	6 3 3 1 0	4.9 2.5 2.2 1.2 0.0 0.7 3.9	423.5 223.0 213.5 91.6 2.1 56.2 309.8
D	60.0	Developed, Low Intensity Developed, Medium Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses	87 91 95 94 77 77 77 80 85 80 85 80	6 3 3 1 0 1 5 62	4.9 2.5 2.2 1.2 0.0 0.7 3.9	423.5 223.0 213.5 91.6 2.1 56.2 309.8
D	60.0	Developed, Low Intensity Developed, Medium Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses Woody Wetlands	87 91 95 94 77 77 77 80 78 80 85 80 85	6 3 3 1 0	4.9 2.5 2.2 1.2 0.0 0.7 3.9	423.5 223.0 213.5 91.6 2.1 56.2 309.8
		Developed, Low Intensity Developed, Medium Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses Woody Wetlands Emergent Herbaceous Wetlands	87 91 95 94 77 77 77 80 78 80 85 80 85 80 77 84 Total =	6 3 3 1 0 1 5 62	4.9 2.5 2.2 1.2 0.0 0.7 3.9 49.9	423.5 223.0 213.5 91.6 2.1 56.2 309.8 4241.6
D Water	3.7081684	Developed, Low Intensity Developed, Medium Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses Woody Wetlands	87 91 95 94 77 77 77 80 85 80 85 80	6 3 3 1 0 1 5 62	4.9 2.5 2.2 1.2 0.0 0.7 3.9	423.5 223.0 213.5 91.6 2.1 56.2 309.8
Water	3.7081684	Developed, Low Intensity Developed, Medium Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses Woody Wetlands Emergent Herbaceous Wetlands	87 91 95 94 77 77 77 80 78 80 85 80 85 80 77 84 Total =	6 3 3 1 0 1 5 62	4.9 2.5 2.2 1.2 0.0 0.7 3.9 49.9	423.5 223.0 213.5 91.6 2.1 56.2 309.8 4241.6
		Developed, Low Intensity Developed, Medium Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses Woody Wetlands Emergent Herbaceous Wetlands	87 91 95 94 77 77 77 80 78 80 85 80 85 80 77 84 Total =	6 3 3 1 0 1 5 62	4.9 2.5 2.2 1.2 0.0 0.7 3.9 49.9	423.5 223.0 213.5 91.6 2.1 56.2 309.8 4241.6
Water	3.7081684	Developed, Low Intensity Developed, Medium Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses Woody Wetlands Emergent Herbaceous Wetlands	87 91 95 94 77 77 77 80 78 80 85 80 85 80 77 84 Total =	6 3 3 1 0 1 5 62	4.9 2.5 2.2 1.2 0.0 0.7 3.9 49.9	423.5 223.0 213.5 91.6 2.1 56.2 309.8 4241.6
Water	3.7081684	Developed, Low Intensity Developed, Medium Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses Woody Wetlands Emergent Herbaceous Wetlands	87 91 95 94 77 77 77 80 78 80 85 80 85 80 77 84 Total =	6 3 3 1 0 1 5 62	4.9 2.5 2.2 1.2 0.0 0.7 3.9 49.9	423.5 223.0 213.5 91.6 2.1 56.2 309.8 4241.6
Water	3.7081684	Developed, Low Intensity Developed, Medium Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses Woody Wetlands Emergent Herbaceous Wetlands	87 91 95 94 77 77 77 80 78 80 85 80 85 80 77 84 Total =	6 3 3 1 0 1 5 62	4.9 2.5 2.2 1.2 0.0 0.7 3.9 49.9	423.5 223.0 213.5 91.6 2.1 56.2 309.8 4241.6

Calcs. By

IKH

Date

2/17/2021

Burke Project No.

Soil Name Soil Name and Hydrologic Group A	2 % Area for Each Soil Type	Cover Description Open Water Developed, Open Space Developed, Low Intensity Developed, High Intensity Developed, High Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses	CN 100 51 61 75 89 77 25 25 25 39 30 39 94	MWM % Land Use Area per Soil Type		2/18/2021 CN X % Total Area
Soil Name and Hydrologic Group A	Each Soil Type	Open Water Developed, Open Space Developed, Low Intensity Developed, Medium Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses	100 51 61 75 89 77 25 25 25 39 30 39	Area per Soil	% Total Area	CN X % Total Area
Hydrologic Group A	Each Soil Type	Open Water Developed, Open Space Developed, Low Intensity Developed, Medium Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses	100 51 61 75 89 77 25 25 25 39 30 39	Area per Soil	% Total Area	CN X % Total Area
A		Open Water Developed, Open Space Developed, Low Intensity Developed, Medium Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses	100 51 61 75 89 77 25 25 25 39 30 39	Туре	% Total Area	CN X % Total Area
		Developed, Open Space Developed, Low Intensity Developed, Medium Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses	51 61 75 89 77 25 25 25 39 30 39			
В		Developed, Low Intensity Developed, Medium Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses	61 75 89 77 25 25 25 39 30 39			
В	10	Developed, Medium Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses	75 89 77 25 25 25 25 39 30 39			
В	10	Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses	89 77 25 25 25 25 39 30			
В	10	Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses	77 25 25 25 25 39 30 39			
В	10	Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses	25 25 25 39 30 39			
В	10	Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses	25 25 25 39 30 39			
В	4.0	Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses	25 25 39 30 39			
В	4.0	Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses	25 39 30 39			i
В	4.6	Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses	39 30 39			
В	4.6	Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses	30 39		1	
В	4.6	Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses	39			
В	4.0	Cultivated Crops Small Grains Urban/Recreational Grasses				
В	4.6	Small Grains Urban/Recreational Grasses				
В	4.6	Urban/Recreational Grasses	64			
В	1.0		39			
В	1.0		39			
В	1.6	Woody Wetlands	30			
В	1.6	Emergent Herbaceous Wetlands	49			
В			Total =			
	1.0	Open Water	100			
		Developed, Open Space	68	6	0.1	6.0
		Developed, Low Intensity	75	1	0.0	1.3
		Developed, Medium Intensity	84			
		Developed, High Intensity	92			
		Barren Land (Rock / Sand / Clay)	86			
		Deciduous Forest	55			
		Evergreen Forest	55			
		Mixed Forest	55			
		Shrub / Scrub	61			
		Grasslands / Herbaceous	58			
		Pasture / Hay	61	17	0.3	16.6
				76		
		Cultivated Crops	75	76	1.2	90.7
		Small Grains	61			
		Urban/Recreational Grasses	61			
		Woody Wetlands	55			
		Emergent Herbaceous Wetlands	69			
			Total =	100		
С	9.3	Open Water	100			
		Developed, Open Space	79	4	0.4	27.7
		Developed, Low Intensity	83	1	0.0	4.0
		Developed, Medium Intensity	89			
		Developed, High Intensity	94			
		Barren Land (Rock / Sand / Clay)	91			
		Deciduous Forest	70			
		Evergreen Forest	70			
		Mixed Forest	70	0	0.0	1.2
		Shrub / Scrub	74	Ü	0.0	1.2
		Grasslands / Herbaceous	71			
			74	9	0.9	64.1
		Pasture / Hay Cultivated Crops	1			
		·	82	86	8.0	659.3
		Small Grains	74			
		Urban/Recreational Grasses	74			
		Woody Wetlands	70			
		Emergent Herbaceous Wetlands	79			
			Total =	100		
D	89.1	Open Water	100			
		Developed, Open Space	84	2	1.7	145.1
		Developed, Low Intensity	87	2	1.7	146.0
		Developed, Medium Intensity	91	0	0.1	7.0
		Developed, High Intensity	95			
		Barren Land (Rock / Sand / Clay)	94			
		Deciduous Forest	77	0	0.3	25.1
		Evergreen Forest	77			
		Mixed Forest	77	0	0.2	13.4
		Shrub / Scrub	80			
		Grasslands / Herbaceous	78			
		Pasture / Hay	80	13	11.2	896.5
		Cultivated Crops	85	83	73.9	6281.8
		Small Grains	80	00	10.0	0201.0
		Urban/Recreational Grasses	80			
		Woody Wetlands	77			
		Emergent Herbaceous Wetlands	84	46.5		
	ļ		Total =	100		
Water		Open Water	100			
T-4-1-	400				400	0005 7
Totals	100				100	8385.7
					CN =	83.9
					Use CN	84

Composite Curve Number Calculation Worksheet Calcs. By IKH Date

2/17/2021

Burke Project No.

	Burke Project No. Burke Project Name	Amity Ditch	Floodplain Reduction Feasibility Study	Calcs. By Check By	MWM	Date Date	2/17/2021 2/18/2021
Soli Name and Pack Soli Cover Description Cover Description Cover Description Type No. Total Area CN X % T	Basin Name	3					
Pyterloopic Group Type							
A Open Water Developed, Open Space Developed, Medium Intensity 25 Developed, High Intensity 26 Developed, High Intensity 26 Developed, High Intensity 27 Developed, High Intensity 27 Developed, High Intensity 28 Developed, High Intensity 28 Developed, High Intensity 28 Developed, High Intensity 35 Developed, Develope			Cayou Dagarintian	CNI		0/ Tatal Area	CN V % Total Area
Developed, Commission Commi		Type		-	туре	% Total Area	CN X % TOTAL Area
Developed, Medium Intensity 0	^						
Developed, High Intensity Provided							
Barron Land (Rock / Sand / Clay) 77				1			
Barron Land (Rock / Sand / Clay) 77				89			
Evergreen Forest 25			Barren Land (Rock / Sand / Clay)	77			
Mosed Forest 25 39 39 39 39 39 39 39 3			Deciduous Forest	25			
Shrub / Scrub Grasslands / Horbacoous Gasslands / Gasslands / Gasslands Gasslands / Horbacoous Gasslands / Gasslands / Gasslands / Horbacoous Gasslands / Horbacoous Gasslands / Gasslands / Horbacoous Gasslands / Gasslands / Horbacoous Gasslands / Gasslands / Horbacoous			Ŭ	25			
Cansistands / Herbaceous 30				1			
Pasture / Hay 39							
Cultivated Crops 64 9 9 9 9 9 9 9 9 9				1			
Small Crains Urban/Recreational Grasses 39 Woody Wellands Total			•				
Urban/Rocreational Crasses 39				1			
B							
B				1			
B			•				
Developed, Open Space 68			3	1			
Developed, Low Intensity 0	В	0.1	Open Water	100			
Developed, Medium Intensity			Developed, Open Space	68	2	0.0	0.1
Developed, High Intensity 92 52 0.1 6.2				1			
Barren Land (Rock / Sand / Clay) B8 Decidious Forest 55 Evergreen Forest 55 Mixed Forest 55 Strub / Scrub 61 Grasslands / Herbaceous 58 Pasture / Hay 61 Cullivated Crops 57 Small Grains 61 Uhan/Recreational Grasses 62 Developed, Individual Grasses 70 10 0 0 0 0 0 0 0 0							
Deciduous Forest 55 Evergreen Forest 55 Mixed Forest 57 Mixed Forest 57 Mixed Forest 55 Mixed Forest 55 Mixed Forest 55 Mixed Forest 55 Mixed Forest 57 Mixed Forest 55 Mixed Forest 57 Mixed Forest 55 Mixed Forest 57 Mixed Forest 5				1	52	0.1	6.2
Evergreen Forest 55 Strub / Scrub Forest 55 Strub / Scrub 61 Grasslands / Herbaceous 58 Pasture / Hay 61 Cultivated Crops 75 Small Grains 61 Urban/Recreational Grasses 61 Woody Wetlands 55 Emergent Herbaceous Wetlands 79 11 1.8 144.3 184.4 18				1			
Mixed Forest So				1			
Struty Scrut Scr			o a				
Grasslands / Herbaceous 58 Pasture / Hay 61 Cultivated Crops 75 Small Grains 61 Urban/Recreational Grasses 61 Woody Wetlands 55 Emergent Herbaceous Wetlands 55 Emergent Herbaceous Wetlands 55 Emergent Herbaceous Wetlands 70 11 1.8 144.4 1.8 144.3 1.8 144.3 1.8 144.3 1.8 144.3 1.8 144.3 1.8 144.3 1.8 144.3 1.8 144.3 1.8 144.3 1.8 144.3 1.8 144.3 1.8 144.3 1.8 144.3 1.8 144.3 1.8 144.3 1.8 144.3 1.8 1.8 144.3 1.8							
Pasture / Hay				1			
Cultivated Crops Small Grains Grains Grains Grains Grains Grains Gray Wellands Gray Wellands Gray Wellands Gray				1			
Small Grains Uthan/Recreational Grasses 61				1			
Woody Wetlands Emergent Herbaceous Wetlands Forest				1			
Emergent Herbaceous Wetlands			Urban/Recreational Grasses	61			
Total = 100			Woody Wetlands	55			
C 17.3 Open Water			Emergent Herbaceous Wetlands				
Developed, Come Space 79							
Developed, Low Intensity 83 83 13 2.3 188.1 Developed, Medium Intensity 94 2 0.3 27.6 Barren Land (Rock / Sand / Clay) 91 Deciduous Forest 70 1 0.2 13.4 Evergreen Forest 70 0 0.0 0.4 Shrub / Scrub 74 70 1 2 0.4 28.6 Pasture / Hay 74 7 1.2 89.1 Cultivated Crops 82 56 9.6 790.9 Small Grains 74 0.1 1 8.8 765.1 Developed, Upen Space 84 9 7.4 619.0 Developed, Medium Intensity 91 8 6.9 627.7 Developed, High Intensity 95 10 8.3 786.4 Barren Land (Rock / Sand / Clay) 94 Deciduous Forest 77 70 0.3 20.4 Barren Land (Rock / Sand / Clay) 94 Deciduous Forest 77 77 70 0.3 20.4 Shrub / Scrub 80 5 4.2 334.6 Pasture / Hay 80 5 4.2 334.6 Cultivated Crops 85 49 40.6 3448.6 Water 0.3878082 Open Water 100 0.4 38.8 Totals 100 100 8520.9 CN = 85.2	С	17.3	·	1			
Developed, Medium Intensity 89				1			
Developed, High Intensity 94 2 0.3 27.6							
Barren Land (Rock / Sand / Clay) 91				1			
Deciduous Forest 70					2	0.5	27.0
Evergreen Forest 70 Nixed Forest 70 Nixed Forest 70 Nixed Forest 70 Nixed Forest 74 Shrub / Scrub 74 Grasslands / Herbaceous 71 2 0.4 28.6 28.6 79.1 2 28.9 1 2 2 2 2 2 2 2 2 2				1	1	0.2	13.4
Shrub / Scrub 74 2 0.4 28.6					· ·	0.2	
Grasslands / Herbaceous			o a	1	0	0.0	0.4
Pasture / Hay Cultivated Crops 82 56 9.6 790.9			Shrub / Scrub	74			
Cultivated Crops Small Grains 74			Grasslands / Herbaceous	71	2	0.4	28.6
Small Grains			Pasture / Hay	74	7	1.2	89.1
Urban/Recreational Grasses Woody Wetlands Emergent Herbaceous Wetlands D 82.2 Open Water Developed, Open Space Developed, Low Intensity Developed, Low Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses Woody Wetlands Water 0.3878082 Open Water D 100 0.3 26.2 100 0.3 26.2 100 0.3 26.2 100 0.3 26.2 100 0.3 26.2 100 0.3 26.2 100 0.3 26.2 100 0.3 26.2 100 0.3 27.7 100 0.8.3 786.4 8.6.9 9.627.7 100 0.8.3 786.4 8.3 786.4 8.3 786.4 8.3 786.4 8.3 786.4 8.3 336.2 8.3 8.0 8.0 8.0 8.0 8.0 8.0 8.0 8.0 8.0 8.0			·		56	9.6	790.9
Woody Wetlands Total = 100							
Emergent Herbaceous Wetlands Total = 100 Total = 100				1			
D 82.2 Open Water 100 0 0.3 26.2							
D 82.2 Open Water 100 0 0.3 26.2			Emergent Herbaceous Wellands	1	100		
Developed, Open Space Developed, Low Intensity Developed, Low Intensity Developed, Medium Intensity Developed, High Intensity Developed, Medium Intensity Developed Reveal As a 6.9 Deve	D	82.2	Open Water			0.3	26.2
Developed, Low Intensity 87				1			
Developed, Medium Intensity 91 8 6.9 627.7							
Barren Land (Rock / Sand / Clay) 94 77 5 4.4 336.2 Evergreen Forest 77 7 7 7 7 Mixed Forest 77 7 7 7 7 Mixed Forest 77 7 7 7 7 7 7 Mixed Forest 77 7 7 7 7 7 7 7 7				91	8	6.9	627.7
Deciduous Forest 77				1	10	8.3	786.4
Evergreen Forest 77							
Mixed Forest				1	5	4.4	336.2
Shrub / Scrub 80 1 1.1 88.0 80 67asslands / Herbaceous 78 1 1.1 88.0 80 5 4.2 334.6 80 80 5 4.2 334.6 80 80 80 80 80 80 80 8				1	6	0.0	00.4
Grasslands / Herbaceous 78				1	0	0.3	20.4
Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses Woody Wetlands Emergent Herbaceous Wetlands Water 0.3878082 Open Water 100 CN = 85.2 334.6 4.2 334.6 49 40.6 3448.6 3448.6 3448.6 3448.6 3448.6 3448.6 3448.6 3448.6 3448.6 3448.6 3448.6 3448.6 3448.6 CN = 85.2					1	1 1	88.0
Cultivated Crops Small Grains B0 Urban/Recreational Grasses Woody Wetlands Total = 100 Water 0.3878082 Open Water 100 CN = 85.2							
Small Grains 80 Urban/Recreational Grasses 80 Woody Wetlands 77 Emergent Herbaceous Wetlands 84 0 0.1 6.1			•	1			
Urban/Recreational Grasses 80 77 84 0 0.1 6.1			·				2=.2
Emergent Herbaceous Wetlands							
Total = 100 Water 0.3878082 Open Water 100 0.4 38.8 Totals 100 100 8520.9 CN = 85.2							
Water 0.3878082 Open Water 100 0.4 38.8 Totals 100 100 8520.9 CN = 85.2			Emergent Herbaceous Wetlands			0.1	6.1
Totals 100 100 8520.9 CN = 85.2				Total =	100		
Totals 100 100 8520.9 CN = 85.2	Water	U 3828085	Onen Water	100		0.4	38 B
CN = 85.2	v v alcı	0.0010002	Open Water	100		0.4	30.0
	Totals	100				100	8520.9
				_		CN -	05.0
Use CN 85						CN =	85.2
						Use CN	85

urke Project No. urke Project Name	20-0396.000 Amity Ditch	000 Floodplain Reduction Feasibility Study	Calcs. By	IKH MWM	Date Date	2/17/2021 2/18/2021
asin Name	4		_			ı
Soil Name and	% Area for Each Soil			% Land Use		
Hydrologic Group	Type	Cover Description	CN	Area per Soil Type	% Total Area	CN X % Total Area
A	турс	Open Water	100	Туре	70 TOTAL AIGA	ON X 70 TOTAL ALCO
		Developed, Open Space	51			
		Developed, Low Intensity	61			
		Developed, Medium Intensity	75			
		Developed, High Intensity	89			
		Barren Land (Rock / Sand / Clay)	77			
		Deciduous Forest Evergreen Forest	25 25			
		Mixed Forest	25			
		Shrub / Scrub	39			
		Grasslands / Herbaceous	30			
		Pasture / Hay	39			
		Cultivated Crops	64			
		Small Grains Urban/Recreational Grasses	39 39			
		Woody Wetlands	39			
		Emergent Herbaceous Wetlands	49			
			Total =		1	
В	0.1	Open Water	100			
		Developed, Open Space	68			
	1	Developed, Low Intensity	75	3	0.0	0.2
	1	Developed, Medium Intensity	84	23	0.0	1.5
		Developed, High Intensity Barren Land (Rock / Sand / Clay)	92 86	75	0.1	5.3
	1	Deciduous Forest	55			
	1	Evergreen Forest	55			
	1	Mixed Forest	55			
	1	Shrub / Scrub	61			
		Grasslands / Herbaceous	58			
		Pasture / Hay	61			
		Cultivated Crops Small Grains	75 61			
		Urban/Recreational Grasses	61			
		Woody Wetlands	55			
		Emergent Herbaceous Wetlands	69			
		· ·	Total =	100		
С	4.4	Open Water	100			
		Developed, Open Space	79	6	0.3	20.5
		Developed, Low Intensity	83	1	0.0	2.0
		Developed, Medium Intensity Developed, High Intensity	89 94	3 2	0.1 0.1	12.2 6.2
		Barren Land (Rock / Sand / Clay)	91	2	0.1	0.2
		Deciduous Forest	70	0	0.0	1.1
		Evergreen Forest	70			
		Mixed Forest	70	0	0.0	0.2
		Shrub / Scrub	74			
		Grasslands / Herbaceous	71	1	0.0	0.4
		Pasture / Hay Cultivated Crops	74 82	88	0.0 3.9	2.1 317.2
		Small Grains	74	00	3.9	317.2
	1	Urban/Recreational Grasses	74			
	1	Woody Wetlands	70			
		Emergent Herbaceous Wetlands	79			
			Total =	100		
D	94.5	Open Water	100	0	0.3	25.7
		Developed, Open Space	84 87	5 5	4.5 4.7	378.7 408.1
	1	Developed, Low Intensity Developed, Medium Intensity	91	3	4.7 3.1	408.1 282.0
	1	Developed, High Intensity	95	3	3.1	288.2
	1	Barren Land (Rock / Sand / Clay)	94	0	0.0	2.0
	1	Deciduous Forest	77	9	8.1	625.0
	1	Evergreen Forest	77			
		Mixed Forest	77	1	1.3	99.0
	1	Shrub / Scrub	80		0.0	0.7
	1	Grasslands / Herbaceous	78 80	0 2	0.0 1.6	0.7 126.9
	1	Pasture / Hay Cultivated Crops	80 85	71	1.6 67.2	126.9 5707.8
	1	Small Grains	80	7.1	01.2	3707.0
	1	Urban/Recreational Grasses	80			
		Woody Wetlands	77	1	0.8	59.3
	1	Emergent Herbaceous Wetlands	84			
			Total =	100		
Matar	0.0026042	Open Water	100		1.0	00.3
Water	0.9926042	Open Water	100		1.0	99.3
Totals	100				100	8471.1
					-	
					CN =	84.7
					Use CN	85

Calcs. By

IKH

Date

2/17/2021

Burke Project No.

	Soil Name and Hydrologic Group	CN X % Total Are
Soil Name and Warea for Each Soil Pyge Py	Soil Name and Hydrologic Group	
Soil Name and Each Soil Type Cover Description Cover Description Cover Description Type Water	Soil Name and Hydrologic Group Type Cover Description CN Type % Total Area	
Note	Hydrologic Group	
A Open Water	A	
Developed, Open Space 51	Developed, Low Intensity	1.7
Developed, Medium (Intensity Developed, Deve	Developed, Medium Intensity 89	1.7
Developed, High Intensity 75 Developed, High Intensity 25 Evergreen Forest 25 Evergreen Forest 25 26 27 28 28 29 29 29 29 29 29	Developed, High Intensity 75 8 8 8 8 8 8 8 8 8	1.7
Developed, High Intensity 89 89 89 80 80 80 80 80	Developed, High Intensity 88 Barren Land (Rock / Sand / Clay) 77 Deciduous Forest 25 Evergreen Forest 25 Mixed Forest 25 Shrub / Scrub 39 Grasslands / Herbaceous 30 Pasture / Hay 39 Cultivated Crops 64 Small Grains 39 Urban/Recreational Grasses 39 Woody Wetlands 30 Total = 100	1.7
Barren Land (Rock / Sand / Clay)	Barren Land (Rock / Sand / Clay)	1.7
Deciduous Forest 25	Deciduous Forest 25	1.7
Evergreen Forest 25 Shrub / Serub 39 Grasslands / Herbaceous 30 Pasture / Hay 39 Cultivated Crops 64 Shrall Grains 30 Grasslands / Herbaceous 30 Pasture / Hay 39 Cultivated Crops 64 Shrall Grains 30 Union / Personal Crops 64 Shrall Grains 30 Union / Personal Crops 49 Total	Evergreen Forest 25 Mixed Forest 25 Shrub / Scrub 39 Grasslands / Herbaceous 30 Pasture / Hay 39 Cultivated Crops 64 Small Grains 39 Urban/Recreational Grasses 39 Woody Wetlands 30 Emergent Herbaceous Wetlands 49 Total = B	1.7
Mised Forest 25 Shrub Serub Grasslands / Hebaeous 30 Grasslands / Hebaeous 30 Paturo / Hay 39 Cultivated Crops 64 Shrub Serub Crops 64 Shrub Serub Crops 64 Shrub Serub Carlot 64 Shrub Serub Carlot 64 Shrub Serub Carlot 64 Shrub Serub 65 Shr	Mixed Forest 25 39 39 39 30 30 30 30 30	1.7
Shrub / Serub Grasslands / Herbaceous 30 Patiture / Hay 39 Cultivated Crops 64 Small Grains 39 Urban/Recreational Grasses 39 Woody Wellands 30 Channel Recreational Grasses 39 Woody Wellands 30 Channel Recreational Grasses 30 Woody Wellands 30 Channel Recreational Grasses 30 Channel Gras	Shrub / Scrub 39 Grasslands / Herbaceous 30 39 Cultivated Crops 64 Small Grains 39 Urban/Recreational Grasses 39 Woody Wetlands 30 Emergent Herbaceous Wetlands 49 Total =	1.7
Grasslands / Horbacoous 30 Pasture / Hay 39 Cultivated Crops 64 Small Crains 39 Urban/Recreational Grasses 39 Woody Welfands 30 Emergent Herbacoous 30 Emergent He	Grasslands / Herbaceous 30 Pasture / Hay 39 Cultivated Crops 64 Small Grains 39 Urban/Recreational Grasses 39 Woody Wellands 30 Emergent Herbaceous Wetlands 49 Total =	1.7
Pasture / Hay Cultivated Crops 64	Pasture / Hay	1.7
Culfwarded Crope Sama Carina Sama Carina Sama Carina Sama Carina Sama S	Cultivated Crops 64 Small Grains 39 Urban/Recreational Grasses 39 Woody Wetlands 49 Total =	1.7
Small Crains Urban/Recreational Grasses 39 Woody Welands Emergent Herbacous Wetlands 100 1.7 100 1.7	Small Grains 39	1.7
Urban/Recreational Grasses 30 49 70 70 70 70 70 70 70 7	Urban/Recreational Grasses 39 Woody Wetlands 30	1.7
B 0.2 Open Water Developed, Open Space Open Spa	Woody Wetlands	1.7
Emergent Herbaceous Wetlands	B D.2 Open Water 100	1.7
Emergent Herbaceous Wetlands	B D.2 Open Water 100	1.7
B 0.2 Open Water 100 Developed, Open Space 68 Developed, Open Space 68 Developed, Open Space 0.0 Developed, Medium Intensity 94 Developed, Medium Intensity 92 Barren Land (Rock / Sand / Clay) 86 Deciduous Forest 55 Evergreen Forest 55 Mwd Forest 55 Shrub / Scrub 61 Grasslands / Herbaceous 58 Pasture / Hay 61 Grasslands / Herbaceous 77 84 0.1 10.0 0.1 0.0	B 0.2 Open Water 100 Developed, Open Space 68 Developed, Low Intensity 75 Developed, Medium Intensity 84 Developed, High Intensity 92 Barren Land (Rock / Sand / Clay) 86 Deciduous Forest 55 Shrub / Scrub 61 Grasslands / Herbaceous 58 Pasture / Hay 61 Cultivated Crops 75 84 0.1 Small Grains 61 Urban/Recreational Grasses 61 Woody Wetlands 69 Total 100 0 0.0	1.7
B	B 0.2 Open Water	1.7
Developed, Open Space Developed, Unit britanily Developed, Medium Intensity Developed, Medium Intensity Developed, Medium Intensity Sarren Land (Sock / Sand / Clay) Developed, Medium Intensity Sarren Land (Sock / Sand / Clay) Developed, Periodiculous Forces S5 Developed, Sock / Sand / Clay) Developed, Periodiculous Forces S5 Developed, Periodiculous Forces S5 Developed, Periodiculous Forces S5 Developed, Open Space Developed, Open Space Developed, Medium Intensity Devel	Developed, Open Space 68	1.7
Developed, Low Intensity Proveloped, Medium Intensity 92 Barren Land (Rock / Sand / Clay) 88 Pediutous Forest 55 55 55 55 55 55 55	Developed, Low Intensity Property Developed, Medium Intensity Property Developed, High Intensity Property P	
Developed, Medium Intensity 92	Developed, Medium Intensity 92	
Developed, High Intensity 92	Developed, High Intensity 92 Barren Land (Rock / Sand / Clay) 86	
Barren Land (Rock / Sand / Clay) B8 Deciduous Forest 55 Evergreen Forest 55 Mixed Forest 55 Shrub / Scrub 61 Grasslands / Herbaceous 58 Pasture / Hay 61 Cultivated Crops 75 84 0.1 10.0 1	Barren Land (Rock / Sand / Clay) 86 Deciduous Forest 55 Evergreen Forest 55 Mixed Forest 56 Mixed Forest 70 Mixed Forest 70 Mixed Forest 70 Mixed Forest 74 Mixed Forest 76 Mixed Forest 77 Mixed Forest 74 Mixed Forest 75 Mixed Forest 76 Mixed Forest 77 74 74 74 74 75 75 75	
Deciduous Forest 556 Evergreen Forest 556 Mixed Forest 557 Mixed Forest 557 Mixed Forest 558 Mixed Forest 559 Mixed Forest 559 Mixed Forest 550	Deciduous Forest 55 Evergreen Forest 55 Mixed Forest 55 Mixed Forest 55 Shrub / Scrub 61 Grasslands / Herbaceous 58 Pasture / Hay 61 Cultivated Crops 75 84 0.1 Small Grains 61 Urban/Recreational Grasses 61 Woody Wetlands 55 Emergent Herbaceous Wetlands 55 Emergent Herbaceous Wetlands 55 Developed, Open Space 79 5 0.5 0.5 Developed, Low Intensity 83 3 3 0.3 Developed, Medium Intensity 89 0 0.0 0.0 Developed, High Intensity 94 Barren Land (Rock / Sand / Clay) 91 Deciduous Forest 70 3 0.3 Evergreen Forest 70 Mixed Forest 70 Mixed Forest 70 Shrub / Scrub 74 Grasslands / Herbaceous 71 0 0.0 0.0 Pasture / Hay 74 28 2.7 Cultivated Crops 82 60 5.6 Small Grains 74 Urban/Recreational Grasses 74 Woody Wetlands 70	
Evergreen Forest 55	Evergreen Forest 55 Mixed Forest 55 Shrub / Scrub 61 Grasslands / Herbaceous 58 Pasture / Hay 61 Cultivated Crops 75 84 0.1 Small Grains 61 Urban/Recreational Grasses 61 Woody Wetlands 55 Emergent Herbaceous Wetlands 55 Emergent Herbaceous Wetlands 69 Total = 100 0 0.	
Mixed Forest 55	Mixed Forest 55 Shrub / Scrub 61 Grasslands / Herbaceous 58 Pasture / Hay 61 Cultivated Crops 75 84 0.1	
Shrub / Scrub Grasslands / Herbaceous 58 Pasture / Hay 61 Cultivated Crops Small Grains 61 Urban/Recreational Grasses 61 Woody Wellands 55 Emergent Herbaceous Wellands 69 Total = 100 0 0 0 3.8 0 0 0 0 0 0 0 0 0	Shrub / Scrub G1 Grasslands / Herbaceous 58 Pasture / Hay 61 Cultivated Crops 75 84 0.1 Small Grains 61 Urban/Recreational Grasses 61 Woody Wetlands 55 Emergent Herbaceous Wetlands 69 Total = 100 100 0 0.	
Grasslands / Herbaceous 58 Pasture / Hay 61 Cultivated Crops 75 84 0.1 10.0	Grasslands / Herbaceous	
Pasture / Hay 61	Pasture / Hay	
Cultivated Crops 75 84 0.1 10.0	Cultivated Crops 75	
Small Grains 61	Small Grains	i
Urban/Recreational Grasses 61 Woody Wetlands 55 Energent Herbaceous Wetlands 55 Energent Herbaceous Wetlands 69 Total	Urban/Recreational Grasses 61 Woody Wetlands 55 Emergent Herbaceous Wetlands 55 Emergent Herbaceous Wetlands 69 Total = 100	10.0
Woody Wetlands	Woody Wetlands	
Woody Wetlands	Woody Wetlands	
Emergent Herbaceous Wetlands	Emergent Herbaceous Wetlands 69	
C	C 9.4 Open Water 100 0 0.0 0.0 Developed, Open Space 79 5 0.5 Developed, Low Intensity 83 3 0.3 Developed, High Intensity 94 Barren Land (Rock / Sand / Clay) Deciduous Forest 70 3 0.3 Evergreen Forest 70 Mixed Forest 70 Mixed Forest 70 Mixed Forest 70 Shrub / Scrub 74 Grasslands / Herbaceous 71 0 0.0 Pasture / Hay 74 28 2.7 Cultivated Crops Small Grains 74 Woody Wetlands 70	
C 9.4 Open Water Developed, Open Space Peveloped, Low Intensity Barren Land (Rock / Sand / Clay) Pasture / Hay Developed, Low Intensity Barren Land (Rock / Sand / Clay) Pasture / Hay Developed, High Intensity Barren Forest Peveloped, High Intensity Pasture / Hay Developed, High Intensity Pasture / Hay Developed, High Intensity Pasture / Hay Developed, Medium Intensity Pasture / Hay Cultivated Crops Bac Good Sond Sond Sond Sond Sond Sond Sond S	C 9.4 Open Water 100 0 0.0 Developed, Open Space 79 5 0.5 Developed, Low Intensity 83 3 0.3 Developed, Medium Intensity 89 0 0.0 Developed, High Intensity 94 Barren Land (Rock / Sand / Clay) 91 Deciduous Forest 70 Evergreen Forest 70 Mixed Forest 70 Mixed Forest 70 Shrub / Scrub 74 Grasslands / Herbaceous 71 0 0.0 Pasture / Hay 74 28 2.7 Cultivated Crops 82 60 5.6 Small Grains 74 Urban/Recreational Grasses 74 Woody Wetlands 70	
Developed, Open Space	Developed, Open Space 79 5 0.5	3.0
Developed, Medium Intensity 89	Developed, Low Intensity 83 3 0.3	
Developed, High Intensity 89	Developed, Medium Intensity 89 0 0.0	
Developed, High Intensity 94 94 91 91 92 91 91 92 91 91	Developed, High Intensity 94 94 94 94 94 95 95 95	
Barren Land (Rock / Sand / Clay) 91 70 3 0.3 20.8	Barren Land (Rock / Sand / Clay) Deciduous Forest Forest Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses Woody Wetlands 91 3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0	0.0
Deciduous Forest 70 3 0.3 20.8	Deciduous Forest	
Evergreen Forest 70 Mixed Forest 70 Shrub / Scrub 74 Grasslands / Herbaceous 71 0 0.0 1.2 Pasture / Hay 74 28 2.7 198.5 198.	Evergreen Forest 70 70 70 70 70 70 70 7	
Mixed Forest 70 Shrub / Scrub 74	Mixed Forest 70 Shrub / Scrub 74 Grasslands / Herbaceous 71 0 0.0 Pasture / Hay 74 28 2.7 Cultivated Crops 82 60 5.6 Small Grains 74 Urban/Recreational Grasses 74 Woody Wetlands 70 70 70	20.8
Shrub / Scrub 74 0 0.0 1.2	Shrub / Scrub	
Grasslands / Herbaceous	Grasslands / Herbaceous	
Pasture / Hay	Pasture / Hay	
Cultivated Crops 82 5.6 461.9	Cultivated Crops 82 60 5.6 Small Grains 74 Urban/Recreational Grasses 74 Woody Wetlands 70	1.2
Cultivated Crops Small Grains 74	Cultivated Crops 82 60 5.6 Small Grains 74 Urban/Recreational Grasses 74 Woody Wetlands 70	198.5
Small Grains	Small Grains 74 Urban/Recreational Grasses 74 Woody Wetlands 70	461.9
Urban/Recreational Grasses 74 Woody Wetlands 70	Urban/Recreational Grasses 74 Woody Wetlands 70	
Woody Wetlands Total = 100 Total = 100 1.8	Woody Wetlands 70	
Emergent Herbaceous Wetlands 79 Total = 100 100 1.8 100 1.8 100 100 1.8 100 100 1.8 100 1.8 100 100 1.8 100 100 1.8 100 100 1.5 100 100 1.5 100 100 1.5 100 100 1.5 100 100 1.5 100 100 1.5 100 100 1.5 100 100 1.5 100 100 1.5 100 100 1.5 100 100 1.5 100 100 1.5 100 100 1.5 100 100 1.5 100 100 1.5 100 100 1.5 100 100 1.5 100 100 100 100 1.5 100 100 100 1.5 100 100 100 100 100 100 100 100 100 100 1.5 100		
D 89.9 Open Water 100 100 1.8	LINGUEDI DEDIAGEOUS WEBARDS 79	
D 89.9 Open Water 100 0 0.0 1.8		
Developed, Open Space Developed, Low Intensity Developed, How Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Totals Outlivated Crops Small Grains Water Outlivated Crops Water Outlivated Crops Water Outlivated Crops Water Outlivated Crops Developed, High Intensity Barren Land (Rock / Sand / Clay) Pasture / Hay Deciduous Forest Totals Outlivated Crops Small Grains Outlivated Crops Butter / Hay Deciduous Forest Totals Outlivated Crops Totals Outlivated Cro		1.0
Developed, Low Intensity 87 5 4.2 362.2		
Developed, Medium Intensity 91 0 0.4 40.5		
Developed, High Intensity 95 8 8 94 94 94 94 94 94		
Barren Land (Rock / Sand / Clay) 94 1 1.2 88.6		40.5
Deciduous Forest		
Evergreen Forest 77		
Mixed Forest Shrub / Scrub 80 Grasslands / Herbaceous 78 0 0.0 0.2 Pasture / Hay 80 7 6.5 518.0 Cultivated Crops 85 82 73.4 6236.9 Small Grains 80 Urban/Recreational Grasses 80 Woody Wetlands 77 Emergent Herbaceous Wetlands 84 0 0.0 1.5 Water 0.4736239 Open Water 100 0.5 47.4 Totals 100 100 8414.6		88.6
Shrub / Scrub 80 0 0.0 0.2		
Grasslands / Herbaceous 78		24.1
Pasture / Hay		
Cultivated Crops 85 82 73.4 6236.9 Small Grains 80 Urban/Recreational Grasses 80 Woody Wetlands 77 Emergent Herbaceous Wetlands 84 0 0.0 1.5 Total = 100 0.5 47.4 Totals 100 100 8414.6 CN = 84.1		0.2
Cultivated Crops 85 82 73.4 6236.9 Small Grains 80 Urban/Recreational Grasses 80 Woody Wetlands 77 Emergent Herbaceous Wetlands 84 0 0.0 1.5 Total = 100 0.5 47.4 Totals 100 100 8414.6 CN = 84.1	Pasture / Hay 80 7 6.5	518.0
Small Grains		6236.9
Urban/Recreational Grasses 80 77 84 0 0.0 1.5		
Woody Wetlands		
Emergent Herbaceous Wetlands 84 0 0.0 1.5		İ
Water 0.4736239 Open Water 100 0.5 47.4 Totals 100 100 8414.6 CN = 84.1	· · · · · · · · · · · · · · · · · · ·	
Water 0.4736239 Open Water 100 0.5 47.4 Totals 100 100 8414.6 CN = 84.1		1.5
Totals 100 100 8414.6 CN = 84.1	10tal - 100	1.5
Totals 100 100 8414.6 CN = 84.1	Water 0.4736239 Open Water 100 0.5	1.5
CN = 84.1	νταιοι 0.47.002.05 Open γνατεί 100 0.5	
CN = 84.1	Totals 100	
	100 100 100 100 100 100 100 100 100 100	47.4
	ON	47.4
Use CN 84	CN =	47.4 8414.6
Use CN 84		47.4 8414.6
	Use CN	47.4 8414.6 84.1

Basin Name Soil Name and Hydrologic Group A	% Area for Each Soil Type	Cover Description Open Water Developed, Open Space Developed, Low Intensity Developed, Medium Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses Woody Wetlands Emergent Herbaceous Wetlands Open Water Developed, Open Space	CN 100 51 61 75 89 77 25 25 25 25 39 30 39 64 39 30 49 Total =	% Land Use Area per Soil Type	% Total Area	CN X % Total Area
Soil Name and Hydrologic Group A	Each Soil Type	Open Water Developed, Open Space Developed, Low Intensity Developed, Medium Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses Woody Wetlands Emergent Herbaceous Wetlands Open Water Developed, Open Space	100 51 61 75 89 77 25 25 25 30 39 64 39 39 30 49 Total =	Area per Soil	% Total Area	CN X % Total Area
Hydrologic Group A	Туре	Open Water Developed, Open Space Developed, Low Intensity Developed, Medium Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses Woody Wetlands Emergent Herbaceous Wetlands Open Water Developed, Open Space	100 51 61 75 89 77 25 25 25 30 39 64 39 39 30 49 Total =		% Total Area	CN X % Total Area
A		Open Water Developed, Open Space Developed, Low Intensity Developed, Medium Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses Woody Wetlands Emergent Herbaceous Wetlands Open Water Developed, Open Space	100 51 61 75 89 77 25 25 25 30 39 64 39 39 30 49 Total =	.,,,,		
	24.5	Developed, Open Space Developed, Low Intensity Developed, Hedium Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses Woody Wetlands Emergent Herbaceous Wetlands Open Water Developed, Open Space	51 61 75 89 77 25 25 25 39 30 39 64 39 39 30 49 Total =			
В	24.5	Developed, Medium Intensity Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses Woody Wetlands Emergent Herbaceous Wetlands Open Water Developed, Open Space	75 89 77 25 25 25 39 30 39 64 39 39 30 49			
В	24.5	Developed, High Intensity Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses Woody Wetlands Emergent Herbaceous Wetlands Open Water Developed, Open Space	89 77 25 25 25 39 30 39 64 39 39 30 49 Total =			
В	24.5	Barren Land (Rock / Sand / Clay) Deciduous Forest Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses Woody Wetlands Emergent Herbaceous Wetlands Open Water Developed, Open Space	77 25 25 25 39 30 39 64 39 30 49 Total =			
В	24.5	Deciduous Forest Evergreen Forest Mixed Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses Woody Wetlands Emergent Herbaceous Wetlands Open Water Developed, Open Space	25 25 25 39 30 39 64 39 39 30 49 Total =			
В	24.5	Evergreen Forest Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses Woody Wetlands Emergent Herbaceous Wetlands Open Water Developed, Open Space	25 25 39 30 39 64 39 39 30 49 Total =			
В	24.5	Mixed Forest Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses Woody Wetlands Emergent Herbaceous Wetlands Open Water Developed, Open Space	25 39 30 39 64 39 39 30 49 Total =			
В	24.5	Shrub / Scrub Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses Woody Wetlands Emergent Herbaceous Wetlands Open Water Developed, Open Space	39 30 39 64 39 39 30 49 Total =			
В	24.5	Grasslands / Herbaceous Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses Woody Wetlands Emergent Herbaceous Wetlands Open Water Developed, Open Space	30 39 64 39 39 30 49 Total =			
В	24.5	Pasture / Hay Cultivated Crops Small Grains Urban/Recreational Grasses Woody Wetlands Emergent Herbaceous Wetlands Open Water Developed, Open Space	39 64 39 39 30 49 Total =			
В	24.5	Small Grains Urban/Recreational Grasses Woody Wetlands Emergent Herbaceous Wetlands Open Water Developed, Open Space	39 39 30 49 Total =			
В	24.5	Urban/Recreational Grasses Woody Wetlands Emergent Herbaceous Wetlands Open Water Developed, Open Space	39 30 49 Total =			
В	24.5	Woody Wetlands Emergent Herbaceous Wetlands Open Water Developed, Open Space	30 49 Total =			
В	24.5	Emergent Herbaceous Wetlands Open Water Developed, Open Space	49 Total =			
В	24.5	Open Water Developed, Open Space	Total =			
В	24.5	Developed, Open Space			1	
J	24.0	Developed, Open Space				
			68	10	2.6	173.5
		Developed, Low Intensity	75	6	1.5	114.2
		Developed, Medium Intensity	84	1	0.2	14.6
		Developed, High Intensity	92	0	0.0	1.5
		Barren Land (Rock / Sand / Clay)	86			
		Deciduous Forest	55	2	0.4	20.4
		Evergreen Forest	55			
		Mixed Forest	55	1	0.2	8.6
		Shrub / Scrub	61		0.4	0.0
		Grasslands / Herbaceous	58	0 6	0.1	6.6
		Pasture / Hay Cultivated Crops	61 75	74	1.5 18.1	90.9 1360.1
		Small Grains	61	74	10.1	1300.1
		Urban/Recreational Grasses	61			
		Woody Wetlands	55	0	0.0	0.0
		Emergent Herbaceous Wetlands	69			
			Total =	100		
С	16.5	Open Water	100	0	0.0	4.9
		Developed, Open Space	79	11	1.8	145.1
		Developed, Low Intensity	83 89	4 1	0.7 0.2	54.6 14.7
		Developed, Medium Intensity Developed, High Intensity	94		0.2	14.7
		Barren Land (Rock / Sand / Clay)	91	0	0.0	0.5
		Deciduous Forest	70	13	2.2	153.3
		Evergreen Forest	70			
		Mixed Forest	70	0	0.0	0.3
		Shrub / Scrub	74			
		Grasslands / Herbaceous	71	20	0.5	400.7
		Pasture / Hay	74	39 31	6.5 5.1	480.7 415.1
		Cultivated Crops Small Grains	82 74	31	5.1	415.1
		Urban/Recreational Grasses	74			
		Woody Wetlands	70			
		Emergent Herbaceous Wetlands	79			
		<u> </u>	Total =	100	<u></u>	<u> </u>
D	57.8	Open Water	100	0	0.1	6.5
		Developed, Open Space	84	10	5.7	476.1
		Developed, Low Intensity	87	6	3.3	290.2
		Developed, Medium Intensity	91	1 0	0.4	36.4
		Developed, High Intensity Barren Land (Rock / Sand / Clay)	95 94	0	0.0 0.0	0.4 1.2
		Deciduous Forest	77	3	1.5	116.1
		Evergreen Forest	77		I	
		Mixed Forest	77	0	0.1	9.4
		Shrub / Scrub	80			
		Grasslands / Herbaceous	78	0	0.0	1.5
		Pasture / Hay	80	15	8.6	690.9
		Cultivated Crops	85	66	38.1	3236.4
		Small Grains Urban/Recreational Grasses	80 80			
		Woody Wetlands	77			
		Emergent Herbaceous Wetlands	84			
			Total =	100		
Water	1.1592546	Open Water	100		1.2	115.9
Totals	100				100	8040.5
					CN =	80.4
					Use CN	80

APPENDIX 2:	HYDRAULIC MODEL RESULTS	

HEC-RAS Plan: Existing River: AmityDitch Reach: Study776 Profile: 1%

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
redon	Taverota	TTOME	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	1 Todac # Offi
Study776	34146	1%	157.00	717.22	721.89	()	721.91	0.000462	1.35	272.46	325.64	0.17
Study776	33518	1%	157.00	716.33	721.34	719.46	721.42	0.001481	2.56	107.09	162.81	0.31
Study776	33069	1%	157.00	715.76	721.18	718.69	721.19	0.000232	1.16	329.92	385.48	0.13
Study776	32337	1%	410.00	715.31	720.93	719.96	720.95	0.000377	1.49	742.73	606.62	0.16
Study776	31600	1%	410.00	714.81	720.67	719.27	720.68	0.000334	1.52	621.37	477.69	0.15
Study776	31086	1%	410.00	714.41	720.02		720.27	0.003179	4.82	184.65	187.62	0.46
Study776	30952	1%	410.00	714.30	719.67		719.83	0.002938	4.05	245.66	321.04	0.45
Study776	30843	1%	410.00	714.20	719.48		719.58	0.001712	3.08	305.15	354.86	0.35
Study776	30630	1%	410.00	714.08	719.44		719.45	0.000220	1.12	895.18	613.52	0.12
Study776	30527	1%	410.00	714.02	719.42		719.43	0.000185	1.06	984.30	688.28	0.11
Study776	30318	1%	410.00	713.80	719.39		719.39	0.000168	0.90	1083.28	804.32	0.10
Study776	29940	1%	410.00	713.62	719.35		719.36	0.000052	0.59	1767.60	1070.89	0.06
Study776	29793	1%	410.00	713.61	719.35		719.35	0.000042	0.52	1984.87	1206.66	0.05
Study776	29695	1%	410.00	713.60	719.34		719.35	0.000035	0.47	2165.34	1293.99	0.05
Study776	29590	1%	410.00	713.59	719.34	717.43	719.34	0.000030	0.46	2260.12	1354.37	0.05
Study776	29561 Farm Crossing		Culvert									
Study776	29508	1%	410.00	713.58	719.34		719.34	0.000029	0.40	2410.01	1497.53	0.04
Study776	29402	1%	410.00	713.31	719.34		719.34	0.000026	0.43	2482.87	1466.90	0.04
Study776	29104	1%	410.00	713.13	719.33		719.33	0.000036	0.52	2160.15	1326.79	0.05
Study776	28820	1%	410.00	712.96	719.27	717.22	719.30	0.000517	1.98	471.06	1229.15	0.20
Study776	28514	1%	410.00	712.65	718.92	718.09	719.03	0.001632	3.30	241.26	254.97	0.34
Study776	28217	1%	410.00	712.37	718.58		718.62	0.001006	2.49	434.80	468.91	0.26
Study776	27896	1%	410.00	712.06	718.30	716.80	718.36	0.000743	2.43	467.47	695.42	0.24
Study776	27672	1%	410.00	711.74	718.08	715.85	718.16	0.000950	2.71	230.02	930.36	0.27
Study776	27559 SR 44		Culvert									
Study776	27414	1%	410.00	711.72	717.93	716.09	718.12	0.002010	3.61	136.90	551.56	0.38
Study776	27140	1%	410.00	711.80	717.83	716.74	717.84	0.000334	1.53	783.32	680.89	0.15
Study776	26840	1%	410.00	711.82	717.78		717.79	0.000112	0.97	1124.17	682.88	0.09
Study776	26542	1%	466.00	712.06	717.77	715.77	717.77	0.000027	0.48	2414.32	1151.88	0.05

HEC-RAS Plan: Proposed River: AmityDitch Reach: Study776 Profile: 1%

1120101011	an: Proposed River: AmityDitc		yrro Frome.									
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Study776	34146	1%	157.00	717.22	720.96	719.81	720.99	0.000675	1.41	111.12	189.90	0.20
Study776	33518	1%	157.00	716.33	720.74	718.92	720.75	0.000233	0.99	158.57	100.18	0.12
Study776	33069	1%	157.00	715.76	720.67	718.32	720.68	0.000119	0.80	197.17	313.98	0.09
Study776	32337	1%	410.00	715.31	720.37	718.45	720.42	0.000642	1.93	234.41	101.60	0.20
Study776	31600	1%	410.00	714.81	719.90	717.97	719.96	0.000623	1.91	242.55	105.19	0.20
Study776	31086	1%	410.00	714.41	719.59	717.51	719.64	0.000594	1.87	227.39	91.64	0.19
Study776	30952	1%	410.00	714.30	719.51	717.39	719.57	0.000568	1.87	220.38	77.47	0.19
Study776	30896 Prop. Crossing 1		Culvert									
Study776	30843	1%	410.00	714.20	719.44	717.24	719.50	0.000510	1.90	215.93	77.63	0.19
Study776	30630	1%	410.00	714.08	719.34	717.18	719.39	0.000502	1.80	245.73	90.13	0.18
Study776	30576 Prop. Crossing 2		Culvert									
Study776	30527	1%	410.00	714.02	719.27	717.11	719.32	0.000546	1.91	214.94	91.12	0.19
Study776	30318	1%	410.00	713.80	719.16	716.92	719.21	0.000496	1.77	241.42	96.08	0.18
Study776	29940	1%	410.00	713.62	718.99	716.70	719.04	0.000427	1.69	278.12	122.36	0.17
Study776	29793	1%	410.00	713.61	718.92	716.72	718.97	0.000489	1.77	251.47	126.60	0.18
Study776	29742 Prop. Crossing 3		Culvert									
Study776	29695	1%	410.00	713.60	718.85	716.68	718.91	0.000541	1.93	212.87	132.50	0.19
Study776	29590	1%	410.00	713.59	718.80	716.61	718.85	0.000493	1.80	248.01	147.15	0.18
Study776	29508	1%	410.00	713.58	718.76		718.81	0.000541	1.82	248.76	121.77	0.19
Study776	29402	1%	410.00	713.31	718.71		718.75	0.000429	1.71	260.12	103.26	0.17
Study776	29104	1%	410.00	713.13	718.58		718.62	0.000435	1.71	257.63	101.03	0.17
Study776	28820	1%	410.00	712.96	718.47	716.03	718.51	0.000384	1.64	274.30	115.19	0.16
Study776	28514	1%	410.00	712.65	718.36	715.81	718.39	0.000361	1.57	293.35	134.36	0.15
Study776	28217	1%	410.00	712.37	718.26		718.29	0.000318	1.51	276.67	105.30	0.14
Study776	27896	1%	410.00	712.06	718.18	715.19	718.21	0.000214	1.31	385.38	184.98	0.12
Study776	27672	1%	410.00	711.74	718.15	714.79	718.16	0.000140	1.15	413.25	1035.97	0.10
Study776	27559 SR 44		Culvert									
Study776	27414	1%	410.00	711.72	717.93	716.09	718.12	0.002010	3.61	136.90	551.56	0.38
Study776	27140	1%	410.00	711.80	717.83	716.74	717.84	0.000334	1.53	783.32	680.89	0.15
Study776	26840	1%	410.00	711.82	717.78		717.79	0.000112	0.97	1124.17	682.88	0.09
Study776	26542	1%	466.00	712.06	717.77	715.77	717.77	0.000027	0.48	2414.32	1151.88	0.05