DRAFT ENVIRONMENTAL IMPACT STATEMENT

for

PARKER ROAD RESIDENTIAL SUBDIVISION

Town of Hamburg, Erie County, New York

Volume 2 OF 3 (Appendices 4-6)

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APPENDIX 4:

TRAFFIC IMPACT STUDY

Traffic Impact Study

for the proposed

Residential Projects at Big Tree Road and Parker Road

Town of Hamburg
Erie County, New York

April 2, 2021

Project No. 41019

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EXECUTIVE SUMMARY

OVERVIEW

The purpose of this report is to evaluate the potential traffic impacts related to two proposed residential projects located along the south side of Big Tree Road and west side of Parker Road in the Town of Hamburg, NY. Within this report, the operating characteristics of the proposed access drives and impacts to the adjacent roadway network are identified and evaluated, and mitigating measures, if needed, are provided to minimize capacity or safety concerns.

To define traffic impact, this analysis establishes existing baseline traffic conditions, projects background traffic flow including area growth, and determines the traffic operations that would result from the proposed project.

As stated, this report evaluates two separate residential projects in this singular report. One of the residential projects consists entirely of single-family homes (located along Parker Road) and one consists entirely of multifamily apartment units (located along Big Tree Road). It is important to mention that the two proposed residential projects are not dependent on each other since they involve different project sponsors and do not involve vehicular connections (roadway, driveways, etc.) between the two separate project sites. It is our understanding that the Town of Hamburg Planning Board requested that the potential traffic impacts of both residential projects be evaluated simultaneously given the geographic proximity of the project sites to determine if there would be cumulative potentially significant adverse traffic impacts.

The single-family residential subdivision project site is bounded by residential development to the north, Parker Road to the east, residential development to the south, and undeveloped lands to the west. The multifamily project site is bounded by Big Tree Road to the north, primarily undeveloped lands to the east, residential development to the south, and commercial development to the west. Each project site is currently undeveloped.

Land uses in the vicinity of the proposed projects include commercial, educational, and residential. The study area includes the following existing intersections:

- Big Tree Road/Southwestern Boulevard
- Big Tree Road/Parker Road
- Big Tree Road/Abbott Road
- Parker Road/Marilyn Drive

The proposed projects consist of a 156-unit multifamily complex along Big Tree Road and a 67-lot single-family residential subdivision along Parker Road. It is important to mention that the project site for the multifamily project will include 20.1 acre of Permanent Open (nearly 50% of the approximately 42-acre site) that will remain permanently undeveloped via a deed restriction to be recorded at the Erie County Clerk's Office and that there will not be any roadway or driveway connections (including no gated emergency access driveway) from the multifamily project site onto Wilson Road. The original Concept Plan for the multifamily project site included a proposed 18 lot residential subdivision that would have included a public roadway connecting to Wilson Drive opposite of Tomaka Drive. However, the 18-lot residential subdivision was eliminated based on input received during the review process.

Access to the multifamily project will be provided via two new driveways along Big Tree Road. Access to the residential subdivision will be provided via two new driveways along Parker Road; of which one will be at the existing intersection of Parker Road/Marilyn Drive. Figures 5

(multifamily project) and 6 (single-family residential subdivision) depict the proposed site plans for each project.

Construction of both residential projects are anticipated to reach full build-out in approximately two to three years depending on market conditions. Town of Hamburg personnel were contacted to discuss any other specific projects that are currently approved or under construction that would generate additional traffic in the study area. No projects were identified.

In addition, to account for normal increases in background traffic growth, including any unforeseen developments in the project study area, and given the length of time (3 years) associated with full build-out of the proposed project, a growth rate of 0.5% has been applied to the existing traffic volumes in the study area based upon a review of historical traffic information obtained from the NYSDOT. All ambient growth calculations are included in the Appendices.

CONCLUSIONS & RECOMMENDATIONS

This Traffic Impact Study identifies and evaluates the potential traffic impacts that can be expected from the two proposed residential projects in the Town of Hamburg, New York, as described in this study. The results of this study determined that the existing transportation network can adequately accommodate the cumulative projected traffic volumes from both proposed residential projects and the resulting minor impacts to study area intersections with the noted improvements in place. The following sets forth the conclusions and recommendations based upon the results of the analyses:

1. The proposed residential projects are expected to generate approximately 30 entering/95 exiting vehicle trips during the AM peak hour and 98 entering/59 exiting vehicle trips during the PM peak hour.

2. The existing crash investigation did not reveal inherent safety deficiencies related to the geometric design of the study area intersections.

3. The left-turn warrant investigation at the proposed driveways along Big Tree Road determined that the proposed Driveway multifamily project Big Tree Road/Proposed Multifamily Easterly Driveway during the PM peak hour was satisfied; no other peak hours at either the proposed westerly or easterly intersections for the proposed multifamily family project were satisfied.

4. At the intersection of Big Tree Road/Proposed Multifamily Westerly Driveway, the existing striping pattern should be restriped to legally accommodate drivers turning left from Big Tree Road onto the proposed driveway via a two-way left-turn lane (TWLTL) treatment. This maintains the ability for drivers to turn left onto the commercial driveway west of the proposed driveway location while accommodating drivers to exit the proposed westerly driveway.

5. The projected traffic impacts resulting from full development of both of the proposed residential projects during both peak hours can be accommodated by the existing transportation network with the noted improvements in place.

6. For purposes of the environmental review of the proposed residential projects pursuant to the State Environmental Quality Review Act (SEQRA), it is our firm's professional opinion that the proposed residential projects will not result in any cumulative potentially significant adverse traffic impacts to the study area intersections. Given that both proposed residential projects will not result in any cumulative potentially significant traffic impacts, our firm's professional opinion as state above also applies to each of the two proposed residential projects if they had been evaluated separately.

I. INTRODUCTION

The purpose of this report is to evaluate the potential traffic impacts related to the proposed residential projects located along the south side of Big Tree Road and west side of Parker Road in the Town of Hamburg, NY. Within this report, the operating characteristics of the proposed access drives and impacts to the adjacent roadway network are identified and evaluated, and mitigating measures, if needed, are provided to minimize capacity or safety concerns.

To define traffic impact, this analysis establishes existing baseline traffic conditions, projects background traffic flow including area growth, and determines the traffic operations that would result from the proposed project.

II. LOCATION

As stated previously above, this report evaluates two separate residential projects located in close geographic proximity in this singular report as requested by the Town of Hamburg Planning Board. One of the residential projects consists entirely of single-family homes (located along Parker Road) and one consists entirely of multifamily units (located along Big Tree Road with no vehicular connections to Wilson Drive).

The single-family development is bounded by residential development to the north, Parker Road to the east, residential development to the south, and undeveloped lands to the west. The multifamily development is bounded by Big Tree Road to the north, primarily undeveloped lands to the east, residential development to the south, and commercial development to the west. Each of the project sites are currently undeveloped.

Land uses in the vicinity of the proposed projects include commercial, educational, and residential. The study area includes the following existing intersections:

- Big Tree Road/Southwestern Boulevard
- Big Tree Road/Parker Road
- Big Tree Road/Abbott Road
- Parker Road/Marilyn Drive

The site location and study area are illustrated in Figure 1 (all figures are included at the end of this report).

III. EXISTING HIGHWAY SYSTEM

The following information outlined in Table I provides a description of the existing roadway network within project study area. Figure 2 illustrates the lane geometry at each of the study intersections and the Annual Average Daily Traffic (AADT) volumes on the study roadways. The AADTs reflect the most recently collected data obtained from the New York State Department of Transportation (NYSDOT)

TABLE I: EXISTING HIGHWAY SYSTEM

ROADWAY[1]	CLASS[2]	AGENCY[3]	SPEED LIMIT[4]	# OF TRAVEL LANES[5]	TRAVEL PATTERN/ DIRECTION	EST. AADT[6] & SOURCE[7]
Southwestern Blvd (US-20)	14	NYSDOT	50	6	Two-way/ Northeast-Southwest	21,267 NYSDOT (2016)
Big Tree Road (US-20A)	14	NYSDOT	45	2	Two-way/ East-West	12,584 NYSDOT (2018)
Abbott Road (CR-4)	16	ECDPW	45	4	Two-way/ North-South	7,586 NYSDOT (2018)
Parker Road	19	Town	30	2	Two-way/ North-South	1,500 SRF (2021)
Marilyn Drive	19	Town	30	2	Two-way/ East-West	280 SRF (2021)

Notes:
1. Route Name/Number: "NY" = New York; "CR" = County Road
2. State Functional Classification of Roadway (All are Urban): 14 = Principal Arterial, 16 = Minor Arterial, 19 = Local
3. Jurisdictional Agency of Roadway. "NYSDOT" = New York State Department of Transportation; "ECDPW" = Erie County Department of Public Works
4. Posted or Statewide Limit in Miles per Hour (mph).
5. Excludes turning/auxiliary lanes developed at intersections.
6. Estimated AADT in Vehicles per Day (vpd).
7. AADT Source (Year). SRF data estimated based upon an extrapolation of turning movement counts.

PEDESTRIAN & BICYCLE FACILITIES

There are sidewalks along both sides of Southwestern Boulevard and there is a short segment of sidewalk along the south side Big Tree Rd that extends from Southwestern Boulevard to the commercial plaza driveway.

There are no dedicated bicycle lanes or trails although cyclists are permitted to share the road on all roadways within the study area.

TRANSIT FACILITIES

Public transit service within the study area is provided by the Niagara Frontier Transit Metro System, Inc (NFTA). NFTA currently provides service via Route 72 along Abbott Road and Big Tree Road (east of Abbott Road).

IV. EXISTING TRAFFIC CONDITIONS

A. Peak Intervals for Analysis

Given the functional characteristics of the corridors, adjacent land uses, and the proposed land use for the project sites (residential), the peak hours selected for analysis are the weekday commuter AM and PM peak periods. The combination of site traffic and adjacent through traffic produces the greatest demand during these time periods.

B. Existing Traffic Volume Data

Turning movement traffic counts were collected by SRF at the study area intersections described. Traffic counts were conducted on a typical weekday between 7:00-9:00 AM and 4:00-6:00 PM and on the dates noted in Table II. The peak hour traffic periods for each study intersection are noted in the table. The unadjusted weekday AM and PM peak hour volumes are reflected in Figure 3A. Traffic data for the Big Tree Road/Abbott Road intersection was obtained from the GBNRTC database. This data was collected on Tuesday, September 10, 2019 and inflated using the growth rate discussed in *Section V* to establish representative 2021 peak hour volumes.

TABLE II: STUDY INTERSECTION PEAK HOURS

INTERSECTION	DATE OF STUDY	AM PEAK HOUR	PM PEAK HOUR
Southwestern Boulevard/Big Tree Road	March 4, 2021	7:30-8:30 AM	4:00-5:00 PM
Big Tree Road/Parker Road/ECC Driveway	March 4, 2021	7:15-8:15 AM	4:00-5:00 PM
Big Tree Road/Abbott Road	September 10, 2019	7:30-8:30 AM	4:00-5:00 PM
Parker Road/Marilyn Drive	March 4, 2021	7:15-8:15 AM	4:00-5:00 PM

It is noted, however, that traffic volumes are currently lower than normal because of business restrictions resulting from COVID-19 pandemic. Traffic volumes were compared to traffic data obtained in various locations before the COVID-19 pandemic by the NYSDOT and adjusted to reflect 2021 representative traffic conditions by increasing the collected traffic volumes. This is consistent with NYSDOT and ITE methodology for adjustments related to collected traffic volumes affected by the COVID-19 pandemic. The collected traffic volumes were generally 20% lower during the peak periods.

Given the proximity to ECC South Campus, this study researched the effect of the pandemic on in-person sessions at the campus. ECC personnel stated that approximately 20% of sessions are held in-person. Therefore, this study increased the volume of traffic related to ECC South Campus, using the traffic counts obtained at the Big Tree Road/Parker Road/ECC Driveway, to reflect typical ECC South Campus conditions.

Figure 3B illustrates the representative 2021 weekday AM and PM peak hour base volumes used for analysis purposes in this study.

C. Field Observations

The study intersections were observed during both peak intervals to assess current traffic operations. Signal timing information was obtained from the NYSDOT through a Freedom of Information (FOIL) request to determine peak hour phasing plans and phase durations during each interval. This information was used to support and/or calibrate capacity analysis models described in detail later in this report.

D. Existing Crash Investigation

The purpose of this crash analysis is to identify inherent safety issues by studying and quantifying historical crashes at the study intersections and identifying potential crash patterns and clusters.

A crash cluster is defined as an abnormal occurrence of similar crash types occurring at approximately the same location or involving the same geometric features. The severity of the crashes should also be considered. A history of crashes is an indication that further analysis is required to determine the cause(s) of the crash(es) and to identify what actions, if any, could be taken to mitigate the crashes.

A crash investigation within the study area was conducted to assess the safety history from January 1, 2018 through December 31, 2020. The data was provided by the New York State Department of Motor Vehicles (NYSDMV) through a Freedom of Information (FOIL) request.

Reportable (non-injury, injury, and fatal injury) type crashes are defined as damage to one person's property in the amount of $1,001 or more. The Non-Reportable type crashes result in property damage of $1,000 or less. Crash rates were computed for the study intersections and compared with New York State Department of Transportation average crash rates for similar intersections, as summarized in the following table. Intersection rates are listed as accidents (crashes) per million entering vehicle (Acc/MEV). Pertinent crash data is provided in the Appendices.

TABLE III: EXISTING ACCIDENT INVESTIGATION

INTERSECTION	TOTAL NO. OF ACCIDENTS	ACTUAL CRASH RATE	STATEWIDE AVERAGE CRASH RATE
Southwestern Boulevard/Big Tree Road	28	0.88	0.23
Big Tree Road/Parker Road	3	0.26	0.31
Big Tree Road/Abbott Road	15	0.74	0.23
Parker Road/Marilyn Drive	0	0.00	0.18

Two of the four study intersections had a crash rate lower than the statewide average. The results of the two intersections with calculated rates higher than the statewide average are described in greater detail.

Southwestern Boulevard/Big Tree Road

As shown in Table III, the study intersection has a crash rate that is 3.8 times higher than the statewide average crash rate for similar intersections. Of the 28 crashes, one was fixed object related and one was animal related. When discounting these two crashes from the total rate, the actual crash rate decreases to 0.81 Acc/MEV. Notable crash clusters—approaches with three or greater identifiable consistent crash patterns—at this location include:

- Rear-end (nine total crashes)
    - Eastbound (four crashes)
    - Westbound (three crashes)
- Right angle
    - Westbound (three crashes)

The frequency of rear-end crashes is characteristic of signalized intersections along heavily trafficked corridors, such as Southwestern Boulevard. Most of these crashes, in addition to the other reported crashes, were caused by driver inattention, following too closely, or disregard of the traffic control device. Despite the number of crashes, no inherent safety deficiencies exist related to the geometric conditions of the intersection.

Big Tree Road/Abbott Road

As shown in Table III, the study intersection has a crash rate that is 3.2 times higher than the statewide average crash rate for similar intersections. Of the 15 total crashes, three right angle crashes occurred in the northbound direction. These crashes were reportedly caused by a failure to yield the right of way. No other discernible crash patterns were identified related to geometric conditions and no apparent safety deficiencies exist.

V. FUTURE AREA DEVELOPMENT AND LOCAL GROWTH

Construction of both residential projects are anticipated to reach full build-out in approximately two to three years depending on market conditions. Town of Hamburg personnel were contacted to discuss any other specific projects that are currently approved or under construction that would generate additional traffic in the study area. No projects were identified.

In addition, to account for normal increases in background traffic growth, including any unforeseen developments in the project study area, and given the length of time (3 years) associated with full build-out of the proposed project, a growth rate of 0.5% has been applied to the existing traffic volumes in the study area based upon a review of historical traffic information obtained from the NYSDOT. All ambient growth calculations are included in the Appendices. The background traffic volumes are depicted in Figure 4.

VI. PROPOSED DEVELOPMENT

A. Description

The proposed projects consist of a 156-unit multifamily complex along Big Tree Road and a 67-lot single-family residential subdivision along Parker Road. It is important to mention that the project site for the multifamily project will include 20.1 acre of Permanent Open (nearly 50% of the approximately 42-acre site) that will remain permanently undeveloped via a deed restriction to be recorded at the Erie County Clerk's Office and that there will not be any roadway or driveway connections (including no gated emergency access driveway) from the multifamily project site onto Wilson Road. The original Concept Plan for the multifamily project site included a proposed 18 lot residential subdivision that would have included a public roadway connecting to Wilson Drive opposite of Tomaka Drive. However, the 18-lot residential subdivision was eliminated based on input received during the review process.

B. Site Traffic

The volume of traffic generated by a site is dependent on the intended land use and size of the development. Trip generation is an estimate of the number of trips generated by a specific building or land use. These trips represent the volume of traffic entering and exiting the development. Trip Generation, 10th Edition (2017) published by the Institute of Transportation Engineers (ITE) is used as a reference for this information. The trip rate for the peak hour of the generator may or may not coincide in time or volume with the trip rate for the peak hour of adjacent street traffic. Volumes generated during the peak hour of the adjacent street traffic and proposed land uses, in this case, the weekday commuter AM and PM peaks, represent a more critical volume when analyzing the capacity of the system; those intervals will provide the basis of this analysis.

Table IV shows the total site generated trips for the weekday commuter AM and PM peak hours for the proposed project. All trip generation information has been included in the Appendices.

TABLE IV: SITE GENERATED TRIPS

DESCRIPTION	ITE LUC[1]	SIZE	AM PEAK HOUR		PM PEAK HOUR	
			ENTER	EXIT	ENTER	EXIT
Multifamily Project	220	156 Units	17	56	55	33
Single-Family Project	210	67 Lots	13	39	43	26
Total Site Generated Trips			**30**	**95**	**98**	**59**

Note:
1. LUC = Land Use Code.

The proposed projects are expected to generate approximately 30 entering/95 exiting vehicle trips during the AM peak hour and 98 entering/59 exiting vehicle trips during the PM peak hour.

C. *Site Traffic Distribution*

The cumulative effect of site-generated traffic on the transportation network is dependent on the origins and destinations of that traffic and the location of the access drives serving the site. The proposed arrival/departure distribution of traffic generated by the proposed project is considered a function of several parameters, including:

- Employment centers using Census Data (e.g., OnTheMap)
- Commercial centers and schools
- Site access driveway locations
- Existing traffic patterns
- Existing traffic conditions and controls

Figure 7A shows the anticipated trip distribution pattern percentages for the traffic from the proposed multifamily project, Figure 7B shows the anticipated project trip distribution pattern percentages for the traffic from the proposed single-family project. Figures 8A and 8B illustrate the peak hour project site generated traffic based on those percentages for the multifamily and single-family projects, respectively. Figure 8C illustrates the combined total site generated trips from both projects.

VII. FULL DEVELOPMENT VOLUMES

Proposed design hour traffic volumes are developed for the AM and PM peak hours by combining the background traffic conditions (Figure 4) and the new site generated traffic volumes (Figure 8C) to yield the traffic volumes under full development conditions. The resulting design hour volumes for the proposed project are illustrated in Figure 9 under full build-out conditions.

VIII. CAPACITY ANALYSIS

A. Description of Capacity Analysis

Capacity analysis is a technique used for determining a measure of effectiveness for a section of roadway and/or intersection based on the number of vehicles during a specific time period. The measure of effectiveness used for the capacity analysis is referred to as a Level of Service (LOS). Levels of Service are calculated to provide an indication of the amount of delay that a motorist experiences while traveling along a roadway or through an intersection. Since the most amount of delay to motorists usually occurs at intersections, capacity analysis focuses on intersections, as opposed to highway segments.

Six Levels of Service are defined for analysis purposes. They are assigned letter designations, from "A" to "F", with LOS "A" representing the conditions with little to no delay, and LOS "F" conditions with very long delays. Suggested ranges of service capacity and an explanation of Levels of Service are included in the Appendices.

The standard procedure for capacity analysis of signalized and unsignalized intersections is outlined in the Highway Capacity Manual (HCM 2016) published by the Transportation Research Board. Traffic analysis software, Synchro 10, which is based on procedures and methodologies contained in the HCM, was used to analyze operating conditions at study area intersections. The procedure yields a Level of Service based on the HCM as an indicator of how well intersections operate. This study used HCM 2000 methodology for determining operations at the unsignalized intersections in accordance with local NYSDOT Region 5 guidelines.

B. Capacity Analysis Results

Existing and background operating conditions during the peak study periods are evaluated to determine a basis for comparison with the projected future conditions. The future traffic conditions generated by the project were analyzed to assess the operation of the study area intersections. Capacity results for existing, background and full development conditions are listed in Table V. The discussion following the table summarizes capacity conditions.

TABLE V: CAPACITY ANALYSIS RESULTS

INTERSECTION	2021 EXISTING BASE CONDITIONS				2024 NO BUILD CONDITIONS				2024 FULL BUILD CONDITIONS				2024 FULL BUILD CONDITIONS W/ IMPROVEMENTS			
	AM		PM		AM		PM		AM		PM		AM		PM	
1. SOUTHWESTERN BOULEVARD/BIG TREE ROAD (S)																
EB Left - Southwestern Boulevard	A	6.9	B	13.1	A	7.0	B	13.3	A	8.1	B	13.8				
EB Thru - Southwestern Boulevard	A	7.6	B	16.9	A	7.7	B	17.2	B	10.0	B	17.9				
EB Right - Southwestern Boulevard	A	0.7	A	0.9	A	0.7	A	0.9	A	0.8	A	1.0				
WB Left - Southwestern Boulevard	A	7.1	B	12.9	A	7.2	B	13.0	A	8.2	B	13.5				
WB Thru/Right - Southwestern Boulevard	A	9.0	C	21.5	A	9.1	C	21.9	B	10.2	C	22.8	NA		NA	
NB Left - Big Tree Road	E	60.6	D	54.9	E	60.8	D	54.6	E	59.3	D	53.6				
NB Left/Thru/Right - Big Tree Road	E	59.6	D	54.6	E	59.6	D	54.2	E	57.3	D	53.5				
SB Left - Radigan's	E	55.3	E	55.1	E	55.3	E	55.1	E	55.3	E	55.1				
SB Thru/Right - Radigan's	D	41.4	C	34.0	D	41.4	C	34.0	D	41.4	C	34.0				
Overall LOS	***B***	***13.6***	***C***	***23.5***	***B***	***13.7***	***C***	***23.7***	***B***	***15.8***	***C***	***24.0***				
Volume-to-Capacity (v/c) Ratio	***0.61***		***0.72***		***0.62***		***0.72***		***0.65***		***0.73***					
2. BIG TREE ROAD/PARKER ROAD/ECC DRIVEWAY (U)																
EB - Big Tree Road	A	0.5	A	0.3	A	0.5	A	0.3	A	0.5	A	0.3				
WB - Big Tree Road	A	0.5	A	0.9	A	0.5	A	0.9	A	0.7	A	1.5	NA		NA	
NB - Parker Road	C	15.2	C	20.8	C	15.3	C	21.2	C	18.3	D	28.0				
SB - ECC Dwy	C	15.7	C	16.5	C	15.9	C	16.7	C	17.8	C	18.7				
3. BIG TREE ROAD/ABBOTT ROAD (S)																
EB Left - Big Tree Road	B	10.3	A	9.8	B	10.4	A	10.0	B	10.9	B	10.8				
EB Thru/Right - Big Tree Road	B	14.6	B	12.4	B	14.7	B	12.5	B	15.6	B	13.0				
WB Left - Big Tree Road	B	10.5	B	11.8	B	10.5	B	12.1	B	10.8	B	12.5				
WB Thru/Right - Big Tree Road	B	13.1	B	15.0	B	13.2	B	15.2	B	13.4	B	16.4	NA		NA	
NB Left - Abbott Road	B	13.8	B	15.6	B	14.1	B	15.7	B	14.5	B	16.1				
NB Thru/Right - Abbott Road	B	16.4	B	15.0	B	17.0	B	15.2	B	17.3	B	15.4				
SB Left - Abbott Road	B	19.2	B	16.6	B	20.0	B	16.8	C	20.5	B	17.1				
SB Thru/Right - Abbott Road	B	12.0	B	17.9	B	12.3	B	18.1	B	12.3	B	18.6				
Overall LOS	***B***	***14.5***	***B***	***14.7***	***B***	***14.8***	***B***	***14.9***	***B***	***15.2***	***B***	***15.5***				
Volume-to-Capacity (v/c) Ratio	***0.57***		***0.64***		***0.57***		***0.65***		***0.62***		***0.68***					
4. PARKER ROAD/MARILYN DRIVE/PROPOSED SF NORTHERLY DWY (U)																
EB - Proposed Driveway	NA		NA		NA		NA		A	9.6	B	10.2				
WB - Marilyn Drive	A	8.8	A	8.9	A	8.8	A	8.9	A	8.9	A	9.1	NA		NA	
NB - Parker Road	NA		NA		NA		NA		A	0.0	A	0.1				
SB - Parker Road	A	1.5	A	1.1	A	1.6	A	1.1	A	1.0	A	0.7				
5. PARKER ROAD/PROPOSED SF SOUTHERLY DWY (U)																
EB - Proposed Driveway	NA		NA		NA		NA		A	9.2	A	9.4	NA		NA	
NB - Parker Road									A	0.0	A	0.1				
6. BIG TREE ROAD/PROPOSED MF EASTERLY DWY (U)																
WB - Big Tree Road	NA		NA		NA		NA		A	0.3	A	0.7	NA		NA	
NB - Proposed Driveway									B	13.5	C	18.6				
7. BIG TREE ROAD/PROPOSED MF WESTERLY DWY (U)																
WB Left - Big Tree Road									A	8.1	A	8.5	A	8.1	A	8.5
WB Thru - Big Tree Road	NA		NA		NA		NA		A	0.0	A	0.0	A	0.0	A	0.0
NB - Proposed Driveway									B	13.1	C	18.4	B	11.1	B	12.9

Notes:

1. A(2.8) = Level of Service (Delay in seconds per vehicle)
2. EB = Eastbound, WB = Westbound, NB = Northbound, SB = Southbound
3. (S) = Signalized; (U) = Unsignalized
4. N/A = Approach does not exist and/or was not analyzed during this condition
5. Green shaded cells indicate low delays, yellow shaded cells indicate moderate delays, red shaded cells indicate long delays.
6. The v/c ratio, also referred to as degree of saturation, represents the sufficiency of an intersection to accommodate the vehicular demand. A v/c ratio less than 0.85 generally indicates that adequate capacity is available and vehicles are not expected to experience significant queues and delays. A v/c ratio between 0.85 and 0.95 generally indicates an intersection is nearing capacity. Intersections with a v/c ratio of 1.0 or greater generally indicate conditions at or above capacity.

1. Southwestern Boulevard/Big Tree Road

All movements operate at LOS "E" or better under existing and projected no build conditions during both peak hours with short to moderate delays. In urbanized conditions, LOS "D" is considered an acceptable condition. The movements resulting in LOS "E", namely the northbound left/thru/right and southbound left, are near borderline conditions, as the threshold between LOS "D" and "E" is 55.0 seconds of delay per vehicle for signalized intersections.

Between no build and full build conditions, the eastbound thru and westbound thru/right movements change from LOS "A" to "B" during the AM peak hour; a borderline condition as the threshold is 10.0 seconds of delay per vehicle. No other movements are projected to change in LOS because of the proposed residential projects during either peak hour and no improvements are warranted nor recommended at this location.

2. Big Tree Road/Parker Road/ECC South Campus Driveway

All movements operate at a highly acceptable LOS "C" or better under existing and projected no build conditions during both peak hours. Between no build and full build conditions, the northbound movement changes from LOS "C" to an acceptable "D" during the PM peak hour; a change that occurs at 25.0 seconds of delay per vehicle. The projected minor impacts resulting from the proposed residential projects can be sufficiently accommodated by the existing intersection and no improvements are warranted nor recommended at this location.

3. Big Tree Road/Abbott Road

All movements operate at LOS "B" or better under existing and projected no build conditions during both peak hours. Between no build and full build conditions, the southbound left movement changes from LOS "B" to a highly acceptable "C" during the AM peak hour; a borderline condition as the change that occurs at 20.0 seconds of delay per vehicle. The projected minor impacts resulting from the proposed residential projects can be sufficiently accommodated by the existing intersection and no improvements are warranted nor recommended at this location.

4. Parker Road/Marilyn Drive/Proposed Single Family Northerly Driveway

All approaches operate at LOS "A" or better under existing and projected no build conditions during both peak hours. Under full build conditions, the eastbound approach from the proposed project is projected to operate at LOS "B". No changes in LOS are projected because of the proposed residential projects and the projected minor impacts can be sufficiently accommodated by the existing intersection; thus, no improvements are warranted nor recommended at this location. The proposed driveway should consist of one entering and one exiting lane.

5. Parker Road/Proposed Single Family Southerly Driveway

All approaches are projected to operate at LOS "A" under full build conditions. No improvements are warranted nor recommended at this location. The proposed driveway should consist of one entering and one exiting lane.

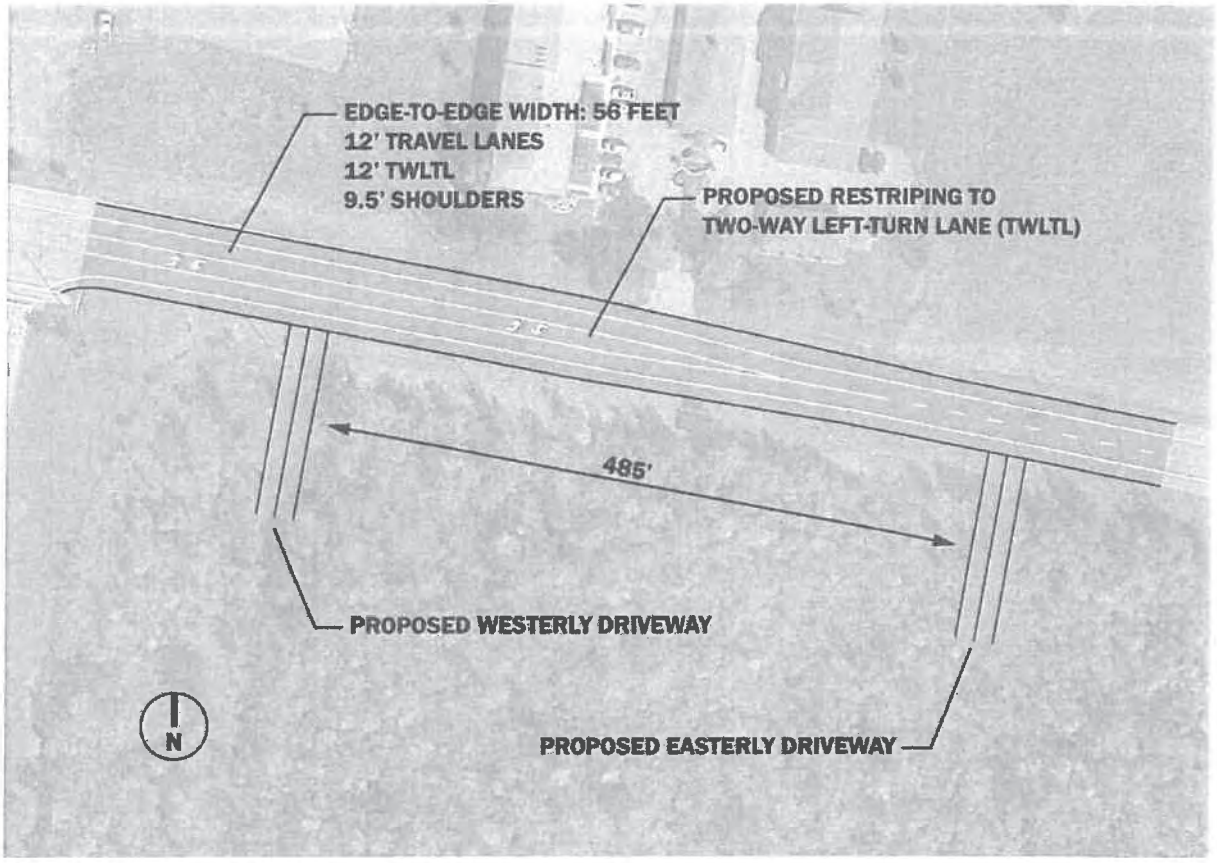
6. Big Tree Road/Proposed Multifamily Easterly Driveway

The proposed northbound approach is projected to operate at LOS "B" and "C" under full build conditions during the AM and PM peak hours, respectively. Big Tree Road approaches are projected to operate at LOS "A".

This study evaluated warrants for a left-turn treatment at this location and determined that they are only satisfied during the PM peak hour. This evaluation is discussed in greater detail in the following section. There are 22 left-turn vehicles entering the Proposed Multifamily Easterly Driveway (one vehicle every 2.7 minutes). Based upon the projected vehicle trips and capacity analysis results, no improvements are recommended at this location.

7. Big Tree Road/Proposed Multifamily Westerly Driveway

The proposed northbound approach is projected to operate at LOS "B" and "C" under full build conditions during the AM and PM peak hours, respectively. Big Tree Road approaches are projected to operate at LOS "A". The warrants for a left-turn treatment were not satisfied during both peak hours. However, the existing striping pattern should be restriped to legally accommodate drivers turning left from Big Tree Road onto the proposed driveway via a two-way left-turn lane (TWLTL) treatment. This concept is illustrated in the following figure. This maintains the ability for drivers to turn left onto the commercial driveway west of the proposed driveway location while accommodating drivers to exit the Proposed Multifamily Westerly Driveway. The Proposed Multifamily Westerly Driveway should consist of one entering and one exiting lane.



IX. LEFT TURN TREATMENT INVESTIGATION

Volume warrants for left turn treatments at the proposed driveways for the multifamily project along Big Tree Road were investigated using the Transportation Research Board's NCHRP Report 279, Intersection Channelization Design Guide. Provisions for left turn lane facilities should be established where traffic volumes are high enough and safety considerations are sufficient to warrant the additional lane. All warrant calculations are included in the Appendices.

Warrants were investigated for full build conditions of the multifamily project site during both peak hours analyzed. For the intersection of Big Tree Road/Proposed Multifamily Easterly Driveway, the proposed traffic volumes turning left onto the proposed driveway from Big Tree Road indicates that the warrants for a westbound left turn lane are not satisfied during the AM peak hour but are satisfied during the PM peak hour. It should be noted that the projected volumes turning left onto the multifamily project site at this location is 22 vehicles per hour (one vehicle every 2.7 minutes).

For the intersection of Big Tree Road/Proposed Multifamily Westerly Driveway, the proposed traffic volumes turning left onto the proposed driveway from Big Tree Road indicates that the warrants for a westbound left turn lane are not satisfied during both peak hours studied.

X. CONCLUSIONS & RECOMMENDATIONS

This Traffic Impact Study identifies and evaluates the potential traffic impacts that can be expected from the proposed project in the Town of Hamburg, New York, as described in this study. The results of this study determined that the existing transportation network can adequately accommodate the projected traffic volumes and resulting minor impacts to study area intersections with the noted improvements in place. The following sets forth the conclusions and recommendations based upon the results of the analyses:

1. The proposed residential projects are expected to generate approximately 30 entering/95 exiting vehicle trips during the AM peak hour and 98 entering/59 exiting vehicle trips during the PM peak hour.

2. The existing crash investigation did not reveal inherent safety deficiencies related to the geometric design of the study area intersections.

3. The left-turn warrant investigation at the proposed driveways along Big Tree Road determined that the proposed Driveway multifamily project Big Tree Road/Proposed Multifamily Easterly Driveway during the PM peak hour was satisfied; no other peak hours at either the proposed westerly or easterly intersections for the proposed multifamily family project were satisfied.

4. At the intersection of Big Tree Road/Proposed Multifamily Westerly Driveway, the existing striping pattern should be restriped to legally accommodate drivers turning left from Big Tree Road onto the proposed driveway via a two-way left-turn lane (TWLTL) treatment. This maintains the ability for drivers to turn left onto the commercial driveway west of the proposed driveway location while accommodating drivers to exit the proposed westerly driveway.

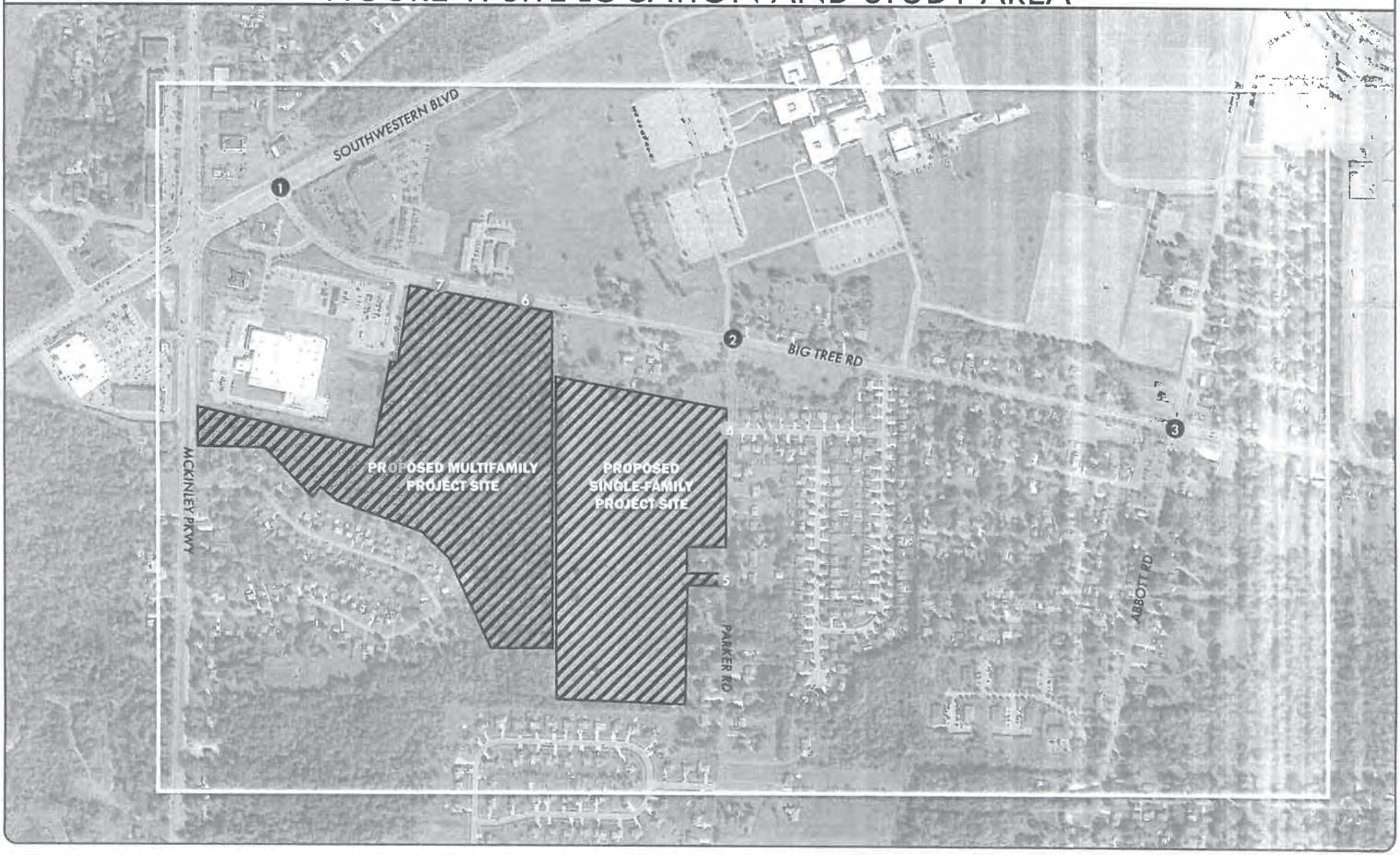
5. The projected traffic impacts resulting from full development of both of the proposed residential projects during both peak hours can be accommodated by the existing transportation network with the noted improvements in place.

6. For purposes of the environmental review of the proposed residential projects pursuant to the State Environmental Quality Review Act (SEQRA), it is our firm's professional opinion that the proposed residential projects will not result in any cumulative potentially significant adverse traffic impacts to the study area intersections. Given that both proposed residential projects will not result in any cumulative potentially significant traffic impacts, our firm's professional opinion as state above also applies to each of the two proposed residential projects if they had been evaluated separately.

XI. FIGURES

Figures 1 through 9 are included on the following pages.

FIGURE 1: SITE LOCATION AND STUDY AREA



Key

- Study Intersection
- Proposed Intersection
- Study/Proposed Intersection
- Study Area
- Site Location

PROPOSED RESIDENTIAL PROJECTS AT BIG TREE ROAD AND PARKER ROAD

TOWN OF HAMBURG, ERIE COUNTY, NEW YORK

N

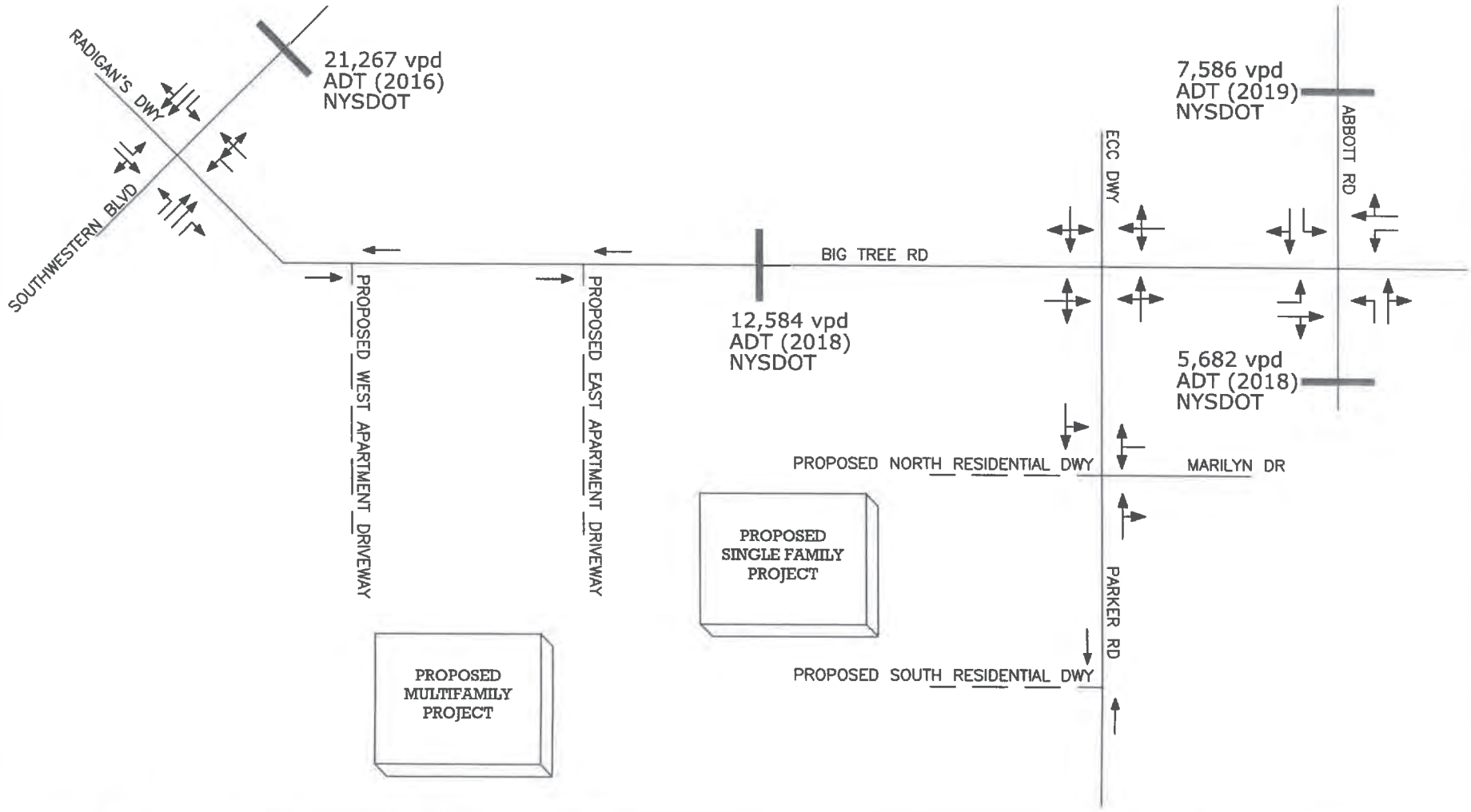
0 600
FEET

Project No: 41019

SRF ASSOCIATES
Transportation Planning / Engineering / Design

Notes:

1. All AADT volumes by those noted:
   1.1. NYSDOT = New York State Department of Transportation.
2. V.P.D. = Vehicles per Day.



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N
NOT TO SCALE

FIGURE 2

LANE GEOMETRY &
AVERAGE DAILY TRAFFIC

PROPOSED BIG TREE RESIDENTIAL PORJECTS
TOWN OF HAMBURG, NY

KEY

PROJECT NO: 41019

Notes:

1. Data for the Big Tree Rd/Abbott Rd intersection was obtained the GBNRTC database. Data for this intersection is from 2019.
2. Data for the remaining intersections is from 2021.

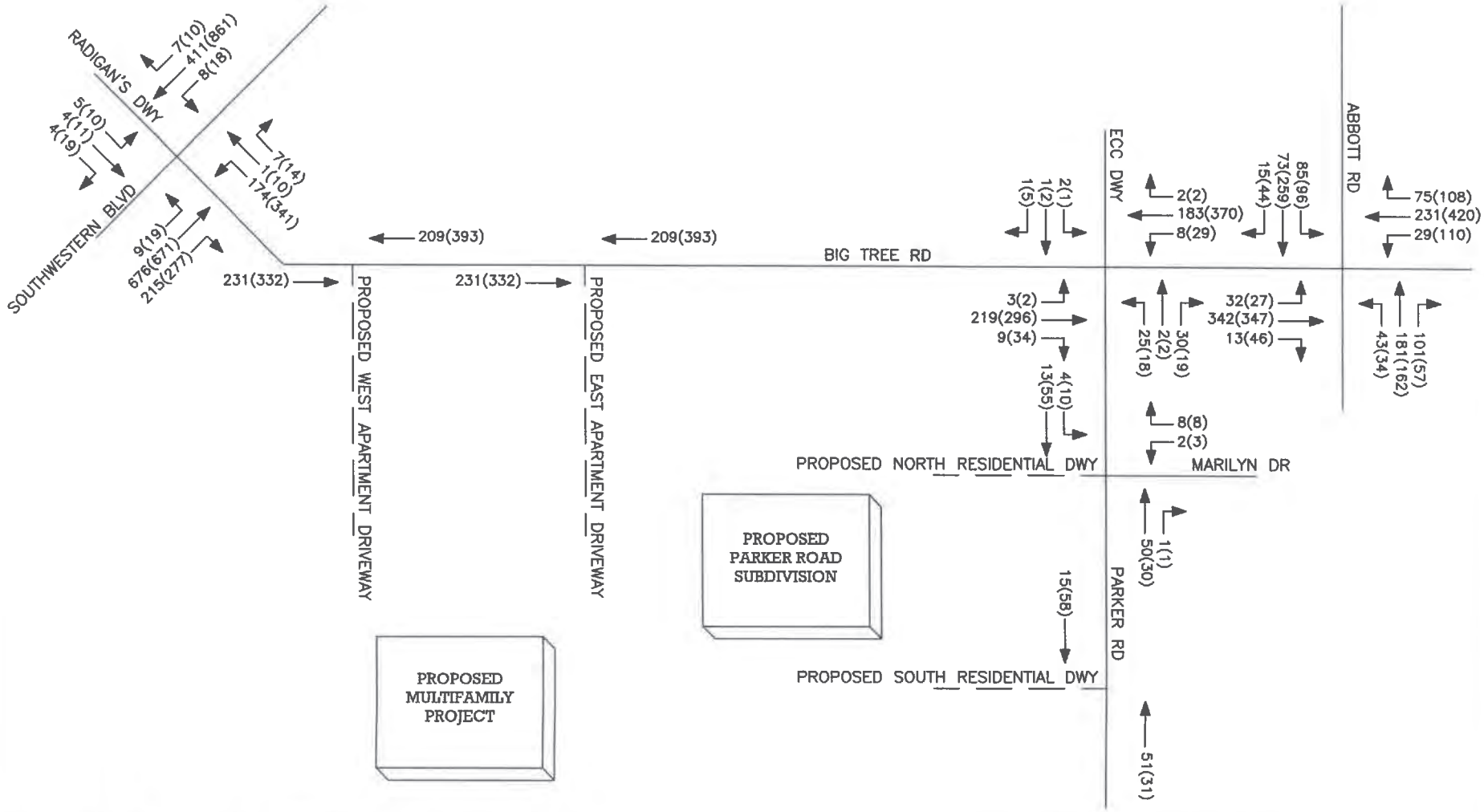

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FIGURE 3A

PEAK HOUR VOLUMES
EXISTING CONDITIONS

PROPOSED BIG TREE RESIDENTIAL PORJECTS
TOWN OF HAMBURG, NY

KEY

00(00) = AM(PM)

PROJECT NO: 41019

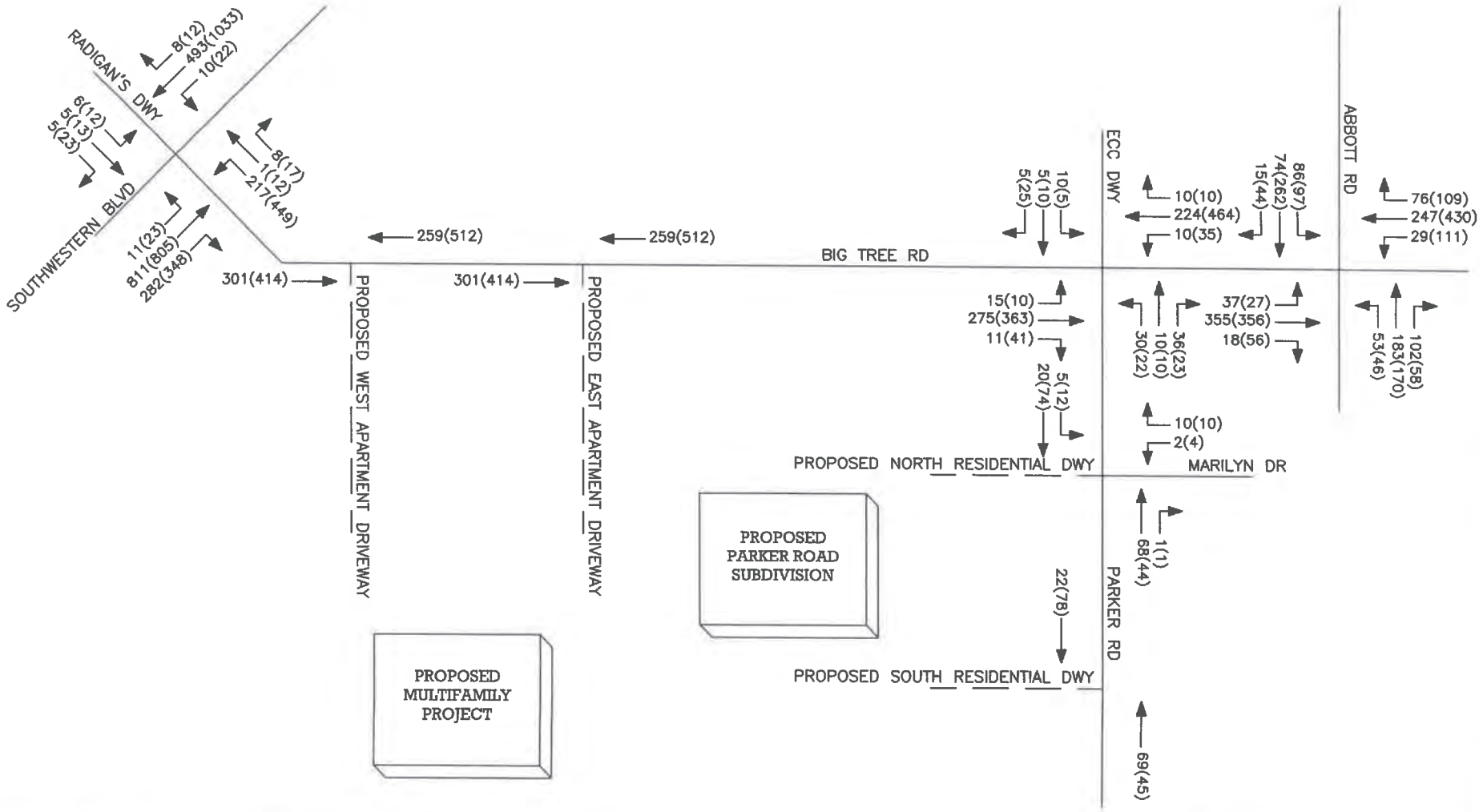

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FIGURE 3B

PEAK HOUR VOLUMES
2021 ADJUSTED BASE CONDITIONS

PROPOSED BIG TREE RESIDENTIAL PORJECTS
TOWN OF HAMBURG, NY

KEY

00(00) = AM(PM)

PROJECT NO: 41019

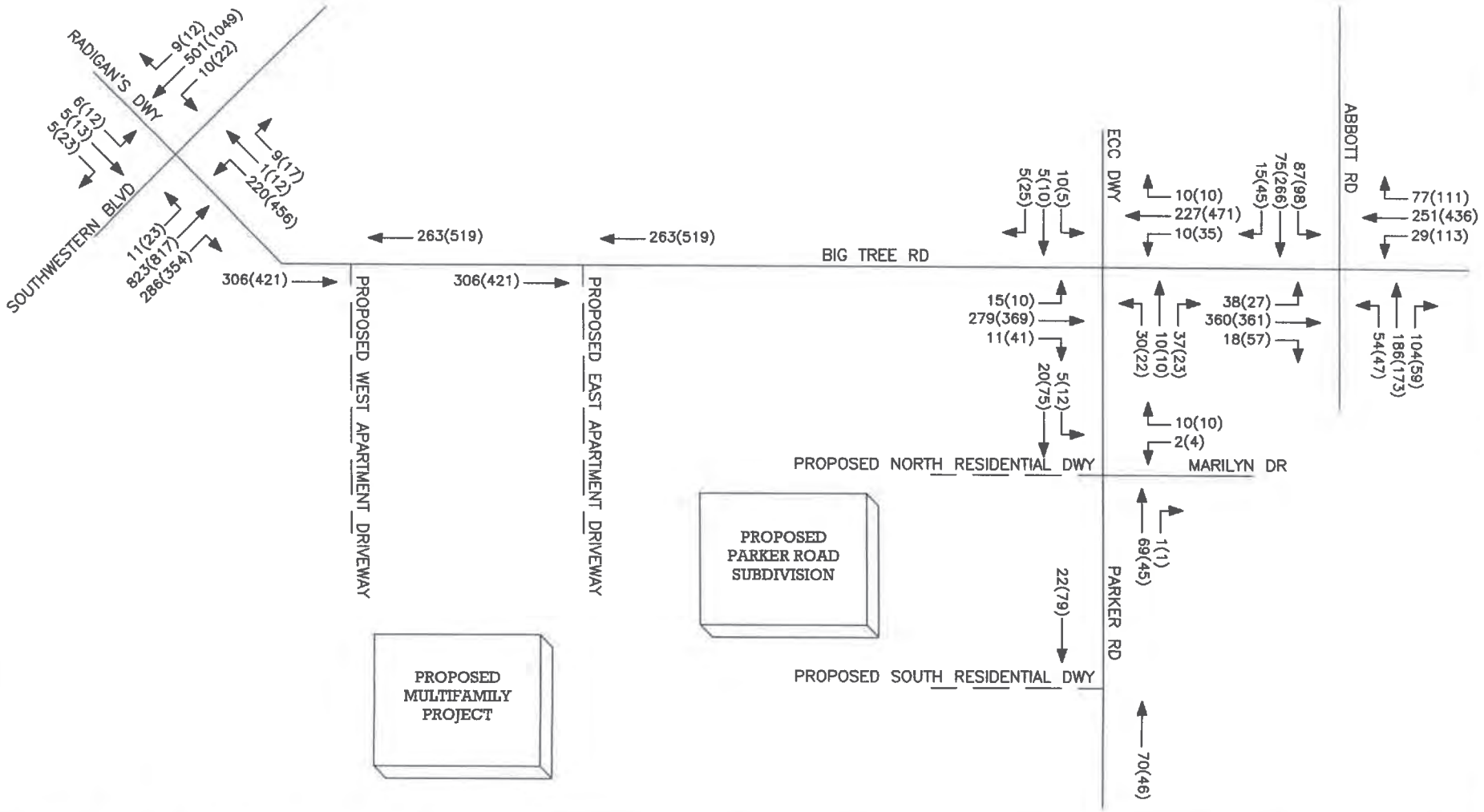

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FIGURE 4

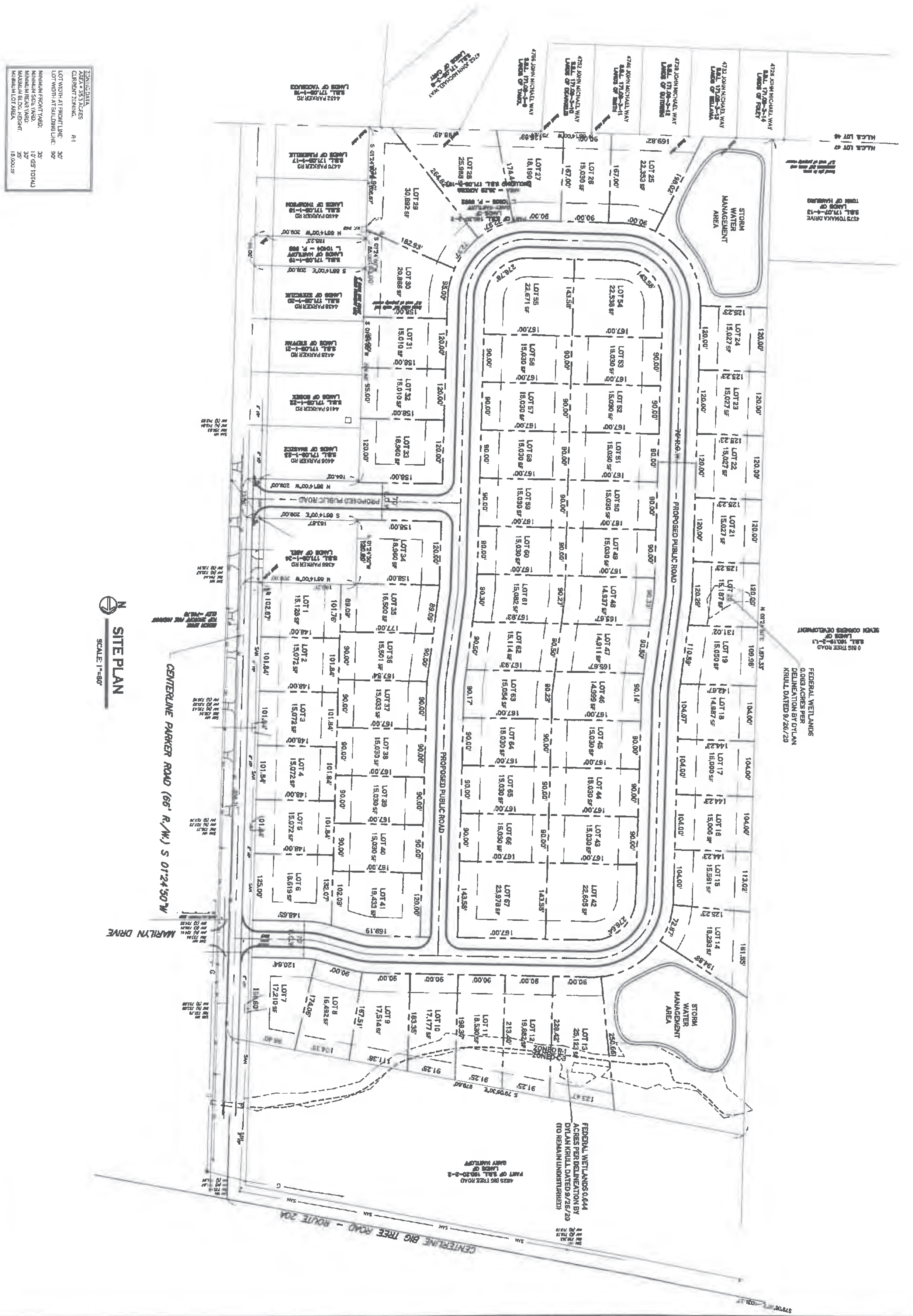
PEAK HOUR VOLUMES
2024 BACKGROUND CONDITIONS

PROPOSED BIG TREE RESIDENTIAL PORJECTS
TOWN OF HAMBURG, NY

KEY

00(00) = AM(PM)

PROJECT NO: 41019



PROJECT NAME:

New Construction

Single Family Subdivision

Parker Rd & Rte 20A
Hamburg, New York

REVISIONS:

No.	Description	Date

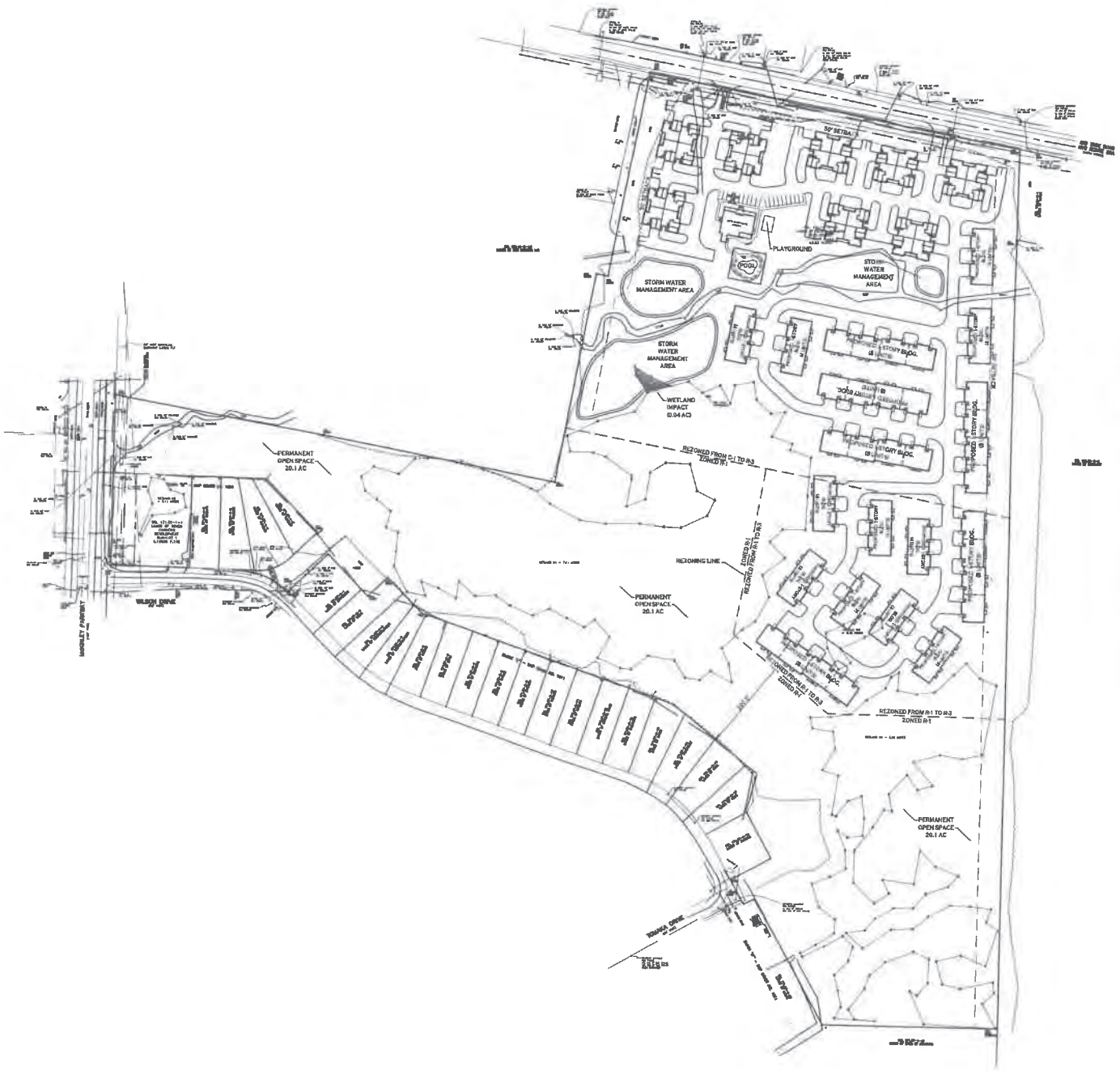
Date: 2/3/21
Drawn by: C. Wood
Scale: As Noted

DRAWING NAME:
Preliminary Plat Plan

DRAWING NO.
C-100

Project no.: 19.241

Carmina Wood Morris PC



SITE DATA - R3 AREA

SITE AREA = 42.5 AC TOTAL SITE (22.4 AC REZONED TO R-3)
ZONED: TO BE REZONED FROM C-1 TO R-3 (MULTI-FAMILY DISTRICT)
DESCRIPTION: (82) 1-STORY UNITS W/ ATTACHED GARAGE
(94) 2-STORY UNITS W/ ATTACHED GARAGES

	REQUIRED	PROVIDED
SETBACKS - BUILDING		
FRONT:	50 FT	> 50 FT
SIDE (3 OR MORE FAMILY DWELLING):	50 FT	> 50 FT
REAR (3 OR MORE FAMILY DWELLING):	50 FT	56 FT MIN.
SETBACKS - PARKING		
FRONT:	50 FT	> 50 FT
SIDE	5 FT	> 5 FT
REAR	5 FT	> 5 FT
PRINCIPAL BLDG. SEPARATION		
BETWEEN VERTICAL WALLS OF BLDGS. (AVERAGE HEIGHT OF BLDG)	35 FT MIN.	35 FT MIN.
GREENSPACE		
TOTAL SITE (10%):	4.25 AC	> 10.0%
INTERIOR TO PARKING AREA (5%):	0.4 AC	> 5.0%
PARKING	AS	174 OPEN
# OF SPACES - SEE CALCULATION BELOW	DETERMINED BY P.B.	156 GARAGE 330 TOTAL
LOT FRONTAGE		
LOT WIDTH AT FRONT LOT LINE:	200.0 FT MIN.	317.56 FT

NOTE: BOUNDARY AND TOPOGRAPHIC INFORMATION PROVIDED BY OTHERS. CARMINA WOOD MORRIS, D.P.C. ASSUMES NO RESPONSIBILITY FOR ITS ACCURACY.

100' 100 0 100 200' FT.

Carmina Wood Morris DPC
437 Main Street, Suite 300
Buffalo, New York 14203
P 716.842.0186
F 716.842.0283

REVISIONS:

No.	Description	Date

PROJECT NAME:
New Construction
Multi-Family Development
Big Tree Road
Town of Hamburg, New York

Date: 11/2/20
Drawn by: C. Wood
Scale: AS Noted

DRAWING NAME:
Concept Site Plan

DRAWING NO.
C-100

Project no.: 20,062

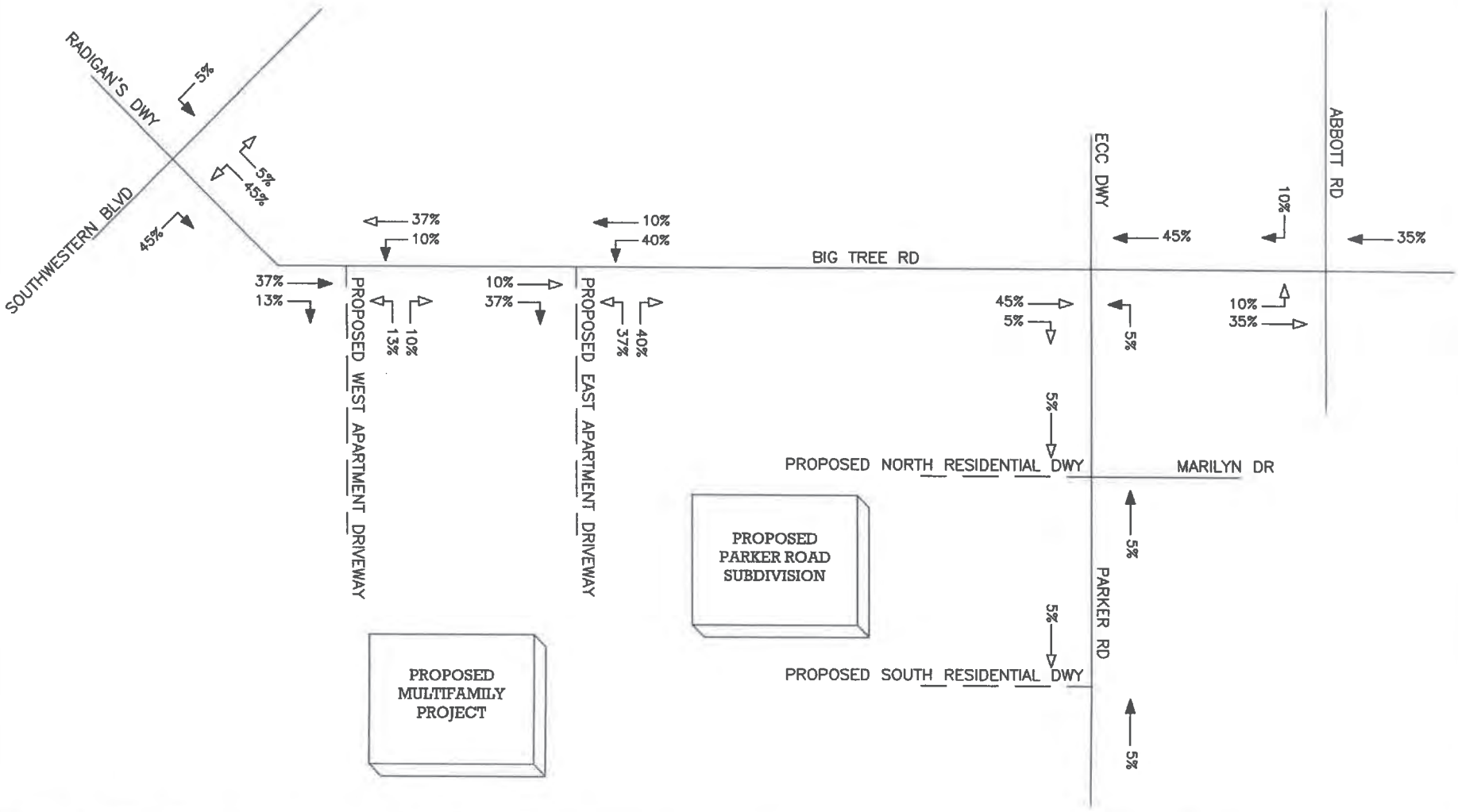


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FIGURE 7A

MULTIFAMILY PROJECT TRIP DISTRIBUTION

PROPOSED BIG TREE RESIDENTIAL PORJECTS
TOWN OF HAMBURG, NY

KEY

00(00) = AM(PM)
→ = ENTERING TRIPS
→ = EXITING TRIPS

PROJECT NO: 41019

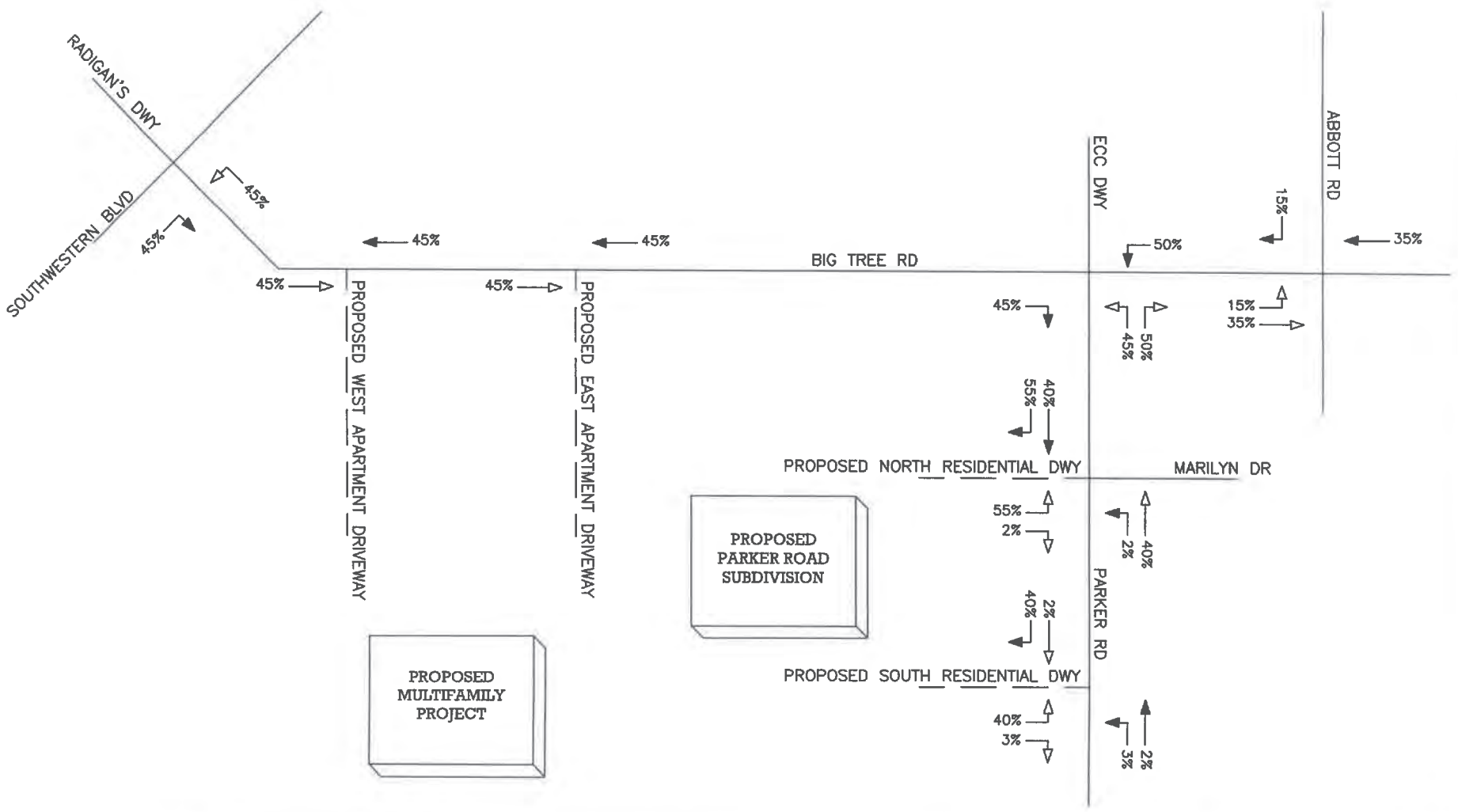

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FIGURE 7B

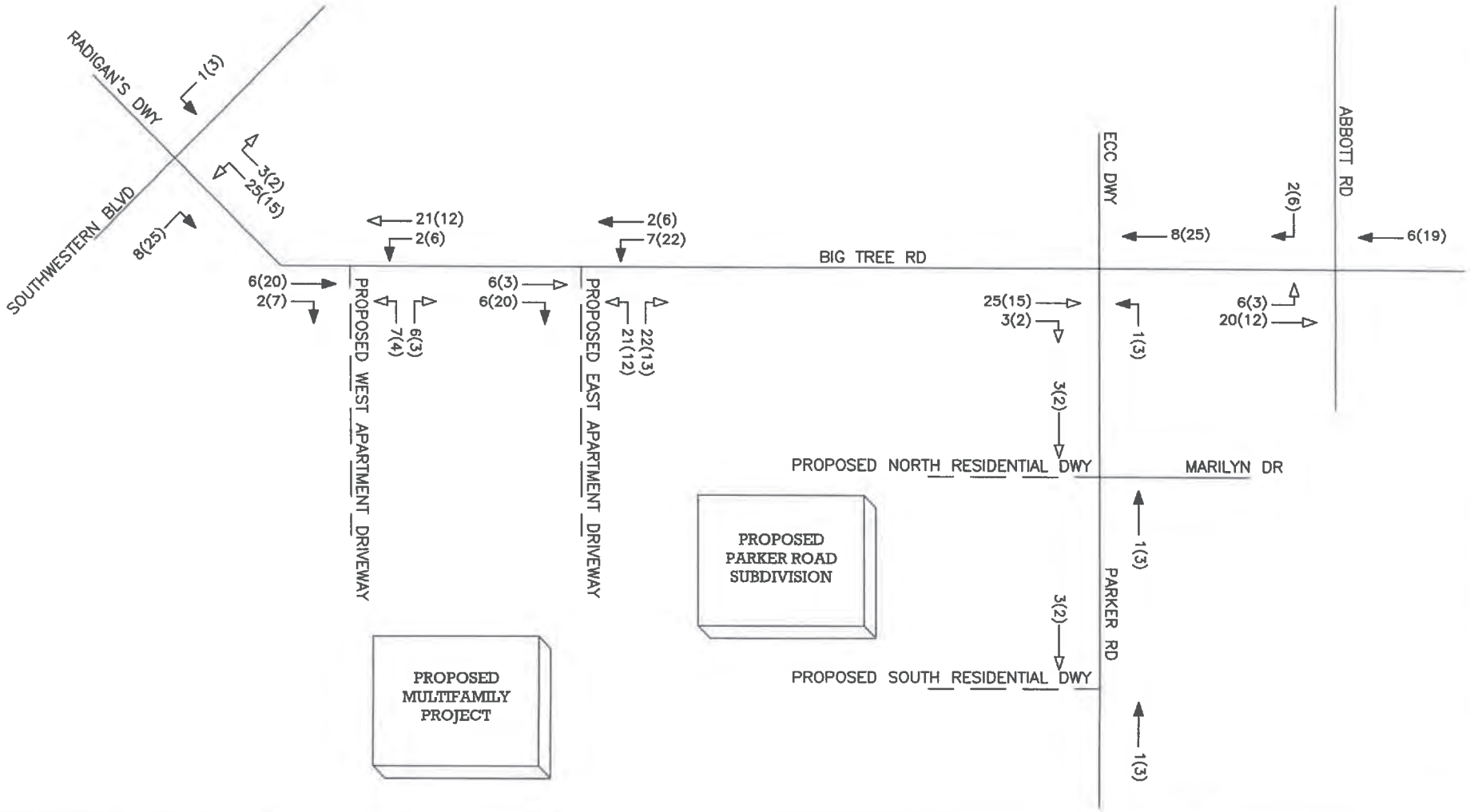
PARKER RD SUBDIVISION TRIP DISTRIBUTION

PROPOSED BIG TREE RESIDENTIAL PORJECTS
TOWN OF HAMBURG, NY

KEY

00(00) = AM(PM)
→ = ENTERING TRIPS
→ = EXITING TRIPS

PROJECT NO: 41019



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N
NOT TO SCALE

FIGURE 8A

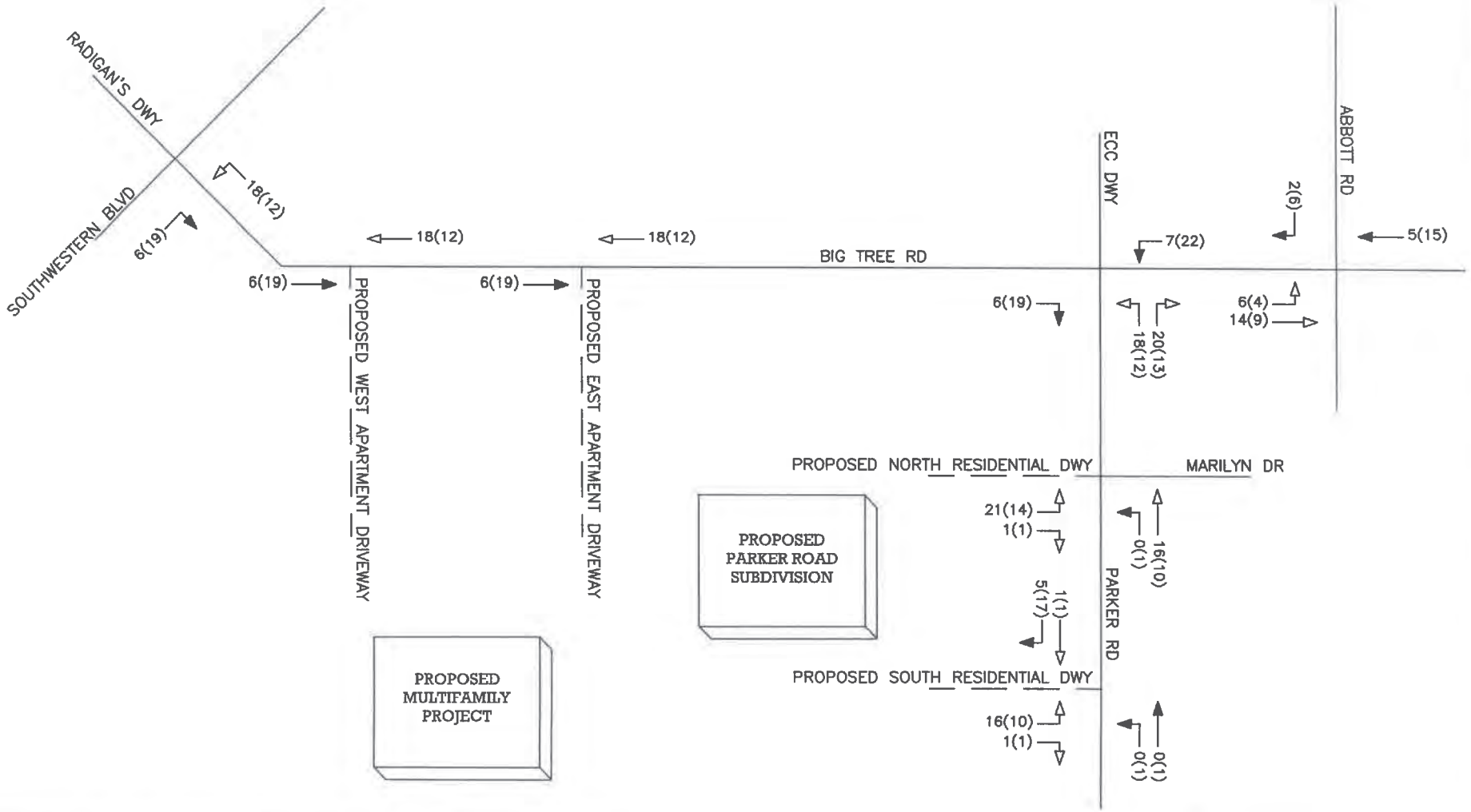
MULTIFAMILY PROJECT SITE GENERATED TRIPS

PROPOSED BIG TREE RESIDENTIAL PORJECTS
TOWN OF HAMBURG, NY

KEY

00(00) = AM(PM)
→ = ENTERING TRIPS
→ = EXITING TRIPS

PROJECT NO: 41019



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NOT TO SCALE

FIGURE 8B

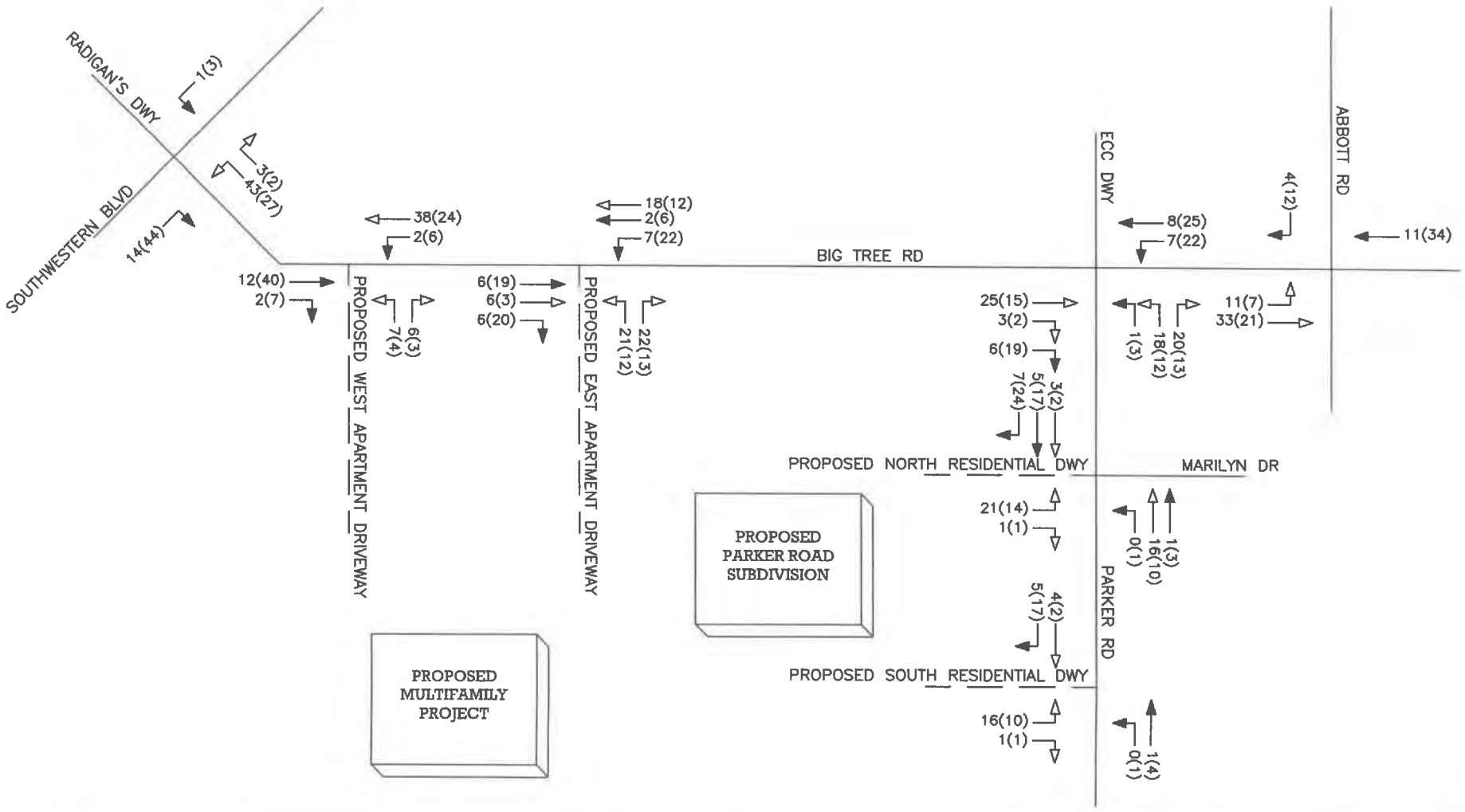
PARKER RD SUBDIVISION TRIP DISTRIBUTION

PROPOSED BIG TREE RESIDENTIAL PORJECTS
TOWN OF HAMBURG, NY

KEY

00(00) = AM(PM)
→ = ENTERING TRIPS
→ = EXITING TRIPS

PROJECT NO: 41019



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NOT TO SCALE

FIGURE 8C

TOTAL SITE GENERATED TRIPS

PROPOSED BIG TREE RESIDENTIAL PORJECTS
TOWN OF HAMBURG, NY

KEY

00(00) = AM(PM)
→ = ENTERING TRIPS
→ = EXITING TRIPS

PROJECT NO: 41019

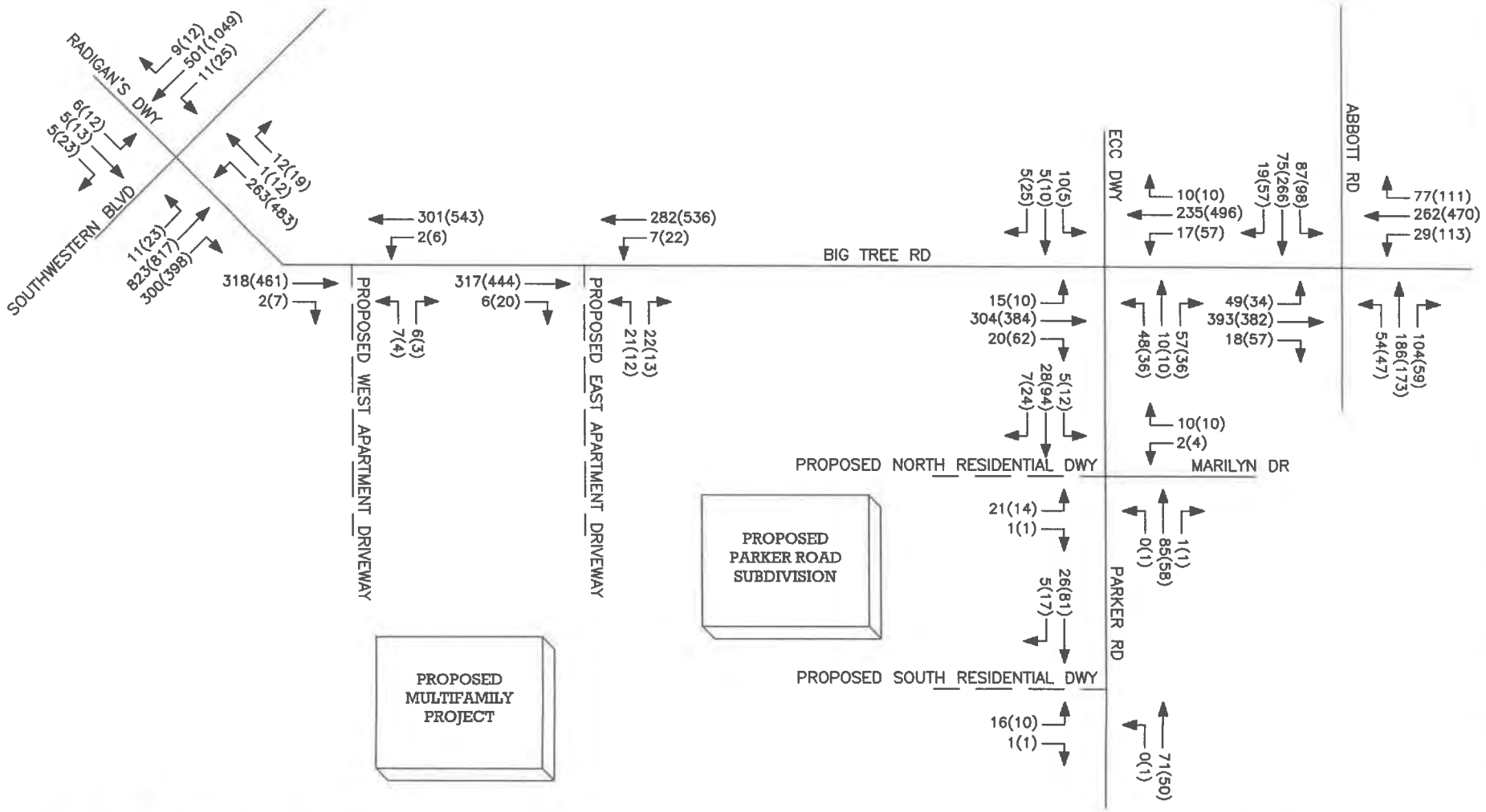

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FIGURE 9

PEAK HOUR VOLUMES
FULL DEVELOPMENT CONDITIONS

PROPOSED BIG TREE RESIDENTIAL PORJECTS
TOWN OF HAMBURG, NY

KEY

00(00) = AM(PM)

PROJECT NO: 41019

APPENDICES

A1

Collected Traffic Volume Data

Peak Hour Data for Intersection

Int ID: 270
Community: Orchard Park
Road 1: Abbott Rd
Road 2: Big Tree Rd

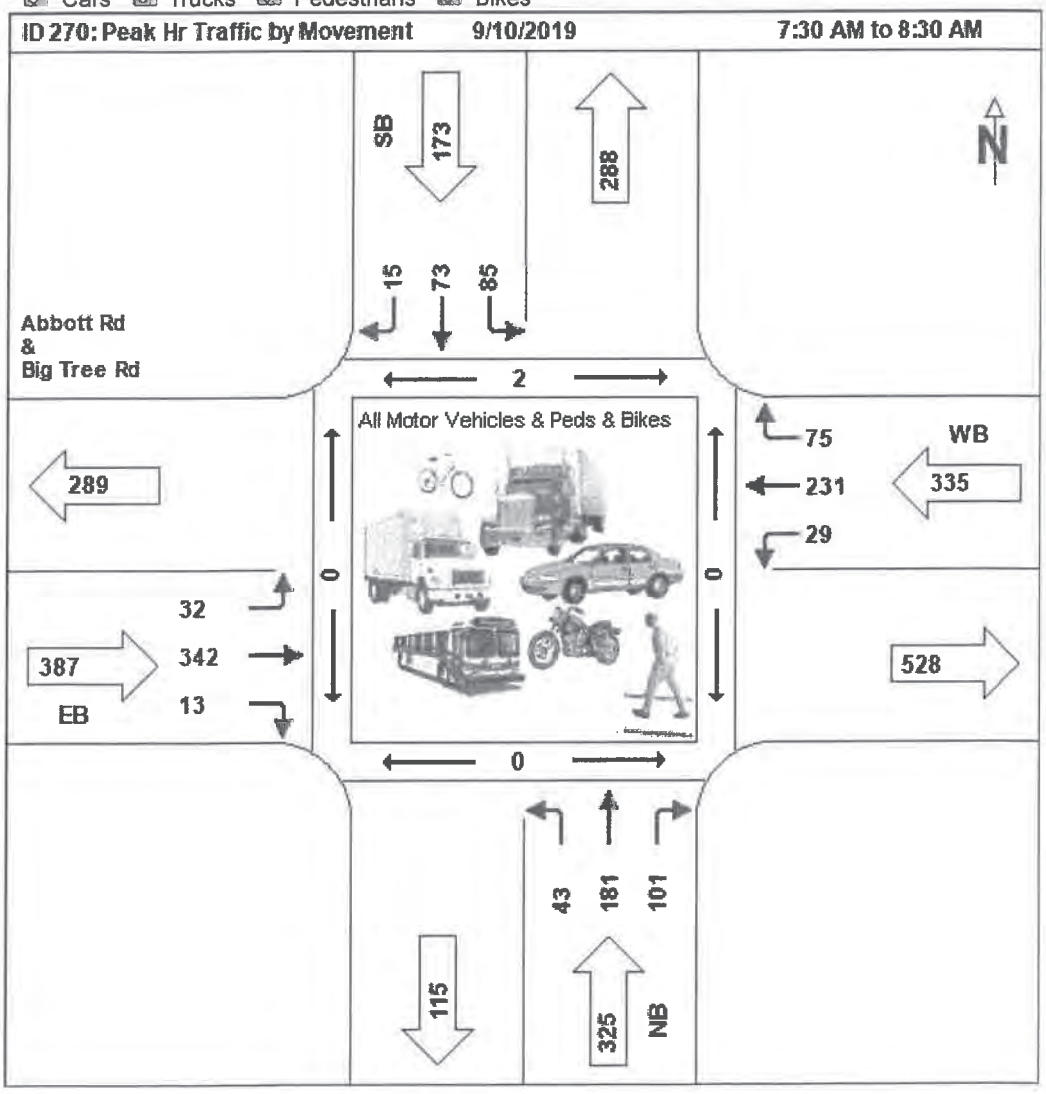
Corridor: NA
Road 3:
Road 4:

|<< | < | > | >>| 1-2 of 2

AM Peak Hour
09/10/2019

Start Time	NB Left	NB Thru	NB Right	NB Ped	NB App Total	EB Left	EB Thru	EB Right	EB Ped	EB App Total	SB Left	SB Thru	SB Right	SB Ped	SB App Total	WB Left	WB Thru	WB Right	WB Ped	WB App Total	Int Total
7:30 AM	11	50	23	0	84	8	85	4	0	97	19	31	2	0	52	5	66	22	2	93	326
7:45 AM	14	60	37	0	111	12	108	1	0	121	30	12	4	0	46	7	67	22	0	96	374
8:00 AM	7	34	20	0	61	7	77	4	0	88	17	15	5	0	37	9	49	18	0	76	262
8:15 AM	11	37	21	0	69	5	72	4	0	81	19	15	4	0	38	8	49	13	0	70	258
Total	43	181	101	0	325	32	342	13	0	387	85	73	15	0	173	29	231	75	2	335	1220
PHF	0.77	0.75	0.68		0.73	0.67	0.79	0.81		0.80	0.71	0.59	0.75		0.83	0.81	0.86	0.85		0.87	
HV %	2	4	1			3	4	15			11	4	0			7	6	11			

☑ Cars ☑ Trucks ☑ Pedestrians ☑ Bikes

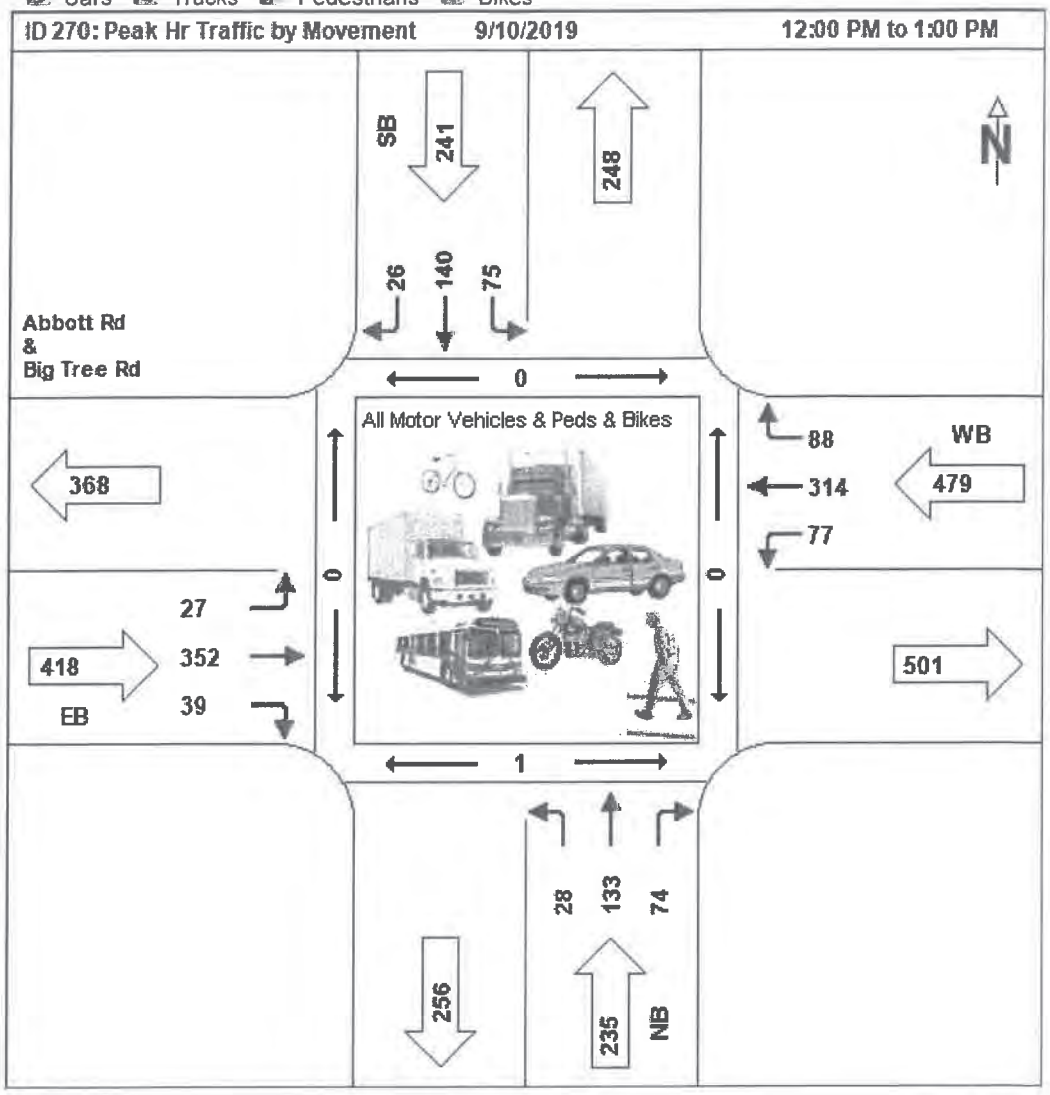


Midday Peak Hour
09/10/2019

Start Time	NB Left	NB Thru	NB Right	NB Ped	NB App Total	EB Left	EB Thru	EB Right	EB Ped	EB App Total	SB Left	SB Thru	SB Right	SB Ped	SB App Total	WB Left	WB Thru	WB Right	WB Ped	WB App Total	Int Total
12:00 PM	5	33	18	0	56	1	65	9	0	75	21	31	4	0	56	34	101	38	0	173	360

12:15 PM	8	27	19	0	54	8	116	13	1	137	21	30	9	0	60	18	78	16	0	112	363
12:30 PM	6	33	20	0	59	9	89	12	0	110	13	33	10	0	56	13	71	17	0	101	326
12:45 PM	9	40	17	0	66	9	82	5	0	96	20	46	3	0	69	12	64	17	0	93	324
Total	28	133	74		235	27	352	39	1	418	75	140			241		314		0		1373
PHF	0.78	0.83	0.93															0.56			
HV %	0	2	4														4				

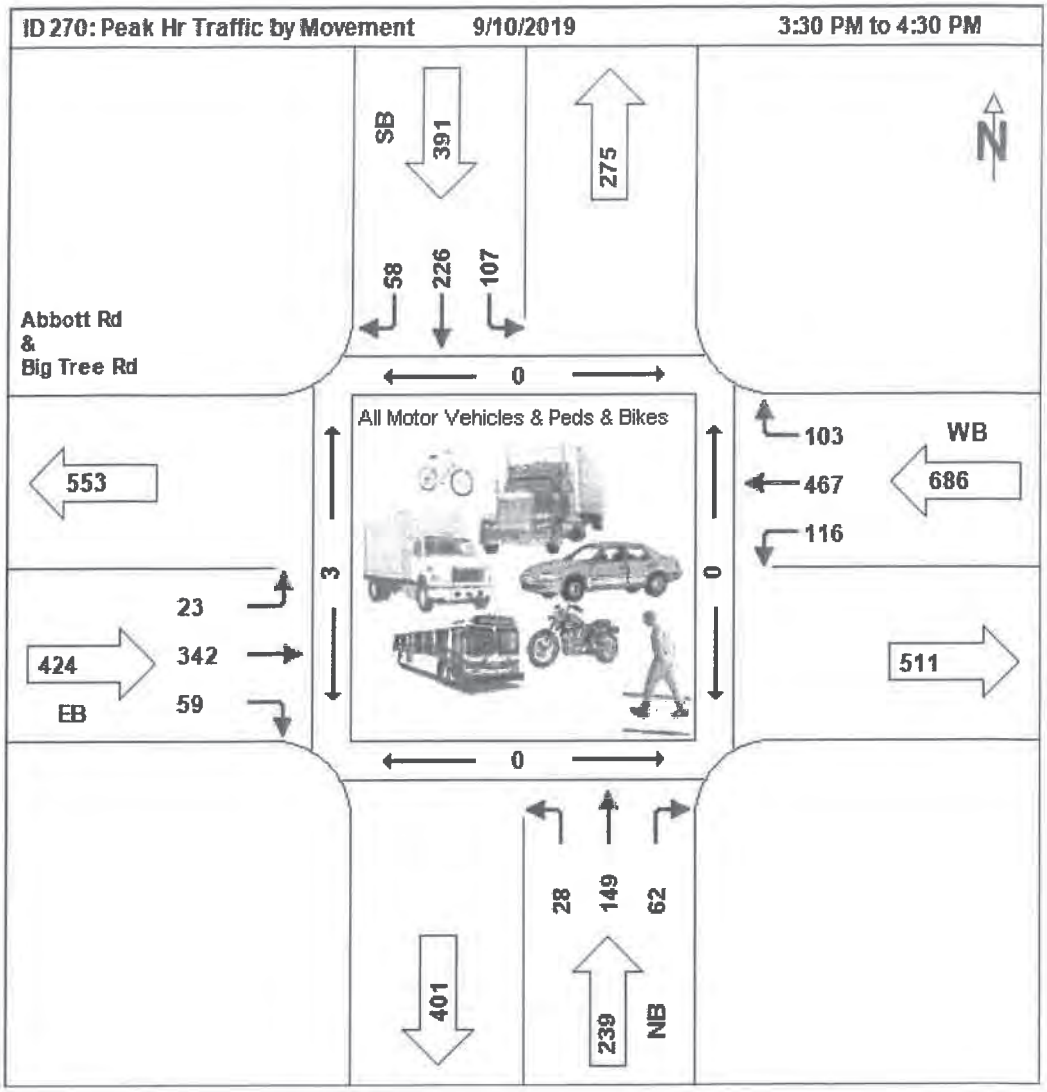
☑ Cars ☑ Trucks ☑ Pedestrians ☑ Bikes



PM Peak Hour
09/10/2019

Start Time	NB Left	NB Thru	NB Right	NB Ped	NB App Total	EB Left	EB Thru	EB Right	EB Ped	EB App Total	SB Left	SB Thru	SB Right	SB Ped	SB App Total	WB Left	WB Thru	WB Right	WB Ped	WB App Total	Int Total
3:30 PM	4	31	10	0	45	7	79	11	0	97	31	59	12	3	102	42	130	28	0	200	444
3:45 PM	8	37	21	0	66	5	94	16	0	115	23	55	16	0	94	22	127	23	0	172	447
4:00 PM	4	38	13	0	55	5	82	18	0	105	29	61	17	0	107	29	101	33	0	163	430
4:15 PM	12	43	18	0	73	6	87	14	0	107	24	51	13	0	88	23	109	19	0	151	419
Total	28	149	62	0	239	23	342	59	0	424	107	226	58	3	391	116	467	103	0	686	1740
PHF	0.58	0.87	0.74		0.82	0.82	0.91	0.82		0.92	0.86	0.93	0.85		0.91	0.69	0.90	0.78		0.86	
HV %	0	1	5			4	2	3			5	1	3			2	1	5			

☑ Cars ☑ Trucks ☑ Pedestrians ☑ Bikes


ID 270: Peak Hr Traffic by Movement
9/10/2019
3:30 PM to 4:30 PM
SB
391
275
N
58
226
107
Abbott Rd
&
Big Tree Rd
0
All Motor Vehicles & Peds & Bikes
103
WB
467
686
116
553
3
0
23
424
342
59
EB
511
0
28
149
62
401
239
NB

File Name : Big Tree Rd-Abbott PM
Site Code : 00000000
Start Date : 9/10/2019
Page No : 1

Groups Printed- Class 1 - Class 2

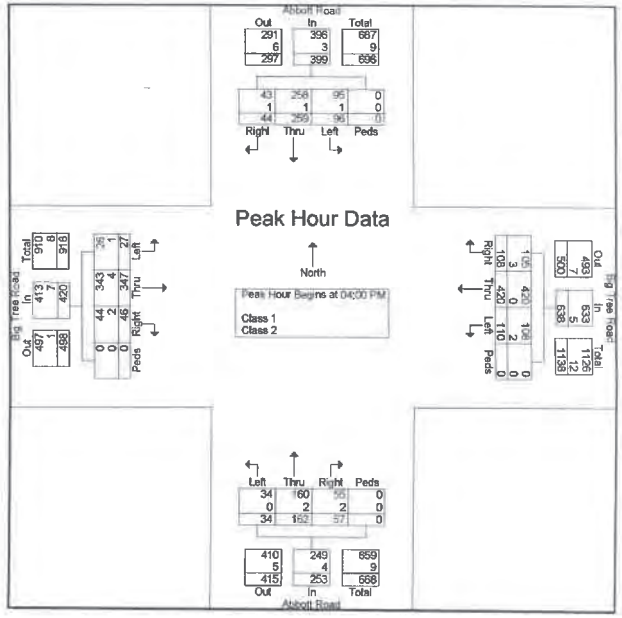
	Abbott Road Southbound				Big Tree Road Westbound				Abbott Road Northbound				Big Tree Road Eastbound				
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
04:00 PM	16	61	29	0	33	100	29	0	13	38	4	0	18	82	5	0	428
04:15 PM	13	51	24	0	19	109	23	0	18	43	12	0	14	87	6	0	419
04:30 PM	10	70	16	0	31	110	32	0	12	41	8	0	6	91	7	0	434
04:45 PM	5	77	27	0	25	101	26	0	14	40	10	0	8	87	9	0	429
Total	44	259	96	0	108	420	110	0	57	162	34	0	48	347	27	0	1710
Grand Total	44	259	96	0	108	420	110	0	57	162	34	0	48	347	27	0	1710
Apprch %	11	64.9	24.1	0	16.9	65.8	17.2	0	22.5	64	13.4	0	11	82.6	6.4	0	
Total %	2.6	15.1	5.6	0	6.3	24.6	6.4	0	3.3	9.5	2	0	2.7	20.3	1.6	0	
Class 1	43	258	95	0	105	420	108	0	55	160	34	0	44	343	26	0	1691
% Class 1	97.7	99.6	99	0	97.2	100	98.2	0	96.5	98.8	100	0	95.7	98.8	96.3	0	98.9
Class 2	1	1	1	0	3	0	2	0	2	2	0	0	2	4	1	0	19
% Class 2	2.3	0.4	1	0	2.8	0	1.8	0	3.5	1.2	0	0	4.3	1.2	3.7	0	1.1

SRF ASSOCIATES, D.P.C.
3495 Winton Place, Building E, Suite 110
Rochester, New York 14623

File Name : Big Tree Rd-Abbott PM
Site Code : 00000000
Start Date : 9/10/2019

Page No : 2

	Abbott Road Southbound					Big Tree Road Westbound					Abbott Road Northbound					Big Tree Road Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 04:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	16	61	29	0	106	33	100	29	0	162	13	38	4	0	55	18	82	5	0	105	428
04:15 PM	13	51	24	0	88	19	109	23	0	151	18	43	12	0	73	14	87	6	0	107	419
04:30 PM	10	70	16	0	96	31	110	32	0	173	12	41	8	0	61	6	91	7	0	104	434
04:45 PM	5	77	27	0	109	25	101	26	0	152	14	40	10	0	64	8	87	9	0	104	429
Total Volume	44	259	96	0	399	108	420	110	0	638	57	162	34	0	253	46	347	27	0	420	1710
% App. Total	11	64.9	24.1	0		16.9	65.8	17.2	0		22.5	64	13.4	0		11	82.6	6.4	0		
PHF	.688	.841	.828	.000	.915	.818	.955	.859	.000	.922	.792	.942	.708	.000	.866	.639	.953	.750	.000	.981	.985
Class 1	43	258	95	0	396	105	420	108	0	633	55	160	34	0	249	44	343	26	0	413	1691
% Class 1	97.7	99.6	99.0	0	99.2	97.2	100	98.2	0	99.2	96.5	98.8	100	0	98.4	95.7	98.8	96.3	0	98.3	98.9
Class 2	1	1	1	0	3	3	0	2	0	5	2	2	0	0	4	2	4	1	0	7	19
% Class 2	2.3	0.4	1.0	0	0.8	2.8	0	1.8	0	0.8	3.5	1.2	0	0	1.6	4.3	1.2	3.7	0	1.7	1.1



TRI-STATE TRAFFIC DATA

www.TSTData.com
184 Baker Rd

Coatesville, Pennsylvania, United States 19320
610-466-1469
Serving Transportation Professionals Since 1995

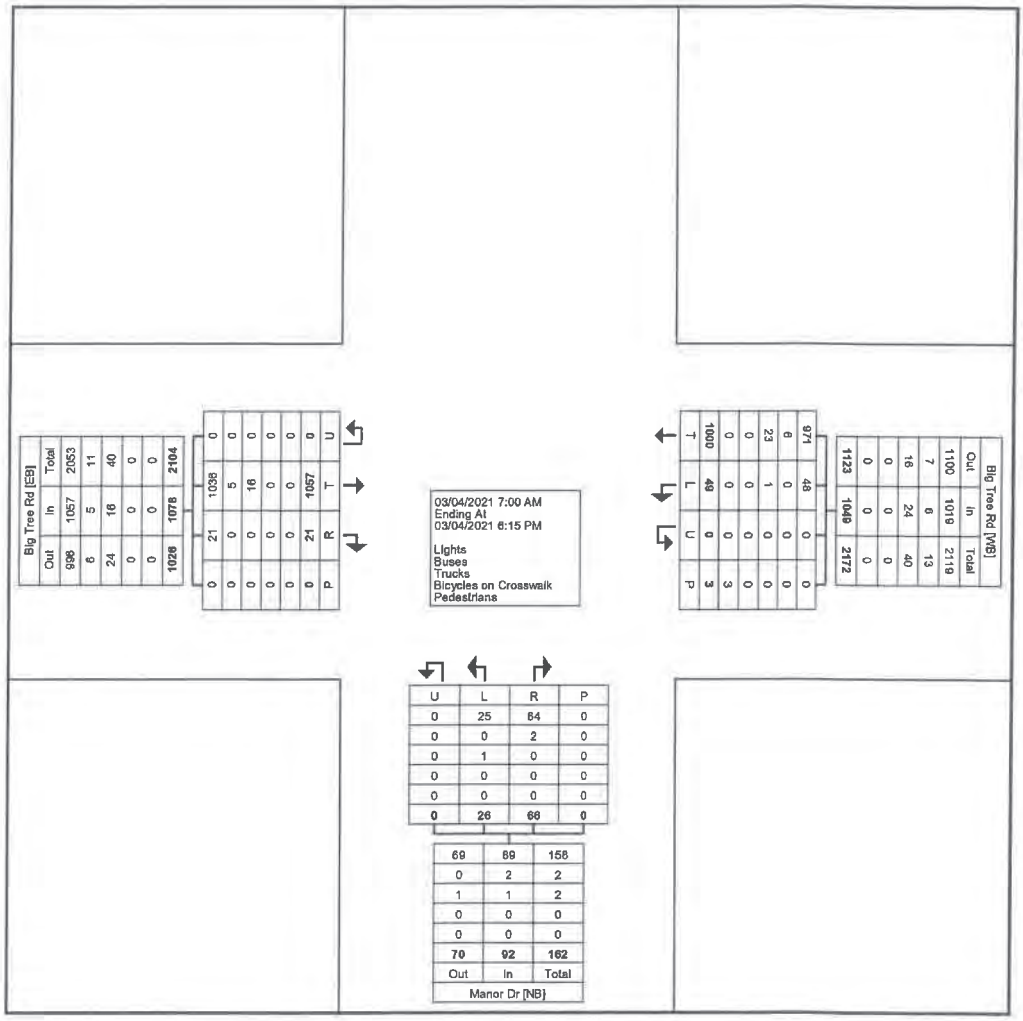
Hamburg, NY

Thursday, March 4, 2021
Location: 42.768041, -78.79735

Count Name: Big Tree Rd/Manor Dr
Site Code:
Start Date: 03/04/2021
Page No: 1

Turning Movement Data

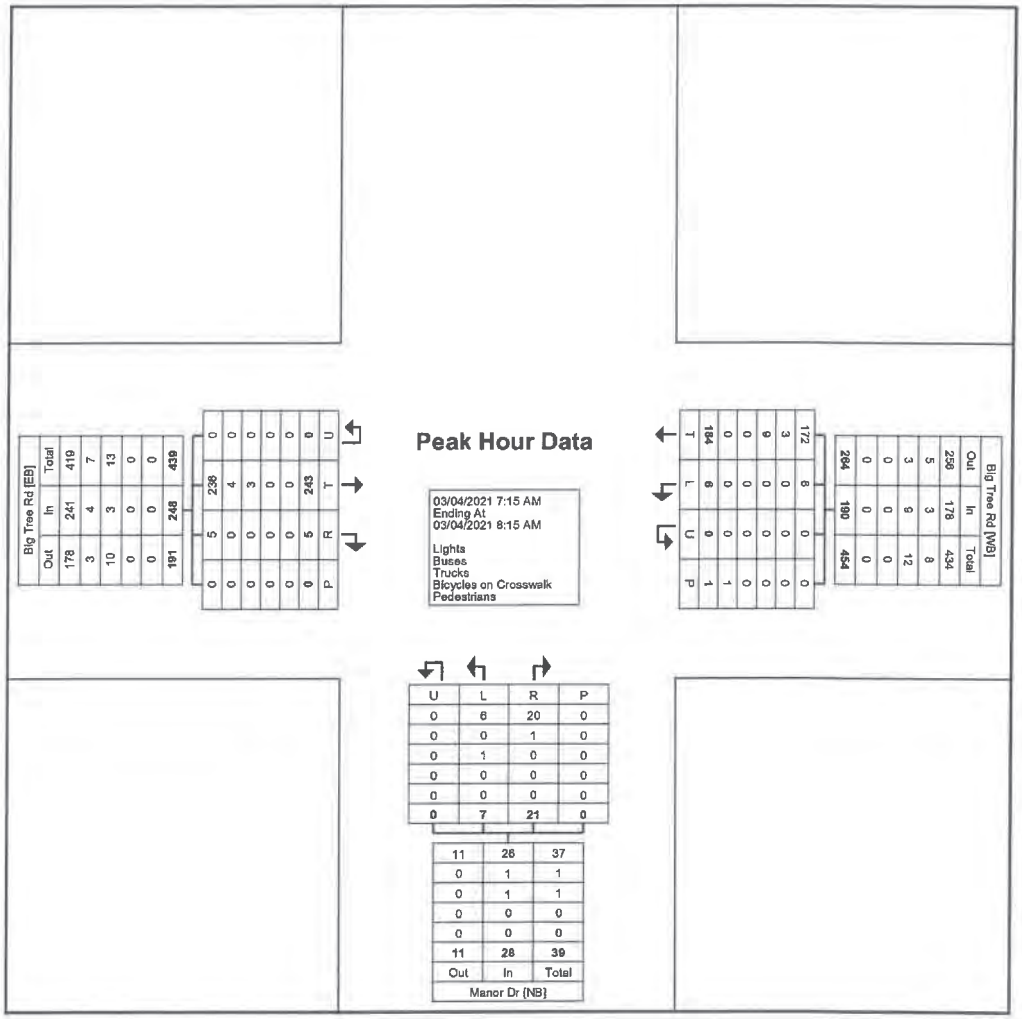
Start Time	Big Tree Rd Westbound					Manor Dr Northbound					Big Tree Rd Eastbound					Int. Total
	Thru	Left	U-Turn	Peds	App. Total	Right	Left	U-Turn	Peds	App. Total	Right	Thru	U-Turn	Peds	App. Total	
7:00 AM	34	0	0	0	34	5	0	0	0	5	0	46	0	0	46	85
7:15 AM	36	3	0	1	39	7	1	0	0	8	2	51	0	0	53	100
7:30 AM	47	0	0	0	47	2	4	0	0	6	0	69	0	0	69	122
7:45 AM	60	1	0	0	61	7	2	0	0	9	1	73	0	0	74	144
Hourly Total	177	4	0	1	181	21	7	0	0	28	3	239	0	0	242	451
8:00 AM	41	2	0	0	43	5	0	0	0	5	2	50	0	0	52	100
8:15 AM	31	0	0	0	31	6	1	0	0	7	1	49	0	0	50	88
8:30 AM	45	0	0	0	45	6	4	0	0	10	1	56	0	0	57	112
8:45 AM	45	0	0	0	45	4	2	0	0	6	0	60	0	0	60	111
Hourly Total	162	2	0	0	164	21	7	0	0	28	4	215	0	0	219	411
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
4:00 PM	96	6	0	0	102	4	0	0	0	4	2	76	0	0	78	184
4:15 PM	89	8	0	0	97	6	3	0	0	9	4	65	0	0	69	175
4:30 PM	110	5	0	0	115	2	2	0	0	4	1	76	0	0	77	196
4:45 PM	93	5	0	0	98	1	2	0	0	3	6	84	0	0	90	191
Hourly Total	388	24	0	0	412	13	7	0	0	20	13	301	0	0	314	746
5:00 PM	79	7	0	0	86	0	3	0	0	3	1	85	0	0	86	175
5:15 PM	65	3	0	1	68	5	1	0	0	6	0	82	0	0	82	156
5:30 PM	61	4	0	1	65	2	0	0	0	2	0	66	0	0	66	133
5:45 PM	68	5	0	0	73	4	1	0	0	5	0	69	0	0	69	147
Hourly Total	273	19	0	2	292	11	5	0	0	16	1	302	0	0	303	611
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	1000	49	0	3	1049	66	26	0	0	92	21	1057	0	0	1078	2219
Approach %	95.3	4.7	0.0		-	71.7	28.3	0.0	-	-	1.9	98.1	0.0		-	-
Total %	45.1	2.2	0.0		47.3	3.0	1.2	0.0	-	4.1	0.9	47.6	0.0		48.6	-
Lights	971	48	0	-	1019	64	25	0	-	89	21	1036	0		1057	2165
% Lights	97.1	98.0	-	-	97.1	97.0	96.2	-	-	96.7	100.0	98.0	-		98.1	97.6
Buses	6	0	0	-	6	2	0	0	-	2	0	5	0		5	13
% Buses	0.6	0.0	-	-	0.6	3.0	0.0	-	-	2.2	0.0	0.5	-	-	0.5	0.6
Trucks	23	1	0	-	24	0	1	0	-	1	0	16	0		16	41
% Trucks	2.3	2.0	-	-	2.3	0.0	3.8	-	-	1.1	0.0	1.5	-	-	1.5	1.8
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	3	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	-	-	-	-	-		-	-



Turning Movement Data Plot

Turning Movement Peak Hour Data (7:15 AM)

Start Time	Big Tree Rd Westbound					Manor Dr Northbound					Big Tree Rd Eastbound					
	Thru	Left	U-Turn	Peds	App. Total	Right	Left	U-Turn	Peds	App. Total	Right	Thru	U-Turn	Peds	App. Total	Int. Total
7:15 AM	36	3	0	1	39	7	1	0	0	8	2	51	0	0	53	100
7:30 AM	47	0	0	0	47	2	4	0	0	6	0	69	0	0	69	122
7:45 AM	60	1	0	0	61	7	2	0	0	9	1	73	0	0	74	144
8:00 AM	41	2	0	0	43	5	0	0	0	5	2	50	0	0	52	100
Total	184	6	0	1	190	21	7	0	0	28	5	243	0	0	248	466
Approach %	96.8	3.2	0.0		-	75.0	25.0	0.0	-	-	2.0	98.0	0.0		-	-
Total %	39.5	1.3	0.0		40.8	4.5	1.5	0.0		6.0	1.1	52.1	0.0	-	53.2	-
PHF	0.767	0.500	0.000		0.779	0.750	0.438	0.000		0.778	0.625	0.832	0.000	-	0.838	0.809
Lights	172	6	0		178	20	6	0		26	5	236	0	-	241	445
% Lights	93.5	100.0	-	-	93.7	95.2	85.7	-	-	92.9	100.0	97.1	-	-	97.2	95.5
Buses	3	0	0	-	3	1	0	0	-	1	0	4	0		4	8
% Buses	1.6	0.0	-	-	1.6	4.8	0.0	-	-	3.6	0.0	1.6	-	-	1.6	1.7
Trucks	9	0	0	-	9	0	1	0	-	1	0	3	0	-	3	13
% Trucks	4.9	0.0	-	-	4.7	0.0	14.3	-	-	3.6	0.0	1.2	-	-	1.2	2.8
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	1	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	-



Turning Movement Peak Hour Data Plot (7:15 AM)

TRI-STATE TRAFFIC DATA

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Coatesville, Pennsylvania, United States 19320
610-466-1469
Serving Transportation Professionals Since 1995

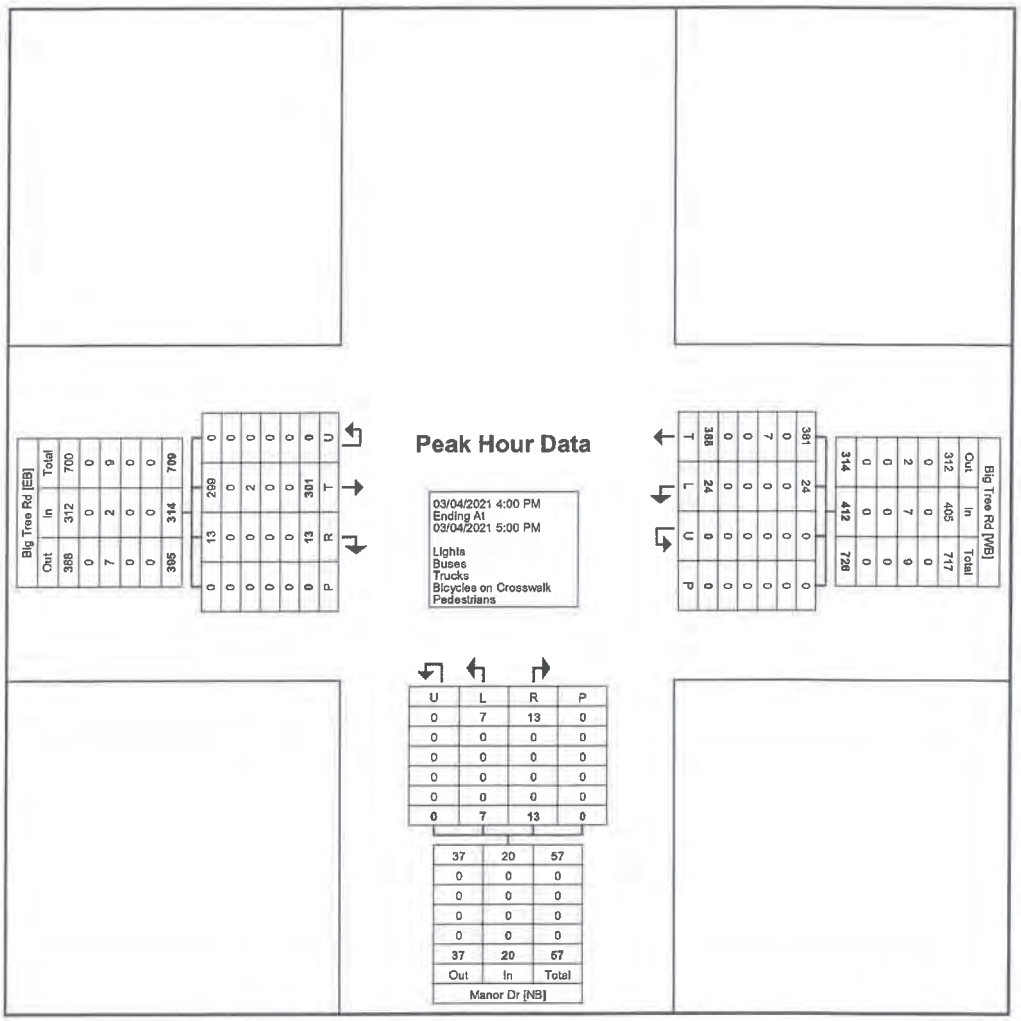
Hamburg, NY

Thursday, March 4, 2021
Location: 42.768041, -78.79735

Count Name: Big Tree Rd/Manor Dr
Site Code:
Start Date: 03/04/2021

Turning Movement Peak Hour Data (4:00 PM)

Start Time	Big Tree Rd Westbound					Manor Dr Northbound					Big Tree Rd Eastbound					Int. Total
	Thru	Left	U-Turn	Peds	App. Total	Right	Left	U-Turn	Peds	App. Total	Right	Thru	U-Turn	Peds	App. Total	
4:00 PM	96	6	0	0	102	4	0	0	0	4	2	76	0	0	78	184
4:15 PM	89	8	0	0	97	6	3	0	0	9	4	65	0	0	69	175
4:30 PM	110	5	0	0	115	2	2	0	0	4	1	76	0	0	77	196
4:45 PM	93	5	0	0	98	1	2	0	0	3	6	84	0	0	90	191
Total	388	24	0	0	412	13	7	0	0	20	13	301	0	0	314	746
Approach %	94.2	5.8	0.0	-	-	65.0	35.0	0.0	-	-	4.1	95.9	0.0	-	-	-
Total %	52.0	3.2	0.0	-	55.2	1.7	0.9	0.0	-	2.7	1.7	40.3	0.0	-	42.1	-
PHF	0.882	0.750	0.000	-	0.896	0.542	0.583	0.000	-	0.556	0.542	0.896	0.000	-	0.872	0.952
Lights	381	24	0	-	405	13	7	0	-	20	13	299	0	-	312	737
% Lights	98.2	100.0	-	-	98.3	100.0	100.0	-	-	100.0	100.0	99.3	-	-	99.4	98.8
Buses	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Buses	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0
Trucks	7	0	0	-	7	0	0	0	-	0	0	2	0	-	2	9
% Trucks	1.8	0.0	-	-	1.7	0.0	0.0	-	-	0.0	0.0	0.7	-	-	0.6	1.2
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Turning Movement Peak Hour Data Plot (4:00 PM)

TRI-STATE TRAFFIC DATA

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184 Baker Rd

Coatesville, Pennsylvania, United States 19320
610-466-1469
Serving Transportation Professionals Since 1995

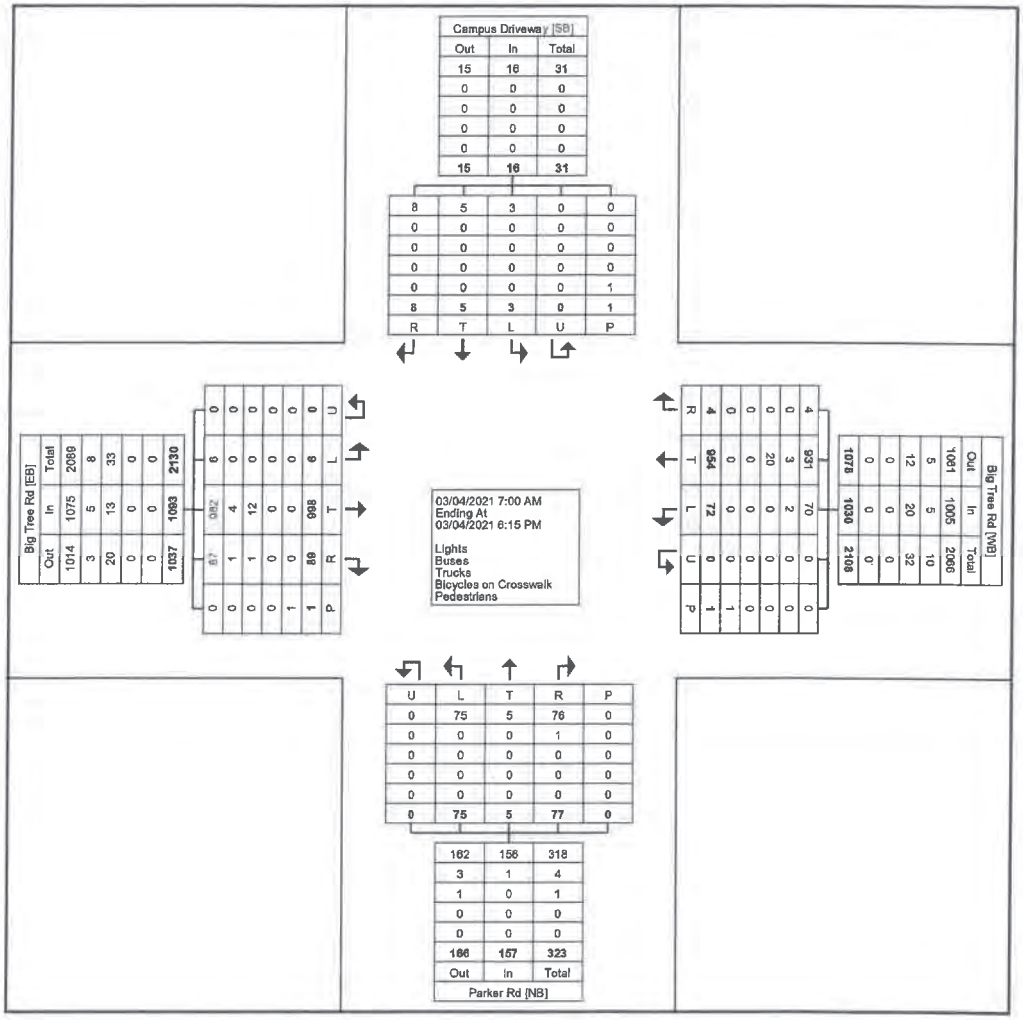
Hamburg, NY

Thursday, March 4 2021
Location: 42.768461, -78.800467

Count Name: Parker Rd/Big Tree Rd
Site Code:
Start Date: 03/04/2021
Page No: 1

Turning Movement Data

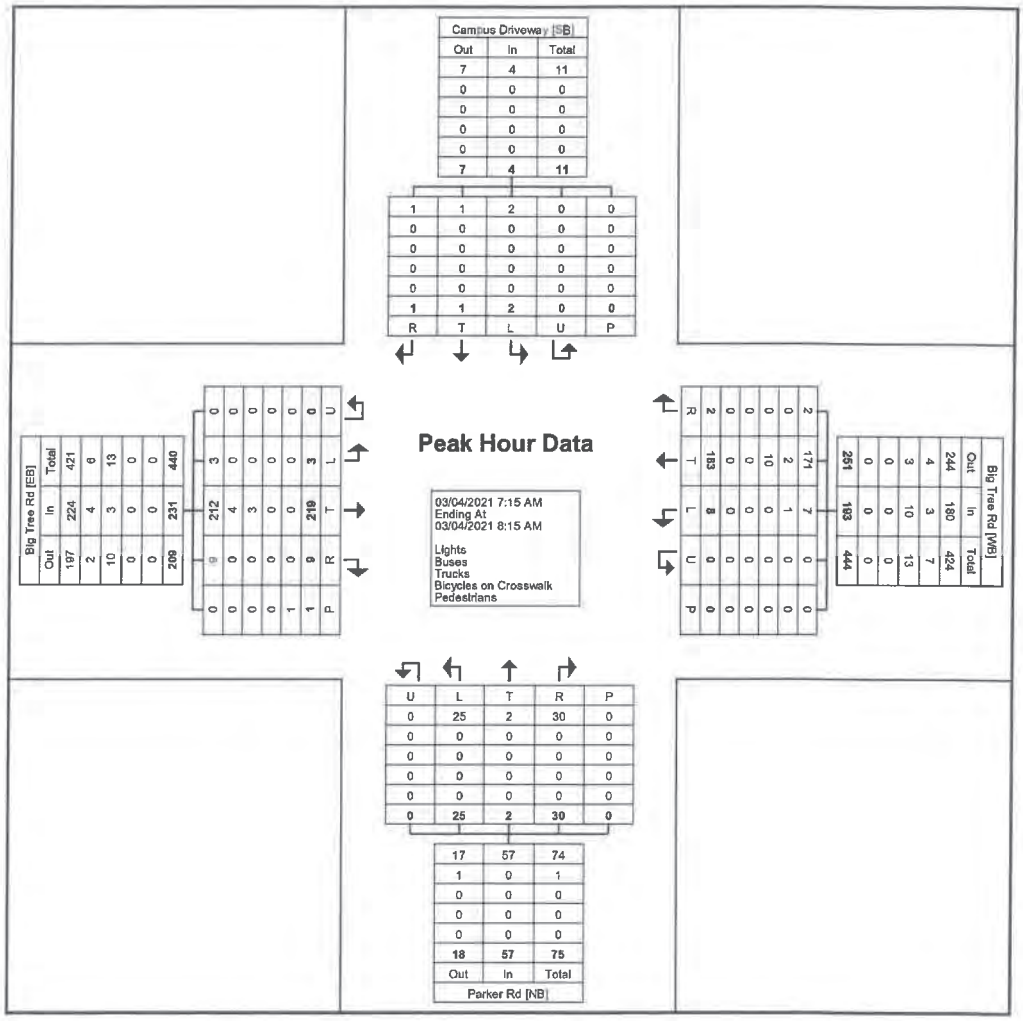
Start Time	Campus Driveway Southbound						Big Tree Rd Westbound						Parker Rd Northbound						Big Tree Rd Eastbound						Int. Total
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	
7:00 AM	0	0	0	0	0	0	0	31	1	0	0	32	4	0	2	0	0	6	0	40	1	0	0	41	79
7:15 AM	0	0	0	0	0	0	0	36	1	0	0	37	7	1	6	0	0	14	2	44	0	0	1	46	97
7:30 AM	0	0	0	0	0	0	0	52	2	0	0	54	8	0	5	0	0	13	3	61	1	0	0	65	132
7:45 AM	1	0	1	0	0	2	2	57	2	0	0	61	8	1	6	0	0	15	3	69	2	0	0	74	152
Hourly Total	1	0	1	0	0	2	2	176	6	0	0	184	27	2	19	0	0	48	8	214	4	0	1	226	460
8:00 AM	0	1	1	0	0	2	0	38	3	0	0	41	7	0	8	0	0	15	1	45	0	0	0	46	104
8:15 AM	0	1	0	0	0	1	0	31	1	0	0	32	4	0	7	0	0	11	2	47	0	0	0	49	93
8:30 AM	0	0	0	0	0	0	0	49	1	0	0	50	6	0	3	0	0	9	11	49	0	0	0	60	119
8:45 AM	1	0	0	0	0	1	0	44	4	0	0	48	5	0	4	0	0	9	2	58	0	0	0	60	118
Hourly Total	1	2	1	0	0	4	0	162	9	0	0	171	22	0	22	0	0	44	16	199	0	0	0	215	434
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	2	0	0	0	0	2	0	89	10	0	0	99	5	2	5	0	0	12	6	74	0	0	0	80	193
4:15 PM	1	1	0	0	0	2	0	88	6	0	0	94	6	0	5	0	0	11	12	63	1	0	0	76	183
4:30 PM	0	1	1	0	1	2	1	102	8	0	1	111	4	0	4	0	0	8	9	75	1	0	0	85	206
4:45 PM	2	0	0	0	0	2	1	91	5	0	0	97	4	0	4	0	0	8	7	84	0	0	0	91	198
Hourly Total	5	2	1	0	1	8	2	370	29	0	1	401	19	2	18	0	0	39	34	296	2	0	0	332	780
5:00 PM	0	0	0	0	0	0	0	75	8	0	0	83	2	0	2	0	0	4	7	86	0	0	0	93	180
5:15 PM	0	1	0	0	0	1	0	62	4	0	0	66	2	1	4	0	0	7	12	76	0	0	0	88	162
5:30 PM	0	0	0	0	0	0	0	48	7	0	0	55	1	0	5	0	0	6	4	68	0	0	0	72	133
5:45 PM	1	0	0	0	0	1	0	61	9	0	0	70	4	0	5	0	0	9	8	59	0	0	0	67	147
Hourly Total	1	1	0	0	0	2	0	246	28	0	0	274	9	1	16	0	0	26	31	289	0	0	0	320	622
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	8	5	3	0	1	16	4	954	72	0	1	1030	77	5	75	0	0	157	89	998	6	0	1	1093	2296
Approach %	50.0	31.3	18.8	0.0	-	-	0.4	92.6	7.0	0.0	-	-	49.0	3.2	47.8	0.0		-	8.1	91.3	0.5	0.0	-	-	-
Total %	0.3	0.2	0.1	0.0	-	0.7	0.2	41.6	3.1	0.0	-	44.9	3.4	0.2	3.3	0.0		6.8	3.9	43.5	0.3	0.0	-	47.6	-
Lights	8	5	3	0	-	16	4	931	70	0	-	1005	76	5	75	0		156	87	982	6	0	-	1075	2252
% Lights	100.0	100.0	100.0	-	-	100.0	100.0	97.6	97.2	-	-	97.6	98.7	100.0	100.0	-		99.4	97.8	98.4	100.0	-	-	98.4	98.1
Buses	0	0	0	0	-	0	0	3	2	0	-	5	1	0	0	0		1	1	4	0	0	-	5	11
% Buses	0.0	0.0	0.0	-	-	0.0	0.0	0.3	2.8	-	-	0.5	1.3	0.0	0.0	-	-	0.6	1.1	0.4	0.0	-	-	0.5	0.5
Trucks	0	0	0	0	-	0	0	20	0	0	-	20	0	0	0	0	-	0	1	12	0	0	-	13	33
% Trucks	0.0	0.0	0.0	-	-	0.0	0.0	2.1	0.0	-	-	1.9	0.0	0.0	0.0	-	-	0.0	1.1	1.2	0.0	-	-	1.2	1.4
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-		-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	1	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-		-	-	-	-	-	100.0	-	-



Turning Movement Data Plot

Turning Movement Peak Hour Data (7:15 AM)

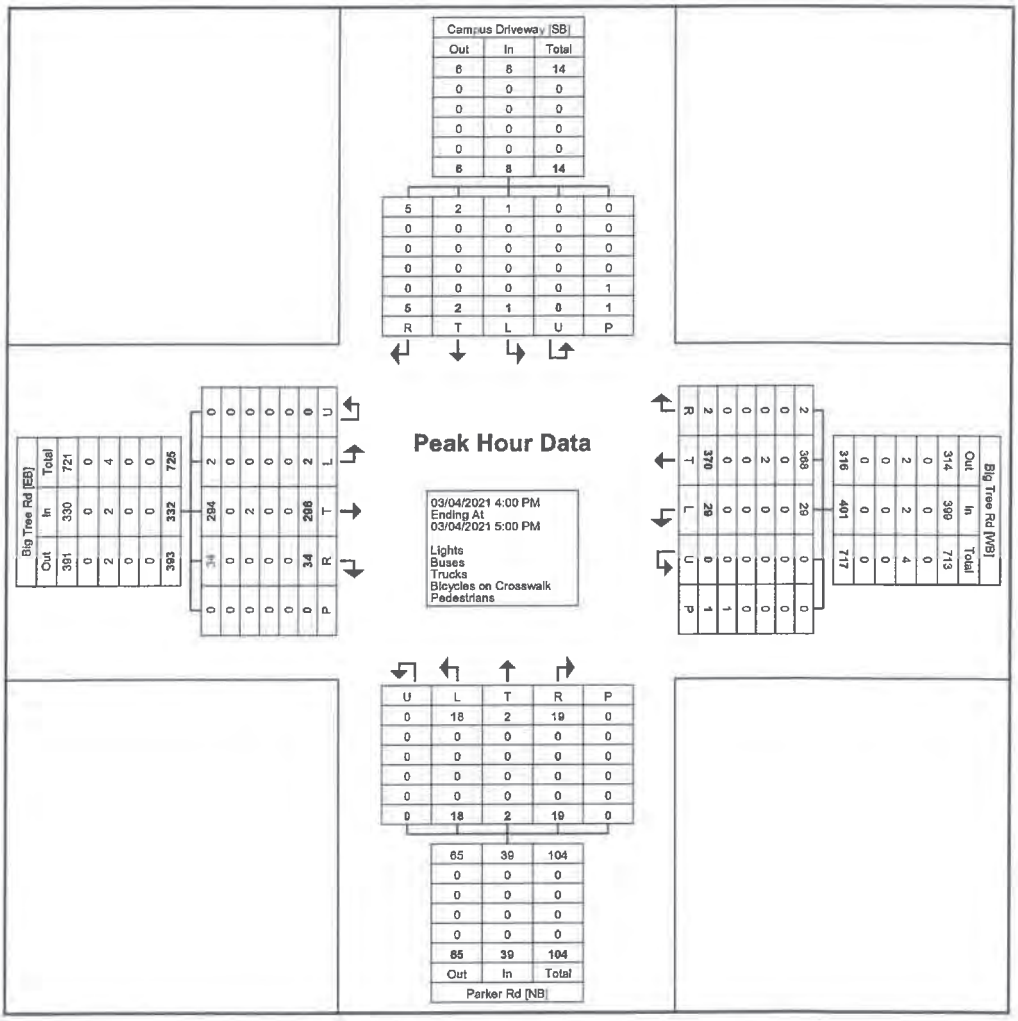
Start Time	Campus Driveway Southbound						Big Tree Rd Westbound						Parker Rd Northbound						Big Tree Rd Eastbound						Int. Total
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	
7:15 AM	0	0	0	0	0	0	0	36	1	0	0	37	7	1	6	0	0	14	2	44	0	0	1	46	97
7:30 AM	0	0	0	0	0	0	0	52	2	0	0	54	8	0	5	0	0	13	3	61	1	0	0	65	132
7:45 AM	1	0	1	0	0	2	2	57	2	0	0	61	8	1	6	0	0	15	3	69	2	0	0	74	152
8:00 AM	0	1	1	0	0	2	0	38	3	0	0	41	7	0	8	0	0	15	1	45	0	0	0	46	104
Total	1	1	2	0	0	4	2	183	8	0	0	193	30	2	25	0	0	57	9	219	3	0	1	231	485
Approach %	25.0	25.0	50.0	0.0	-	-	1.0	94.8	4.1	0.0	-	-	52.6	3.5	43.9	0.0	-	-	3.9	94.8	1.3	0.0	-	-	-
Total %	0.2	0.2	0.4	0.0	-	0.8	0.4	37.7	1.6	0.0	-	39.8	6.2	0.4	5.2	0.0	-	11.8	1.9	45.2	0.6	0.0	-	47.6	-
PHF	0.250	0.250	0.500	0.000	-	0.500	0.250	0.803	0.667	0.000	-	0.791	0.938	0.500	0.781	0.000	-	0.950	0.750	0.793	0.375	0.000	-	0.780	0.798
Lights	1	1	2	0	-	4	2	171	7	0	-	180	30	2	25	0	-	57	9	212	3	0	-	224	465
% Lights	100.0	100.0	100.0	-	-	100.0	100.0	93.4	87.5	-	-	93.3	100.0	100.0	100.0	-	-	100.0	100.0	96.8	100.0	-	-	97.0	95.9
Buses	0	0	0	0	-	0	0	2	1	0	-	3	0	0	0	0	-	0	0	4	0	0	-	4	7
% Buses	0.0	0.0	0.0	-	-	0.0	0.0	1.1	12.5	-	-	1.6	0.0	0.0	0.0	-	-	0.0	0.0	1.8	0.0	-	-	1.7	1.4
Trucks	0	0	0	0	-	0	0	10	0	0	-	10	0	0	0	0	-	0	0	3	0	0	-	3	13
% Trucks	0.0	0.0	0.0	-	-	0.0	0.0	5.5	0.0	-	-	5.2	0.0	0.0	0.0	-	-	0.0	0.0	1.4	0.0	-	-	1.3	2.7
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	1	-	-
% Pedestrians	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-



Turning Movement Peak Hour Data Plot (7:15 AM)

Turning Movement Peak Hour Data (4:00 PM)

Start Time	Campus Driveway Southbound						Big Tree Rd Westbound						Parker Rd Northbound						Big Tree Rd Eastbound						Int. Total
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	
4:00 PM	2	0	0	0	0	2	0	89	10	0	0	99	5	2	5	0	0	12	6	74	0	0	0	80	193
4:15 PM	1	1	0	0	0	2	0	88	6	0	0	94	6	0	5	0	0	11	12	63	1	0	0	76	183
4:30 PM	0	1	1	0	1	2	1	102	8	0	1	111	4	0	4	0	0	8	9	75	1	0	0	85	206
4:45 PM	2	0	0	0	0	2	1	91	5	0	0	97	4	0	4	0	0	8	7	84	0	0	0	91	198
Total	5	2	1	0	1	8	2	370	29	0	1	401	19	2	18	0	0	39	34	296	2	0	0	332	780
Approach %	62.5	25.0	12.5	0.0	-	-	0.5	92.3	7.2	0.0	-	-	48.7	5.1	46.2	0.0	-	-	10.2	89.2	0.6	0.0	-	-	-
Total %	0.6	0.3	0.1	0.0	-	1.0	0.3	47.4	3.7	0.0	-	51.4	2.4	0.3	2.3	0.0	-	5.0	4.4	37.9	0.3	0.0	-	42.6	-
PHF	0.625	0.500	0.250	0.000	-	1.000	0.500	0.907	0.725	0.000	-	0.903	0.792	0.250	0.900	0.000	-	0.813	0.708	0.881	0.500	0.000	-	0.912	0.947
Lights	5	2	1	0	-	8	2	368	29	0	-	399	19	2	18	0	-	39	34	294	2	0	-	330	776
% Lights	100.0	100.0	100.0	-	-	100.0	100.0	99.5	100.0	-	-	99.5	100.0	100.0	100.0	-	-	100.0	100.0	99.3	100.0	-	-	99.4	99.5
Buses	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Buses	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Trucks	0	0	0	0	-	0	0	2	0	0	-	2	0	0	0	0	-	0	0	2	0	0	-	2	4
% Trucks	0.0	0.0	0.0	-	-	0.0	0.0	0.5	0.0	-	-	0.5	0.0	0.0	0.0	-	-	0.0	0.0	0.7	0.0	-	-	0.6	0.5
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Turning Movement Peak Hour Data Plot (4:00 PM)

TRI-STATE TRAFFIC DATA

www.TSTData.com
184 Baker Rd

Coatesville, Pennsylvania, United States 19320
610-466-1469
Serving Transportation Professionals Since 1995

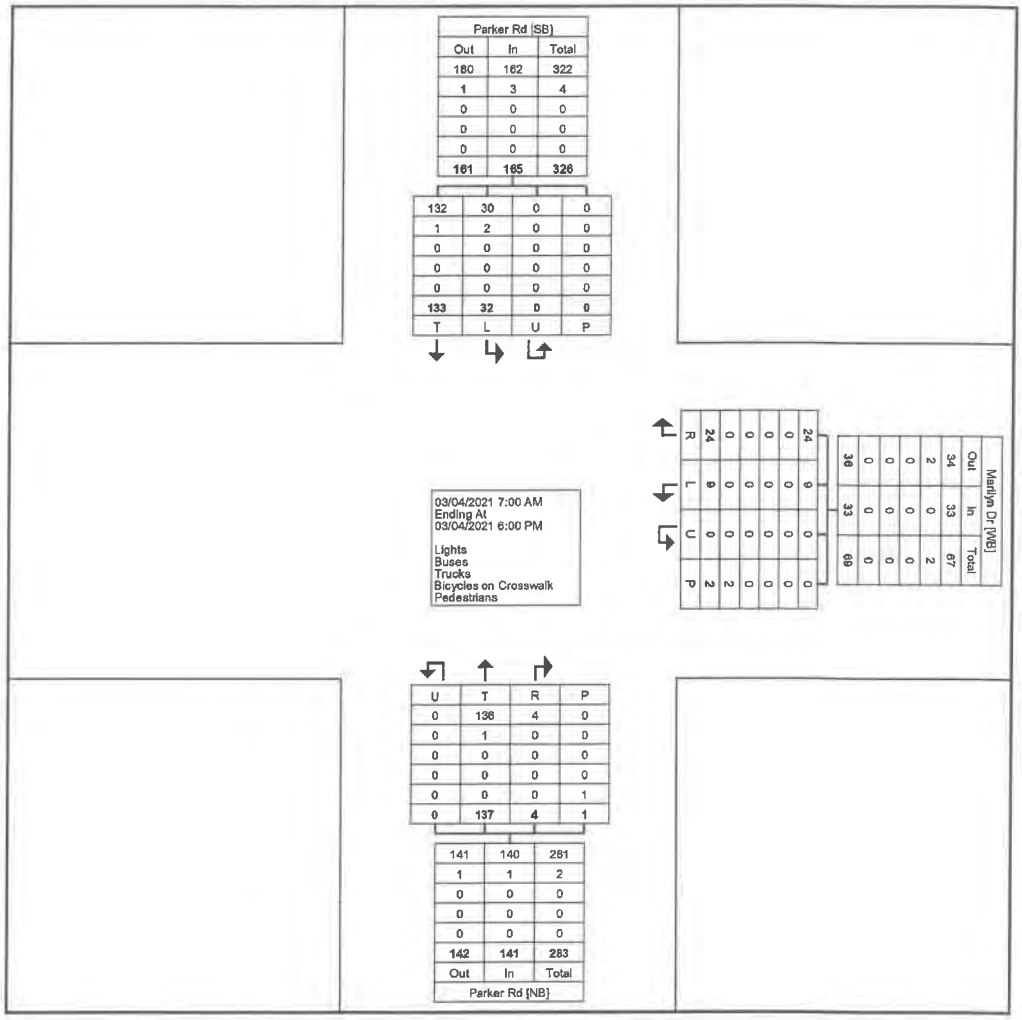
Hamburg, NY

Thursday, March 4, 2021
Location: 42.767123, -78.800485

Count Name: Parker Rd/Marilyn Dr
Site Code:
Start Date: 03/04/2021
Page No: 1

Turning Movement Data

Start Time	Parker Rd Southbound					Marilyn Dr Westbound					Parker Rd Northbound					Int. Total
	Thru	Left	U-Turn	Peds	App. Total	Right	Left	U-Turn	Peds	App. Total	Right	Thru	U-Turn	Peds	App. Total	
7:00 AM	1	0	0	0	1	0	1	0	0	1	0	6	0	0	6	8
7:15 AM	1	2	0	0	3	4	0	0	0	4	0	11	0	0	11	18
7:30 AM	4	1	0	0	5	2	0	0	0	2	1	10	0	0	11	18
7:45 AM	4	1	0	0	5	1	2	0	0	3	0	15	0	0	15	23
Hourly Total	10	4	0	0	14	7	3	0	0	10	1	42	0	0	43	67
8:00 AM	4	0	0	0	4	1	0	0	0	1	0	14	0	0	14	19
8:15 AM	4	1	0	0	5	2	0	0	0	2	1	9	0	0	10	17
8:30 AM	6	4	0	0	10	1	0	0	0	1	0	7	0	0	7	18
8:45 AM	6	1	0	0	7	0	0	0	0	0	0	12	0	0	12	19
Hourly Total	20	6	0	0	26	4	0	0	0	4	1	42	0	0	43	73
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	14	1	0	0	15	4	1	0	1	5	0	8	0	0	8	28
4:15 PM	14	6	0	0	20	3	1	0	0	4	0	8	0	0	8	32
4:30 PM	17	1	0	0	18	0	0	0	0	0	1	7	0	0	8	26
4:45 PM	10	2	0	0	12	1	1	0	0	2	0	7	0	0	7	21
Hourly Total	55	10	0	0	65	8	3	0	1	11	1	30	0	0	31	107
5:00 PM	11	3	0	0	14	1	1	0	0	2	0	4	0	0	4	20
5:15 PM	15	3	0	0	18	0	1	0	0	1	0	7	0	1	7	26
5:30 PM	9	2	0	0	11	2	1	0	1	3	0	3	0	0	3	17
5:45 PM	13	4	0	0	17	2	0	0	0	2	1	9	0	0	10	29
Hourly Total	48	12	0	0	60	5	3	0	1	8	1	23	0	1	24	92
Grand Total	133	32	0	0	165	24	9	0	2	33	4	137	0	1	141	339
Approach %	80.6	19.4	0.0	-	-	72.7	27.3	0.0	-	-	2.8	97.2	0.0	-	-	-
Total %	39.2	9.4	0.0	-	48.7	7.1	2.7	0.0		9.7	1.2	40.4	0.0	-	41.6	-
Lights	132	30	0	-	162	24	9	0		33	4	136	0	-	140	335
% Lights	99.2	93.8	-	-	98.2	100.0	100.0	-	-	100.0	100.0	99.3	-	-	99.3	98.8
Buses	1	2	0	-	3	0	0	0	-	0	0	1	0	-	1	4
% Buses	0.8	6.3	-	-	1.8	0.0	0.0	-	-	0.0	0.0	0.7	-	-	0.7	1.2
Trucks	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Trucks	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	0.0	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	0	-	-	-	-	2	-	-	-	-	1	-	-
% Pedestrians	-	-	-	-	-	-	-	-	100.0	-	-	-	-	100.0	-	-



Turning Movement Data Plot

TRI-STATE TRAFFIC DATA

www.TSTData.com
184 Baker Rd

Coatesville, Pennsylvania, United States 19320
610-466-1469
Serving Transportation Professionals Since 1995

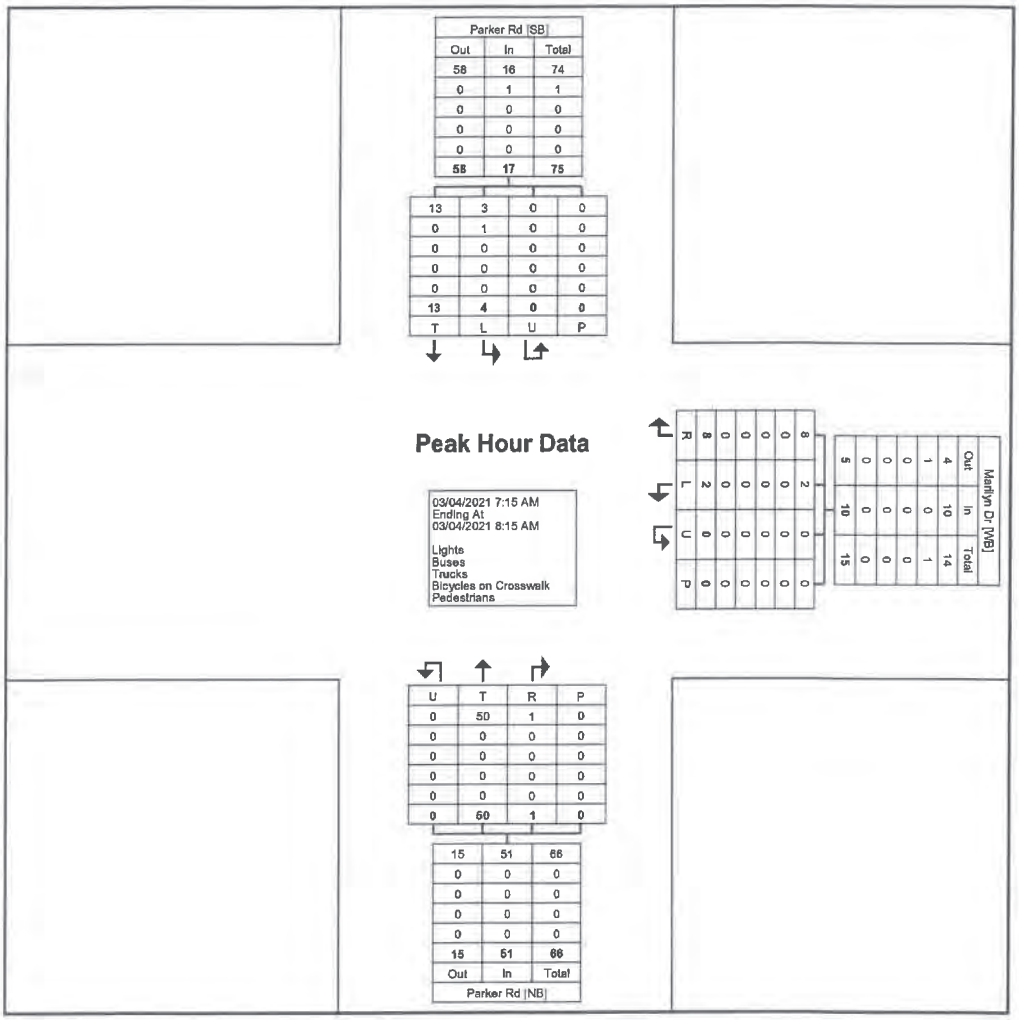
Hamburg, NY

Thursday, March 4, 2021
Location: 42.767123, -78.800485

Count Name: Parker Rd/Marilyn Dr
Site Code:
Start Date: 03/04/2021
Page No: 3

Turning Movement Peak Hour Data (7:15 AM)

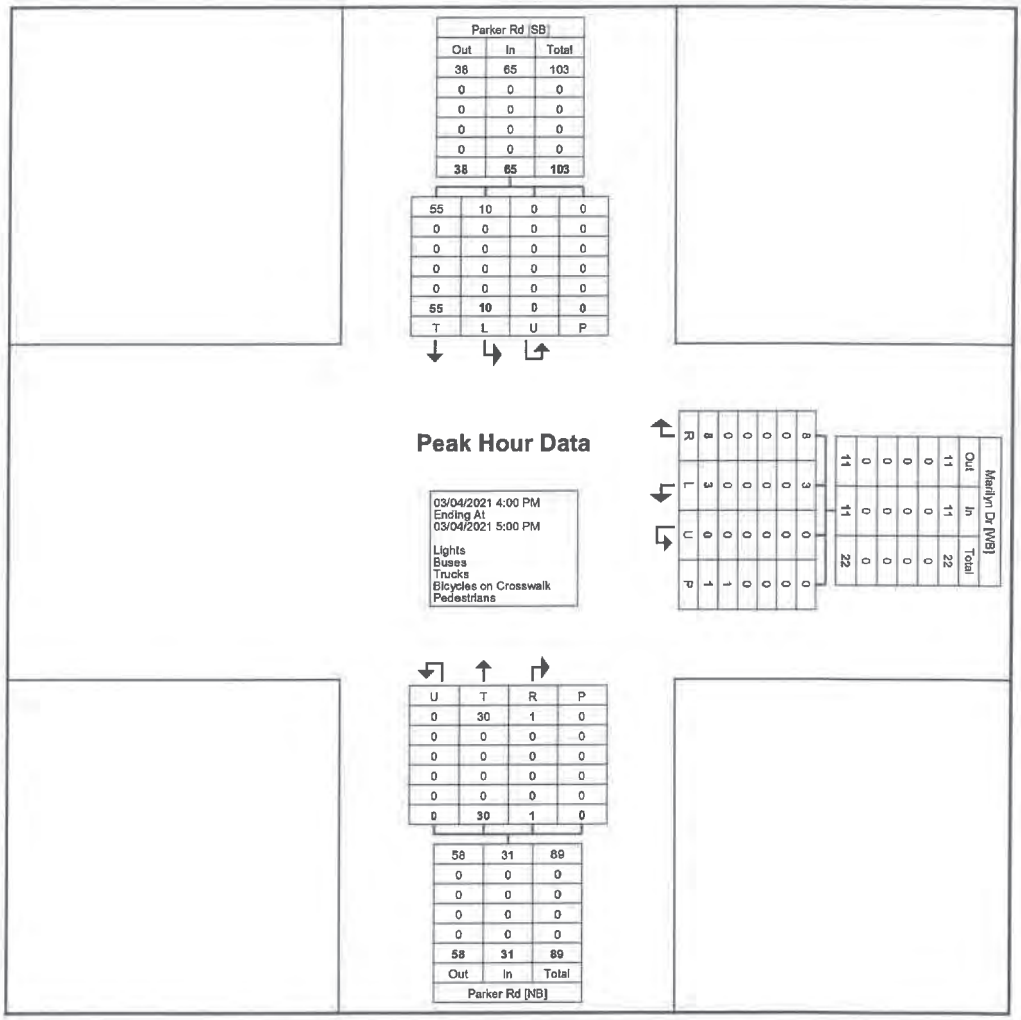
Start Time	Parker Rd Southbound					Marilyn Dr Westbound					Parker Rd Northbound					Int. Total
	Thru	Left	U-Turn	Peds	App. Total	Right	Left	U-Turn	Peds	App. Total	Right	Thru	U-Turn	Peds	App. Total	
7:15 AM	1	2	0	0	3	4	0	0	0	4	0	11	0	0	11	18
7:30 AM	4	1	0	0	5	2	0	0	0	2	1	10	0	0	11	18
7:45 AM	4	1	0	0	5	1	2	0	0	3	0	15	0	0	15	23
8:00 AM	4	0	0	0	4	1	0	0	0	1	0	14	0	0	14	19
Total	13	4	0	0	17	8	2	0	0	10	1	50	0	0	51	78
Approach %	76.5	23.5	0.0	-	-	80.0	20.0	0.0	-	-	2.0	98.0	0.0	-	-	-
Total %	16.7	5.1	0.0	-	21.8	10.3	2.6	0.0	-	12.8	1.3	64.1	0.0	-	65.4	-
PHF	0.813	0.500	0.000	-	0.850	0.500	0.250	0.000	-	0.625	0.250	0.833	0.000	-	0.850	0.848
Lights	13	3	0	-	16	8	2	0	-	10	1	50	0	-	51	77
% Lights	100.0	75.0	-	-	94.1	100.0	100.0	-	-	100.0	100.0	100.0	-	-	100.0	98.7
Buses	0	1	0	-	1	0	0	0	-	0	0	0	0	-	0	1
% Buses	0.0	25.0	-	-	5.9	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	1.3
Trucks	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Trucks	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Turning Movement Peak Hour Data Plot (7:15 AM)

Turning Movement Peak Hour Data (4:00 PM)

Start Time	Parker Rd Southbound					Marilyn Dr Westbound					Parker Rd Northbound					Int. Total
	Thru	Left	U-Turn	Peds	App. Total	Right	Left	U-Turn	Peds	App. Total	Right	Thru	U-Turn	Peds	App. Total	
4:00 PM	14	1	0	0	15	4	1	0	1	5	0	8	0	0	8	28
4:15 PM	14	6	0	0	20	3	1	0	0	4	0	8	0	0	8	32
4:30 PM	17	1	0	0	18	0	0	0	0	0	1	7	0	0	8	26
4:45 PM	10	2	0	0	12	1	1	0	0	2	0	7	0	0	7	21
Total	55	10	0	0	65	8	3	0	1	11	1	30	0	0	31	107
Approach %	84.6	15.4	0.0	-	-	72.7	27.3	0.0	-	-	3.2	96.8	0.0	-	-	-
Total %	51.4	9.3	0.0	-	60.7	7.5	2.8	0.0	-	10.3	0.9	28.0	0.0	-	29.0	-
PHF	0.809	0.417	0.000	-	0.813	0.500	0.750	0.000	-	0.550	0.250	0.938	0.000	-	0.969	0.836
Lights	55	10	0	-	65	8	3	0	-	11	1	30	0	-	31	107
% Lights	100.0	100.0	-	-	100.0	100.0	100.0	-	-	100.0	100.0	100.0	-	-	100.0	100.0
Buses	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Buses	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0
Trucks	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Trucks	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	-	-
Pedestrians	-	-	-	0	-	-	-	-	1	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	-	-



Turning Movement Peak Hour Data Plot (4:00 PM)

TRI-STATE TRAFFIC DATA

www.TSTData.com
184 Baker Rd

Coatesville, Pennsylvania, United States 19320
610-466-1469
Serving Transportation Professionals Since 1995

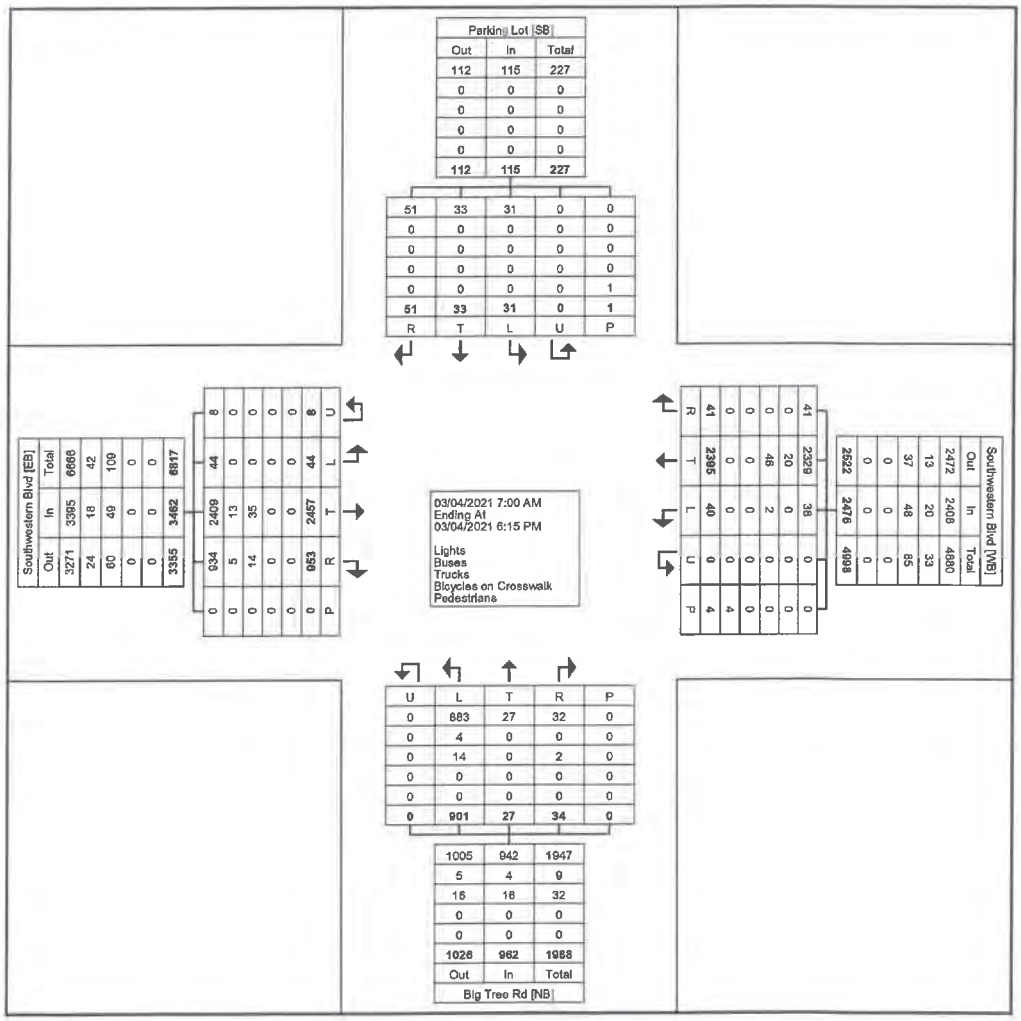
Hamburg, NY

Thursday, March 4, 2021
Location: 42.770732, -78.809658

Count Name: Southwestern Blvd/Big Tree Rd
Site Code:
Start Date: 03/04/2021
Page No: 1

Turning Movement Data

Start Time	Parking Lot Southbound							Southwestern Blvd Westbound							Big Tree Rd Northbound							Southwestern Blvd Eastbound							Int. Total
	Right	Right on Red	Thru	Left	U-Turn	Peds	App. Total	Right	Right on Red	Thru	Left	U-Turn	Peds	App. Total	Right	Right on Red	Thru	Left	U-Turn	Peds	App. Total	Right	Right on Red	Thru	Left	U-Turn	Peds	App. Total	
7:00 AM	0	0	0	0	0	0	0	1	0	81	0	0	0	82	0	0	0	32	0	0	32	41	2	124	0	1	0	168	282
7:15 AM	0	1	0	2	0	0	3	1	0	89	1	0	0	91	0	0	1	33	0	0	34	41	4	139	2	0	0	186	314
7:30 AM	0	1	1	1	0	0	3	2	0	99	3	0	0	104	0	0	0	47	0	0	47	48	12	181	2	1	0	244	398
7:45 AM	1	1	3	2	0	1	7	1	0	128	3	0	0	132	0	2	1	55	0	0	58	50	13	176	3	0	0	242	439
Hourly Total	1	3	4	5	0	1	13	5	0	397	7	0	0	409	0	2	2	167	0	0	171	180	31	620	7	2	0	840	1433
8:00 AM	0	0	0	1	0	0	1	0	0	92	2	0	0	94	4	0	0	42	0	0	46	39	8	163	3	1	0	214	355
8:15 AM	0	1	0	1	0	0	2	4	0	92	0	0	0	96	1	0	0	30	0	0	31	38	7	156	1	0	0	202	331
8:30 AM	1	0	0	1	0	0	2	0	1	98	2	0	0	101	0	0	1	44	0	0	45	46	11	141	1	0	0	199	347
8:45 AM	0	1	0	0	0	0	1	0	1	110	1	0	0	112	3	2	2	41	0	0	48	47	6	144	0	0	0	197	358
Hourly Total	1	2	0	3	0	0	6	4	2	392	5	0	0	403	8	2	3	157	0	0	170	170	32	604	5	1	0	812	1391
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	9	2	1	5	0	0	17	1	1	221	7	0	0	230	3	0	1	85	0	0	89	50	13	187	4	0	0	254	590
4:15 PM	3	1	2	1	0	0	7	1	0	209	2	0	0	212	1	2	1	80	0	0	84	66	4	162	7	1	0	240	543
4:30 PM	2	0	6	4	0	0	12	3	0	244	7	0	0	254	4	0	6	82	0	0	92	42	26	180	2	0	0	250	608
4:45 PM	2	0	2	0	0	0	4	4	0	187	2	0	0	193	3	1	2	94	0	0	100	61	15	142	6	1	0	225	522
Hourly Total	16	3	11	10	0	0	40	9	1	861	18	0	0	889	11	3	10	341	0	0	365	219	58	671	19	2	0	969	2263
5:00 PM	1	2	4	2	0	0	9	4	0	236	1	0	2	241	2	0	5	70	0	0	77	40	23	152	4	0	0	219	546
5:15 PM	9	3	5	5	0	0	22	3	0	197	3	0	0	203	2	1	2	51	0	0	56	49	25	135	6	1	0	216	497
5:30 PM	4	4	3	4	0	0	15	6	1	161	2	0	0	170	1	1	3	55	0	0	60	54	14	151	1	1	0	221	466
5:45 PM	1	1	6	2	0	0	10	5	1	151	4	0	2	161	0	1	2	60	0	0	63	44	14	124	2	1	0	185	419
Hourly Total	15	10	18	13	0	0	56	18	2	745	10	0	4	775	5	3	12	236	0	0	256	187	76	562	13	3	0	841	1928
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	33	18	33	31	0	1	115	36	5	2395	40	0	4	2476	24	10	27	901	0	0	962	756	197	2457	44	8	0	3462	7015
Approach %	28.7	15.7	28.7	27.0	0.0		-	1.5	0.2	96.7	1.6	0.0	-	-	2.5	1.0	2.8	93.7	0.0	-	-	21.8	5.7	71.0	1.3	0.2		-	-
Total %	0.5	0.3	0.5	0.4	0.0	-	1.6	0.5	0.1	34.1	0.6	0.0	-	35.3	0.3	0.1	0.4	12.8	0.0	-	13.7	10.8	2.8	35.0	0.6	0.1	-	49.4	-
Lights	33	18	33	31	0	-	115	36	5	2329	38	0	-	2408	22	10	27	883	0	-	942	740	194	2409	44	8	-	3395	6860
% Lights	100.0	100.0	100.0	100.0	-	-	100.0	100.0	100.0	97.2	95.0	-	-	97.3	91.7	100.0	100.0	98.0	-		97.9	97.9	98.5	98.0	100.0	100.0	-	98.1	97.8
Buses	0	0	0	0	0	-	0	0	0	20	0	0	-	20	0	0	0	4	0	-	4	5	0	13	0	0	-	18	42
% Buses	0.0	0.0	0.0	0.0	-		0.0	0.0	0.0	0.8	0.0	-	-	0.8	0.0	0.0	0.0	0.4	-	-	0.4	0.7	0.0	0.5	0.0	0.0	-	0.5	0.6
Trucks	0	0	0	0	0	-	0	0	0	46	2	0	-	48	2	0	0	14	0	-	16	11	3	35	0	0	-	49	113
% Trucks	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	1.9	5.0	-	-	1.9	8.3	0.0	0.0	1.6	-	-	1.7	1.5	1.5	1.4	0.0	0.0	-	1.4	1.6
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-		-	-	-	-	-	-		-	-
Pedestrians	-	-	-	-	-	1	-	-	-	-	-	-	4	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	100.0	-	-	-	-	-	-	100.0	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-



Turning Movement Data Plot

TRI-STATE TRAFFIC DATA

www.TSTData.com
184 Baker Rd

Coatesville, Pennsylvania, United States 19320
610-466-1469
Serving Transportation Professionals Since 1995

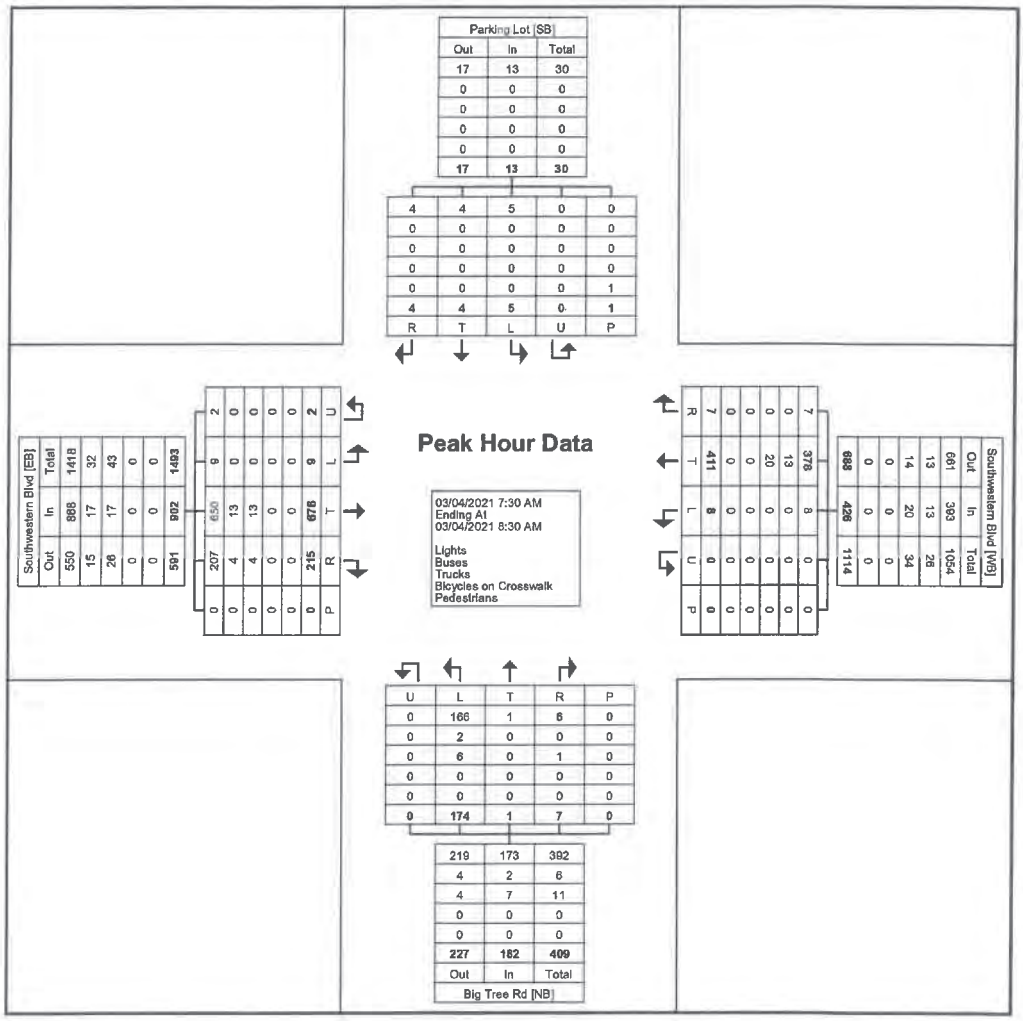
Hamburg, NY

Thursday, March 4, 2021
Location: 42.770732, -78.809658

Count Name: Southwestern Blvd/Big Tree Rd
Site Code:
Start Date: 03/04/2021

Turning Movement Peak Hour Data (7:30 AM)

Start Time	Parking Lot Southbound							Southwestern Blvd Westbound							Big Tree Rd Northbound							Southwestern Blvd Eastbound							Int. Total
	Right	Right on Red	Thru	Left	U-Turn	Peds	App. Total	Right	Right on Red	Thru	Left	U-Turn	Peds	App. Total	Right	Right on Red	Thru	Left	U-Turn	Peds	App. Total	Right	Right on Red	Thru	Left	U-Turn	Peds	App. Total	
7:30 AM	0	1	1	1	0	0	3	2	0	99	3	0	0	104	0	0	0	47	0	0	47	48	12	181	2	1	0	244	398
7:45 AM	1	1	3	2	0	1	7	1	0	128	3	0	0	132	0	2	1	55	0	0	58	50	13	176	3	0	0	242	439
8:00 AM	0	0	0	1	0	0	1	0	0	92	2	0	0	94	4	0	0	42	0	0	46	39	8	163	3	1	0	214	355
8:15 AM	0	1	0	1	0	0	2	4	0	92	0	0	0	96	1	0	0	30	0	0	31	38	7	156	1	0	0	202	331
Total	1	3	4	5	0	1	13	7	0	411	8	0	0	426	5	2	1	174	0	0	182	175	40	676	9	2	0	902	1523
Approach %	7.7	23.1	30.8	38.5	0.0	-	-	1.6	0.0	96.5	1.9	0.0		-	2.7	1.1	0.5	95.6	0.0	-	-	19.4	4.4	74.9	1.0	0.2	-	-	-
Total %	0.1	0.2	0.3	0.3	0.0	-	0.9	0.5	0.0	27.0	0.5	0.0	-	28.0	0.3	0.1	0.1	11.4	0.0	-	12.0	11.5	2.6	44.4	0.6	0.1	-	59.2	-
PHF	0.250	0.750	0.333	0.625	0.000	-	0.464	0.438	0.000	0.803	0.667	0.000	-	0.807	0.313	0.250	0.250	0.791	0.000	-	0.784	0.875	0.769	0.934	0.750	0.500	-	0.924	0.867
Lights	1	3	4	5	0	-	13	7	0	378	8	0	-	393	4	2	1	166	0	-	173	168	39	650	9	2	-	868	1447
% Lights	100.0	100.0	100.0	100.0	-		100.0	100.0	-	92.0	100.0	-	-	92.3	80.0	100.0	100.0	95.4	-		95.1	96.0	97.5	96.2	100.0	100.0		96.2	95.0
Buses	0	0	0	0	0	-	0	0	0	13	0	0	-	13	0	0	0	2	0	-	2	4	0	13	0	0	-	17	32
% Buses	0.0	0.0	0.0	0.0	-	-	0.0	0.0	-	3.2	0.0	-	-	3.1	0.0	0.0	0.0	1.1	-	-	1.1	2.3	0.0	1.9	0.0	0.0	-	1.9	2.1
Trucks	0	0	0	0	0	-	0	0	0	20	0	0	-	20	1	0	0	6	0	-	7	3	1	13	0	0	-	17	44
% Trucks	0.0	0.0	0.0	0.0	-	-	0.0	0.0	-	4.9	0.0	-	-	4.7	20.0	0.0	0.0	3.4	-	-	3.8	1.7	2.5	1.9	0.0	0.0	-	1.9	2.9
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	-	1	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-		-	-



Turning Movement Peak Hour Data Plot (7:30 AM)

TRI-STATE TRAFFIC DATA

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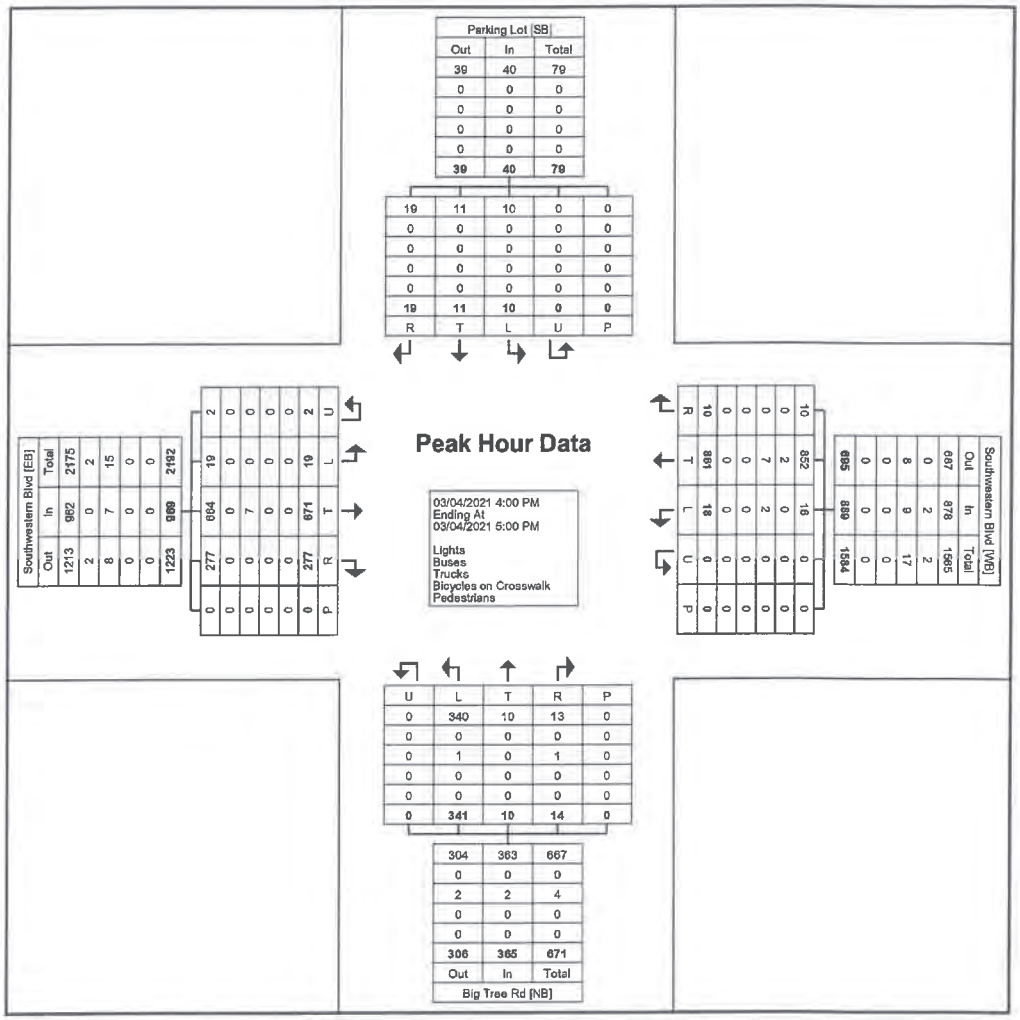
Hamburg, NY

Thursday, March 4, 2021
Location: 42.770732, -78.809658

Count Name: Southwestern Blvd/Big Tree Rd
Site Code:
Start Date: 03/04/2021

Turning Movement Peak Hour Data (4:00 PM)

Start Time	Parking Lot Southbound							Southwestern Blvd Westbound							Big Tree Rd Northbound							Southwestern Blvd Eastbound							Int. Total
	Right	Right on Red	Thru	Left	U-Turn	Peds	App. Total	Right	Right on Red	Thru	Left	U-Turn	Peds	App. Total	Right	Right on Red	Thru	Left	U-Turn	Peds	App. Total	Right	Right on Red	Thru	Left	U-Turn	Peds	App. Total	
4:00 PM	9	2	1	5	0	0	17	1	1	221	7	0	0	230	3	0	1	85	0	0	89	50	13	187	4	0	0	254	590
4:15 PM	3	1	2	1	0	0	7	1	0	209	2	0	0	212	1	2	1	80	0	0	84	66	4	162	7	1	0	240	543
4:30 PM	2	0	6	4	0	0	12	3	0	244	7	0	0	254	4	0	6	82	0	0	92	42	26	180	2	0	0	250	608
4:45 PM	2	0	2	0	0	0	4	4	0	187	2	0	0	193	3	1	2	94	0	0	100	61	15	142	6	1	0	225	522
Total	16	3	11	10	0	0	40	9	1	861	18	0	0	889	11	3	10	341	0	0	365	219	58	671	19	2	0	969	2263
Approach %	40.0	7.5	27.5	25.0	0.0	-	-	1.0	0.1	96.9	2.0	0.0	-	-	3.0	0.8	2.7	93.4	0.0	-	-	22.6	6.0	69.2	2.0	0.2	-	-	-
Total %	0.7	0.1	0.5	0.4	0.0	-	1.8	0.4	0.0	38.0	0.8	0.0	-	39.3	0.5	0.1	0.4	15.1	0.0	-	16.1	9.7	2.6	29.7	0.8	0.1	-	42.8	-
PHF	0.444	0.375	0.458	0.500	0.000	-	0.588	0.583	0.250	0.882	0.643	0.000	-	0.875	0.688	0.375	0.417	0.907	0.000	-	0.913	0.830	0.558	0.897	0.679	0.500	-	0.954	0.931
Lights	16	3	11	10	0	-	40	9	1	852	16	0	-	878	10	3	10	340	0	-	363	219	58	664	19	2	-	962	2243
% Lights	100.0	100.0	100.0	100.0	-	-	100.0	100.0	100.0	99.0	88.9	-	-	98.8	90.9	100.0	100.0	99.7	-	-	99.5	100.0	100.0	99.0	100.0	100.0	-	99.3	99.1
Buses	0	0	0	0	0	-	0	0	0	2	0	0	-	2	0	0	0	0	0	-	0	0	0	0	0	0	-	0	2
% Buses	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.2	0.0	-	-	0.2	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.1
Trucks	0	0	0	0	0	-	0	0	0	7	2	0	-	9	1	0	0	1	0	-	2	0	0	7	0	0	-	7	18
% Trucks	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.8	11.1	-	-	1.0	9.1	0.0	0.0	0.3	-	-	0.5	0.0	0.0	1.0	0.0	0.0	-	0.7	0.8
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-	-	-	-	-	-



Turning Movement Peak Hour Data Plot (4:00 PM)

A2

Miscellaneous Traffic Data and Calculations

SRF ASSOCIATES
Transportation Planning / Engineering / Design

Proposed Residential Projects, Town of Hamburg, Erie County, NY
Documentation of Ambient Traffic Volume Growth

Roadway	Segment starts at	Segment end at	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Annual Growth
SW Blvd	Big Tree Rd	Milestrip Rd	16,649			17,631			21,267					4.16%
Big Tree Rd	SW Blvd	Rte 219	12,059			11,602			12,281		12,584			0.53%
Abbott Rd	Orchard Park TL	Big Tree Rd	6,421					5,722			5,682			-1.52%
Abbott Rd	SW Blvd	Big Tree Rd	8,604					7,074				7,586		-1.39%
													AVERAGE	0.45%

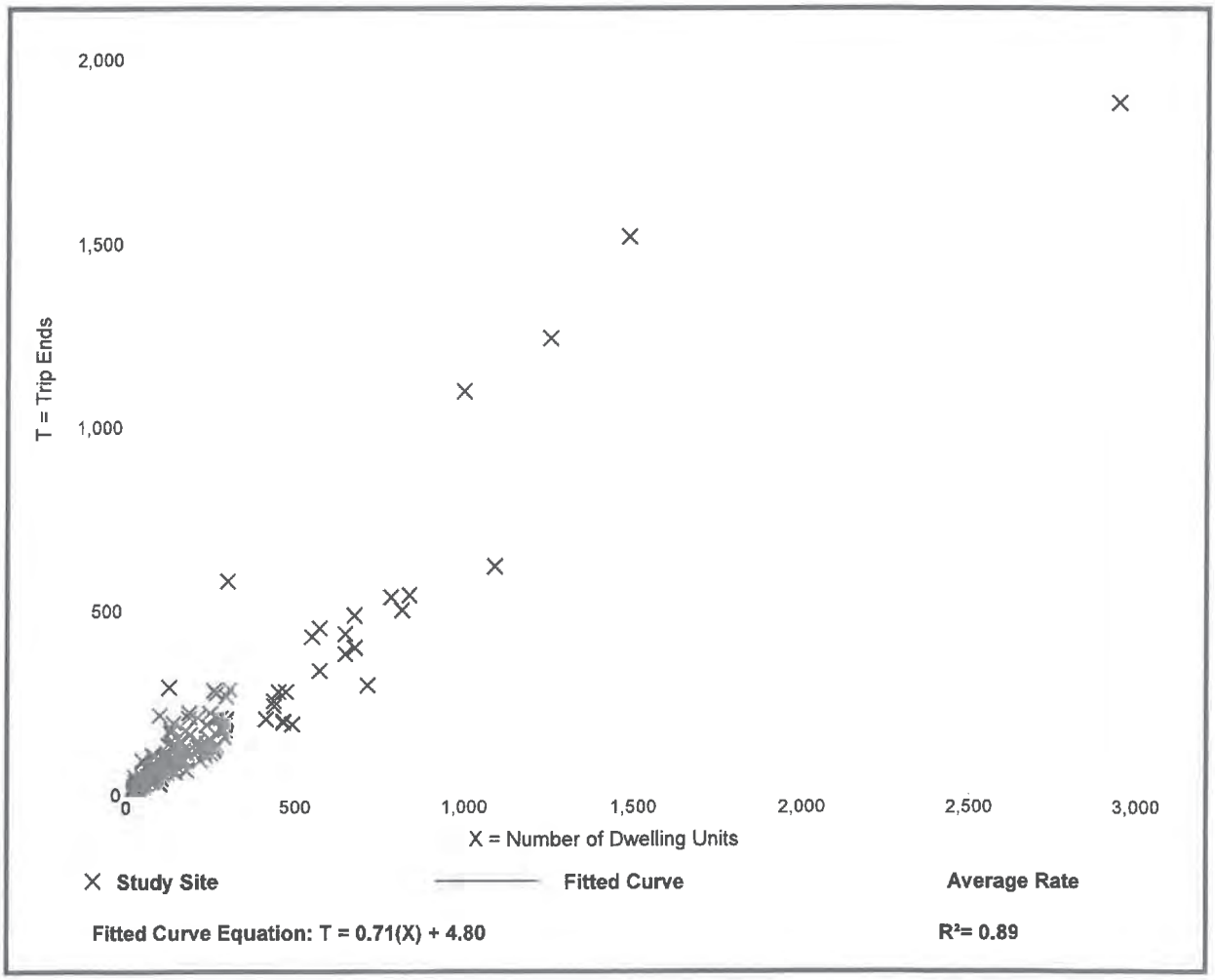
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 173
Avg. Num. of Dwelling Units: 219
Directional Distribution: 25% entering, 75% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.74	0.33 - 2.27	0.27

Data Plot and Equation



Trip Gen Manual, 10th Ed + Supplement • Institute of Transportation Engineers

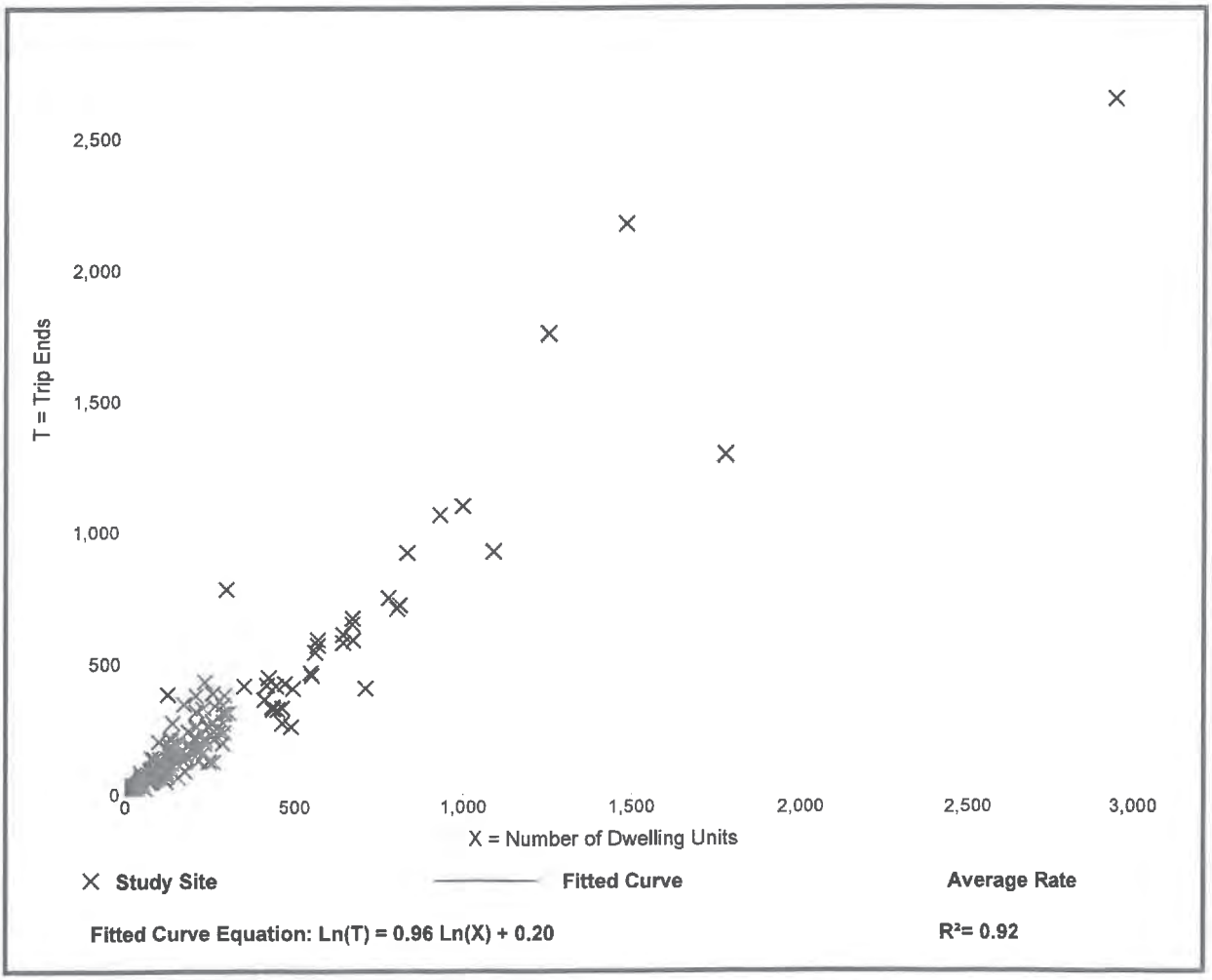
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 190
Avg. Num. of Dwelling Units: 242
Directional Distribution: 63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.99	0.44 - 2.98	0.31

Data Plot and Equation



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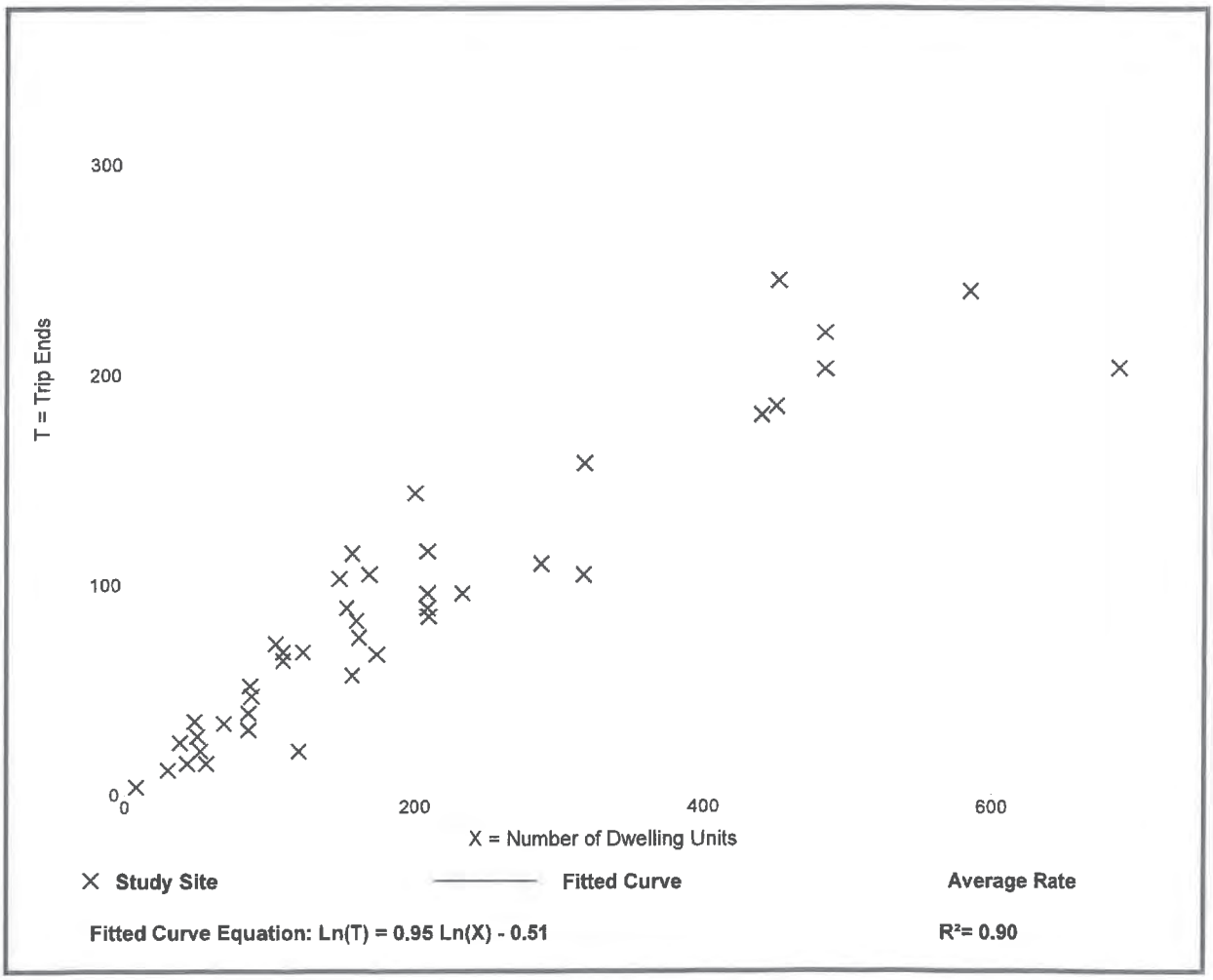
Multifamily Housing (Low-Rise)
(220)

Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 42
Avg. Num. of Dwelling Units: 199
Directional Distribution: 23% entering, 77% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.46	0.18 - 0.74	0.12

Data Plot and Equation



Trip Gen Manual, 10th Ed + Supplement • Institute of Transportation Engineers

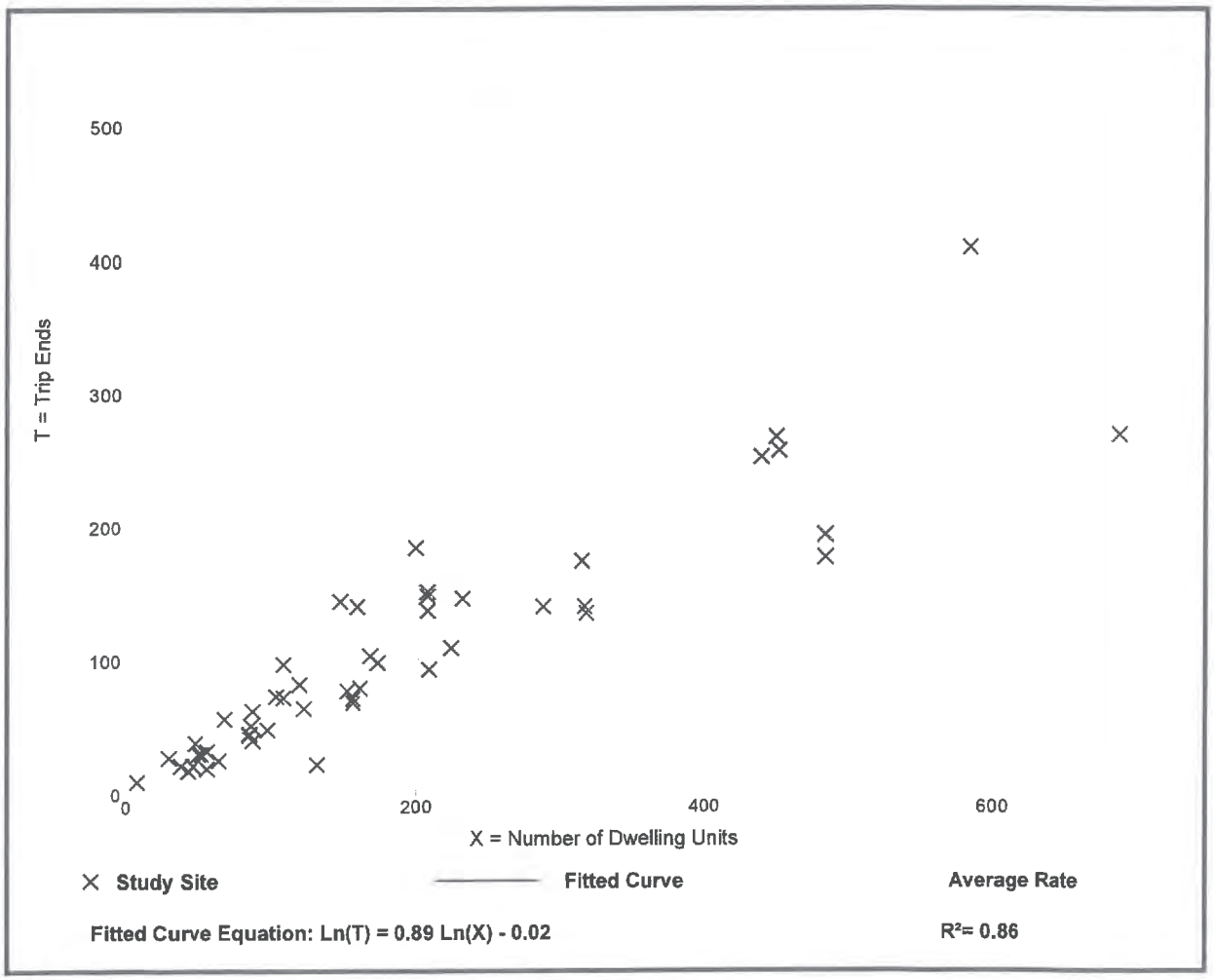
Multifamily Housing (Low-Rise)
(220)

Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 50
Avg. Num. of Dwelling Units: 187
Directional Distribution: 63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.56	0.18 - 1.25	0.16

Data Plot and Equation



Trip Gen Manual, 10th Ed + Supplement • Institute of Transportation Engineers

PROJECT: Proposed Big Tree Residential Projects
LOCATION: Big Tree Rd, Town of Hamburg, New York
PEAK HOUR: AM Peak

Figure Number: 3A 3B 4 6A 7A 6B 7B 7C 8

Num of yrs
3

LOCATION NUMBER	INTERSECTION DESCRIPTION	2019 Volumes	2021 Unadjusted Volumes	2021 Adjusted Base	ECC South Campus (west dwy)	ECC South Campus (east dwy)	2021 Incl. ECC South Adjust.	2024 Bkgd Vol ~ 0.5%	Proposed Multifamily Project Enter Dist. %	Exit Dist. %	Trips IN 17	Trips OUT 56	Total Multifamily Trips	Proposed Parker Rd Subdivision Enter Dist. %	Exit Dist. %	Trips IN 13	Trips OUT 39	Total Parker Rd Trips	Total Site Generated Trips	Full Build Volumes
1	Southwestern Blvd/ Big Tree Rd/Radigan's Dwy			Covid-19 1.20																
	SR		4	5			5	5												5
	ST - Radigan's		4	5			5	5												5
	SL		5	6			6	6												6
	WR		7	8			8	9												9
	WT - SW Blvd		411	493			493	501												501
	WL		8	10			10	10	5%		1		1						1	11
	NR		7	8			8	9		5%		3	3						3	12
	NT - Big Tree Rd		1	1			1	1												1
	NL		174	209	4	4	217	220		45%		25	25		45%		18	18	43	263
	ER		215	256	12	12	282	286	45%		8		8	45%		6		6	14	300
	ET - SW Blvd		676	811			811	823												823
	EL		9	11			11	11												11
2	Big Tree Rd/ Parker Rd/ECC Dwy																			
	SR		1	1	5		5	5												5
	ST		1	1	5		5	5												5
	SL		2	2	10		10	10												10
	WR		2	2	10		10	10												10
	WT		183	220		4	224	227	45%		8		8						8	235
	WL		8	10			10	10						50%		7		7	7	17
	NR		30	36			36	37							50%		20	20	20	57
	NT		2	2	10		10	10												10
	NL		25	30			30	30	5%		1		1		45%		18	18	18	48
	ER		9	11			11	11		5%		3	3	45%		6		6	9	20
	ET		219	263		12	275	279		45%		25	25						25	304
	EL		3	3	15		15	15												15
3	Big Tree Rd/ Abbott Rd			2 0.5%																
	SR	15		15			15	15	10%		2		2	15%		2		2	4	19
	ST	73		74			74	75												75
	SL	85		86			86	87												87
	WR	75		76			76	77												77
	WT	231		233	6	8	247	251	35%		6		6	35%		5		5	11	262
	WL	29		29			29	29												29
	NR	101		102			102	104												104
	NT	181		183			183	186												186
	NL	43		43	2	8	53	54												54
	ER	13		13	1	4	18	18												18
	ET	342		345	5	5	355	360		35%		20	20		35%		14	14	33	393
	EL	32		32	2	3	37	38		10%		6	6		15%		6	6	11	49
4	Parker Rd/Marilyn Dr/ Proposed Northerly SF Home Dwy																			
	SR													55%		7		7	7	7
	ST		13	16	4		20	20		5%		3	3	40%		5		5	8	28
	SL		4	5			5	5												5
	WR		8	10			10	10												10
	WT																			
	WL		2	2			2	2												2
	NR		1	1			1	1												1
	NT		50	60	8		68	69	5%		1		1		40%		16	16	16	85
	NL													2%		0		0	0	0
	ER														2%		1	1	1	1
	ET																			
	EL														55%		21	21	21	21
5	Parker Rd/ Proposed Southerly SF Home Dwy																			
	SR													40%		5		5	5	5
	ST		15	18	4		22	22		5%		3	3		2%		1	1	4	26
	SL																			
	WR																			
	WT																			
	WL																			
	NR													2%		0		0	1	71
	NT		51	61	8		69	70	5%		1		1	3%		0		0	0	0
	NL																			
	ER														3%		1	1	1	1
	ET																			
	EL														40%		16	16	16	16
6	Big Tree Rd/ Proposed Easterly Multifamily Dwy																			
	SR																			
	ST																			
	SL																			
	WR																			
	WT		209	251	4	4	259	263	10%		2		2		45%		18	18	18	282
	WL								40%		7		7						7	7
	NR									40%		22	22						22	22
	NT																			
	NL									37%		21	21						21	21
	ER								37%		6		6						6	6
	ET		231	277	12	12	301	306		10%		6	6	45%		6		6	11	317
	EL																			
7	Big Tree Rd/ Proposed Westerly Multifamily Dwy																			
	SR																			
	ST																			
	SL																			
	WR																			
	WT		209	251	4	4	259	263		37%		21	21		45%		18	18	38	301
	WL								10%		2		2						2	2
	NR									10%		6	6						6	6
	NT																			
	NL									13%		7	7						7	7
	ER								13%		2		2						2	2
	ET		231	277	12	12	301	306	37%		6		6	45%		6		6	12	318
	EL																			

PROJECT: Proposed Big Tree Residential Projects
LOCATION: Big Tree Rd, Town of Hamburg, New York
PEAK HOUR: PM Peak

Figure Number: 3A | 3B | 4 (Num of yrs: 3) | 6A | 7A | 6B | 7B | 7C | 8

LOCATION NUMBER	INTERSECTION DESCRIPTION	2019 Volumes	2021 Unadjusted Volumes	2021 Adjusted Base	ECC South Campus (west dwy)	ECC South Campus (east dwy)	2021 Incl. ECC South Adjust.	2024 Bkgd Vol 0.5%	Proposed Multifamily Project: Enter Dist. %	Exit Dist. %	Trips IN 55	Trips OUT 33	Total Multifamily Trips	Proposed Parker Rd Subdivision: Enter Dist. %	Exit Dist. %	Trips IN 43	Trips OUT 26	Total Parker Rd Trips	Total Site Generated Trips	Full Build Volumes
1	Southwestern Blvd/ Big Tree Rd/Radigan's Dwy			Covid-19 1.20																
	SR		19	23			23	23												23
	ST - Radigan's		11	13			13	13												13
	SL		10	12			12	12												12
	WR		10	12			12	12												12
	WT - SW Blvd		861	1033			1033	1049												1049
	WL		18	22			22	22	5%		3		3						3	25
	NR		14	17			17	17		5%		2	2						2	19
	NT - Big Tree Rd		10	12			12	12												12
	NL		341	409	20	20	449	456		45%		15	15		45%		12	12	27	483
	ER		277	332	8	8	348	354	45%		25		25	45%		19		19	44	398
	ET - SW Blvd		671	805			805	817												817
	EL		19	23			23	23												23
2	Big Tree Rd/ Parker Rd/ECC Dwy																			
	SR		5	5	25		25	25												25
	ST		2	2	10		10	10												10
	SL		1	1	5		5	5												5
	WR		2	2	10		10	10												10
	WT		370	444		20	464	471	45%		25		25						25	496
	WL		29	35			35	35						50%		22		22	22	57
	NR		19	23			23	23							50%		13	13	13	36
	NT		2	2	10		10	10												10
	NL		18	22			22	22	5%		3		3		45%		12	12	14	36
	ER		34	41			41	41		5%		2	2	45%		19		19	21	62
	ET		296	356		8	363	369		45%		15	15						15	384
	EL		2	2	10		10	10												10
3	Big Tree Rd/ Abbott Rd			2 0.5%																
	SR	44		44			44	45	10%		6		6	15%		6		6	12	57
	ST	259		262			262	266												266
	SL	96		97			97	98												98
	WR	108		109			109	111												111
	WT	420		424	6		430	436	35%		19		19	35%		15		15	34	470
	WL	110		111			111	113												113
	NR	57		58			58	59												59
	NT	162		164		6	170	173												173
	NL	34		34	2	10	46	47												47
	ER	46		46	1	9	56	57												57
	ET	347		350	3	3	356	361		35%		12	12		35%		9	9	21	382
	EL	27		27			27	27		10%		3	3		15%		4	4	7	34
4	Parker Rd/Marilyn Dr/ Proposed Northerly SF Home Dwy																			
	SR													55%		24		24	24	24
	ST		55	66	8		74	75		5%		2	2	40%		17		17	19	94
	SL		10	12			12	12												12
	WR		8	10			10	10												10
	WT																			
	WL		3	4			4	4												4
	NR		1	1			1	1												1
	NT		30	36	8		44	45	5%		3		3		40%		10	10	13	58
	NL													2%		1		1	1	1
	ER														2%		1	1	1	1
	ET																			
	EL														55%		14	14	14	14
5	Parker Rd/ Proposed Southerly SF Home Dwy																			
	SR													40%		17		17	17	17
	ST		58	70	8		78	79		5%		2	2		2%		1	1	2	81
	SL																			
	WR																			
	WT																			
	WL																			
	NR																			
	NT		31	37	8		45	46	5%		3		3	2%		1		1	4	50
	NL													3%		1		1	1	1
	ER														3%		1	1	1	1
	ET																			
	EL														40%		10	10	10	10
6	Big Tree Rd/ Proposed Easterly Multifamily Dwy																			
	SR																			
	ST																			
	SL																			
	WR																			
	WT		393	472	20	20	512	519	10%		6		6		45%		12	12	17	536
	WL								40%		22		22						22	22
	NR									40%		13	13						13	13
	NT																			
	NL									37%		12	12						12	12
	ER								37%		20		20						20	20
	ET		332	398	8	8	414	421		10%		3	3	45%		19		19	23	444
	EL																			
7	Big Tree Rd/ Proposed Westerly Multifamily Dwy																			
	SR																			
	ST																			
	SL																			
	WR																			
	WT		393	472	20	20	512	519		37%		12	12		45%		12	12	24	543
	WL								10%		6		6						6	6
	NR									10%		3	3						3	3
	NT																			
	NL									13%		4	4						4	4
	ER								13%		7		7						7	7
	ET		332	398	8	8	414	421	37%		20		20	45%		19		19	40	461
	EL																			

INTERSECTION CRASH RATE CALCULATIONS

$$\text{Rate per MEV} = \frac{\text{\# of Crashes} \times 1{,}000{,}000}{\text{Total No. of Entering Vehicles}} =$$

$$\text{Rate} = \frac{\text{\# of Crashes} \times 1{,}000{,}000}{\text{Veh./Day} \times \text{Duration of Study}} =$$

Crashes per million entering vehicles (Crash / MEV)

---

1 Southwestern Boulevard/Big Tree Road

ADT = Peak hour entering volume / k factor

ADT = 2769 VPH / 0.095 = 29147 VPD

$$\text{Rate} = \frac{28 \text{ Acc.} \times 1{,}000{,}000}{29147 \text{ VPD} \times 365 \text{ Days} \times 3.000 \text{ Yrs.}} = 0.88 \text{ Crash / MEV}$$

2 Big Tree Road/Parker Road

ADT = Peak hour entering volume / k factor

ADT = 1018 VPH / 0.095 = 10716 VPD

$$\text{Rate} = \frac{3 \text{ Acc.} \times 1{,}000{,}000}{10716 \text{ VPD} \times 365 \text{ Days} \times 3.000 \text{ Yrs.}} = 0.26 \text{ Crash / MEV}$$

3 Big Tree Road/Abbott Road

ADT = Peak hour entering volume / k factor

ADT = 1766 VPH / 0.095 = 18589 VPD

$$\text{Rate} = \frac{15 \text{ Acc.} \times 1{,}000{,}000}{18589 \text{ VPD} \times 365 \text{ Days} \times 3.000 \text{ Yrs.}} = 0.74 \text{ Crash / MEV}$$

4 Parker Road/Marilyn Drive

ADT = Peak hour entering volume / k factor

ADT = 145 VPH / 0.095 = 1526 VPD

$$\text{Rate} = \frac{0 \text{ Acc.} \times 1{,}000{,}000}{1526.3 \text{ VPD} \times 365 \text{ Days} \times 3.000 \text{ Yrs.}} = 0.00 \text{ Crash / MEV}$$

Guideline for determining left-turn Lane at a two-way stop-controlled intersection

TWO LANE ROADWAY

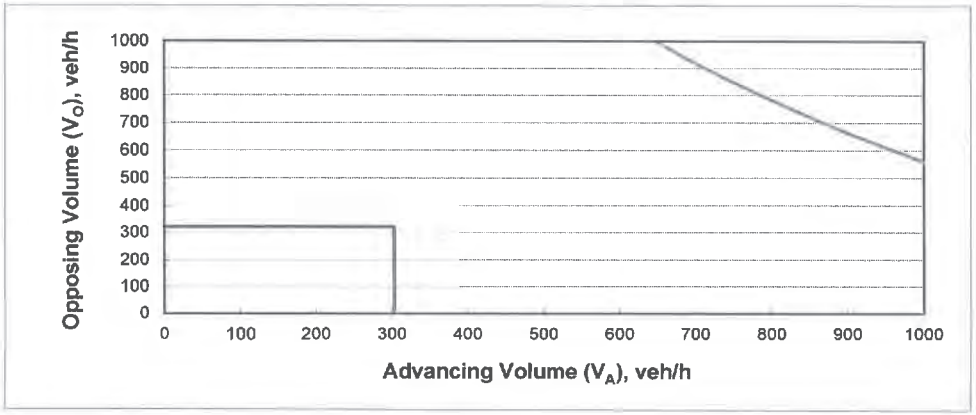
INPUT

Variable	Value
Major Approach	Big Tree Road @ Westerly MF Dwy
Approach	Westbound (AM Peak Hour)
Design Speed Limit - MPH	50
Percent of left-turns in advancing volume (V_A), %:	1%
Advancing volume (V_A), veh/h:	303
Opposing volume (V_O), veh/h:	320

CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

PLOT - LINE 1		PLOT - LINE 2	
0	320	303	0
303	320	303	320



OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	1286
Guidance for determining the need for a major-road left-turn bay:	
Westbound (AM Peak Hour) Left-turn treatment NOT warranted at Big Tree Road @ Westerly MF Dwy Int	

ρ	0.015
f =	0.79
Wait Time	1.296 s
Service Rate	962 veh/h
Arrival Rate	1286 veh/h

Vo	Time_tw
0	0.0
100	0.4
200	0.8
300	1.2
400	1.7
500	2.2
600	2.8
700	3.5
800	4.2
900	5.0
1000	5.8

Vo	Serv_rate
0	1200
100	1121
200	1046
300	976
400	910
500	848
600	789
700	735
800	683
900	635
1000	590

% LT veh.	1%	10%	15%	20%	40%
Vo	V_A	V_A	V_A	V_A	V_A
0	1862	503	422	377	308
100	1649	445	374	334	273
200	1468	396	333	297	243
300	1314	355	298	266	217
400	1180	319	268	239	195
500	1063	287	241	215	176
600	960	259	218	194	159
700	868	234	197	176	143
800	786	212	178	159	130
900	713	192	162	144	118
1000	647	175	147	131	107

Guideline for determining left-turn Lane at a two-way stop-controlled intersection

TWO LANE ROADWAY

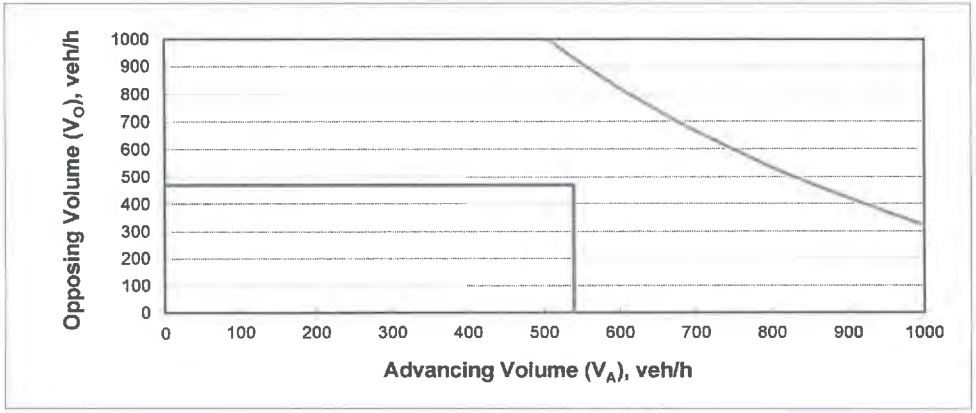
INPUT

Variable	Value
Major Approach	Big Tree Road @ Westerly MF Dwy
Approach	Westbound (PM Peak Hour)
Design Speed Limit - MPH	50
Percent of left-turns in advancing volume (V_A), %:	1%
Advancing volume (V_A), veh/h:	539
Opposing volume (V_O), veh/h:	468

CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

PLOT - LINE 1		PLOT - LINE 2	
0	468	539	0
539	468	539	468



OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	856
Guidance for determining the need for a major-road left-turn bay:	
Westbound (PM Peak Hour) Left-turn treatment NOT warranted at Big Tree Road @ Westerly MF Dwy Int	

ρ	0.015
f =	0.79
Wait Time	2.043 s
Service Rate	867 veh/h
Arrival Rate	856 veh/h

Vo	Time_tw
0	0.0
100	0.4
200	0.8
300	1.2
400	1.7
500	2.2
600	2.8
700	3.5
800	4.2
900	5.0
1000	5.8

Vo	Serv_rate
0	1200
100	1121
200	1046
300	976
400	910
500	848
600	789
700	735
800	683
900	635
1000	590

% LT veh.	1%	10%	15%	20%	40%
Vo	V_A	V_A	V_A	V_A	V_A
0	1450	503	422	377	308
100	1284	445	374	334	273
200	1144	396	333	297	243
300	1023	355	298	266	217
400	919	319	268	239	195
500	828	287	241	215	176
600	747	259	218	194	159
700	676	234	197	176	143
800	612	212	178	159	130
900	555	192	162	144	118
1000	504	175	147	131	107

Guideline for determining left-turn Lane at a two-way stop-controlled intersection
TWO LANE ROADWAY

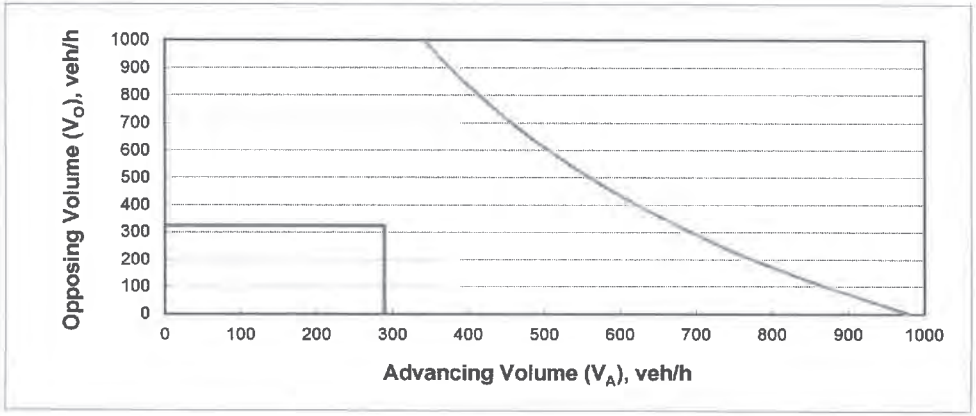
INPUT

Variable	Value
Major Approach	Big Tree Road @ Easterly MF Dwy
Approach	Westbound (AM Peak Hour)
Design Speed Limit - MPH	50
Percent of left-turns in advancing volume (V_A), %:	2%
Advancing volume (V_A), veh/h:	289
Opposing volume (V_O), veh/h:	323

CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

PLOT - LINE 1		PLOT - LINE 2	
0	323	289	0
289	323	289	323



OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	675
Guidance for determining the need for a major-road left-turn bay:	
Westbound (AM Peak Hour) Left-turn treatment NOT warranted at Big Tree Road @ Easterly MF Dwy Int	

ρ	0.015
f =	0.79
Wait Time	1.310 s
Service Rate	960 veh/h
Arrival Rate	675 veh/h

Vo	Time_tw
0	0.0
100	0.4
200	0.8
300	1.2
400	1.7
500	2.2
600	2.8
700	3.5
800	4.2
900	5.0
1000	5.8

Vo	Serv_rate
0	1200
100	1121
200	1046
300	976
400	910
500	848
600	789
700	735
800	683
900	635
1000	590

% LT veh.	2%	10%	15%	20%	40%
Vo	V_A	V_A	V_A	V_A	V_A
0	981	503	422	377	308
100	868	445	374	334	273
200	773	396	333	297	243
300	692	355	298	266	217
400	622	319	268	239	195
500	560	287	241	215	176
600	505	259	218	194	159
700	457	234	197	176	143
800	414	212	178	159	130
900	376	192	162	144	118
1000	341	175	147	131	107

Guideline for determining left-turn Lane at a two-way stop-controlled intersection
TWO LANE ROADWAY

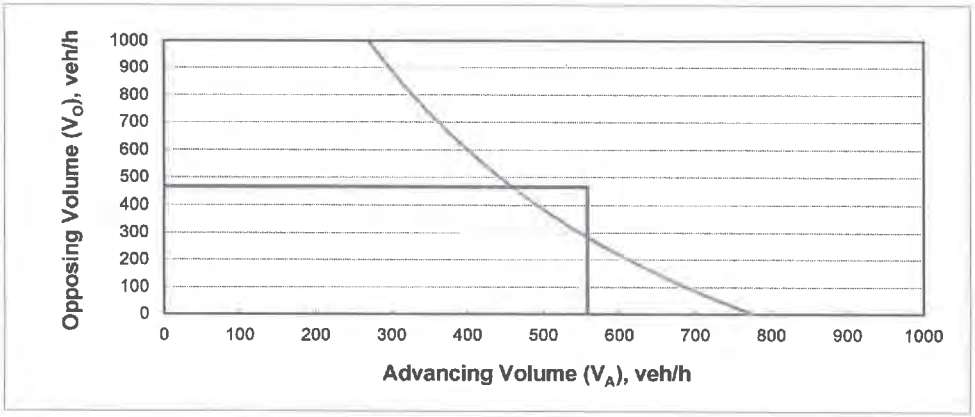
INPUT

Variable	Value
Major Approach	Big Tree Road @ Easterly MF Dwy
Approach	Westbound (PM Peak Hour)
Design Speed Limit - MPH	50
Percent of left-turns in advancing volume (V_A), %:	4%
Advancing volume (V_A), veh/h:	558
Opposing volume (V_O), veh/h:	464

CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

PLOT - LINE 1		PLOT - LINE 2	
0	464	558	0
558	464	558	464



OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	459
Guidance for determining the need for a major-road left-turn bay:	
Westbound (PM Peak Hour) Left-turn treatment warranted at Big Tree Road @ Easterly MF Dwy Intersec	

ρ	0.015
f =	0.79
Wait Time	2.021 s
Service Rate	870 veh/h
Arrival Rate	459 veh/h

Vo	Time_tw
0	0.0
100	0.4
200	0.8
300	1.2
400	1.7
500	2.2
600	2.8
700	3.5
800	4.2
900	5.0
1000	5.8

Vo	Serv_rate
0	1200
100	1121
200	1046
300	976
400	910
500	848
600	789
700	735
800	683
900	635
1000	590

% LT veh.	4%	10%	15%	20%	40%
Vo	V_A	V_A	V_A	V_A	V_A
0	775	503	422	377	308
100	686	445	374	334	273
200	611	396	333	297	243
300	547	355	298	266	217
400	491	319	268	239	195
500	442	287	241	215	176
600	399	259	218	194	159
700	361	234	197	176	143
800	327	212	178	159	130
900	297	192	162	144	118
1000	269	175	147	131	107

A3

Level of Service: Criteria and Definitions

Level of Service Criteria

Highway Capacity Manual 2016

SIGNALIZED INTERSECTIONS

Level of Service is a qualitative measure describing operational conditions within a traffic stream, based on service measures such as speed and travel time, freedom to maneuver, traffic interruptions, comfort, and convenience. Level of Service for signalized intersections is defined in terms of delay specifically, average total delay per vehicle for a 15 minute analysis period. The ranges are as follows:

Level of Service	Control Delay per vehicle (seconds)
A	< 10
B	10 – 20
C	20 – 35
D	35 – 55
E	55 – 80
F	>80

UNSIGNALIZED INTERSECTIONS

Level of Service for unsignalized intersections is also defined in terms of delay. However, the delay criteria are different from a signalized intersection. The primary reason for this is driver expectation that a signalized intersection is designed to carry higher volumes than an unsignalized intersection. The total delay threshold for any given Level of Service is less for an unsignalized intersection than for a signalized intersection. The ranges are as follows:

Level of Service	Control Delay per vehicle (seconds)
A	< 10
B	10 – 15
C	15 – 25
D	25 – 35
E	35 - 50
F	>50

A4

Level of Service Calculations: Existing Conditions

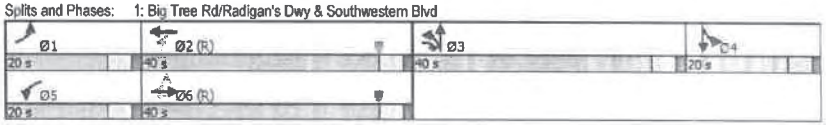
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	811	282	10	493	8	217	1	8	6	5	5
Future Volume (vph)	11	811	282	10	493	8	217	1	8	6	5	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	45		190	140		0	205		0	0		0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (ft)	105			120			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00
Frt			0.850		0.998			0.990			0.925	
Flt Protected	0.950			0.950			0.950	0.956		0.950		
Satd. Flow (prot)	1805	4988	1553	1805	3340	0	1633	1617	0	1805	1758	0
Flt Permitted	0.411			0.283			0.950	0.956		0.950		
Satd. Flow (perm)	781	4988	1553	538	3340	0	1633	1617	0	1805	1758	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			324		1			3			6	
Link Speed (mph)		50			50			45			10	
Link Distance (ft)		720			735			884			251	
Travel Time (s)		9.8			10.0			13.4			17.1	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Heavy Vehicles (%)	0%	4%	4%	0%	8%	0%	5%	0%	15%	0%	0%	0%
Adj. Flow (vph)	13	932	324	11	567	9	249	1	9	7	6	6
Shared Lane Traffic (%)							48%					
Lane Group Flow (vph)	13	932	324	11	576	0	129	130	0	7	12	0
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		Split	NA		Split	NA	
Protected Phases	1	6	3	5	2		3	3		4	4	
Permitted Phases	6		6	2								
Detector Phase	1	6	3	5	2		3	3		4	4	
Switch Phase												
Minimum Initial (s)	6.0	20.0	6.0	6.0	20.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	11.0	27.0	37.0	11.0	27.0		37.0	37.0		37.0	37.0	
Total Split (s)	20.0	40.0	40.0	20.0	40.0		40.0	40.0		20.0	20.0	
Total Split (%)	16.7%	33.3%	33.3%	16.7%	33.3%		33.3%	33.3%		16.7%	16.7%	
Maximum Green (s)	15.0	35.0	35.0	15.0	35.0		35.0	35.0		15.0	15.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lead	Lag	Lead	Lead	Lag		Lead	Lead		Lag	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	C-Max	None	None	C-Max		None	None		None	None	
Walk Time (s)		7.0	7.0		7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		15.0	25.0		15.0		25.0	25.0		25.0	25.0	
Pedestrian Calls (#/hr)		0	0		0		0	0		0	0	
Act Effct Green (s)	88.6	87.4	110.9	87.6	85.1		15.6	15.6		6.4	6.4	
Actuated g/C Ratio	0.74	0.73	0.92	0.73	0.71		0.13	0.13		0.05	0.05	
v/c Ratio	0.02	0.26	0.22	0.02	0.24		0.61	0.61		0.07	0.12	
Control Delay	6.9	7.6	0.7	7.1	9.0		60.6	59.6		55.3	41.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay	6.9	7.6	0.7	7.1	9.0		60.6	59.6		55.3	41.4	
LOS	A	A	A	A	A		E	E		E	D	
Approach Delay		5.8			8.9			60.1			46.5	
Approach LOS		A			A			E			D	
Queue Length 50th (ft)	2	57	0	2	50		101	98		5	5	
Queue Length 95th (ft)	11	170	17	10	159		153	152		20	23	
Internal Link Dist (ft)		640			655			804			171	
Turn Bay Length (ft)	45		190	140			205					
Base Capacity (vph)	711	3631	1520	560	2370		476	473		225	225	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.02	0.26	0.21	0.02	0.24		0.27	0.27		0.03	0.05	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow
Natural Cycle: 115
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.61
Intersection Signal Delay: 13.6 Intersection LOS: B
Intersection Capacity Utilization 40.0% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 1: Big Tree Rd/Radigan's Dwy & Southwestern Blvd



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	15	275	11	10	224	10	30	10	36	10	5	5
Future Volume (vph)	15	275	11	10	224	10	30	10	36	10	5	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.995			0.994			0.937			0.968	
Flt Protected		0.997			0.998			0.981			0.975	
Satd. Flow (prot)	0	1835	0	0	1763	0	0	1746	0	0	1793	0
Flt Permitted		0.997			0.998			0.981			0.975	
Satd. Flow (perm)	0	1835	0	0	1763	0	0	1746	0	0	1793	0
Link Speed (mph)		45			45			30			30	
Link Distance (ft)		1782			2441			480			334	
Travel Time (s)		27.0			37.0			10.9			7.6	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Heavy Vehicles (%)	0%	3%	0%	12%	7%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	19	344	14	13	280	13	38	13	45	13	6	6
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	377	0	0	306	0	0	96	0	0	25	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	32.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	15	275	11	10	224	10	30	10	36	10	5	5
Future Volume (Veh/h)	15	275	11	10	224	10	30	10	36	10	5	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	19	344	14	13	280	13	38	13	45	13	6	6
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	293			358			710	708	351	753	708	286
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	293			358			710	708	351	753	708	286
tC, single (s)	4.1			4.2			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			99			89	96	94	96	98	99
cM capacity (veh/h)	1280			1147			337	353	697	293	352	757

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	377	306	96	25
Volume Left	19	13	38	13
Volume Right	14	13	45	6
cSH	1280	1147	448	360
Volume to Capacity	0.01	0.01	0.21	0.07
Queue Length 95th (ft)	1	1	20	6
Control Delay (s)	0.5	0.5	15.2	15.7
Lane LOS	A	A	C	C
Approach Delay (s)	0.5	0.5	15.2	15.7
Approach LOS			C	C

Intersection Summary					
Average Delay	2.7				
Intersection Capacity Utilization	32.6%	ICU Level of Service		A	
Analysis Period (min)	15				

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	37	355	18	29	247	76	53	183	102	86	74	15
Future Volume (vph)	37	355	18	29	247	76	53	183	102	86	74	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	140		0	70		0	100		0	0		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			130			100		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.993			0.965			0.946			0.975	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1752	1805	0	1687	1711	0	1770	1746	0	1626	1793	0
Flt Permitted	0.479			0.417			0.687			0.456		
Satd. Flow (perm)	884	1805	0	740	1711	0	1280	1746	0	781	1793	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4			24			44			16	
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		2441			661			550			398	
Travel Time (s)		37.0			10.0			8.3			6.0	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Heavy Vehicles (%)	3%	4%	15%	7%	6%	11%	2%	4%	1%	11%	4%	0%
Adj. Flow (vph)	45	433	22	35	301	93	65	223	124	105	90	18
Shared Lane Traffic (%)												
Lane Group Flow (vph)	45	455	0	35	394	0	65	347	0	105	108	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		1			1			3			3	
Permitted Phases	1			1			3			3		
Detector Phase	1	1		1	1		3	3		3	3	
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0		15.0	15.0		15.0	15.0	
Minimum Split (s)	25.9	25.9		25.9	25.9		22.5	22.5		22.5	22.5	
Total Split (s)	40.9	40.9		40.9	40.9		40.0	40.0		40.0	40.0	
Total Split (%)	50.6%	50.6%		50.6%	50.6%		49.4%	49.4%		49.4%	49.4%	
Maximum Green (s)	35.0	35.0		35.0	35.0		35.0	35.0		35.0	35.0	
Yellow Time (s)	4.7	4.7		4.7	4.7		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.2	1.2		1.2	1.2		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.9	5.9		5.9	5.9		5.0	5.0		5.0	5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		Min	Min		None	None		None	None	
Act Effct Green (s)	23.2	23.2		23.2	23.2		18.0	18.0		18.0	18.0	
Actuated g/C Ratio	0.44	0.44		0.44	0.44		0.34	0.34		0.34	0.34	
v/c Ratio	0.12	0.57		0.11	0.51		0.15	0.55		0.39	0.17	
Control Delay	10.3	14.6		10.5	13.1		13.8	16.4		19.2	12.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	10.3	14.6		10.5	13.1		13.8	16.4		19.2	12.0	
LOS	B	B		B	B		B	B		B	B	
Approach Delay		14.2			12.8			16.0			15.5	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		B			B			B			B	
Queue Length 50th (ft)	7	83		5	65		12	63		21	17	
Queue Length 95th (ft)	25	185		21	152		39	149		64	51	
Internal Link Dist (ft)		2361			581			470			318	
Turn Bay Length (ft)	140			70			100					
Base Capacity (vph)	607	1241		508	1182		879	1212		536	1237	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.07	0.37		0.07	0.33		0.07	0.29		0.20	0.09	

Intersection Summary

Area Type: Other
Cycle Length: 80.9
Actuated Cycle Length: 52.4
Natural Cycle: 50
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.57
Intersection Signal Delay: 14.5 Intersection LOS: B
Intersection Capacity Utilization 72.3% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 3: Abbott Rd & Big Tree Rd

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	2	10	68	1	5	20
Future Volume (vph)	2	10	68	1	5	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.884		0.998			
Flt Protected	0.993					0.990
Satd. Flow (prot)	1668	0	1896	0	0	1791
Flt Permitted	0.993					0.990
Satd. Flow (perm)	1668	0	1896	0	0	1791
Link Speed (mph)	30		30			30
Link Distance (ft)	742		1530			480
Travel Time (s)	16.9		34.8			10.9
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	0%	0%	0%	0%	25%	0%
Adj. Flow (vph)	2	12	80	1	6	24
Shared Lane Traffic (%)						
Lane Group Flow (vph)	14	0	81	0	0	30
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	15.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	2	10	68	1	5	20
Future Volume (Veh/h)	2	10	68	1	5	20
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	2	12	80	1	6	24
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	116	80			81	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	116	80			81	
tC, single (s)	6.4	6.2			4.3	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.4	
p0 queue free %	100	99			100	
cM capacity (veh/h)	881	985			1383	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	14	81	30
Volume Left	2	0	6
Volume Right	12	1	0
cSH	969	1700	1383
Volume to Capacity	0.01	0.05	0.00
Queue Length 95th (ft)	1	0	0
Control Delay (s)	8.8	0.0	1.5
Lane LOS	A		A
Approach Delay (s)	8.8	0.0	1.5
Approach LOS	A		

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	15.4%	ICU Level of Service	A
Analysis Period (min)	15		

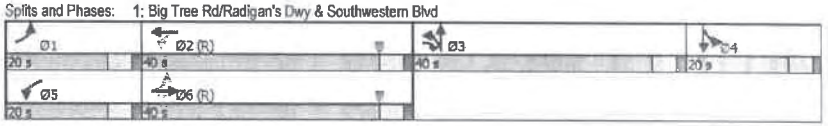
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	23	805	348	22	1033	12	449	12	17	12	13	23
Future Volume (vph)	23	805	348	22	1033	12	449	12	17	12	13	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	45		190	140		0	205		0	0		0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (ft)	105			120			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00
Frt			0.850		0.998			0.990			0.904	
Flt Protected	0.950			0.950			0.950	0.958		0.950		
Satd. Flow (prot)	1805	5136	1615	1626	3568	0	1698	1689	0	1805	1718	0
Flt Permitted	0.168			0.282			0.950	0.958		0.950		
Satd. Flow (perm)	319	5136	1615	483	3568	0	1698	1689	0	1805	1718	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			374		1			3			25	
Link Speed (mph)		50			50			45			10	
Link Distance (ft)		720			735			884			251	
Travel Time (s)		9.8			10.0			13.4			17.1	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	0%	1%	0%	11%	1%	0%	1%	0%	7%	0%	0%	0%
Adj. Flow (vph)	25	866	374	24	1111	13	483	13	18	13	14	25
Shared Lane Traffic (%)							47%					
Lane Group Flow (vph)	25	866	374	24	1124	0	256	258	0	13	39	0
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		Split	NA		Split	NA	
Protected Phases	1	6	3	5	2		3	3		4	4	
Permitted Phases	6		6	2								
Detector Phase	1	6	3	5	2		3	3		4	4	
Switch Phase												
Minimum Initial (s)	6.0	20.0	6.0	6.0	20.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	11.0	27.0	37.0	11.0	27.0		37.0	37.0		37.0	37.0	
Total Split (s)	20.0	40.0	40.0	20.0	40.0		40.0	40.0		20.0	20.0	
Total Split (%)	16.7%	33.3%	33.3%	16.7%	33.3%		33.3%	33.3%		16.7%	16.7%	
Maximum Green (s)	15.0	35.0	35.0	15.0	35.0		35.0	35.0		15.0	15.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lead	Lag	Lead	Lead	Lag		Lead	Lead		Lag	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	C-Max	None	None	C-Max		None	None		None	None	
Walk Time (s)		7.0	7.0		7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		15.0	25.0		15.0		25.0	25.0		25.0	25.0	
Pedestrian Calls (#/hr)		0	0		0		0	0		0	0	
Act Effct Green (s)	71.9	67.8	99.0	72.0	67.9		25.2	25.2		7.1	7.1	
Actuated g/C Ratio	0.60	0.56	0.82	0.60	0.57		0.21	0.21		0.06	0.06	
v/c Ratio	0.09	0.30	0.27	0.07	0.56		0.72	0.72		0.12	0.31	
Control Delay	13.1	16.9	0.9	12.9	21.5		54.9	54.6		55.1	34.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay	13.1	16.9	0.9	12.9	21.5		54.9	54.6		55.1	34.0	
LOS	B	B	A	B	C		D	D		E	C	
Approach Delay		12.1			21.4			54.8			39.3	
Approach LOS		B			C			D			D	
Queue Length 50th (ft)	7	136	0	7	310		195	194		10	11	
Queue Length 95th (ft)	24	212	23	24	482		264	265		30	46	
Internal Link Dist (ft)		640			655			804			171	
Turn Bay Length (ft)	45		190	140			205					
Base Capacity (vph)	384	2903	1459	444	2018		495	494		225	236	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.07	0.30	0.26	0.05	0.56		0.52	0.52		0.06	0.17	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow
Natural Cycle: 125
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.72
Intersection Signal Delay: 23.5 Intersection LOS: C
Intersection Capacity Utilization 57.2% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 1: Big Tree Rd/Radigan's Dwy & Southwestern Blvd



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (vph)	10	363	41	35	464	10	22	10	23	5	10	25
Future Volume (vph)	10	363	41	35	464	10	22	10	23	5	10	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.987			0.997			0.944			0.916	
Flt Protected		0.999			0.997			0.981			0.994	
Satd. Flow (prot)	0	1857	0	0	1872	0	0	1760	0	0	1730	0
Flt Permitted		0.999			0.997			0.981			0.994	
Satd. Flow (perm)	0	1857	0	0	1872	0	0	1760	0	0	1730	0
Link Speed (mph)		45			45			30			30	
Link Distance (ft)		1782			2441			480			334	
Travel Time (s)		27.0			37.0			10.9			7.6	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	11	382	43	37	488	11	23	11	24	5	11	26
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	436	0	0	536	0	0	58	0	0	42	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	56.5%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	10	363	41	35	464	10	22	10	23	5	10	25
Future Volume (Veh/h)	10	363	41	35	464	10	22	10	23	5	10	25
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	11	382	43	37	488	11	23	11	24	5	11	26
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	499			425			1024	998	404	1022	1014	494
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	499			425			1024	998	404	1022	1014	494
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			97			88	95	96	97	95	96
cM capacity (veh/h)	1075			1145			192	235	651	194	230	580

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	436	536	58	42
Volume Left	11	37	23	5
Volume Right	43	11	24	26
cSH	1075	1145	285	355
Volume to Capacity	0.01	0.03	0.20	0.12
Queue Length 95th (ft)	1	3	19	10
Control Delay (s)	0.3	0.9	20.8	16.5
Lane LOS	A	A	C	C
Approach Delay (s)	0.3	0.9	20.8	16.5
Approach LOS			C	C

Intersection Summary				
Average Delay		2.4		
Intersection Capacity Utilization	56.5%	ICU Level of Service		B
Analysis Period (min)	15			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	27	356	56	111	431	109	46	170	58	97	262	43
Future Volume (vph)	27	356	56	111	431	109	46	170	58	97	262	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	140		0	70		0	100		0	0		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			130			100		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.979			0.970			0.962			0.979	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1736	1834	0	1770	1832	0	1805	1792	0	1787	1839	0
Flt Permitted	0.339			0.461			0.497			0.607		
Satd. Flow (perm)	619	1834	0	859	1832	0	944	1792	0	1142	1839	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12			20			27			13	
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		2441			661			550			398	
Travel Time (s)		37.0			10.0			8.3			6.0	
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Heavy Vehicles (%)	4%	1%	4%	2%	0%	3%	0%	2%	2%	1%	1%	2%
Adj. Flow (vph)	27	360	57	112	435	110	46	172	59	98	265	43
Shared Lane Traffic (%)												
Lane Group Flow (vph)	27	417	0	112	545	0	46	231	0	98	308	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		1			1			3			3	
Permitted Phases	1			1			3			3		
Detector Phase	1	1		1	1		3	3		3	3	
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0		15.0	15.0		15.0	15.0	
Minimum Split (s)	25.9	25.9		25.9	25.9		22.5	22.5		22.5	22.5	
Total Split (s)	40.9	40.9		40.9	40.9		40.0	40.0		40.0	40.0	
Total Split (%)	50.6%	50.6%		50.6%	50.6%		49.4%	49.4%		49.4%	49.4%	
Maximum Green (s)	35.0	35.0		35.0	35.0		35.0	35.0		35.0	35.0	
Yellow Time (s)	4.7	4.7		4.7	4.7		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.2	1.2		1.2	1.2		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.9	5.9		5.9	5.9		5.0	5.0		5.0	5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		Min	Min		None	None		None	None	
Act Effct Green (s)	24.6	24.6		24.6	24.6		17.7	17.7		17.7	17.7	
Actuated g/C Ratio	0.46	0.46		0.46	0.46		0.33	0.33		0.33	0.33	
v/c Ratio	0.10	0.49		0.28	0.64		0.15	0.38		0.26	0.50	
Control Delay	9.8	12.4		11.8	15.0		15.6	15.0		16.6	17.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	9.8	12.4		11.8	15.0		15.6	15.0		16.6	17.9	
LOS	A	B		B	B		B	B		B	B	
Approach Delay		12.2			14.4			15.1			17.6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		B			B			B			B	
Queue Length 50th (ft)	4	72		18	102		9	42		20	64	
Queue Length 95th (ft)	19	176		59	248		36	118		64	166	
Internal Link Dist (ft)		2361			581			470			318	
Turn Bay Length (ft)	140			70			100					
Base Capacity (vph)	416	1237		577	1238		634	1213		767	1240	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.06	0.34		0.19	0.44		0.07	0.19		0.13	0.25	

Intersection Summary

Area Type: Other
Cycle Length: 80.9
Actuated Cycle Length: 53.6
Natural Cycle: 50
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.64
Intersection Signal Delay: 14.7 Intersection LOS: B
Intersection Capacity Utilization 93.0% ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 3: Abbott Rd & Big Tree Rd

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	4	10	44	1	12	74
Future Volume (vph)	4	10	44	1	12	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.905		0.997			
Flt Protected	0.986					0.993
Satd. Flow (prot)	1695	0	1894	0	0	1887
Flt Permitted	0.986					0.993
Satd. Flow (perm)	1695	0	1894	0	0	1887
Link Speed (mph)	30		30			30
Link Distance (ft)	742		1530			480
Travel Time (s)	16.9		34.8			10.9
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	5	12	52	1	14	88
Shared Lane Traffic (%)						
Lane Group Flow (vph)	17	0	53	0	0	102
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	21.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	4	10	44	1	12	74
Future Volume (Veh/h)	4	10	44	1	12	74
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	5	12	52	1	14	88
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	168	52			53	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	168	52			53	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	99			99	
cM capacity (veh/h)	819	1021			1566	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	17	53	102
Volume Left	5	0	14
Volume Right	12	1	0
cSH	952	1700	1566
Volume to Capacity	0.02	0.03	0.01
Queue Length 95th (ft)	1	0	1
Control Delay (s)	8.9	0.0	1.1
Lane LOS	A		A
Approach Delay (s)	8.9	0.0	1.1
Approach LOS	A		

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	21.2%	ICU Level of Service	A
Analysis Period (min)	15		

A5

Level of Service Calculations: Background Conditions

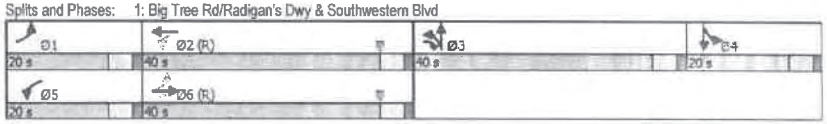
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	823	286	10	501	8	220	1	9	6	5	5
Future Volume (vph)	11	823	286	10	501	8	220	1	9	6	5	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	45		190	140		0	205		0	0		0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (ft)	105			120			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00
Frt			0.850		0.998			0.989			0.925	
Flt Protected	0.950			0.950			0.950	0.956		0.950		
Satd. Flow (prot)	1805	4988	1553	1805	3340	0	1633	1614	0	1805	1758	0
Flt Permitted	0.406			0.278			0.950	0.956		0.950		
Satd. Flow (perm)	771	4988	1553	528	3340	0	1633	1614	0	1805	1758	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			329		1			3			6	
Link Speed (mph)		50			50			45			10	
Link Distance (ft)		720			735			884			251	
Travel Time (s)		9.8			10.0			13.4			17.1	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Heavy Vehicles (%)	0%	4%	4%	0%	8%	0%	5%	0%	15%	0%	0%	0%
Adj. Flow (vph)	13	946	329	11	576	9	253	1	10	7	6	6
Shared Lane Traffic (%)							48%					
Lane Group Flow (vph)	13	946	329	11	585	0	132	132	0	7	12	0
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		Split	NA		Split	NA	
Protected Phases	1	6	3	5	2		3	3		4	4	
Permitted Phases	6		6	2								
Detector Phase	1	6	3	5	2		3	3		4	4	
Switch Phase												
Minimum Initial (s)	6.0	20.0	6.0	6.0	20.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	11.0	27.0	37.0	11.0	27.0		37.0	37.0		37.0	37.0	
Total Split (s)	20.0	40.0	40.0	20.0	40.0		40.0	40.0		20.0	20.0	
Total Split (%)	16.7%	33.3%	33.3%	16.7%	33.3%		33.3%	33.3%		16.7%	16.7%	
Maximum Green (s)	15.0	35.0	35.0	15.0	35.0		35.0	35.0		15.0	15.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lead	Lag	Lead	Lead	Lag		Lead	Lead		Lag	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	C-Max	None	None	C-Max		None	None		None	None	
Walk Time (s)		7.0	7.0		7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		15.0	25.0		15.0		25.0	25.0		25.0	25.0	
Pedestrian Calls (#/hr)		0	0		0		0	0		0	0	
Act Effct Green (s)	88.5	87.2	110.9	87.4	85.0		15.8	15.8		6.4	6.4	
Actuated g/C Ratio	0.74	0.73	0.92	0.73	0.71		0.13	0.13		0.05	0.05	
v/c Ratio	0.02	0.26	0.23	0.02	0.25		0.62	0.62		0.07	0.12	
Control Delay	7.0	7.7	0.7	7.2	9.1		60.8	59.6		55.3	41.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay	7.0	7.7	0.7	7.2	9.1		60.8	59.6		55.3	41.4	
LOS	A	A	A	A	A		E	E		E	D	
Approach Delay		5.9			9.0			60.2			46.5	
Approach LOS		A			A			E			D	
Queue Length 50th (ft)	2	59	0	2	51		103	101		5	5	
Queue Length 95th (ft)	11	173	17	10	163		156	154		20	23	
Internal Link Dist (ft)		640			655			804			171	
Turn Bay Length (ft)	45		190	140			205					
Base Capacity (vph)	703	3623	1519	553	2365		476	472		225	225	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.02	0.26	0.22	0.02	0.25		0.28	0.28		0.03	0.05	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow
Natural Cycle: 115
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.62
Intersection Signal Delay: 13.7 Intersection LOS: B
Intersection Capacity Utilization 40.2% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 1: Big Tree Rd/Radigan's Dwy & Southwestern Blvd



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (vph)	15	279	11	10	227	10	30	10	37	10	5	5
Future Volume (vph)	15	279	11	10	227	10	30	10	37	10	5	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.995			0.994			0.936			0.968	
Flt Protected		0.998			0.998			0.981			0.975	
Satd. Flow (prot)	0	1836	0	0	1763	0	0	1745	0	0	1793	0
Flt Permitted		0.998			0.998			0.981			0.975	
Satd. Flow (perm)	0	1836	0	0	1763	0	0	1745	0	0	1793	0
Link Speed (mph)		45			45			30			30	
Link Distance (ft)		1782			2441			480			334	
Travel Time (s)		27.0			37.0			10.9			7.6	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Heavy Vehicles (%)	0%	3%	0%	12%	7%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	19	349	14	13	284	13	38	13	46	13	6	6
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	382	0	0	310	0	0	97	0	0	25	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary				
Area Type:	Other			
Control Type: Unsignalized				
Intersection Capacity Utilization 32.9%		ICU Level of Service A		
Analysis Period (min) 15				

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	15	279	11	10	227	10	30	10	37	10	5	5
Future Volume (Veh/h)	15	279	11	10	227	10	30	10	37	10	5	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	19	349	14	13	284	13	38	13	46	13	6	6
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	297			363			720	717	356	763	718	290
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	297			363			720	717	356	763	718	290
tC, single (s)	4.1			4.2			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			99			89	96	93	95	98	99
cM capacity (veh/h)	1276			1142			332	348	693	288	348	753

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	382	310	97	25
Volume Left	19	13	38	13
Volume Right	14	13	46	6
cSH	1276	1142	445	355
Volume to Capacity	0.01	0.01	0.22	0.07
Queue Length 95th (ft)	1	1	21	6
Control Delay (s)	0.5	0.5	15.3	15.9
Lane LOS	A	A	C	C
Approach Delay (s)	0.5	0.5	15.3	15.9
Approach LOS			C	C

Intersection Summary						
Average Delay		2.7				
Intersection Capacity Utilization	32.9%	ICU Level of Service	A			
Analysis Period (min)	15					

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	38	360	18	29	251	77	54	186	104	87	75	15
Future Volume (vph)	38	360	18	29	251	77	54	186	104	87	75	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	140		0	70		0	100		0	0		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			130			100		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.993			0.965			0.946			0.975	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1752	1805	0	1687	1711	0	1770	1746	0	1626	1793	0
Flt Permitted	0.473			0.411			0.687			0.445		
Satd. Flow (perm)	873	1805	0	730	1711	0	1280	1746	0	762	1793	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4			24			44			16	
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		2441			661			550			398	
Travel Time (s)		37.0			10.0			8.3			6.0	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Heavy Vehicles (%)	3%	4%	15%	7%	6%	11%	2%	4%	1%	11%	4%	0%
Adj. Flow (vph)	46	439	22	35	306	94	66	227	127	106	91	18
Shared Lane Traffic (%)												
Lane Group Flow (vph)	46	461	0	35	400	0	66	354	0	106	109	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		1			1			3			3	
Permitted Phases	1			1			3			3		
Detector Phase	1	1		1	1		3	3		3	3	
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0		15.0	15.0		15.0	15.0	
Minimum Split (s)	25.9	25.9		25.9	25.9		22.5	22.5		22.5	22.5	
Total Split (s)	40.9	40.9		40.9	40.9		40.0	40.0		40.0	40.0	
Total Split (%)	50.6%	50.6%		50.6%	50.6%		49.4%	49.4%		49.4%	49.4%	
Maximum Green (s)	35.0	35.0		35.0	35.0		35.0	35.0		35.0	35.0	
Yellow Time (s)	4.7	4.7		4.7	4.7		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.2	1.2		1.2	1.2		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.9	5.9		5.9	5.9		5.0	5.0		5.0	5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		Min	Min		None	None		None	None	
Act Effct Green (s)	23.6	23.6		23.6	23.6		18.2	18.2		18.2	18.2	
Actuated g/C Ratio	0.45	0.45		0.45	0.45		0.34	0.34		0.34	0.34	
v/c Ratio	0.12	0.57		0.11	0.52		0.15	0.56		0.41	0.17	
Control Delay	10.4	14.7		10.5	13.2		14.1	17.0		20.0	12.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	10.4	14.7		10.5	13.2		14.1	17.0		20.0	12.3	
LOS	B	B		B	B		B	B		B	B	
Approach Delay		14.3			13.0			16.5			16.1	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		B			B			B			B	
Queue Length 50th (ft)	7	85		5	67		12	65		21	17	
Queue Length 95th (ft)	26	189		21	155		40	158		67	53	
Internal Link Dist (ft)		2361			581			470			318	
Turn Bay Length (ft)	140			70			100					
Base Capacity (vph)	595	1232		497	1174		873	1204		519	1228	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.08	0.37		0.07	0.34		0.08	0.29		0.20	0.09	

Intersection Summary

Area Type: Other
Cycle Length: 80.9
Actuated Cycle Length: 53
Natural Cycle: 50
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.57
Intersection Signal Delay: 14.8 Intersection LOS: B
Intersection Capacity Utilization 73.5% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 3: Abbott Rd & Big Tree Rd

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	2	10	69	1	5	20
Future Volume (vph)	2	10	69	1	5	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.864		0.998			
Flt Protected	0.993					0.990
Satd. Flow (prot)	1668	0	1896	0	0	1791
Flt Permitted	0.993					0.990
Satd. Flow (perm)	1668	0	1896	0	0	1791
Link Speed (mph)	30		30			30
Link Distance (ft)	742		1530			480
Travel Time (s)	16.9		34.8			10.9
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	0%	0%	0%	0%	25%	0%
Adj. Flow (vph)	2	12	81	1	6	24
Shared Lane Traffic (%)						
Lane Group Flow (vph)	14	0	82	0	0	30
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	15.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	2	10	69	1	5	20
Future Volume (Veh/h)	2	10	69	1	5	20
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	2	12	81	1	6	24
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	118	82			82	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	118	82			82	
tC, single (s)	6.4	6.2			4.3	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.4	
p0 queue free %	100	99			100	
cM capacity (veh/h)	879	984			1382	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	14	82	30
Volume Left	2	0	6
Volume Right	12	1	0
cSH	967	1700	1382
Volume to Capacity	0.01	0.05	0.00
Queue Length 95th (ft)	1	0	0
Control Delay (s)	8.8	0.0	1.6
Lane LOS	A		A
Approach Delay (s)	8.8	0.0	1.6
Approach LOS	A		

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	15.4%	ICU Level of Service	A
Analysis Period (min)	15		

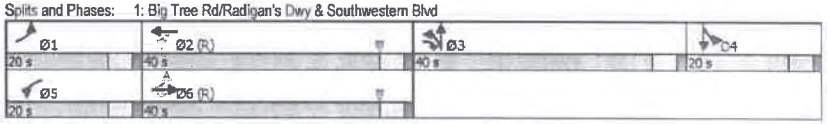
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	23	817	354	22	1049	12	456	12	17	12	13	23
Future Volume (vph)	23	817	354	22	1049	12	456	12	17	12	13	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	45		190	140		0	205		0	0		0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (ft)	105			120			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00
Frt			0.850		0.998			0.990			0.904	
Flt Protected	0.950			0.950			0.950	0.958		0.950		
Satd. Flow (prot)	1805	5136	1615	1626	3568	0	1698	1689	0	1805	1718	0
Flt Permitted	0.162			0.277			0.950	0.958		0.950		
Satd. Flow (perm)	308	5136	1615	474	3568	0	1698	1689	0	1805	1718	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			381		1			3			25	
Link Speed (mph)		50			50			45			10	
Link Distance (ft)		720			735			884			251	
Travel Time (s)		9.8			10.0			13.4			17.1	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	0%	1%	0%	11%	1%	0%	1%	0%	7%	0%	0%	0%
Adj. Flow (vph)	25	878	381	24	1128	13	490	13	18	13	14	25
Shared Lane Traffic (%)							47%					
Lane Group Flow (vph)	25	878	381	24	1141	0	260	261	0	13	39	0
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		Split	NA		Split	NA	
Protected Phases	1	6	3	5	2		3	3		4	4	
Permitted Phases	6		6	2								
Detector Phase	1	6	3	5	2		3	3		4	4	
Switch Phase												
Minimum Initial (s)	6.0	20.0	6.0	6.0	20.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	11.0	27.0	37.0	11.0	27.0		37.0	37.0		37.0	37.0	
Total Split (s)	20.0	40.0	40.0	20.0	40.0		40.0	40.0		20.0	20.0	
Total Split (%)	16.7%	33.3%	33.3%	16.7%	33.3%		33.3%	33.3%		16.7%	16.7%	
Maximum Green (s)	15.0	35.0	35.0	15.0	35.0		35.0	35.0		15.0	15.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lead	Lag	Lead	Lead	Lag		Lead	Lead		Lag	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	C-Max	None	None	C-Max		None	None		None	None	
Walk Time (s)		7.0	7.0		7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		15.0	25.0		15.0		25.0	25.0		25.0	25.0	
Pedestrian Calls (#/hr)		0	0		0		0	0		0	0	
Act Effct Green (s)	71.5	67.4	99.0	71.6	67.5		25.5	25.5		7.1	7.1	
Actuated g/C Ratio	0.60	0.56	0.82	0.60	0.56		0.21	0.21		0.06	0.06	
v/c Ratio	0.10	0.30	0.27	0.07	0.57		0.72	0.72		0.12	0.31	
Control Delay	13.3	17.2	0.9	13.0	21.9		54.6	54.2		55.1	34.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay	13.3	17.2	0.9	13.0	21.9		54.6	54.2		55.1	34.0	
LOS	B	B	A	B	C		D	D		E	C	
Approach Delay		12.3			21.8			54.4			39.3	
Approach LOS		B			C			D			D	
Queue Length 50th (ft)	7	140	0	7	317		198	197		10	11	
Queue Length 95th (ft)	24	217	24	24	493		268	267		30	46	
Internal Link Dist (ft)		640			655			804			171	
Turn Bay Length (ft)	45		190	140			205					
Base Capacity (vph)	378	2885	1456	438	2007		495	494		225	236	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.07	0.30	0.26	0.05	0.57		0.53	0.53		0.06	0.17	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow
Natural Cycle: 125
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.72
Intersection Signal Delay: 23.7 Intersection LOS: C
Intersection Capacity Utilization 57.8% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 1: Big Tree Rd/Radigan's Dwy & Southwestern Blvd



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (vph)	10	369	41	35	471	10	22	10	23	5	10	25
Future Volume (vph)	10	369	41	35	471	10	22	10	23	5	10	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.987			0.997			0.944			0.916	
Flt Protected		0.999			0.997			0.981			0.994	
Satd. Flow (prot)	0	1857	0	0	1872	0	0	1760	0	0	1730	0
Flt Permitted		0.999			0.997			0.981			0.994	
Satd. Flow (perm)	0	1857	0	0	1872	0	0	1760	0	0	1730	0
Link Speed (mph)		45			45			30			30	
Link Distance (ft)		1782			2441			480			334	
Travel Time (s)		27.0			37.0			10.9			7.6	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	11	388	43	37	496	11	23	11	24	5	11	26
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	442	0	0	544	0	0	58	0	0	42	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 57.0%		ICU Level of Service B	
Analysis Period (min) 15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	10	369	41	35	471	10	22	10	23	5	10	25
Future Volume (Veh/h)	10	369	41	35	471	10	22	10	23	5	10	25
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	11	388	43	37	496	11	23	11	24	5	11	26
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	507			431			1038	1012	410	1036	1028	502
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	507			431			1038	1012	410	1036	1028	502
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			97			88	95	96	97	95	95
cM capacity (veh/h)	1068			1139			187	231	646	190	226	574

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	442	544	58	42
Volume Left	11	37	23	5
Volume Right	43	11	24	26
cSH	1068	1139	280	349
Volume to Capacity	0.01	0.03	0.21	0.12
Queue Length 95th (ft)	1	3	19	10
Control Delay (s)	0.3	0.9	21.2	16.7
Lane LOS	A	A	C	C
Approach Delay (s)	0.3	0.9	21.2	16.7
Approach LOS			C	C

Intersection Summary				
Average Delay		2.4		
Intersection Capacity Utilization		57.0%	ICU Level of Service	B
Analysis Period (min)		15		

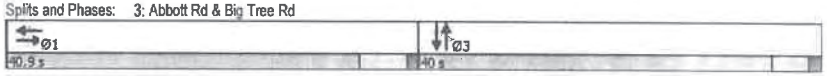
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	27	361	57	113	436	111	47	173	59	98	266	45
Future Volume (vph)	27	361	57	113	436	111	47	173	59	98	266	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	140		0	70		0	100		0	0		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			130			100		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.979			0.970			0.962			0.979	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1736	1834	0	1770	1832	0	1805	1792	0	1787	1839	0
Flt Permitted	0.331			0.454			0.489			0.600		
Satd. Flow (perm)	605	1834	0	846	1832	0	929	1792	0	1129	1839	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12			20			27			13	
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		2441			661			550			398	
Travel Time (s)		37.0			10.0			8.3			6.0	
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Heavy Vehicles (%)	4%	1%	4%	2%	0%	3%	0%	2%	2%	1%	1%	2%
Adj. Flow (vph)	27	365	58	114	440	112	47	175	60	99	269	45
Shared Lane Traffic (%)												
Lane Group Flow (vph)	27	423	0	114	552	0	47	235	0	99	314	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		1			1			3			3	
Permitted Phases	1			1			3			3		
Detector Phase	1	1		1	1		3	3		3	3	
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0		15.0	15.0		15.0	15.0	
Minimum Split (s)	25.9	25.9		25.9	25.9		22.5	22.5		22.5	22.5	
Total Split (s)	40.9	40.9		40.9	40.9		40.0	40.0		40.0	40.0	
Total Split (%)	50.6%	50.6%		50.6%	50.6%		49.4%	49.4%		49.4%	49.4%	
Maximum Green (s)	35.0	35.0		35.0	35.0		35.0	35.0		35.0	35.0	
Yellow Time (s)	4.7	4.7		4.7	4.7		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.2	1.2		1.2	1.2		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.9	5.9		5.9	5.9		5.0	5.0		5.0	5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		Min	Min		None	None		None	None	
Act Effct Green (s)	24.8	24.8		24.8	24.8		17.9	17.9		17.9	17.9	
Actuated g/C Ratio	0.46	0.46		0.46	0.46		0.33	0.33		0.33	0.33	
v/c Ratio	0.10	0.50		0.29	0.65		0.15	0.38		0.26	0.51	
Control Delay	10.0	12.5		12.1	15.2		15.7	15.2		16.8	18.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	10.0	12.5		12.1	15.2		15.7	15.2		16.8	18.1	
LOS	A	B		B	B		B	B		B	B	
Approach Delay		12.4			14.7			15.3			17.8	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		B			B			B			B	
Queue Length 50th (ft)	4	73		18	104		9	44		20	67	
Queue Length 95th (ft)	19	182		61	255		36	120		65	169	
Internal Link Dist (ft)		2361			581			470			318	
Turn Bay Length (ft)	140			70			100					
Base Capacity (vph)	404	1231		566	1233		622	1208		755	1235	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.07	0.34		0.20	0.45		0.08	0.19		0.13	0.25	

Intersection Summary

Area Type: Other
Cycle Length: 80.9
Actuated Cycle Length: 53.9
Natural Cycle: 50
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.65
Intersection Signal Delay: 14.9 Intersection LOS: B
Intersection Capacity Utilization 93.8% ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 3: Abbott Rd & Big Tree Rd



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	4	10	45	1	12	75
Future Volume (vph)	4	10	45	1	12	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.905		0.998			
Flt Protected	0.986					0.993
Satd. Flow (prot)	1695	0	1896	0	0	1887
Flt Permitted	0.986					0.993
Satd. Flow (perm)	1695	0	1896	0	0	1887
Link Speed (mph)	30		30			30
Link Distance (ft)	742		1530			480
Travel Time (s)	16.9		34.8			10.9
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	5	12	54	1	14	89
Shared Lane Traffic (%)						
Lane Group Flow (vph)	17	0	55	0	0	103
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	21.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	4	10	45	1	12	75
Future Volume (Veh/h)	4	10	45	1	12	75
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	5	12	54	1	14	89
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	172	54			55	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	172	54			55	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	99			99	
cM capacity (veh/h)	816	1018			1563	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	17	55	103
Volume Left	5	0	14
Volume Right	12	1	0
cSH	949	1700	1563
Volume to Capacity	0.02	0.03	0.01
Queue Length 95th (ft)	1	0	1
Control Delay (s)	8.9	0.0	1.1
Lane LOS	A		A
Approach Delay (s)	8.9	0.0	1.1
Approach LOS	A		

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	21.3%	ICU Level of Service	A
Analysis Period (min)	15		

A6

Level of Service Calculations: Full Development Conditions

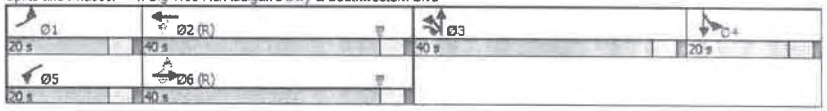
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	823	300	11	501	8	263	1	12	6	5	5
Future Volume (vph)	11	823	300	11	501	8	263	1	12	6	5	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	45		190	140		0	205		0	0		0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (ft)	105			120			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00
Frt			0.850		0.998			0.987			0.925	
Flt Protected	0.950			0.950			0.950	0.957		0.950		
Satd. Flow (prot)	1805	4988	1553	1805	3340	0	1633	1611	0	1805	1758	0
Flt Permitted	0.409			0.270			0.950	0.957		0.950		
Satd. Flow (perm)	777	4988	1553	513	3340	0	1633	1611	0	1805	1758	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			345		1			4			6	
Link Speed (mph)		50			50			45			10	
Link Distance (ft)		720			735			884			251	
Travel Time (s)		9.8			10.0			13.4			17.1	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Heavy Vehicles (%)	0%	4%	4%	0%	8%	0%	5%	0%	15%	0%	0%	0%
Adj. Flow (vph)	13	946	345	13	576	9	302	1	14	7	6	6
Shared Lane Traffic (%)							47%					
Lane Group Flow (vph)	13	946	345	13	585	0	160	157	0	7	12	0
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		Split	NA		Split	NA	
Protected Phases	1	6	3	5	2		3	3		4	4	
Permitted Phases	6		6	2								
Detector Phase	1	6	3	5	2		3	3		4	4	
Switch Phase												
Minimum Initial (s)	6.0	20.0	6.0	6.0	20.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	11.0	27.0	37.0	11.0	27.0		37.0	37.0		37.0	37.0	
Total Split (s)	20.0	40.0	40.0	20.0	40.0		40.0	40.0		20.0	20.0	
Total Split (%)	16.7%	33.3%	33.3%	16.7%	33.3%		33.3%	33.3%		16.7%	16.7%	
Maximum Green (s)	15.0	35.0	35.0	15.0	35.0		35.0	35.0		15.0	15.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lead	Lag	Lead	Lead	Lag		Lead	Lead		Lag	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	C-Max	None	None	C-Max		None	None		None	None	
Walk Time (s)		7.0	7.0		7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		15.0	25.0		15.0		25.0	25.0		25.0	25.0	
Pedestrian Calls (#/hr)		0	0		0		0	0		0	0	
Act Effct Green (s)	85.1	82.6	108.7	85.1	82.6		18.1	18.1		6.4	6.4	
Actuated g/C Ratio	0.71	0.69	0.91	0.71	0.69		0.15	0.15		0.05	0.05	
v/c Ratio	0.02	0.28	0.24	0.03	0.25		0.65	0.64		0.07	0.12	
Control Delay	8.1	10.0	0.8	8.2	10.2		59.3	57.3		55.3	41.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay	8.1	10.0	0.8	8.2	10.2		59.3	57.3		55.3	41.4	
LOS	A	B	A	A	B		E	E		E	D	
Approach Delay		7.6			10.2			58.3			46.5	
Approach LOS		A			B			E			D	
Queue Length 50th (ft)	2	65	0	2	56		124	118		5	5	
Queue Length 95th (ft)	12	186	17	12	174		178	173		20	23	
Internal Link Dist (ft)		640			655			804			171	
Turn Bay Length (ft)	45		190	140			205					
Base Capacity (vph)	692	3431	1484	533	2298		476	472		225	225	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.02	0.28	0.23	0.02	0.25		0.34	0.33		0.03	0.05	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow
Natural Cycle: 115
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.65
Intersection Signal Delay: 15.8 Intersection LOS: B
Intersection Capacity Utilization 41.1% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 1: Big Tree Rd/Radigan's Dwy & Southwestern Blvd



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	15	304	20	17	235	10	48	10	57	10	5	5
Future Volume (vph)	15	304	20	17	235	10	48	10	57	10	5	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.992			0.995			0.933			0.968	
Flt Protected		0.998			0.997			0.980			0.975	
Satd. Flow (prot)	0	1832	0	0	1761	0	0	1737	0	0	1793	0
Flt Permitted		0.998			0.997			0.980			0.975	
Satd. Flow (perm)	0	1832	0	0	1761	0	0	1737	0	0	1793	0
Link Speed (mph)		45			45			30			30	
Link Distance (ft)		1128			2441			480			334	
Travel Time (s)		17.1			37.0			10.9			7.6	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Heavy Vehicles (%)	0%	3%	0%	12%	7%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	19	380	25	21	294	13	60	13	71	13	6	6
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	424	0	0	328	0	0	144	0	0	25	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	36.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	15	304	20	17	235	10	48	10	57	10	5	5
Future Volume (Veh/h)	15	304	20	17	235	10	48	10	57	10	5	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	19	380	25	21	294	13	60	13	71	13	6	6
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	307			405			782	780	392	850	786	300
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	307			405			782	780	392	850	786	300
tC, single (s)	4.1			4.2			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			98			80	96	89	95	98	99
cM capacity (veh/h)	1265			1102			299	318	661	238	316	744

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	424	328	144	25
Volume Left	19	21	60	13
Volume Right	25	13	71	6
cSH	1265	1102	413	306
Volume to Capacity	0.02	0.02	0.35	0.08
Queue Length 95th (ft)	1	1	36	7
Control Delay (s)	0.5	0.7	18.3	17.8
Lane LOS	A	A	C	C
Approach Delay (s)	0.5	0.7	18.3	17.8
Approach LOS			C	C

Intersection Summary					
Average Delay	3.8				
Intersection Capacity Utilization	36.1%	ICU Level of Service		A	
Analysis Period (min)	15				

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	49	393	18	29	262	77	54	186	104	87	75	19
Future Volume (vph)	49	393	18	29	262	77	54	186	104	87	75	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	140		0	70		0	100		0	0		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			130			100		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.993			0.966			0.946			0.970	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1752	1806	0	1687	1713	0	1770	1746	0	1626	1786	0
Flt Permitted	0.459			0.373			0.684			0.442		
Satd. Flow (perm)	847	1806	0	662	1713	0	1274	1746	0	757	1786	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4			23			44			20	
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		2441			661			550			398	
Travel Time (s)		37.0			10.0			8.3			6.0	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Heavy Vehicles (%)	3%	4%	15%	7%	6%	11%	2%	4%	1%	11%	4%	0%
Adj. Flow (vph)	60	479	22	35	320	94	66	227	127	106	91	23
Shared Lane Traffic (%)												
Lane Group Flow (vph)	60	501	0	35	414	0	66	354	0	106	114	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		1			1			3			3	
Permitted Phases	1			1			3			3		
Detector Phase	1	1		1	1		3	3		3	3	
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0		15.0	15.0		15.0	15.0	
Minimum Split (s)	25.9	25.9		25.9	25.9		22.5	22.5		22.5	22.5	
Total Split (s)	40.9	40.9		40.9	40.9		40.0	40.0		40.0	40.0	
Total Split (%)	50.6%	50.6%		50.6%	50.6%		49.4%	49.4%		49.4%	49.4%	
Maximum Green (s)	35.0	35.0		35.0	35.0		35.0	35.0		35.0	35.0	
Yellow Time (s)	4.7	4.7		4.7	4.7		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.2	1.2		1.2	1.2		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.9	5.9		5.9	5.9		5.0	5.0		5.0	5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		Min	Min		None	None		None	None	
Act Effct Green (s)	24.2	24.2		24.2	24.2		18.4	18.4		18.4	18.4	
Actuated g/C Ratio	0.45	0.45		0.45	0.45		0.34	0.34		0.34	0.34	
v/c Ratio	0.16	0.62		0.12	0.53		0.15	0.57		0.41	0.18	
Control Delay	10.9	15.6		10.8	13.4		14.5	17.3		20.5	12.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	10.9	15.6		10.8	13.4		14.5	17.3		20.5	12.3	
LOS	B	B		B	B		B	B		C	B	
Approach Delay		15.1			13.2			16.9			16.3	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		B			B			B			B	
Queue Length 50th (ft)	9	97		5	72		12	66		21	17	
Queue Length 95th (ft)	32	209		21	162		40	158		68	54	
Internal Link Dist (ft)		2361			581			470			318	
Turn Bay Length (ft)	140			70			100					
Base Capacity (vph)	569	1215		444	1158		856	1187		509	1207	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.11	0.41		0.08	0.36		0.08	0.30		0.21	0.09	

Intersection Summary

Area Type: Other
Cycle Length: 80.9
Actuated Cycle Length: 53.9
Natural Cycle: 50
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.62
Intersection Signal Delay: 15.2 Intersection LOS: B
Intersection Capacity Utilization 82.6% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 3: Abbott Rd & Big Tree Rd

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	21	0	1	2	0	10	0	85	1	5	28	7
Future Volume (vph)	21	0	1	2	0	10	0	85	1	5	28	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.995			0.884			0.999			0.977	
Flt Protected		0.954			0.993						0.994	
Satd. Flow (prot)	0	1804	0	0	1668	0	0	1898	0	0	1788	0
Flt Permitted		0.954			0.993						0.994	
Satd. Flow (perm)	0	1804	0	0	1668	0	0	1898	0	0	1788	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		453			742			825			480	
Travel Time (s)		10.3			16.9			18.8			10.9	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	25%	0%	0%
Adj. Flow (vph)	25	0	1	2	0	12	0	100	1	6	33	8
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	26	0	0	14	0	0	101	0	0	47	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	17.9%	ICU Level of Service A	
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	21	0	1	2	0	10	0	85	1	5	28	7
Future Volume (Veh/h)	21	0	1	2	0	10	0	85	1	5	28	7
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	25	0	1	2	0	12	0	100	1	6	33	8
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	162	150	37	150	154	100	41			101		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	162	150	37	150	154	100	41			101		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.3		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.4		
p0 queue free %	97	100	100	100	100	99	100			100		
cM capacity (veh/h)	795	742	1041	818	739	960	1581			1359		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	26	14	101	47
Volume Left	25	2	0	6
Volume Right	1	12	1	8
cSH	803	937	1581	1359
Volume to Capacity	0.03	0.01	0.00	0.00
Queue Length 95th (ft)	3	1	0	0
Control Delay (s)	9.6	8.9	0.0	1.0
Lane LOS	A	A		A
Approach Delay (s)	9.6	8.9	0.0	1.0
Approach LOS	A	A		

Intersection Summary				
Average Delay		2.2		
Intersection Capacity Utilization		17.9%	ICU Level of Service	A
Analysis Period (min)		15		

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	16	1	0	71	26	5
Future Volume (vph)	16	1	0	71	26	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.994				0.977	
Flt Protected	0.954					
Satd. Flow (prot)	1802	0	0	1900	1856	0
Flt Permitted	0.954					
Satd. Flow (perm)	1802	0	0	1900	1856	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	587			500	825	
Travel Time (s)	13.3			11.4	18.8	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	21	1	0	95	35	7
Shared Lane Traffic (%)						
Lane Group Flow (vph)	22	0	0	95	42	0
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 13.7%		ICU Level of Service A	
Analysis Period (min) 15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	16	1	0	71	26	5
Future Volume (Veh/h)	16	1	0	71	26	5
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	21	1	0	95	35	7
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	134	38	42			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	134	38	42			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	100	100			
cM capacity (veh/h)	865	1039	1580			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	22	95	42
Volume Left	21	0	0
Volume Right	1	0	7
cSH	872	1580	1700
Volume to Capacity	0.03	0.00	0.02
Queue Length 95th (ft)	2	0	0
Control Delay (s)	9.2	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.2	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	13.7%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	317	6	7	282	21	22
Future Volume (vph)	317	6	7	282	21	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.997				0.930	
Flt Protected				0.999	0.976	
Satd. Flow (prot)	1840	0	0	1777	1725	0
Flt Permitted				0.999	0.976	
Satd. Flow (perm)	1840	0	0	1777	1725	0
Link Speed (mph)	45			45	30	
Link Distance (ft)	482			1128	350	
Travel Time (s)	7.3			17.1	8.0	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Heavy Vehicles (%)	3%	0%	0%	7%	0%	0%
Adj. Flow (vph)	396	8	9	353	26	28
Shared Lane Traffic (%)						
Lane Group Flow (vph)	404	0	0	362	54	0
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 30.5%		ICU Level of Service A	
Analysis Period (min) 15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	317	6	7	282	21	22
Future Volume (Veh/h)	317	6	7	282	21	22
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	396	8	9	353	26	28
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			404		771	400
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			404		771	400
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		93	96
cM capacity (veh/h)			1166		368	654

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	404	362	54
Volume Left	0	9	26
Volume Right	8	0	28
cSH	1700	1166	476
Volume to Capacity	0.24	0.01	0.11
Queue Length 95th (ft)	0	1	10
Control Delay (s)	0.0	0.3	13.5
Lane LOS		A	B
Approach Delay (s)	0.0	0.3	13.5
Approach LOS			B

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	30.5%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	318	2	2	301	7	6
Future Volume (vph)	318	2	2	301	7	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	100		0	0
Storage Lanes		0	1		1	0
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.999				0.936	
Flt Protected			0.950		0.974	
Satd. Flow (prot)	1843	0	1805	1776	1732	0
Flt Permitted			0.950		0.974	
Satd. Flow (perm)	1843	0	1805	1776	1732	0
Link Speed (mph)	45			45	30	
Link Distance (ft)	172			482	455	
Travel Time (s)	2.6			7.3	10.3	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Heavy Vehicles (%)	3%	0%	0%	7%	0%	0%
Adj. Flow (vph)	398	3	3	376	9	8
Shared Lane Traffic (%)						
Lane Group Flow (vph)	401	0	3	376	17	0
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 26.9%		ICU Level of Service A	
Analysis Period (min) 15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	318	2	2	301	7	6
Future Volume (Veh/h)	318	2	2	301	7	6
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	398	3	3	376	9	8
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	1056					
pX, platoon unblocked						
vC, conflicting volume			401		782	400
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			401		782	400
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		98	99
cM capacity (veh/h)			1169		365	655

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	401	3	376	17
Volume Left	0	3	0	9
Volume Right	3	0	0	8
cSH	1700	1169	1700	461
Volume to Capacity	0.24	0.00	0.22	0.04
Queue Length 95th (ft)	0	0	0	3
Control Delay (s)	0.0	8.1	0.0	13.1
Lane LOS		A		B
Approach Delay (s)	0.0	0.1		13.1
Approach LOS				B

Intersection Summary				
Average Delay		0.3		
Intersection Capacity Utilization		26.9%	ICU Level of Service	A
Analysis Period (min)		15		

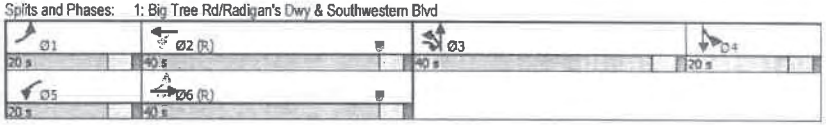
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	23	817	398	25	1049	12	483	12	19	12	13	23
Future Volume (vph)	23	817	398	25	1049	12	483	12	19	12	13	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	45		190	140		0	205		0	0		0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (ft)	105			120			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00
Frt			0.850		0.998			0.989			0.904	
Flt Protected	0.950			0.950			0.950	0.958		0.950		
Satd. Flow (prot)	1805	5136	1615	1626	3568	0	1698	1687	0	1805	1718	0
Flt Permitted	0.157			0.274			0.950	0.958		0.950		
Satd. Flow (perm)	298	5136	1615	469	3568	0	1698	1687	0	1805	1718	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			428		1			3			25	
Link Speed (mph)		50			50			45			10	
Link Distance (ft)		720			735			884			251	
Travel Time (s)		9.8			10.0			13.4			17.1	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	0%	1%	0%	11%	1%	0%	1%	0%	7%	0%	0%	0%
Adj. Flow (vph)	25	878	428	27	1128	13	519	13	20	13	14	25
Shared Lane Traffic (%)							47%					
Lane Group Flow (vph)	25	878	428	27	1141	0	275	277	0	13	39	0
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		Split	NA		Split	NA	
Protected Phases	1	6	3	5	2		3	3		4	4	
Permitted Phases	6		6	2								
Detector Phase	1	6	3	5	2		3	3		4	4	
Switch Phase												
Minimum Initial (s)	6.0	20.0	6.0	6.0	20.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	11.0	27.0	37.0	11.0	27.0		37.0	37.0		37.0	37.0	
Total Split (s)	20.0	40.0	40.0	20.0	40.0		40.0	40.0		20.0	20.0	
Total Split (%)	16.7%	33.3%	33.3%	16.7%	33.3%		33.3%	33.3%		16.7%	16.7%	
Maximum Green (s)	15.0	35.0	35.0	15.0	35.0		35.0	35.0		15.0	15.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lead	Lag	Lead	Lead	Lag		Lead	Lead		Lag	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	C-Max	None	None	C-Max		None	None		None	None	
Walk Time (s)		7.0	7.0		7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		15.0	25.0		15.0		25.0	25.0		25.0	25.0	
Pedestrian Calls (#/hr)		0	0		0		0	0		0	0	
Act Effct Green (s)	70.1	66.0	98.9	70.4	66.2		26.9	26.9		7.1	7.1	
Actuated g/C Ratio	0.58	0.55	0.82	0.59	0.55		0.22	0.22		0.06	0.06	
v/c Ratio	0.10	0.31	0.30	0.08	0.58		0.72	0.73		0.12	0.31	
Control Delay	13.8	17.9	1.0	13.5	22.8		53.6	53.5		55.1	34.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay	13.8	17.9	1.0	13.5	22.8		53.6	53.5		55.1	34.0	
LOS	B	B	A	B	C		D	D		E	C	
Approach Delay		12.4			22.6			53.5			39.3	
Approach LOS		B			C			D			D	
Queue Length 50th (ft)	8	145	0	8	329		208	207		10	11	
Queue Length 95th (ft)	24	217	25	26	493		284	285		30	46	
Internal Link Dist (ft)		640			655			804			171	
Turn Bay Length (ft)	45		190	140			205					
Base Capacity (vph)	370	2825	1452	430	1968		495	494		225	236	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.07	0.31	0.29	0.06	0.58		0.56	0.56		0.06	0.17	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow
Natural Cycle: 125
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 24.0 Intersection LOS: C
Intersection Capacity Utilization 58.7% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 1: Big Tree Rd/Radigan's Dwy & Southwestern Blvd



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	10	384	62	57	496	10	36	10	36	5	10	25
Future Volume (vph)	10	384	62	57	496	10	36	10	36	5	10	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.982			0.997			0.941			0.916	
Flt Protected		0.999			0.995			0.979			0.994	
Satd. Flow (prot)	0	1848	0	0	1868	0	0	1750	0	0	1730	0
Flt Permitted		0.999			0.995			0.979			0.994	
Satd. Flow (perm)	0	1848	0	0	1868	0	0	1750	0	0	1730	0
Link Speed (mph)		45			45			30			30	
Link Distance (ft)		1130			2441			480			334	
Travel Time (s)		17.1			37.0			10.9			7.6	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	11	404	65	60	522	11	38	11	38	5	11	26
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	480	0	0	593	0	0	87	0	0	42	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	74.7%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	10	384	62	57	496	10	36	10	36	5	10	25
Future Volume (Veh/h)	10	384	62	57	496	10	36	10	36	5	10	25
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	11	404	65	60	522	11	38	11	38	5	11	26
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	533			469			1138	1112	436	1150	1138	528
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	533			469			1138	1112	436	1150	1138	528
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			95			76	94	94	97	94	95
cM capacity (veh/h)	1045			1103			156	197	624	151	190	555

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	480	593	87	42
Volume Left	11	60	38	5
Volume Right	65	11	38	26
cSH	1045	1103	242	305
Volume to Capacity	0.01	0.05	0.36	0.14
Queue Length 95th (ft)	1	4	39	12
Control Delay (s)	0.3	1.5	28.0	18.7
Lane LOS	A	A	D	C
Approach Delay (s)	0.3	1.5	28.0	18.7
Approach LOS			D	C

Intersection Summary				
Average Delay		3.5		
Intersection Capacity Utilization		74.7%	ICU Level of Service	D
Analysis Period (min)		15		

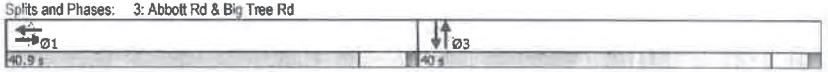
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	34	382	57	113	470	111	47	173	59	98	266	57
Future Volume (vph)	34	382	57	113	470	111	47	173	59	98	266	57
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	140		0	70		0	100		0	0		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			130			100		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.980			0.971			0.962			0.973	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1736	1836	0	1770	1834	0	1805	1792	0	1787	1827	0
Flt Permitted	0.300			0.433			0.468			0.597		
Satd. Flow (perm)	548	1836	0	807	1834	0	889	1792	0	1123	1827	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12			18			27			17	
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		2441			661			550			398	
Travel Time (s)		37.0			10.0			8.3			6.0	
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Heavy Vehicles (%)	4%	1%	4%	2%	0%	3%	0%	2%	2%	1%	1%	2%
Adj. Flow (vph)	34	386	58	114	475	112	47	175	60	99	269	58
Shared Lane Traffic (%)												
Lane Group Flow (vph)	34	444	0	114	587	0	47	235	0	99	327	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		1			1			3			3	
Permitted Phases	1			1			3			3		
Detector Phase	1	1		1	1		3	3		3	3	
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0		15.0	15.0		15.0	15.0	
Minimum Split (s)	25.9	25.9		25.9	25.9		22.5	22.5		22.5	22.5	
Total Split (s)	40.9	40.9		40.9	40.9		40.0	40.0		40.0	40.0	
Total Split (%)	50.6%	50.6%		50.6%	50.6%		49.4%	49.4%		49.4%	49.4%	
Maximum Green (s)	35.0	35.0		35.0	35.0		35.0	35.0		35.0	35.0	
Yellow Time (s)	4.7	4.7		4.7	4.7		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.2	1.2		1.2	1.2		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.9	5.9		5.9	5.9		5.0	5.0		5.0	5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		Min	Min		None	None		None	None	
Act Effct Green (s)	25.4	25.4		25.4	25.4		18.2	18.2		18.2	18.2	
Actuated g/C Ratio	0.46	0.46		0.46	0.46		0.33	0.33		0.33	0.33	
v/c Ratio	0.13	0.52		0.31	0.68		0.16	0.38		0.27	0.53	
Control Delay	10.8	13.0		12.5	16.4		16.1	15.4		17.1	18.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	10.8	13.0		12.5	16.4		16.1	15.4		17.1	18.6	
LOS	B	B		B	B		B	B		B	B	
Approach Delay		12.8			15.8			15.5			18.2	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		B			B			B			B	
Queue Length 50th (ft)	5	81		19	119		10	46		21	73	
Queue Length 95th (ft)	24	198		63	287		36	119		65	175	
Internal Link Dist (ft)		2361			581			470			318	
Turn Bay Length (ft)	140			70			100					
Base Capacity (vph)	360	1211		530	1211		584	1187		738	1207	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.09	0.37		0.22	0.48		0.08	0.20		0.13	0.27	

Intersection Summary

Area Type: Other
Cycle Length: 80.9
Actuated Cycle Length: 54.9
Natural Cycle: 55
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.68
Intersection Signal Delay: 15.5 Intersection LOS: B
Intersection Capacity Utilization 96.3% ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 3: Abbott Rd & Big Tree Rd



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	14	0	1	4	0	10	1	58	1	12	94	24
Future Volume (vph)	14	0	1	4	0	10	1	58	1	12	94	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.992			0.905			0.998			0.975	
Flt Protected		0.955			0.986			0.999			0.996	
Satd. Flow (prot)	0	1800	0	0	1695	0	0	1894	0	0	1845	0
Flt Permitted		0.955			0.986			0.999			0.996	
Satd. Flow (perm)	0	1800	0	0	1695	0	0	1894	0	0	1845	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		397			742			825			480	
Travel Time (s)		9.0			16.9			18.8			10.9	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	17	0	1	5	0	12	1	69	1	14	112	29
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	18	0	0	17	0	0	71	0	0	155	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	23.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	14	0	1	4	0	10	1	58	1	12	94	24
Future Volume (Veh/h)	14	0	1	4	0	10	1	58	1	12	94	24
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	17	0	1	5	0	12	1	69	1	14	112	29
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	238	226	126	227	240	70	141			70		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	238	226	126	227	240	70	141			70		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	100	100	99	100	99	100			99		
cM capacity (veh/h)	707	670	929	726	658	999	1455			1544		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	18	17	71	155
Volume Left	17	5	1	14
Volume Right	1	12	1	29
cSH	716	900	1455	1544
Volume to Capacity	0.03	0.02	0.00	0.01
Queue Length 95th (ft)	2	1	0	1
Control Delay (s)	10.2	9.1	0.1	0.7
Lane LOS	B	A	A	A
Approach Delay (s)	10.2	9.1	0.1	0.7
Approach LOS	B	A		

Intersection Summary					
Average Delay		1.8			
Intersection Capacity Utilization		23.4%	ICU Level of Service		A
Analysis Period (min)		15			

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	10	1	1	50	81	17
Future Volume (vph)	10	1	1	50	81	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.990				0.977	
Flt Protected	0.956			0.999		
Satd. Flow (prot)	1798	0	0	1898	1856	0
Flt Permitted	0.956			0.999		
Satd. Flow (perm)	1798	0	0	1898	1856	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	475			850	825	
Travel Time (s)	10.8			19.3	18.8	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	12	1	1	59	95	20
Shared Lane Traffic (%)						
Lane Group Flow (vph)	13	0	0	60	115	0
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	15.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	10	1	1	50	81	17
Future Volume (Veh/h)	10	1	1	50	81	17
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	12	1	1	59	95	20
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	166	105	115			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	166	105	115			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	100	100			
cM capacity (veh/h)	829	955	1487			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	13	60	115
Volume Left	12	1	0
Volume Right	1	0	20
cSH	837	1487	1700
Volume to Capacity	0.02	0.00	0.07
Queue Length 95th (ft)	1	0	0
Control Delay (s)	9.4	0.1	0.0
Lane LOS	A	A	
Approach Delay (s)	9.4	0.1	0.0
Approach LOS	A		

Intersection Summary				
Average Delay		0.7		
Intersection Capacity Utilization		15.3%	ICU Level of Service	A
Analysis Period (min)		15		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	444	20	22	536	12	13
Future Volume (vph)	444	20	22	536	12	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.994				0.930	
Flt Protected				0.998	0.976	
Satd. Flow (prot)	1871	0	0	1878	1725	0
Flt Permitted				0.998	0.976	
Satd. Flow (perm)	1871	0	0	1878	1725	0
Link Speed (mph)	45			45	30	
Link Distance (ft)	488			1130	435	
Travel Time (s)	7.4			17.1	9.9	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	1%	0%	0%	1%	0%	0%
Adj. Flow (vph)	522	24	26	631	14	15
Shared Lane Traffic (%)						
Lane Group Flow (vph)	546	0	0	657	29	0
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	56.0%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	444	20	22	536	12	13
Future Volume (Veh/h)	444	20	22	536	12	13
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	522	24	26	631	14	15
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			546		1217	534
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			546		1217	534
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		93	97
cM capacity (veh/h)			1033		197	550

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	546	657	29
Volume Left	0	26	14
Volume Right	24	0	15
cSH	1700	1033	294
Volume to Capacity	0.32	0.03	0.10
Queue Length 95th (ft)	0	2	8
Control Delay (s)	0.0	0.7	18.6
Lane LOS		A	C
Approach Delay (s)	0.0	0.7	18.6
Approach LOS			C

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	56.0%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	461	7	6	563	4	3
Future Volume (vph)	461	7	6	563	4	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	100		0	0
Storage Lanes		0	1		1	0
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.998				0.940	
Flt Protected			0.950		0.973	
Satd. Flow (prot)	1878	0	1805	1881	1738	0
Flt Permitted			0.950		0.973	
Satd. Flow (perm)	1878	0	1805	1881	1738	0
Link Speed (mph)	45			45	30	
Link Distance (ft)	164			488	465	
Travel Time (s)	2.5			7.4	10.6	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	1%	0%	0%	1%	0%	0%
Adj. Flow (vph)	542	8	7	662	5	4
Shared Lane Traffic (%)						
Lane Group Flow (vph)	550	0	7	662	9	0
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 39.6%		ICU Level of Service A	
Analysis Period (min) 15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	461	7	6	563	4	3
Future Volume (Veh/h)	461	7	6	563	4	3
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	542	8	7	662	5	4
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	1048					
pX, platoon unblocked						
vC, conflicting volume			550		1222	546
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			550		1222	546
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		97	99
cM capacity (veh/h)			1030		199	541

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	550	7	662	9
Volume Left	0	7	0	5
Volume Right	8	0	0	4
cSH	1700	1030	1700	277
Volume to Capacity	0.32	0.01	0.39	0.03
Queue Length 95th (ft)	0	1	0	3
Control Delay (s)	0.0	8.5	0.0	18.4
Lane LOS		A		C
Approach Delay (s)	0.0	0.1		18.4
Approach LOS				C

Intersection Summary				
Average Delay		0.2		
Intersection Capacity Utilization		39.6%	ICU Level of Service	A
Analysis Period (min)		15		

A7

Level of Service Calculations: Full Development Conditions with Mitigation

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	318	2	2	301	7	6
Future Volume (Veh/h)	318	2	2	301	7	6
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	398	3	3	376	9	8
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			TWLTL		
Median storage veh)	2			2		
Upstream signal (ft)	1056					
pX, platoon unblocked						
vC, conflicting volume			401		782	400
vC1, stage 1 conf vol					400	
vC2, stage 2 conf vol					382	
vCu, unblocked vol			401		782	400
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5	3.3
p0 queue free %			100		98	99
cM capacity (veh/h)			1169		566	655

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	401	3	376	17
Volume Left	0	3	0	9
Volume Right	3	0	0	8
cSH	1700	1169	1700	604
Volume to Capacity	0.24	0.00	0.22	0.03
Queue Length 95th (ft)	0	0	0	2
Control Delay (s)	0.0	8.1	0.0	11.1
Lane LOS		A		B
Approach Delay (s)	0.0	0.1		11.1
Approach LOS				B

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	26.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	461	7	6	563	4	3
Future Volume (Veh/h)	461	7	6	563	4	3
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	542	8	7	662	5	4
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			TWLTL		
Median storage veh)	2			2		
Upstream signal (ft)	1048					
pX, platoon unblocked						
vC, conflicting volume			550		1222	546
vC1, stage 1 conf vol					546	
vC2, stage 2 conf vol					676	
vCu, unblocked vol			550		1222	546
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5	3.3
p0 queue free %			99		99	99
cM capacity (veh/h)			1030		416	541

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	550	7	662	9
Volume Left	0	7	0	5
Volume Right	8	0	0	4
cSH	1700	1030	1700	463
Volume to Capacity	0.32	0.01	0.39	0.02
Queue Length 95th (ft)	0	1	0	1
Control Delay (s)	0.0	8.5	0.0	12.9
Lane LOS		A		B
Approach Delay (s)	0.0	0.1		12.9
Approach LOS				B

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	39.6%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX 5:

PHASE 1 ARCHAEOLOGICAL RECONNAISSANCE SURVEY

Phase 1 Archaeological Reconnaissance Survey

for

Proposed Housing Subdivision at Parker Road and Route 20A

Town of Hamburg
Erie County
New York

By

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Principal Investigator

Reports of the Archaeological Survey, Volume 52, Number 11
Department of Anthropology
University at Buffalo

September 2020

Prepared for:

Parker Road Developers LLC
West Seneca, New York

MANAGEMENT SUMMARY

OPRHP Project Review Number:

Project Type: Project plans call for construction of a 30+ acre residential subdivision consisting of single family homes with ground disturbances to include basements along with associated infrastructure such as utilities, parking and stormwater retention.

Cultural Resource Survey Type: Phase 1 Archaeological Reconnaissance Survey

Location / MCD: Parker Road and Rte. 20A intersection, Town of Hamburg, Erie County, New York (MCD 02953).

Survey Area: The rectangular shaped project area encompasses 14.7 ha (36.3 ac). It has a maximum length of 570 m (1871 ft) and a maximum width of 299 m (980 ft). A 2.5 ha (6.3 ac) rectangular area making up the north end of the parcel where an existing house stands is not included in this development and was excluded from testing. This occupies a 299 x 91 m (980 x 300 ft) area adjacent to Big Tree Road.

USGS 7.5' Quadrangle: Buffalo SE, New York

Sensitivity Assessments:

Pre-contact: The Phase 1 project area is .8 km (.5 mi) northeast of the large, perennially flowing drainage Rush Creek and has areas of level, fairly well drained soils. There is a high sensitivity for camps, workshops and lithic scatters. There is a moderate sensitivity for large base camps and habitation sites.

Historic: The project area has a moderate sensitivity for historic sites given that no prior development has occurred within its limits, but it lies adjacent to the historic Townsend-Naldrelt farmstead. The types of historic archaeological deposits most likely to occur within it limits would consist of task-related artifact scatters and sheet middens reflecting household and farm disposal and land use patterns.

Archaeological Survey Methodology: 12.1 ha (30 ac) of the 14.7 ha (36.3 ac) were plowed for Phase 1 testing. This area was roughly plowed and allowed to weather prior to conducting a pedestrian survey. An additional 46 shovel test pits were dug throughout the project area to test for deeply buried soil strata and to document soil horizons and depths.

Results of Archaeological Survey:

Pre-contact Sites Identified: Parker Road Site (UB 4499).
Historic Sites Identified: None found
Sites Recommended for Further Investigation: None
Listed, Eligible or Potentially Eligible State/National Register Sites: None

Author/Institution: Kathryn Whalen, Ph.D., Heather Lackos, Archaeological Survey, Department of Anthropology, University at Buffalo (SUNY). Reports of the Archaeological Survey, Volume 52, Number 11.

Date: September 2020

Project Sponsor: Parker Road Developers LLC, West Seneca, New York

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INTRODUCTION

In July 2020, the Archaeological Survey, Department of Anthropology, University at Buffalo (SUNY) conducted a Phase 1 archaeological reconnaissance survey for a proposed development of a residential subdivision in the Town of Hamburg, Erie County, New York (MCD 02953). The goal of this study was to locate, identify and describe all archaeological sites within the project limits so that their National Register potential could be assessed. This report (*Reports of the Archaeological Survey Vol.* 52, *No*. 11) presents the results of these investigations.

The purpose of this study was to assure the compliance with Section 106 of the National Historic Preservation Act (1966) and Section 14.09 of the Parks, Recreation and Historic Preservation Law (1980) for the project sponsor, Parker Road Developers LLC, West Seneca, New York. All aspects of this study conform to the New York Archaeological Council's (NYAC) *Standards for Cultural Resource Investigations* (1994).

Project Description

The project plans call for the construction of a residential subdivision. The work scope and the limits of the Phase 1 project area were defined in consultation with Mr. David Manko, Parker Road Developers LLC, West Seneca, New York. This study includes an archaeological reconnaissance survey of 12.1 ha (30 ac) of the 14.7 ha (36.3 ac) rectangular shaped project area. A 2.5 ha (6.3 ac) area across the northern section of the project area was not tested as it would not be disturbed during this development and includes the Townsend-Naldrelt farmstead. The project area has a maximum length of 570 m (1871 ft) and a maximum width of 299 m (980 ft). The area examined by Phase 1 testing encompasses 12.1 ha (30 ac) with no exceptions. Photos 1 through 4 show the conditions of the project area during field work.

Project Location

The Phase 1 project area is located in southern Erie County in western New York State (Figure 1). Figure 2 depicts its location on the 2016 Buffalo SE, New York USGS 7.5 Minute Series Quadrangle south of Big Tree Road at the intersection with Parker Road. Figure 3 shows the project area on a recent satellite photo. A detailed project area map is presented in Figure 12. Photos 1-4 provide representative views of the Phase 1 project area and depict conditions when fieldwork was conducted in 2020.

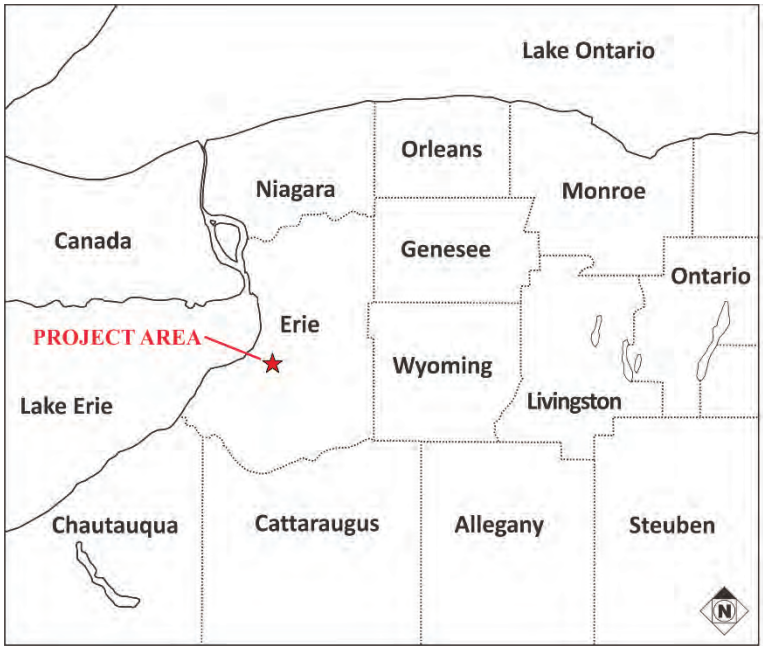

Figure 1. Location of the Phase 1 project area in western New York State.

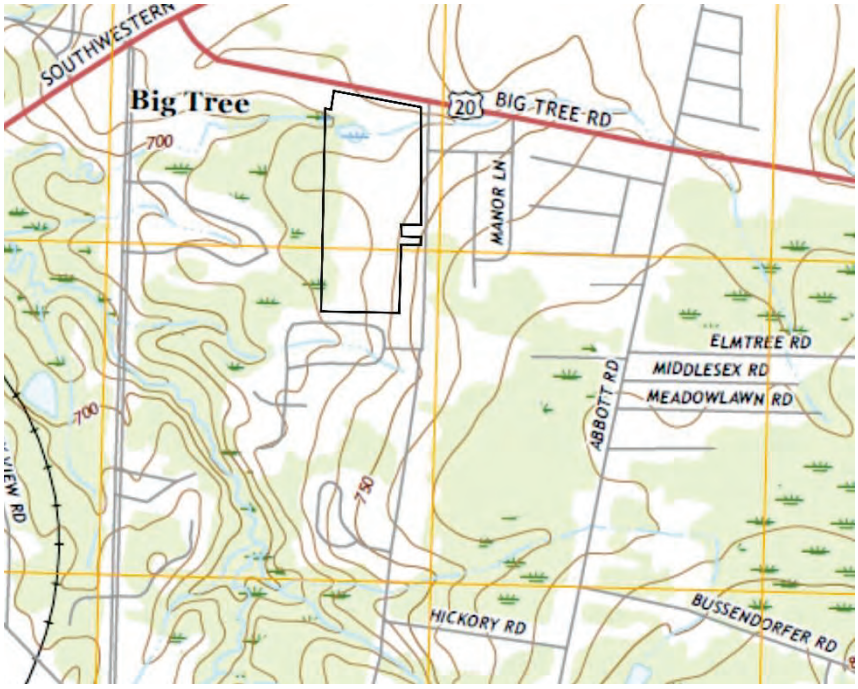

Figure 2. Location of the Phase1 project area shown on the 2016 Buffalo SE, New York USGS 7.5 Minute Series Quadrangle.

Figure 3. Location of the Phase 1 project area shown on a recent satellite photo. (Google Earth)

Photo 1. Panoramic view of the project area from the northwest corner looking southeast

Photo 2. Panoramic view of project area looking northwest from Parker Road, mid PA boundary.

Photo 3. Panoramic view looking northeast from the southwest corner of the project area.

Photo 4. Panoramic view looking northwest from the southeast corner of the project area.

BACKGROUND RESEARCH

Site File Search

A site file search was conducted to determine the locations of previously recorded archaeological sites within a 3.2 km (2 mile) radius of the project area. A search of OPRHP CRIS and the University at Buffalo Archaeological Survey site files identified twenty previously recorded archaeological sites (seventeen pre-contact, two Euro-American, and one site with both components) within the search radius (Table 1). All sites lie well outside the current project limits. One site, the Ellis Site, is eligible for the National Register, ten sites are not eligible for the National Register while the other nine have not had a determination of their status made.

The site file search also identified sixteen cultural resource studies have been previously conducted within a 3.2 km (2 mi) radius of the project area. All lie outside the project limits. The results of these investigations are discussed in the Previous Investigations and the Pre-contact and Historic Contexts sections of this report.

Table 1. Summary of Previously Recorded Sites within a 3.2 km (2 mi) Radius of the Phase 1 Project Area.

Site #	*Name*	*Type*	*Distance to APE*	*Status*	*Source*
2915.000012	Purdy Site	Undifferentiated Precontact	6,625 ft	Undetermined	CRIS
2915.00003	Milestrip Rd Site	Undifferentiated Precontact small lithic scatter/camp	9,200 ft	Undetermined	CRIS
2915.000031	Abbot Road Locality Site	Undifferentiated Precontact Stray find	10,500 ft	Not Eligible	CRIS
2915.000032	Titus Hill Station	Euro-American Commercial Str.	9,450 ft	Not Eligible	CRIS
2915.000033	Rushcreek Park 1	Undifferentiated Precontact small lithic scatter/camp	8,600 ft	Not Eligible	CRIS
2915.000447	PCI/Parker Road-1	Undifferentiated Precontact small lithic scatter/camp	2,800 ft	Not Eligible	CRIS
2915.000473	Goldfinch Site	Euro-American Domestic Str.	9,800 ft	Undetermined	CRIS
2921.000006	Ellis Site (a.k.a. Schultz, Deemer, Benzinger, DuPont, California Rd, Gibralter Site)	Historic Niagara Frontier Iroquois Village and Cemetery	5,800 ft	Eligible	CRIS
2921.000016	Choice Site	Undifferentiated Precontact small lithic scatter/camp	9,000 ft	Undetermined	CRIS
2921.000234	Quaker Crossing Prehistoric Site	LA and UP Workshop/Camps	9,600 ft	Not Eligible	CRIS
2921.000243	MCI 05/326-327 Site	Undifferentiated Precontact lithic scatter/camp	5,300 ft	Undetermined	CRIS
2921.000246	California Road Site	Stray Find, Middle Woodland	8,700 ft	Not Eligible	CRIS

Site #	*Name*	*Type*	*Distance to APE*	*Status*	*Source*
2921.000377	Bussendorfer 1, 2, and 3 Loci	Undifferentiated Precontact small lithic scatter	8,600 ft	Not Eligible	CRIS
2921.000379	Armor Ridge Loci 1-4 Prehistoric Site	Undifferentiated Precontact small lithic scatter	10,100 ft	Not Eligible	CRIS
2921.000389	Orchard Grove Stray Finds Precontact Site	Undifferentiated Precontact Stray Finds	5,100 ft	Not Eligible	CRIS
2921.00039	Orchard Grove Precontact Site	Undifferentiated Precontact small lithic scatter	5,100 ft	Not Eligible	CRIS
2921.000412	Ellis Native American Cemetery Site	Historic Niagara Frontier Iroquois Cemetery	5,200 ft	Undetermined	CRIS
2921.000413	Benzinger House Ellis Village Cemetery	Historic Niagara Frontier Iroquois Cemetery	4500 ft	Undetermined	CRIS
2921.000415	Murphy's Farm Site	Late Woodland Lithic Scatter	9,800 ft	Undetermined	CRIS
2921.000417	Jack Bersch Site	Euro-American and Precontact materials	7,900 ft	Undetermined	CRIS

LA= Late Archaic; UP= Undifferentiated Precontact

Table 2. Summary of Previously Conducted Surveys with a 1.6 km (1 mi) Radius of the Phase 1 Project Area.

OPRHP Project #	*Name*	*Distance to APE*	*Results*
01SR51693	Phase I Cultural Resources Investigation For The Proposed Parker Road Development, Town Of Hamburg, Erie County, New York	500 ft	No sites reported
01SR51990	Phase I Cultural Resources Investigation for the Proposed Northwinds Natural Gas Pipeline, the Cities of Buffalo and Lackawanna, and Towns of Hamburg and Eden, Erie Co., and the Town of Hinsdale, Cattaraugus Co.	4,200 ft	No sites reported
02SR52923	Report Of The Stage 1 Cultural Resources Investigation For Proposed Heritage Square Subdivision	5,000 ft	No sites reported
03SR53491	Stage 1 Cultural Resource Investigation for the South Park Woods Subdivision, Town of Hamburg, Erie County, New York	5,500 ft	No sites reported
03SR54510	Archaeological and Architectural Reconnaissance Survey, PIN 5111.69.101: BIN 1015460, BIN 1015480, BIN 1015490, Rehabilitation and Widening of US Route 20 (Southwestern Boulevard) from US Route 62 (South Park Avenue) to California Road and Placement of Sidewalks from California Road to NY Route 240/277 (Orchard Park Road), Towns of Hamburg and Orchard Park, Erie County, New York	2,750 ft	No sites reported
05SR55343	Phase I/II Cultural Resource Investigation for the Proposed Parker Road Development, Town of Hamburg, Erie County, New York	2,440 ft	One Site: A02915.000447 (PCI/Parker Road-1)
06SR57937	Phase I Cultural Resources Investigation for the Proposed Parker Road Development, Town of Hamburg, Erie County, New York	3,200 ft	No sites reported

OPRHP Project #	*Name*	*Distance to APE*	*Results*
07SR57681	Phase I Cultural Resource Investigation Proposed Orchard Grove Development, Town of Orchard Park, Erie County, New York	5,600 ft	Two sites reported A02921.000389 (Orchard Grove Strays) and A0291.000390 (Orchard Grove)
08SR58309	Cultural Resource Management Report: Phase I Cultural Resource Reconnaissance Survey for the Proposed Brush Mountain Park and Brush Mountain Park West Improvements, Town of Orchard Park, Erie County, New York	5,200 ft	No sites reported
09SR59125	Cultural Resource Management Report: Phase I Cultural Resource Reconnaissance Survey for the Proposed Brush Mountain North Expansion, Town of Orchard Park, Erie County, New York	4,400 ft	No sites reported
10SR59832	Phase I Cultural Resources Investigation for the Proposed 4250 McKinley Parkway Retail Development, Town of Hamburg, Erie County, New York	2,650 ft	No sites reported
16SR00008	Big Tree Rd	3,300 ft	No sites reported
16SR00596	Scheffer Farms Estate Phase IA	5,750 ft	No sites reported
16SR00864	Phase IB Cultural Resource Investigations for the Proposed Sheffer Farms Estates Project, Town of Orchard Park, Erie County, New York	5,750 ft	No sites reported
18SR56713	Phase IA/IB Archaeological Investigations for the Big Tree Substation Expansion, Town of Orchard Park, Erie County, New York	5,300 ft	No sites reported
98SR50203	Report Of The Stage Ia/B Cultural Resource Investigation For The Fiber Optic Cable Project From I-90 Interchange At Canastota To Western New York/Pennsylvania Border (2 Vol)	4,400 ft	No sites reported

Environmental Setting

Topography. The project area lies within the nearly level Erie-Ontario Lake plain physiographic province. Topography found near the project area is primarily the result of glacial activity that ended approximately 12,400 BP. The resulting landscape consists of nearly level lake plains divided by a series of long limestone ridges forming escarpments created when the bedrock proved resistant to the effects of glacial scouring (Buehler and Tesmer 1963). Elevation above mean sea level in the project area is approximately 240 m (800 ft) and relatively flat. This is in accordance with the low topographic relief in the area (Owens et. al. 1986:25).

Bedrock. Bedrock beneath the project area consists of sandstones and shales that are part of the Java and West Falls group (Owens, et al. 1986:3). There is no discernable exposed bedrock are currently observed at the time of Phase 1 investigations. The Onondaga Escarpment, which runs east/west about 20 km (18.5 mi) north of the project area, is a primary source of chert used in pre- and post-contact stone tool production in the region. The geologic history of western New York suggests that glacial and alluvial derived deposits of chert nodules, with other bedrock materials, may also occur within the project area.

Soils. The predominant soil type in the project area is Niagara silt loam (Nh), followed equally by Ilion silt loam (In), Darien silt loam (subsets DbA and DbB), and Canandaigua silt loam (Cc). These four types are associated with glacio-lucustrian depositional environments (https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx). These soils are poorly drained and frequently exhibit a perched water table in the upper part of the soil column. This contributes to seasonal wetness and poor drainage that impacts agricultural use. The Wayland soils complex, which is associated with recent alluvial deposits, is located on either side of the ditch to the north of the project area. This is also a poorly drained soil type and can contribute to seasonal pooling or ephemeral seasonal streams.

Table 3. Soils Series Associated with the Phase 1 Project Area.

Name	Typical Pedon	Characteristics
Niagara silt loam (Nh)	A: 0 to 13 cm, very dark grayish brown (10YR 3/2) silt loam E: 13 to 36 cm, grayish brown (10YR 5/2) silt loam Bt1: 36 to 43 cm, dark grayish brown (10YR 4/2) silt loam Bt2: 43 to 79 cm, dark grayish brown (10YR 4/2) silt loam C: 79 to 183 cm, dark grayish brown (10YR 4/2) silt loam	Very deep, somewhat poorly drained / Silty glacio-lacustrine deposits on level to concave areas on lake plains and valleys / 0-3% slopes
Ilion Silt Loam (In)	Ap: 0-22 cm, very dark grey (10YR 3/1) Silt loam Eg: 22-36 cm, grey (10YR 6/1) Silt loam Btg1: 36-58 cm, dark grey brown (2.5Y 4/2) Silty clay loam Btg1: 58-84 cm, dark grey brown (2.5Y 4/2) Silty clay loam C: 84-152 cm, very dark grey brown (2.5Y3/2) Channery silt loam	Deep or very deep, poorly drained, formed in till. Nearly level or gently sloping in depressions in upland till plains. 0-8% slopes.
Darien Silt Loam (DbA, DbB)	Ap: 0 to 23 cm, very dark grayish brown (10YR 3/2) silt loam Eg: 23 to 28 cm, grayish brown (2.5Y 5/2) silt loam Bt1: 28 to 48 cm, olive brown (2.5Y 4/4) clay loam Btg2: 48 to 81 cm, dark grayish brown (2.5Y 4/2) silty clay loam BC: 81 to 112 cm, olive gray (5Y 4/2) channery silty clay loam C: 112 to 183 cm, olive brown (2.5Y 4/3) channery silty clay loam	Very deep, somewhat poorly drained / On till plains, drumlins, moraines / Slopes: DbA=0-3%, DbB=0-8%
Canandaigua Silt Loam (Cc)	Ap: 0-20 cm; very dark gray (10YR 3/1) silt loam Bg1: 20-30 cm; light brownish gray (10YR 6/2) silt loam Bg2: 30-48 cm; gray (10YR 6/1) silt loam BC: 48-76 cm; light brownish gray (10YR 6/2) silt loam C: 76-183 cm; gray (10YR 6/1) & light brown (7.5YR 6/4) silt loam and very fine sandy loam	Very deep, poorly to very poorly drained / Silty glacio-lacustrine sediments on lowland lake plains / 0-3% slopes.
Wayland Soils Complex (Wd)	Ap: 0-15 cm, Very Dark Grayish Brown (10YR 3/2) silt loam Bg1: 15-30 cm, Dark Grayish Brown (10YR 4/2) silt loam Bg2: 30-46 cm, Grayish Brown (10YR 5/2) silt loam C1: 46-117 cm, Gray (5Y 5/1) silt loam C2: 117-183 cm, Gray 5Y 6/1) silty clay loam	Very deep, very poorly drained/ Nearly level recent alluvium/ Low area or slack water flood plains/ 0-3% slope

Figure 4. Limits of the soil series associated with the Phase 1 project area. From the USGS Soil Mapping service. (Canandaigua silt loam= Cc; Darien silt loam=DbA and DbB; Ilion silt loam=In; Niagara silt loam= Nh; Wayland soils complex= Wd)

Vegetation. Pre-contact forests were often dominated by a Beech-Maple biome found in the more poorly drained areas on the Erie-Ontario Lake plain. Well-drained areas would have supported greater numbers of oak, chestnut, ash and conifer species otherwise sugar maple, beech, birch, elm, as well as a thick undergrowth of nettles and vines would have been common (Miller 1986). Historic land use patterns, in particular agriculture, have modified the natural setting. This parcel has been recently used for agricultural purposes, and therefore has been plowed consistently over the past two centuries. Current vegetation within the project area is determined by its agricultural use, most recently meadow/grasses for haying, with a few mature trees left standing in various locations around the field.

Drainage. The project area lies is drained by a small ephemeral stream running between the Townsend- Naldrelt farm stead and the north of the project area. This drainage can be best seen on the satellite photos, and flows east/west towards Rush Creek. It can be seen best as the tree line in the northern section of the project area in Figure 3. Other relatively large drainages in the area include Rush Creek, which flows approximately 650 m (2,100 ft) southwest of the Parker Road project area. The second is a small tributary of the South Branch of Smoke Creek 1.37 km (4, 500 ft) to the east of the project area. Both creeks drain into Lake Erie after flowing to the northwest for several miles. In addition, there are some very poorly drained areas in the central western portion of the project area, as seen by the green oval in the satellite photo (Figure 4). Examination of historic maps (Figures 5-10) shows that the natural drainage patterns of the area have remained relatively the same, though according to the historical map search in the past the ephemeral stream acting as the northern project limit might have been more substantial.

Current Land Use. Located in a suburban setting, the 14.7 ha (36.3 ac) project area is currently being used for agricultural purposes, with the northern 2.4 ha (6 ac) the site of the Townsend- Naldrelt Farmstead. This part of the parcel is not going to be impacted by the proposed subdivision and therefore was not tested in this survey. Recent satellite photographs show round hay bales in the project area, indicating the encouragement of meadow grass growth. At the time of the Phase 1 survey the ground surface was plowed with a few exceptions of mature trees that were left standing in the project area (Photos 1-4).

Disturbances. The only major ground disturbance noted in the project area is the agricultural activity of plowing. This was introduced in Western New York in the earlier part of the 19th century and was accompanied by vast deforestation. It is probable that this parcel was plowed frequently over the intervening two centuries.

Expectations for Depth of Cultural Deposits. Both pre-contact and historic finds will likely be recovered from the uppermost part of the soil profile comprising a plowzone (Ap-horizon) extending to a depth of about 30 cm (12 in) below ground surface and also in the upper part of the B/E-horizon subsoil containing plow scars. Finds are unlikely to occur at deeper depths unless buried by disturbed/fill soils or are associated with intrusive archaeological features.

Pre-contact Context

Settlement Patterns. The results of a site file search conducted as part of the background research for this study identified twenty previously recorded pre-contact sites within the search radius (Table 1). All sites are listed in the CRIS site files. None of the previously documented sites lies within the project area and no previous archaeological surveys have been conducted within this parcel. One of the previously recorded sites is National Register eligible. The more substantial sites lie relatively close to both Rush Creek and South Branch Smoke Creek. The sites in settings similar to that found in the Phase 1 project area are mostly scattered lithic finds or camps. Only two sites have temporal diagnostic materials. The first is Quaker Crossing Prehistoric Site (2921.000234). This has Late Archaic and undifferentiated pre-Contact materials. The other is the Ellis/Benzinger site complex (2921.000006; 2921.000412; 2921.000413). These sites are associated with a historically documented Native American Settlement and its cemetery. All other are lithic scatters with an unidentified cultural affiliation. Previously recorded sites lying short distances beyond the Phase 1 project limits elsewhere in the region have been dated from the Paleo through late Woodland periods. They demonstrate the recurrent use of this area from some of the earliest inhabitants of Western New York to the late pre-contact period.

Pre-contact Sensitivity. The Phase 1 project area includes a small, seasonally flowing drainage within its limits and has areas of level, poorly drained soils. All the previously identified pre-contact sites lying within the search radius were identified as the result of systematic archaeological investigations. The distribution of previously recorded sites suggests that there is a strong possibility for a camp, workshop or lithic scatter to be located within this area. Based on the results of these studies and considering the characteristics of previously recorded sites near the project area, the project area is assessed as having a high sensitivity for artifact find spots, lithic scatters and short term camps. There is a moderate sensitivity for large base camps and habitation sites.

Historic Context

The site file search identified two previously recorded historic sites within the search radius (Table 1). Both are nineteenth century residences that lie well outside the project area.

Historic Map Analysis. Historic land use patterns indicate that this portion of Erie County was heavily farmed by the mid-nineteenth century with many level to gently sloping areas such as those found in the project area being converted to agricultural use. By the mid-twentieth century, this area began to be developed as a suburban bedroom community with single-family housing subdivisions being built in the latter part of the century.

A review of historic maps (Figures 5-10) indicates there is no prior development recorded within the project area, but that it was located near a farmstead by the mid-nineteenth century. A residence first appears on the parcel in the 1880 Beers map and is associated with E. Naldrelt. The structure also appears on the 1909 New Century Atlas under the name J. Townsend. No structure appears on the 1854 Geil map, or 1866 Stone and Stewart. The house does appears in the 1927 and 1951 Erie County Aerial photographs. This residence and the associated farmstead are the likely source of the historic artifacts found in the project area.

The Townsend- Naldrelt house and the area immediately adjacent to it were purposefully excluded from the Phase 1 project area by design. Although the location of the house varies slightly on the historic maps, the pre-1855 structure standing a short distance from the project area is at its original location. The project area has no associated map documented structures and seems to have been mostly used for agricultural purposes. The project area may include activity areas associated with farm operations.

Historic Sensitivity. The project area has a moderate sensitivity for historic sites given that no prior development occurred has occurred within its limits but that it lies adjacent to the Townsend- Naldrelt farmstead. The types of historic archaeological deposits most likely to occur within it limits would consist of task-related artifact scatters and sheet middens reflecting household and farm disposal and land use patterns. These would include widely scattered finds introduced through farming practices such as plowing and the spreading of manure that create low density sheet middens across areas that were once plowed fields.

Figure 5. Location of Phase 1 project area on the 1854 Geil Map of Erie County. Note there is no residence in the north of the project limits.

Figure 6. Location of the Phase 1 project area on the 1866 Stewart and Stone Atlas of Erie County, New York Map of the Town of Clarence. Note there is no structure in the north of the project limits.

Figure 7. Location of the project area on the
1880 Beers Atlas of Erie County, New York Map of the Town of Clarence.
Note the Naldrelt residence in the north of the project limits.

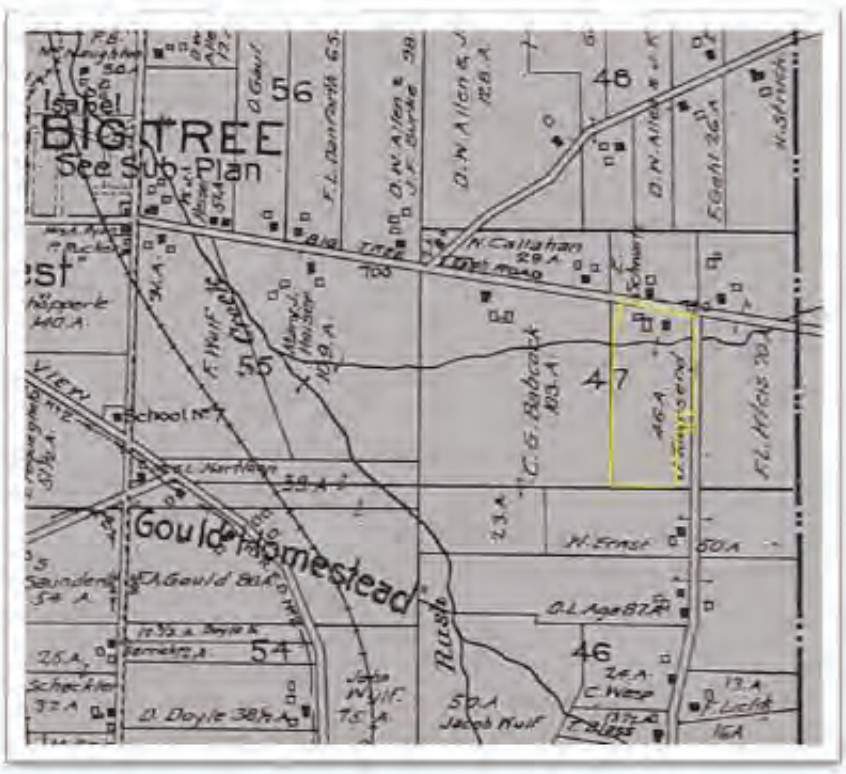

Figure 8. Location of the project area on the
1909 New Century Atlas of Erie County Map of the Town of Clarence.
Note the Townsend residence in the north of the project limits.

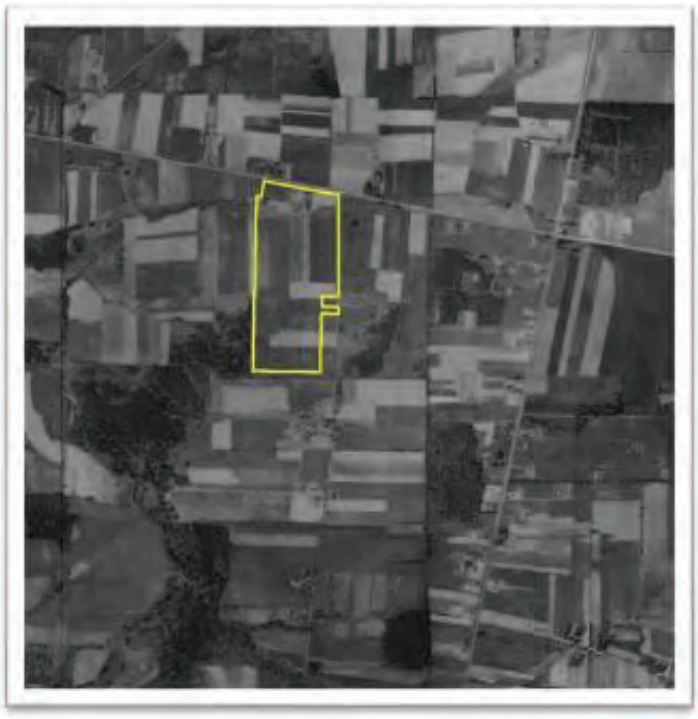

Figure 9. Location of the Phase 1 project area on the 1927 Erie County Highway Department aerial photo. Note the Townsend-Naldrelt residence in the north of the project limits.

Figure 10. Location of the Phase 1 project area on the 1951 Erie County Highway Department aerial photo. Note the Townsend-Naldrelt residence in the north of the project limits.

ARCHAEOLOGICAL RECONNAISSANCE SURVEY

Methodology

The field methodology used to conduct the Phase 1 field investigations of the Parker Road project area conforms to the New York Archaeological Council's (NYAC) Standards for Cultural Resource Investigations (1994). Photographs depict the project area at the time field investigations were conducted, including Photos 1-4 presented in the introduction section of this report. All original field notes, maps, photographs, lab notes and other records generated by the Phase 1 study, along with the artifacts and additional photos of the project area are stored at the Archaeological Survey, Department of Anthropology, SUNY Buffalo.

Pedestrian Survey. The Phase 1 survey of the 12.1 ha (30 ac) project area was completed through a surface inspection. The project area was plowed and allowed to weather to create optimal visibility of artifacts. Surface visibility at the time that the project was conducted was +90% as seen in Photos 1-4. No portion of the project area was unable to be plowed. Technicians walked systematically over the plowed area to look for cultural material, which was then flagged, numbered, and its spatial relationship was marked with a Garmin GPSMap 78sc unit. The data was then mapped using ArcGIS 10.2 software (see Figures 11 and 12).

Subsurface Testing. A series of 46 shovel test pits (STPS) were conducted to ensure that none of the project area had unexpected soil stratigraphy. The STPs were sufficiently deep to test for deeply buried cultural deposits in the upper part of the soil profile. A typical shovel test pit was 35-40 cm (14-16 in) in diameter and excavated at least 15 cm (6 in) in to sterile subsoil, often to depths of about 40-50 cm below ground surface. All excavated soil was screened through a 6 mm (0.25 in) wire mesh to maximize the recovery of artifacts and to standardize results. Soil profiles were recorded for each excavation and are presented in the Shovel Test Pit Summary (Appendix B), along with a summary of any artifacts that were found.

Most STPs were found to have a similar plowzone stratigraphy consisting of dark organic Ap-Horizon soils overlying lighter colored and much denser B-Horizon subsoil. Because much of the project area was once used as agricultural fields, the soils have been plowed many times creating a homogenous Ap-Horizon representing the plowzone. This stratum was about 30 cm (12 in) deep and this depth was fairly consistent across the project area.

Artifact Processing and Analysis. Artifacts recovered by the Phase 1 study were processed at the Archaeological Survey, SUNY Buffalo. Cultural material was separated into categories for processing, maintaining all provenience information and using methods appropriate for preserving their condition. Most artifacts were washed by hand with tap water and soft brushes. Fragile items were dry-brushed. The finds were the sorted, identified, tabulated and analyzed, initially classifying them according to general material types. Pre-contact lithics were described and examined for evidence of use-wear, retouch and burning. Historic artifacts were classified by material type such as glass, ceramic and metal and then assigned function classifications such as food-related, architectural, and tools. These were further identified where possible in terms of more specific material sub-types and color varieties. These data were used to assess their age and function.

Results

Results Summary. The Phase 1 fieldwork for the proposed development of Parker Road project area was conducted under good field conditions in July of 2020 by the Archaeological Survey, Department of Anthropology, University at Buffalo (SUNY). No problems were encountered that would have affected the results of this study. Work within the Phase 1 project limits included a pedestrian survey and the excavation of 46 shovel test pits (STPS) across the 12.1 ha (30 ac) project area (Figures 11 and 12) to ensure the consistency of the soil strata. Photos 1-4 depict field conditions at the time this investigation was conducted.

The Phase 1 investigations documented the previously unrecorded pre-Contact Parker Road site (UB 4499) as part of an assemblage of widely scattered pre-contact lithic artifacts. A detailed description of the site is presented below and includes an OPRHP site inventory form. Photo 1 in the introduction depicts the site's general setting. Appendix B presents descriptions of the finds associated with the site and project area.

A total of 29 pre-contact artifacts were recovered by the Phase 1 survey (Table 4). The majority are chert flakes with a few bifacial tool and core fragments. Two biface fragments and a complete Meadowood cache blade were recovered, as well as two core fragments (Photo 5). The finds may represent work areas associated with the gathering and processing of resources found in localized environmental niches. Several informal flake tools and only two burnt flakes are among the items recovered. The finds are made out of seven or more different types of lithic raw materials including Reynales, Onondaga varieties, Jasper, Edgecliff, Seneca, Huronian, and possibly Upper Mercer chert types. This broad range of raw materials is representative of expedient lithic tool manufacture in locally chert poor region of southwestern New York. These chert types are frequently found in glacial till deposits and this assemblage indicates the use of secondary pebbles and cobbles as raw material sources. The limits of the pre-contact component of the Parker Road site are based on a cluster of five artifacts in the southwest section of the project area in a small 30 x 15 m (98 x 49 ft) area, with a diffused scatter of other lithic artifacts found throughout the project are as a whole.

No additional materials were recovered by shovel test pits. All of the STPs displayed similar stratigraphy which was a typical Ap-Horizon plowzone approximately 30 cm (12 in) deep overlying undisturbed B-Horizon subsoil. The pre-contact surface finds appear to represent sporadic and ephemeral land use pattern in this area.

Recommendations

Given the good field conditions under which the surface collection was conducted, the quantity and pattern of material recovered is unlikely to change based on additional work in this project area. The Parker Road site consist of only five objects- slightly more clustered than the broad scatter of material recovered. Based on artifact quantity and density, this parcel does not appear to have the potential to yield more important information about the pre-contact period of western New York. The site and project area appears not to be National Register eligible under Criterion D. Because of the limited research potential represented by the site, a Phase 2 site examination is not recommended.

Figure 11. Phase 1 project area overview map. Parker Road Site (UB4499) in southwestern corner.

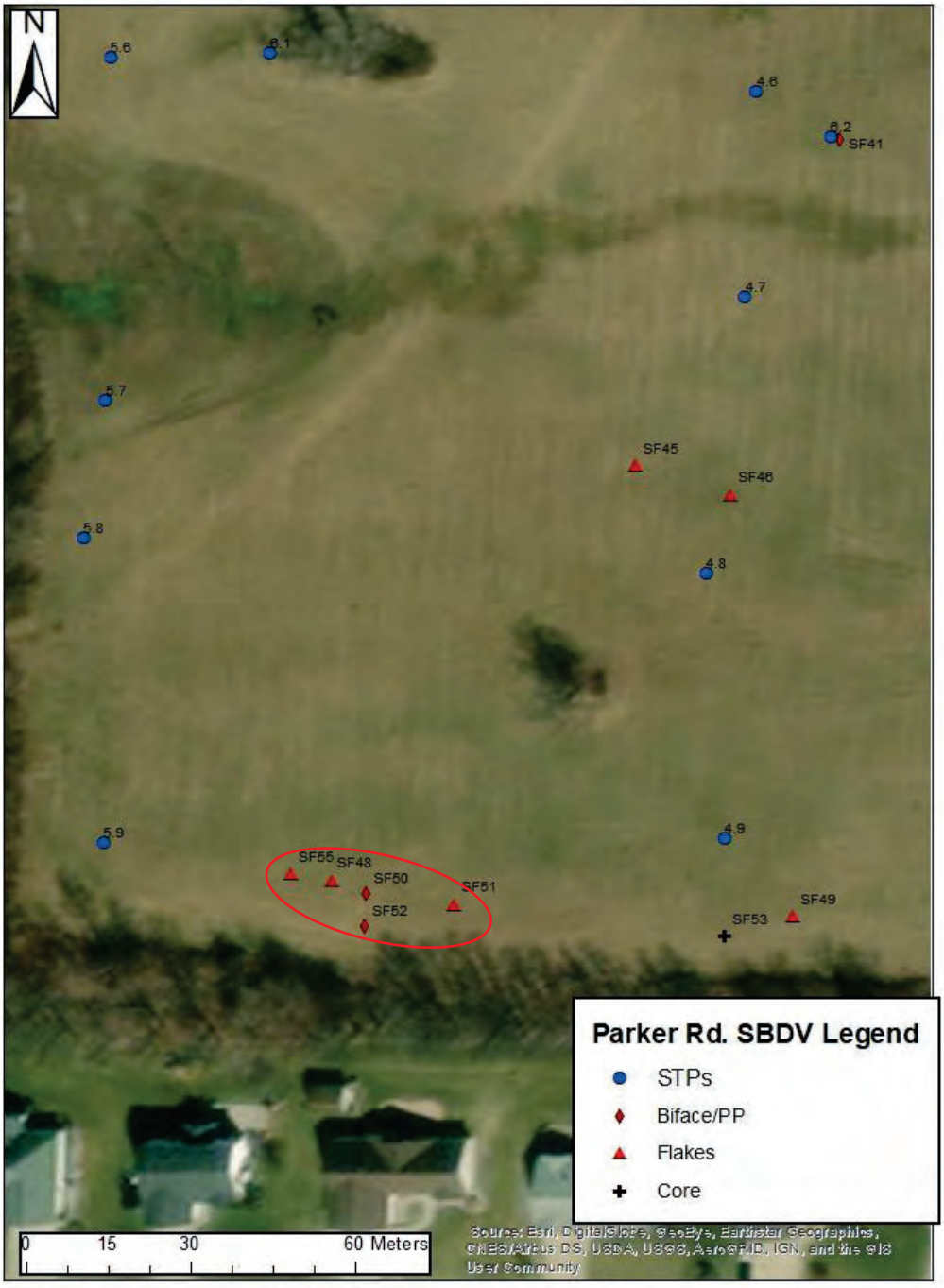

Figure 12. Phase 1 project area map showing a closer view of Parker Road Site (UB 4499).

Parker Road Site Description (UB 4499)

A Phase 1 archaeological reconnaissance survey conducted by University at Buffalo Archaeological Survey in the summer of 2020 identified the previously unrecorded pre-contact Parker Road site (UB 4499) within the limits of a parcel where a residential subdivision is proposed (Figures 11-16). An OPRHP site inventory form follows this site description. Appendix B presents a summary description of the finds associated with the site and project. Photo 1-4 in the introduction section of this report show its general setting at the time the Phase 1 fieldwork was conducted.

Pre-Contact Context. The site file search conducted as part of the background research for this study identified twenty previously recorded pre-contact sites within a 1.6 km (1.0 mi) radius radius (Table 1). The more substantial sites lie relatively close to both Rush Creek and South Smoke Creek. The sites in settings similar to that found in the Phase 1 project area are mostly scattered lithic finds or camps. Previously recorded sites lying short distances beyond the Phase 1 project limits elsewhere in the region have been dated from the Paleo-Indian through Late Woodland periods. They demonstrate the recurrent use of this area from some of the earliest inhabitants of Western New York to the late pre-contact period.

Historic Context. Historic land use patterns indicate that this portion of northern Erie County was heavily farmed by the mid-nineteenth century with many level to gently sloping areas such as those found in the project area being converted to agricultural use. A review of historic maps (Figures 5-10) indicates there is no prior development recorded within the Parker Road site, but it does lie adjacent to the Townsend-Naldrelt farmstead. The Townsend-Naldrelt homestead is shown occupying the farm on maps dating from 1880 to the present. Its associated woodframe residence still stands at that location. The house also appears in the 1927 and 1951 Erie County Aerial photographs. The residence and the associated farmstead are the likely source of the historic artifacts found in the project area.

Site Size. The Parker Road site was identified in the summer of 2020 as a result of a pedestrian survey and the excavation of a series of 46 shovel test across Phase 1 project area (Figure 11-16). The horizontal and vertical site limits of the site are based on these results. The site encompasses a 30 x 15 m (98 x 49 ft) area.

Pre-contact finds were recovered in a pattern of diffuse scattering across the entire project area, with a small cluster in the southwest corner making up the horizontal site limits. The vertical site limits are based on the results of the Phase 1 shovel test pit (Appendix B). All the pre-contact artifacts were recovered from the surface of a 30 cm thick Ap-Horizon plowzone.

Site Location. The Parker Road site is located in the Town of Hamburg, Erie County, New York (MCD 02953). Figure 2 depicts its location of the 2016 Buffalo SE, New York USGS 7.5 Minute Series Quadrangle. A detailed site map showing the site limits is presented in Figure 16. This map is presented after the OPRHP site inventory form at the end of this site description.

Site Characteristics. The Parker Road site lies within the Erie-Ontario Lake plain. Topography found near the project area is primarily the result of glacial activity that ended approximately 12,400 BP. The resulting landscape consists of nearly level lake plains divided by a series of long limestone ridges forming escarpments created when the bedrock proved resistant to the effects of glacial scouring (Buehler and Tesmer 1963).

Soils within the area are associated with glacial lake bed environments. The predominant soil types in the Parker Road Site are Niagara silt loam (Nh), Ilion silt loam (In), and Darien silt loam (subsets DbA and DbB). The limits of the soil series associated with the site are shown in Figure 4. These soils are poorly drained soils with little to no slope. Detailed descriptions of these soils are provided in Table 3.

The Parker Road site lies a short distance north of Rush Creek and to the west of Smokes Creek, both perennially flowing steam that discharge into Lake Erie to the northwest of the site. The northern boundary of the APE is denoted by a now seasonal stream, but in the historic maps was substantial enough to be documented as a tributary to Rush Creek (Figures 5-8).

The Parker Road site lies a considerable distance south the Onondaga Escarpment, which extends from the Finger Lakes region across western New York and into southern Ontario. Created by hard bedrock that was resistant to the effects of glacial scouring, its exposed rocky outcrops contain high quality chert nodules widely used throughout

prehistory by peoples employing a stone tool technology. Chert nodules were both quarried directly from the escarpment and gathered as glacially transported secondary deposits occurring throughout much of western New York as pebbles and cobbles. Onondaga chert was also traded and transported to other regions. Sixteen of the twenty nine lithic artifacts from the Parker Road site are all made from the Onondaga chert; the other artifacts were made of probable glacially transported chert cobbles, as discussed below.

Artifact Summary. Phase 1 surface survey resulted in the recovery of numerous possible pre-contact lithic artifacts that were brought to the lab and processed for cleaning and identification. As a result, a fairly small number (n=29) of pre-contact chipped stone artifacts were identified and many of the potential artifacts were discarded as non-cultural material. This process was necessary as the plowed field making up the project area contained a high density of natural chert pebbles, cobbles and fractured chert fragments. There is a large number of different chert types represented as a result of the glacial origin of secondary chert deposits in the soil. A minimum of eight (8) different chert types were identified among the artifacts saved. These include: Reynales, Clarence Member Onondaga, Pennsylvania Jasper, Edgecliff Member Onondaga, Seneca, possible Upper Mercer chert from Ohio, a very dark form of local Onondaga, and perhaps even one fragment of Huronian chert form Ontario, Canada. This diversity of raw materials is noteworthy and speaks to the glacial and post-glacial water sorted nature of chert deposits in area soils.

The total Phase 1 artifact count is 29 including 23 chert flakes, two cores or core fragments, two projectile point fragments and two biface or projectile point fragments. Due to their fragmentary nature, it is not clear if the latter category represents finished tools or tools in a preliminary stage of production. While none of the bifaces and projectile point fragments are clearly and definitively diagnostic, three of four (FN 31, 50 and 52) appear to represent Early Woodland Meadowood Phase objects due to their general shape, thinness in cross section and fine flaking characteristics (Ritchie 1971, 1980; Justice 1987). The fourth (FN 41) is most likely from the Archaic period based on shape and thickness. It is a common pattern to find Archaic and Early Woodland formal tool fragments on sites throughout western New York.

Table 4. Summary of Pre-Contact artifacts by type.

Artifact Type	*Total*
Flake	23
Biface/Projectile Point	2
Projectile Point Fragment	2
Cores	2
Total	*29*

In terms of the overall distribution of cultural material in the project area, the results show a pattern of widely scattered artifacts throughout the field with a slightly higher density in the southern portions and a cluster of five (5) artifacts making up the archaeological site identified as the Parker Road site (UB 4499, FN 48, 50, 51, 52 and 55). Interestingly, the small site are contains two of the objects that are potentially Early Woodland/Meadowood projectile point fragments and the only two burnt artifacts found during the Phase 1 survey.

In terms of flake types based on a lithic analysis designed to identify the technology responsible for their creation, the overall assemblage consists of nearly equal numbers of all the different flakes types identified (Figure 13). This includes roughly equal proportions of primary (P1), and secondary (P2) flakes form the very early stages of lithic reduction and simple expedient tool making, as well as core reduction flakes (C1) and biface thinning flakes (BFT). The numbers are low so that no clear patterns or interpretation of technological activity or site structure across the project area is warranted. Suffice to say that the overall patter is one of sporadic and short-term use of this landscape for limited tool making and use.

In terms of utilized tools from the assemblage, several of the flakes and cores appear used to some degree, but this interpretation must be cautious as so many of these objects also have some plowing and other damage due to historic and modern land use practices. Analysis has identified four retouched and utilized flakes ranging in apparent function from scrapers to borers with two notched flakes. Two flakes are utilized only, and only two flakes appear burned, again both from the tiny site cluster (n=5).

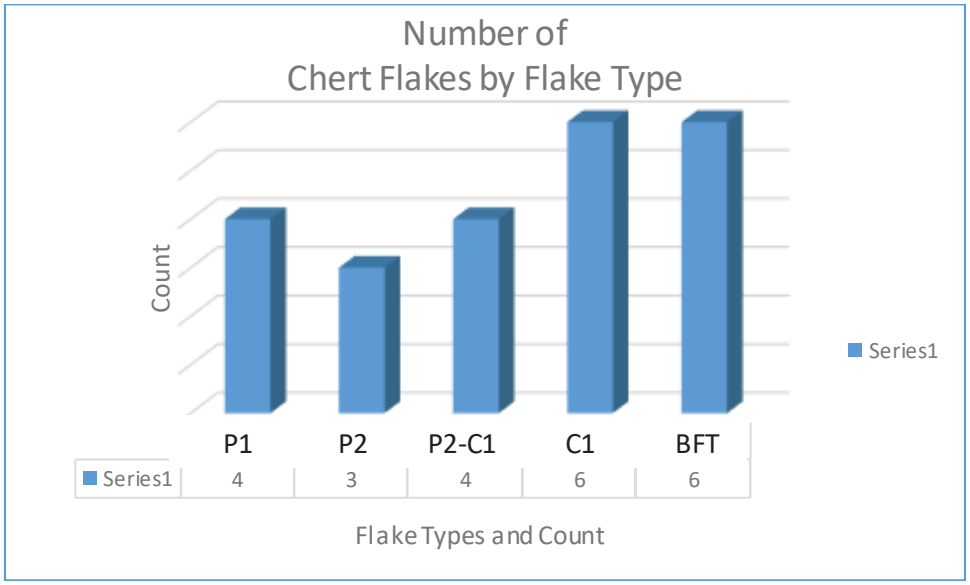

Figure 13. Chert flakes (n=23) by flake type.

Photo 5. Parker Road site (UB 4499) Phase 1 Meadowood Cache Blade Phase 1 find.

Site Structure. The pre-contact assemblage recovered by the phase 1 investigations was recovered from across the entire project area, with a small cluster in the southwest corner of the field constituting the site (Figure 16). Five artifacts that comprise the site's assemblage form a small artifact cluster and with the other twenty four artifacts widely scattered in the rest of the project area. Artifacts within the site and the larger project area appear to be un-related with the potential for the site to represent a small Meadowood Phase use of the local landscape c. 800-500 BCE. Collectively, they likely represent ephemeral use of this part of the landscape over a broad span of time by many different groups of people. The five artifact that make up the Parker Road site include the only two burnt flakes recovered by the Phase 1 and two possible Early Woodland projectile points. Together, the various find spots appear to represent a settlement pattern commonly observed in this area, which consists of large and small base camps surrounded by small, ephemerally occupied sites with relatively few artifacts. In this case, the cluster of five finds may be such an ephemeral site with the other scattered find spots being places of very short term, task based land use.

All the STPs excavated in the Phase 1 survey displayed similar stratigraphy which was a typical Ap-/B- soil profile with an approximately 30 cm (12 in) deep plowzone overlying undisturbed subsoil. This suggests that there is no buried strata in the project area and that the plowzone would be the most likely soil column to bear artifacts.

Features. The Phase 1 subsurface testing encountered no indication of features within the project area. The potential for intact cultural features appears extremely low.

Integrity. Located in an agricultural field that has been plowed many times since the mid-nineteenth century, the integrity of the Parker Road site appears to be relatively good with the effects of plowing having caused only minimal lateral displacement of artifacts. Plowing has also created a homogenous surface layer containing both pre-contact and historic artifacts throughout its approximately 30 cm (12 in) depth.

Research Potential. The Phase 1 study recovered pre-contact finds from relatively undisturbed plowzone soils, but with low artifact density. With the majority of the assemblage (n=24 out of 29 artifacts) being spread over the 12.1 ha (30 ac) project area, and the remaining five constituting the site cluster, the research potential of the Parker Road site is low. The recovery of the only burnt flakes and two of the three projectile point fragments does suggest a possible work space or camp that might have been used briefly, but would have minimal research potential. Furthermore the relationship between the five artifact cluster of the site and the rest of the assemblage is unclear. Although there is only one temporally diagnostic artifact recovered, the pre-contact finds from the Parker Road site are likely to have been deposited over a long period of time and would attest to the long term use of this portion of the Lake Erie plain by peoples practicing a hunter-gatherer life style. Alternatively, the scattered find spots outside the project area could be associated with other sites in the area like the Ellis site, and do not have any relationship with the Parker Site.

Potential Impacts. The project plans call for the construction of a residential subdivision with a group of single family homes. All parts of the project area investigated are likely to be impacted including the site area and non-site scatter.

Recommendations. The Parker Road site does not appear to have the potential to yield important information about the pre-contact and historic periods of western New York. The site does not appear national Register eligible and Phase 2 site examination is not recommended.

Date August 2020 **OPRHP Site Identifier** _____ **PR#**_____

Project Identifier Phase 1 Archeological Reconnaissance Survey of A Proposed Housing Subdivision at Parker Road and Route 20A

Name Kathryn Whalen **Phone** (716) 645-0400
Organization Archaeological Survey, Department of Anthropology, University at Buffalo

1) Site Identifier(s) Parker Road site (UB 4499)

2) County Erie **City/Town/Village/Hamlet** Town of Hamburg **MCD** 02953

3) Present Owner Parker Road Developers LLC **Address** West Seneca, NY

4) Site Description (check all appropriate categories)
XX stray find, surface evidence, stratified, ?? camp, ____ buried evidence,
?? single component, village, XX plowzone evidence, multi-component, burial, ?? below plowzone,
?? workshop, mound ____ feature evidence, shell midden, quarry, ____ intact occupation,
Location: XX upland, XX pasture, never cultivated, XX flood plain, ____brush, previously cultivated
woodland, under erosion, XX under cultivation, grass lawn, suburban/urban, XX rural
Soil Drainage: excellent, good, X fair, X poor
Slope: XX flat, XX gentle, moderate, steep
Distance to nearest water source: .8 km (.5 mi) north of Rush Creek
Elevation: 240 m (800 ft)

5) Site Investigation (append additional sheets if necessary)
Surface - N/A
Site Map - Univ. at Buffalo Archaeological Survey
Collection (Location) - Univ. at Buffalo Archaeological Survey
Surface - Date July 2020 Phase 1 pedestrian survey and subsurface testing included 46 STPs. All STPs are 35-40 cm diameter. All soils screened with 6 mm / 0.25 in mesh.
Investigator: Heather Lackos and Emily Eklund Archaeological Survey, Univ. at Buffalo

Manuscript or Published Reports: Phase 1 Archaeological Reconnaissance Survey of A Proposed Housing Subdivision at Parker Road and Route 20A. Town of Hamburg, Erie County, New York. By Kathryn Whalen, Ph.D, and Heather Lackos, B.A., Douglas Perrelli, Ph.D. RPA. Reports of the Archaeological Survey, Vol. 52, No. 11. Department of Anthropology, University at Buffalo. August 2020.

Final Repository of Materials: Archaeological Survey, Univ. at Buffalo

6) Component(s) (cultural affiliation/date): Unknown Pre-Contact Period/Early Woodland Period

pg 2. 02907.000627, UB 4482 OPRHP site form

7) List of Material Remains: See Appendix B for detailed summary.

Artifact Type	*Total*
Flake	23
Biface/Projectile Point	2
Projectile Point Fragment	2
Cores	2
Total	*29*

Are historic materials are present? No

8) Map References: USGS 7.5' Quad Buffalo SE, NY UTM coordinates_____

9) Photography: See Reports of the Archaeological Survey, Vol. 52, No.11. Additional photos on file.

10) Eligibility Discussion:

A. __ Property appears NR/SR eligible __XX__ Property does NOT appear NR/SR eligible
- Identify relevant theme:

B. - Existence of relevant context? ___ Yes __X___ No (undeveloped)

Specify Eligibility Criteria:

Criterion A. _____ Associated with events making a significant contribution to broad patterns of history.
Criterion B. _____ Associated with the lives of significant persons in our past.
Criterion C. _____ Embodies distinct characteristic of a type, period or method of construction.
Criterion D. _____ Has yielded or is likely to yield information important in prehistory/history.

C. Discussion: Because of the limited research potential and low artifact density, it does not appear that the Parker Road Site is National Registry eligible.

pg 3. 02907.000627, UB 4482 OPRHP site form

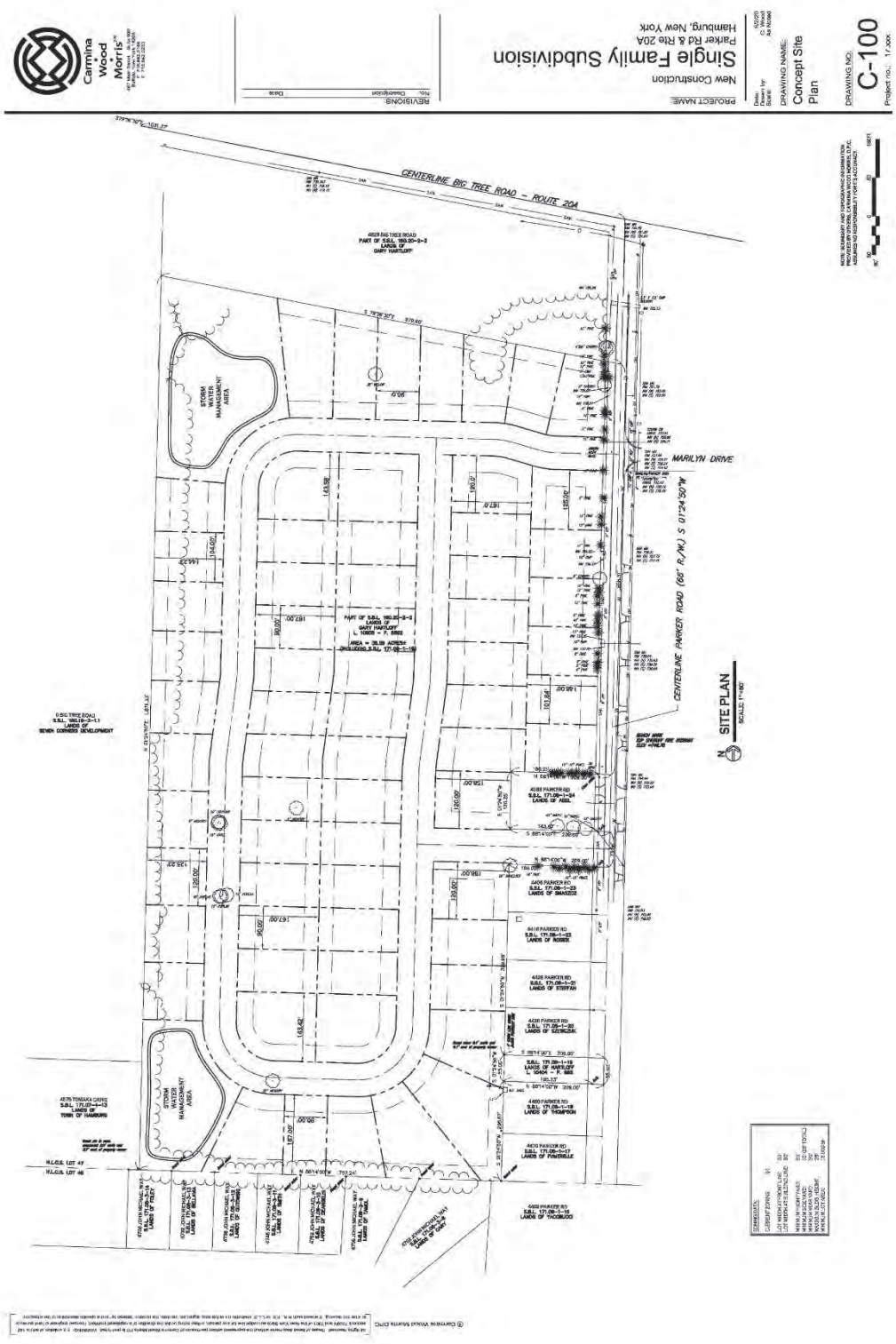

Figure 14. Project development plan showing area of potential effect.

pg 6. 02907.000627, UB 4482 OPRHP site form

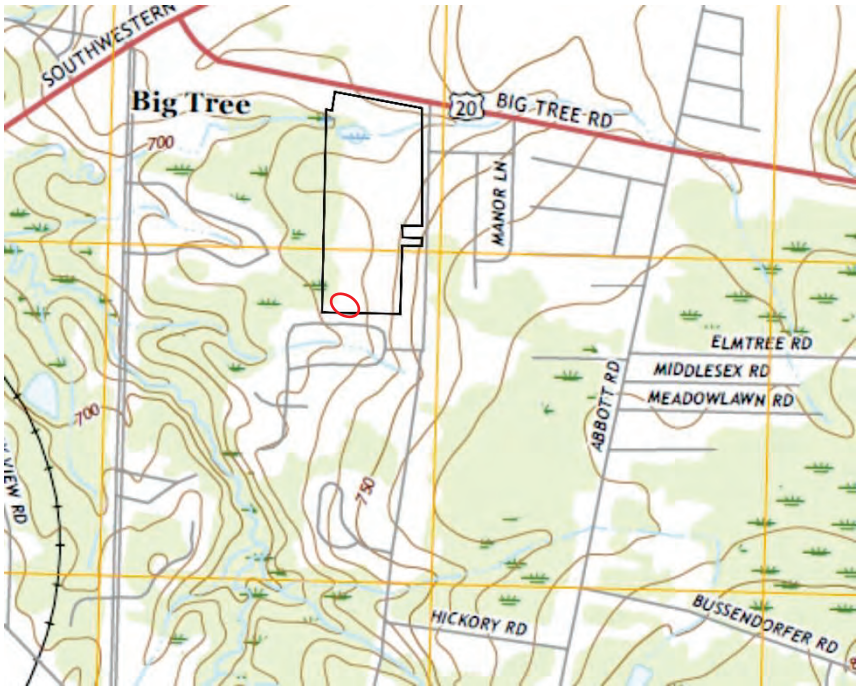

Figure 15. Location of Parker Road site (UB 4499) site on 2016 Buffalo SE, New York 7.5 Minute Series Quadrangle.
Confidential: Site Location Information is NOT for Public Release

pg 7. 02907.000627, UB 4482 OPRHP site form

Figure 16. Phase 1 project area results map showing limits of Parker Road site (UB 4499).
Confidential: Site Location Information is NOT for Public Release.

APPENDIX A: REFERENCES CITED

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APPENDIX B: Roll Road Site (UB 4482) Phase 1 Pre-Contact Artifact Summary.

Surface *FN*	Artifact *Type*	Artifact *Size*	*N*	*Wt (g)*	Raw *Material*	*Ret*	*Utl*	*Brn*	*P1*	*P2*	*P2-C1*	*C1*	*BFT*	NOTES
3	Core	Large	1	5.5	Reynales		x							wedge
13	Flake	Small	1	0.3	O				1					
17	Flake	Small	1	0.4	O					1				
18	Flake	Large	1	3.5	Jasper					1				
20	Flake	Large	1	5.7	Edgecliff				1					
22	Flake	Small	1	0.5	Seneca					1				
23	Flake	Small	1	1.2	O				1					
25	Flake	Large	1	5.3	Upper Mercer?						1			
26	Flake	Small	1	1.5	Upper Mercer?							1		
29	Flake	Large	1	2.7	Dk O	x	x					1		
31	B/PP	Large	1	12.5	Reynales?									
33	Flake	Small	1	0.3	O						1			
34	Flake	Small	1	0.6	O				1					
35	Flake	Large	1	6.9	O	x	x				1			
39	Flake	Small	1	0.9	O						1			
40	Flake	Small	1	0.2	O								?	
41	B/PP	Large	1	14.1	O									
42	Flake	Micro	1	0.4	Edgecliff							1		
43	Flake	Large	1	2.8	Seneca							1		
45	Flake	Small	1	0.1	O								1	
48	Flake	Large	1	0.7	O			xx					1	
49	Flake	Large	1	7.6	Lt O/Huronian?	x	x					1		
50	PP frag	Large	1	2.5	O									

Surface *FN*	Artifact *Type*	Artifact *Size*	*N*	*Wt (g)*	Raw *Material*	*Ret*	*Utl*	*Brn*	*P1*	*P2*	*P2-C1*	*C1*	*BFT*	NOTES
51	Flake	Small	1	0.2	O								1	
52	PP frag	Large	1	3.2	O			x						
53	Core	Large	1	22.3	Seneca	x	x							
54	Flake	Large	1	3.2	Seneca		x?					1		
55	Flake	Small	1	0.6	Upper Mercer?								1	
56	Flake	Small	1	0.8	Upper Mercer?								?	
		TOTAL	**29**		**n=7 diff chert**	**4**	**6**	**2**	**4**	**3**	**4**	**6**	**6**	

APPENDIX B: SHOVEL TEST SUMMARY AND ARTIFACT CATALOG

STP#	*Depth (cm)*	*Color/Texture/Inclusions*	*Artifact Summary*
1.1	0-27	GBrn SiLo	---
	27-50	GBrn/YBrn SiClLo	---
1.2	0-30	GBrn SiLo	---
	30-45	GBrn SiClLo/YBrn SaClLo	---
1.3	0-26	GBrn SiLo	---
	26-41	Lt GBrn SiClLo/YBrn SaClLo	---
1.4	0-24	GBrn SiLo	---
	24-39	GBrn/YBrn SiClLo	---
1.5	0-22	GBrn SiLo	---
	22-37	YBrn ClLo/GBrn SiClLo	---
1.6	0-30	GBrn SiLo	---
	30-45	GBrn/YBrn SaClLo	---
2.1	0-37	Brn SiClLo	---
	37-55	GBrn/YBrn SaClLo	---
2.2	0-27	Brn SiClLo	---
	27-42	Lt GBrn/YBrn SaClLo	---
2.3	0-27	Brn SiClLo	---
	27-47	GBrn/YBrn SaClLo	---
2.4	0-24	Brn SiClLo	---
	24-42	GBrn/YBrn SaClLo	---
2.5	0-27	Brn SiClLo	---
	27-49	GBrn SaClLo	---
2.6	0-27	Brn SiClLo	1-colorless cylindrical glass tube
	27-44	GBrn/YBrn SaClLo	---
2.7	0-27	Brn SiClLo	---
	27-50	YBrn SaClLo	---
2.8	0-27	Brn SiClLo	---
	27-42	GBrn/YBrn SaClLo	---
2.9	0-36	GBrn SiLo	---
	36-51	GBrn/YBrn SaClLo	---
2.10	0-27	Brn SiClLo	---
	27-44	Dk GBrn ClLo	---
3.1	0-28	Brn SiCl	---
	28-43	YBrn/GBrn SaCl	---
3.2	0-20	Brn SiCl	---
	20-40	YBrn/GBrn SaCl	---
3.3	0-20	Brn SiCl	---
	20-37	YBrn/GBrn SaCl	---
3.4	---	water impasse	---
3.5	0-20	Brn SiCl	---
	20-40	YBrn/GBrn SaCl	---
3.6	0-20	Brn SiCl	---
	20-35	Dk GBrn/YBrn SaCl	---
3.7	0-35	Brn SiCl	---
	35-52	Dk YBrn/GBrn SaCl	---
3.8	0-27	Brn SiCl	---
	27-43	Dk YBrn/GBrn SaCl	---
3.9	0-25	Dk Brn SiCl	---
	25-42	Dk GBrn/Dk YBrn SaCl	---
4.1	0-34	GBrn SiLo	---
	34-50	Dk GBrn SiClLo	---

4.2	0-50	GBrn SiLo	---
	50-65	GBrn/YBrn SiClLo	---
4.3	0-30	Brn SiCl	---
	30-45	Dk YBrn/YBrn/GBrn SaCl	---
4.4	0-30	GBrn SiCl	---
	30-45	GBrn/YBrn SiClLo	---
4.5	0-29	GBrn SiCl	---
	29-44	GBrn/YBrn SaCl	---
4.6	0-25	GBrn SiCl	---
	25-40	YBrn/GBrn SaCl	---
4.7	0-30	Dk Brn SiCl	---
	30-50	YBrn SaCl	---
4.8	0-45	GBrn SiCl	---
	45-60	YBrn/GBrn SaCl	---
4.9	0-30	Brn SiCl	---
	30-50	YBrn/GBrn SaCl	---
5.1	0-25	Dk Brn SiCl	---
	25-44	Dk GBrn/YBrn SaCl	---
5.2	0-25	Brn SiCl	---
	25-45	GBrn/YBrn SaCl	---
5.3	0-20	GBrn SiCl	---
	20-40	YBrn/GBrn SiClLo	---
5.4	0-20	Brn SiClLo	---
	20-37	YBrn SaClLo	---
5.5	0-30	Brn SiClLo	---
	30-46	YBrn SaClLo	---
5.6	0-22	Brn SiClLo	---
	22-41	YBrn/GBrn SaClLo	---
5.7	0-33	Brn SiClLo	---
	33-50	Lt YBrn SaLo	---
5.8	0-27	Brn SiClLo	---
	27-49	YBrn SaLo	---
5.9	0-40	GBrn SiClLo	---
	40-59	Lt YBrn SaLo	---
6.1	0-42	Brn SiClLo	---
	42-60	Lt YBrn SaLo	---
6.2	0-25	Brn SiCl	---
	25-40	YBrn/GBrn SaCl	---
6.3	0-20	Brn SiCl	---
	20-36	YBrn/GBrn SaCl	---

Shade: Lt- Light, Dk-Dark
Color: GBrn-Gray Brown, YBrn-Yellow Brown
Soils: Cl- Clay, Lo-Loam, Si-Silt, Sa-Sand

APPENDIX 6:
ENGINEER'S REPORT

CARMINAWOOD
DESIGN

ENGINEER'S REPORT

for

Parker Road Single Family Subdivision

Parker Road
Town of Hamburg, Erie County, New York

Prepared for

Parker Road Development, LLC

4534 Clinton Street, Suite 4
West Seneca, NY 14224

Prepared by

Carmina Wood Design

487 Main Street, Suite 500
Buffalo, NY 14203

Telephone: (716) 842-3165
Fax: (716) 842-0263

January 2024

Table of Contents

Attachments

Section 1 - Location & Description

This project is a proposed subdivision development of a 41.10 acre site located on the west side of Parker Road near Route 20A in the Town of Hamburg. Construction will consist of a proposed public roadway, public storm sewer, sanitary sewer and water mains, and lighting improvements. Fifty-nine (59) lots single family residential building sublots are proposed on the new road and three dedicated open space parcels. The project site is currently an active farm field. The proposed site development area to be disturbed for this project is approximately 27.70 acres when construction is completed.

Section 2 - Water Service

An existing 8" public water main is located along Parker Road will be the source of water for this project. Approximately 3,000 LF of new 8" AWWA C-900 PVC water main will be installed along the public roadway. New ¾" Type 'k" copper services will tap the new 8" main and be installed for each lot. Six (6) new public fire hydrants will be installed with maximum spacing not to exceed 500 feet.

Pipe material for the new main, hydrant installation and all fittings, valves, etc. will be in accordance with Town of Hamburg and Erie County Water Authority (ECWA) standards. The proposed main, hydrant branches and hydrants will be installed and tested in accordance with Town of Hamburg and ECWA Standard Specifications. Inspection and certification of the installation and testing of the water samples will be done by the ECWA. There are no conflicts with existing utilities in the area, the land is currently vacant. The proposed water main will maintain physical separation from other utilities as specified per Ten States Standards.

Domestic Summary:

Peak Operating Demand:	177 gpm (assumed per 3 gpm/unit)
Water Main:	8" PVC on Milestrip Road

See attached water demand calculations in Attachment A for additional information.

The proposed main, hydrant branches and hydrants will be installed and tested in accordance with ECWA Standard Specifications. Inspection and certification of the installation and testing of the water samples will be done by ECWA.

Section 3 - Sanitary Sewer Service

The site is not served by a public sanitary sewer main and will require a sewer extension. The sewer extension will connect to the existing 8" sanitary sewer located along the west side of Parker Road. A pump station and force main will also be required to service each lot with a gravity sewer lateral. The pump station will be located on the south side of the subdivision, and the force main will run along the proposed public road, and connect to the proposed sewer extension on the north side of the subdivision, which then connects to the existing sewer main on Parker Road.

The flow requirement determination has been outlined in the attached appendices:

Design Parameters

Total:	25,960 gpd

The hydraulic loading rate is per "Design Standards for Intermediate Sized Wastewater Treatment Systems" 2014, NYSDEC.

Section 4 - Storm Sewer Service

The site drains from the east to the west and north. A portion of the site drains to an existing natural stream along the north side of the property and leaves at the northwest corner. The rest of the site drains to the west to two natural low areas, which eventually drain to the natural stream off site.

The proposed onsite storm sewer system for this development project consists of smooth interior and perforated HDPE and RC pipes connected by a series of catch basins. The storm water management system for this project consists of two bioretention areas and outlet control structure prior to discharge. There are two ponds proposed, and they are connected by a 36-inch HDPE pipe allowing the ponds to act as one pond with on control structure. The ponds drain to the existing stream. The bioretention areas proposed on site are designed to provide 100% of the required Runoff Reduction volume (RRv) for the site. The soils in the vicinity of the bioretention area are mainly USDA hydrologic group 'D' and therefore the system will be installed with underdrains per NYSDEC requirements. The bioretention areas will consist of 8" perforated HDPE underdrains in 12" of drainage gravel, followed by filter fabric and then finally 18" minimum of planting soil. Overflow catch basins will be installed to allow 6" maximum temporary ponding for RRv treatment. The proposed detention pond outlet control pipe is designed to accommodate the 1-year through 100-year storm events controlling the offsite runoff rate to less than the existing runoff rates for pre-development drainage area which drains to the existing stream.

Runoff reduction volume (RRv), water quality volume (WQv) and stormwater volume attenuation for the site is designed in accordance with Chapter 4 of the NYSDEC Stormwater design manual. The bioretention areas will be provided as a "green infrastructure" practice to provide runoff reduction to meet the Chapter 4 requirements for the currently undeveloped areas. Runoff from the site was looked at as a whole for the calculation of volume attenuation requirements. The amount of impervious cover post-development is 7.5 acres. The proposed detention ponds are designed to accommodate the 1-year through 100-year storm events controlling the offsite runoff rate to less than the existing runoff rates.

<u>Detention Pond Summary:</u>

Top of basin elevation = 726.10
Bottom of basin elevation = 720.50
Max. pond storage volume = 216,387 cf @ 725.59

<u>Water Quality Summary:</u>
WQv req'd = 30,465 cf (0.699 ac-ft)
RRv min. req'd = 5,173 cf (0.119 ac-ft)
RRv provided - bioretention area = 5,333 cf (0.122 ac-ft)
WQv provided – bioretention area = 25,131 cf (0.577 ac-ft)
Total RRv + WQv provided = 5,333 cf + 25,131 cf = 30,465 cf (0.699 ac-ft)

Bioretention: 100% of minimum post-development Runoff Reduction volume (RRv)
Area: 4,000 & 6,000 sf
Bottom Elevation: 723.50, & 724.00 ft

<u>Design Criteria:</u>
Storm pipes: 10-year storm
Detention: Comparison of the existing 1-year vs. the proposed 1-year runoff
Comparison of the existing 10-year vs. the proposed 10-year runoff
Comparison of the existing 100-year vs. the proposed 100-year runoff

Runoff Summary

Drainage Area 1

Event	Ex. Runoff (cfs)	Pro. Runoff (cfs)*	Result (cfs)
1-year	14.88	3.55	11.33
10-year	37.32	11.16	26.16
25-year	48.01	28.08	19.93
100-year	64.69	32.72	31.97

Drainage Area 2

Event	Ex. Runoff (cfs)	Pro. Runoff (cfs)*	Result (cfs)
1-year	13.50	7.08	6.42
10-year	33.89	24.47	9.42
25-year	43.60	33.56	10.04
100-year	58.73	48.20	10.53

Drainage Area 3

Event	Ex. Runoff (cfs)	Pro. Runoff (cfs)*	Result (cfs)
1-year	13.67	0.79	12.88
10-year	33.13	2.76	30.37
25-year	42.35	3.79	38.56
100-year	56.65	5.45	51.20

*See attached storm drainage calculations and drainage report in Appendix B for additional information.

Section 5 – Earthwork Calculations

Refer to Attachment C of this report for an estimated summary of the proposed earthwork calculations for the proposed subdivision.

Appendix A

Sanitary Sewer and Water Demand Calculations

Downstream Sewer Capacity Analysis

CARMINA WOOD DESIGN
487 MAIN STREET, SUITE 500
BUFFALO, NEW YORK, 14203
(716) 842-3165
FAX (716) 842-0263

Project No.: 19.241 Date: 1/24/2024
Project Name: Parker Road Subdivision
Project Address: Parker Road, Hamburg, NY 14075
Subject: Sanitary Sewage Calculations
Sheet: 1 of 1

Sanitary Sewage Demand Calculations:

Proposed Public Road

440 gal/d/unit x 59 uni = 25,960 gpd *use 440 gallons per day per 4-bedroom house

Total Site Sanitary Demand: = 25,960 gpd Average

* The hydraulic loading rate is per "Design Standards for Intermediate Sized Wastewater Treatment Systems" 2014, NYSDEC.

Find Peak Sanitary Demand:

Peaking Factor based on Population:

Total demand: 25,960 gpd / 100 gpcd = 260 per capita

Population (P) = 260 people

Peaking Factor : $(18 + \sqrt{P}) / (4 + \sqrt{P})$ where P is in thousands

Peaking Factor = 4.10

Peak Sanitary Demand = 25,960 x 4.10 = 106,554 gpd
= 0.107 MGD
= 0.165 cfs

Required Infiltration and Inflow Mitigation:

Peak Sanitary Flow = 106,554 gpd = 74.0 gpm

4:1 offset flow per NYSDEC requirements = 74.0 x 4 = 296.0 gpm req'd

Mitigation Credit = 30 gpm / lateral

Laterals to be replaced* = 9.9 laterals
= **10 laterals** ***(or other mitigation as identified by the Town)**

8/6/20

Single Family Subdivision

Parker Road & Route 20A Hamburg, New York

Downstream Sewer Capacity Analysis Report

Project Description

This project is a redevelopment of a 41.10-acre site located on the west side of Parker Road near Route 20A in the Town of Hamburg. Proposed construction includes a 67 lot single family subdivision. The site will also include the construction of new public roads, on-site utility, and landscaping improvements. The sewer extension will connect to the existing 8" sanitary sewer located along the west side of Parker Road.

Node 1 – Big Tree Rd (10"):

Existing Peak Flow measured (overall)	=	0.942 cfs (0.507 mgd)*
Proposed Parker Rd Peak Flow	=	0.141 cfs **
Proposed Peak Flow	=	1.083 cfs

Theoretical capacity of existing 10" RCP pipe @ 3.0% = 4.108 cfs

Conclusion: The proposed peak flow is less than the capacity of the 10" pipe, therefore there is sufficient capacity. At no time during the monitoring did the flow depth exceed the pipe diameter at Node 1 of the downstream monitoring points during the rain events monitored.

Existing Peak Flow measured (wet weather event)	=	0.842 cfs (0.453 mgd)*
Proposed Parker Road Peak Flow	=	0.141 cfs **
Proposed Peak Flow	=	0.983 cfs

Theoretical capacity of existing 10" RCP pipe @ 3.0% = 4.108 cfs

Conclusion: The proposed peak flow is less than the capacity of the 10" pipe, therefore there is sufficient capacity. At no time during the monitoring did the flow depth exceed the pipe diameter at Node 1 of the downstream monitoring points during the rain events monitored.

Notes:

Pipe slopes, sizes and materials provided by Erie County Division of Sewerage Management

* Converted from measurements in TECSmith report dated 7/23/20

** See Sanitary Sewage Demand Calculations

Node 2 – 4707 Milestrip Road (24")

Existing Peak Flow measured (wet weather event)	=	8.518 cfs (4.584 mgd)*
Proposed Parker Road Peak Flow	=	0.141 cfs **
Proposed Peak Flow	=	8.659 cfs

Theoretical capacity of existing 24" RCP pipe @ 0.15% = 9.484 cfs

Conclusion: The proposed peak flow is less than the capacity of the 24" pipe, therefore there is sufficient capacity. At no time during the monitoring did the flow depth exceed the pipe diameter at Node 2 of the downstream monitoring points during the rain events monitored.

Node 3 – McKinley Pkwy (42")

Existing Peak Flow measured (wet weather event)	=	33.331 cfs (17.938 mgd)*
Proposed Parker Road Peak Flow	=	0.141 cfs **
Proposed Peak Flow	=	33.472 cfs

Theoretical Capacity of existing 42" RCP pipe @ 0.43% = 71.412 cfs

Conclusion: The proposed peak flow is less than the capacity of the 42" pipe, therefore there is sufficient capacity. At no time during the monitoring did the flow depth exceed the pipe diameter at Node 3 of the downstream monitoring points during the rain events monitored.

Notes:

Pipe slopes, sizes and materials provided by Erie County Division of Sewerage Management

* Converted from measurements in TECSmith report dated 7/23/20

** See Sanitary Sewage Demand Calculations

Location Map

ArcGIS Web Map

8/6/2020, 1:51:18 PM

Parcels

Municipal Boundaries

1:9,028

0 305 610 1,220 ft

0 90 180 360 m

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS,

Web AppBuilder for ArcGIS

USGS TNM – National Hydrography Dataset. Data Refreshed July, 2020. | NYS GIS Program Office | Telephone: (518) 242-5029 | Email: its.sm.SAM.Maintenance@its.ny.gov

Sanitary Demand Calculations

CARMINA WOOD MORRIS, D.P.C.
487 MAIN STREET, SUITE 500
BUFFALO, NEW YORK, 14203
(716) 842-3165
FAX (716) 842-0263

Project No.: 19.241 Date: 12/18/2020
Project Name: Single Familty Subdivision
Project Address: Parker Road & Route 20A Hamburg, NY
Subject: Sanitary Sewer & Water Demand Calcs
Sheet: 1 of 1

Sanitary Sewage Demand Calculations:

Subdivision

330 gal/d/units x 67 units = 22,110 gpd *use 330 gallons per day per 3-bdrm unit

Total Site Sanitary Demand: = 22,110 gpd

Find Peak Sanitary Demand:

Peaking Factor based on Population:

Total demand: 22,110 gpd / 100 gpcd = 221 per capita

Population (P) = 221 people

Peaking Factor : $(18 + \sqrt{P}) / (4 + \sqrt{P})$ where P is in thousands

Peaking Factor = 4.13

Peak Sanitary Demand = 22,110 x 4.13 = 91,355 gpd
= 0.091 MGD
= 0.141 cfs

Required Infiltration and Inflow Mitigation:

Peak Sanitary Flow = 91,355 gpd = 63.4 gpm

4:1 offset flow per NYSDEC requirements = 63.4 x 4 = 253.8 gpm req'd

Mitigation Credit = 30 gpm / lateral

Laterals to be replaced = 8.46 laterals **(9 laterals to be replaced)**

TECSmith Monitoring Report

Date	Node 1			Node 2			Node 3			Rain[2]
	Big Tree Rd (10")			4707 Milestrip Rd (24")			Mckinley Pkwy 42in (42")			
	FLOW (GAL x 1,000)	PEAK FLOW (MGD)	PEAK LEVEL (IN)	FLOW (GAL x 1,000)	PEAK FLOW (MDG)	PEAK LEVEL (IN)	FLOW (GAL x 1,000)	PEAK FLOW (MDG)	PEAK LEVEL (IN)	(inches)
6/22/2020	82.759	0.269	3.325	310.387	1.141	7.837	1020.848	4.999	7.640	***0.12***
6/23/2020	250.483	0.453	4.694	980.991	2.669	11.808	3594.999	9.618	11.105	***0.54***
6/24/2020	189.808	0.334	3.955	881.536	1.254	8.377	3647.381	5.703	8.335	***0***
6/25/2020	252.459	0.451	5.693	738.116	1.028	7.340	3214.065	5.102	7.476	***0***
6/26/2020	294.508	0.479	5.606	701.348	1.009	7.342	3339.485	5.556	8.185	***0***
6/27/2020	212.727	0.507	6.008	1226.731	2.616	11.966	5053.088	9.059	10.564	***0.4***
6/28/2020	122.148	0.175	4.113	883.183	1.175	7.832	4706.843	6.365	8.673	***0.1***
6/29/2020	113.619	0.177	4.017	762.243	1.063	7.375	4988.538	6.745	8.886	***0***
6/30/2020	106.555	0.141	3.859	717.135	0.970	7.266	4907.955	6.548	8.887	***0***
7/1/2020	109.271	0.134	3.896	678.073	0.922	7.216	4414.382	6.463	9.179	***0***
7/2/2020	116.562	0.246	4.065	684.342	0.993	7.280	4938.180	6.804	9.248	***0***
7/3/2020	104.399	0.145	4.106	671.514	1.023	7.398	4694.301	6.500	8.879	***0***
7/4/2020	90.777	0.136	4.532	623.300	1.001	7.334	4417.707	6.141	8.580	***0***
7/5/2020	99.759	0.134	4.287	618.589	0.948	7.176	4499.472	5.955	8.472	***0***
7/6/2020	103.533	0.143	4.173	638.679	0.914	7.106	5207.236	6.802	9.226	***0***
7/7/2020	96.955	0.148	4.407	621.090	0.838	6.824	5207.200	6.594	9.161	***0***
7/8/2020	86.403	0.132	3.812	627.894	0.903	6.992	4984.745	6.492	9.095	***0***
7/9/2020	148.541	0.276	3.511	633.291	0.862	6.878	4782.729	6.469	8.792	***0***
7/10/2020	145.747	0.225	3.201	629.654	0.988	7.432	4291.941	5.764	8.496	***0***
7/11/2020	169.606	0.262	3.558	876.374	1.538	8.949	5777.424	8.836	10.881	***1.21***
7/12/2020	184.755	0.298	3.327	823.377	1.161	7.695	5765.544	7.326	9.745	***0***
7/13/2020	148.443	0.302	3.658	665.932	0.913	6.956	5191.897	6.456	8.905	***0.47***
7/14/2020	187.530	0.257	3.452	663.803	0.955	7.096	4519.619	6.094	8.834	***0***
7/15/2020	199.145	0.249	3.340	651.062	0.862	6.932	4350.539	5.881	8.348	***0***
7/16/2020	165.265	0.320	3.555	1412.486	4.584	16.872	6715.412	17.938	16.473	***0.86***
7/17/2020	205.061	0.371	3.695	1313.742	1.914	10.356	4999.555	8.352	9.951	***0.03***
7/18/2020	224.563	0.284	3.577	845.278	1.172	7.796	3118.645	5.100	7.686	***0***
7/19/2020	216.508	0.319	3.801	823.783	1.463	8.753	3091.112	4.288	6.550	***0.21***
7/20/2020	102.600	0.312	3.788	336.632	1.031	7.367	1642.547	3.857	6.217	***0***
---	---	---	---	---	---	---	---	---	---	***3.94***

TECsmith

TECSMITH, Inc.
PO Box 383
Elma, New York 14059-0383
Tel: 716-462-0382
Fax: 716-687-1418

Date: July 23, 2020

SANITARY SEWER FLOW CAPACITY STUDY – Summary Review

Prepared For: 4825 Parker Capacity Analysis

Christopher Wood
487 Main Street, Suite 600
Buffalo, New York 14203
P: (716) 842-3165
F: (716) 842-0263

Project Name: 4825 Parker Capacity Analysis

Flow Monitoring Period: June 22, 2020 to July 20, 2020

Rain Events (> 0.5-inches) Monitored: June 23 (0.54”), July 11 (1.21”) and July 16 (0.86”)

Number of Monitoring Nodes: Three (3) downstream manholes

Node Locations and Descriptions:

- Node 1 Big Tree Rd (10")
- Node 2 4707 Milestrip Rd (24")
- Node 3 Mckinley Pkwy 42in (42")

Summary Conclusion:

Based on the data presented in this report, specifically the flow depth measurements recorded (see graphs below)

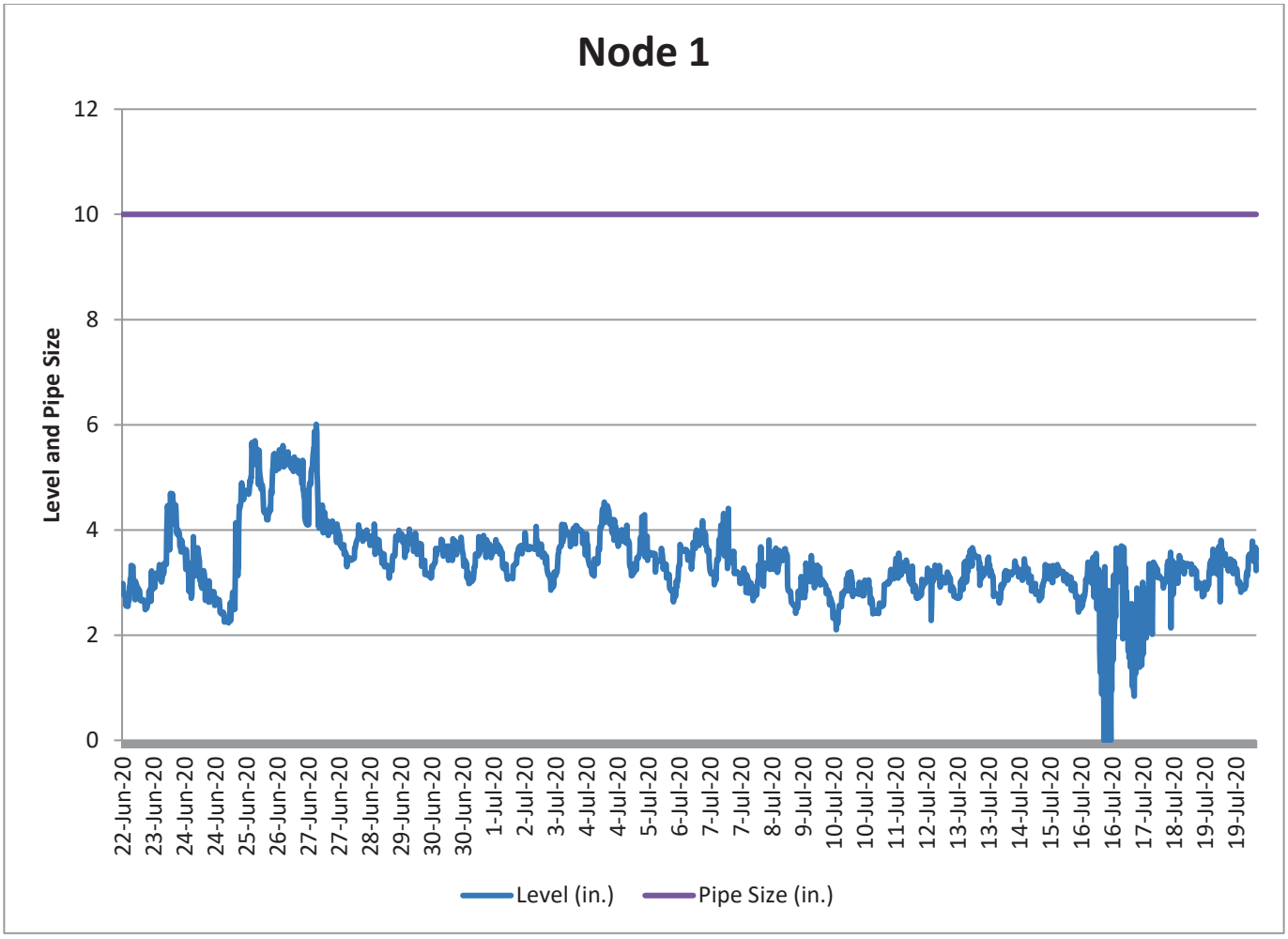
- At no time did the flow depth exceed pipe diameter at any of the downstream monitoring points during the rain events monitored.
- At no time during the monitoring period did the flow at any point slow or stall which would have caused a backup or flooding at the manhole.

TECSMITH, Inc.
PO Box 383
Elma, New York 14059-0383
Tel: 716-462-0382
Fax: 716-687-1418

Depth of Flow Capacity Summary:

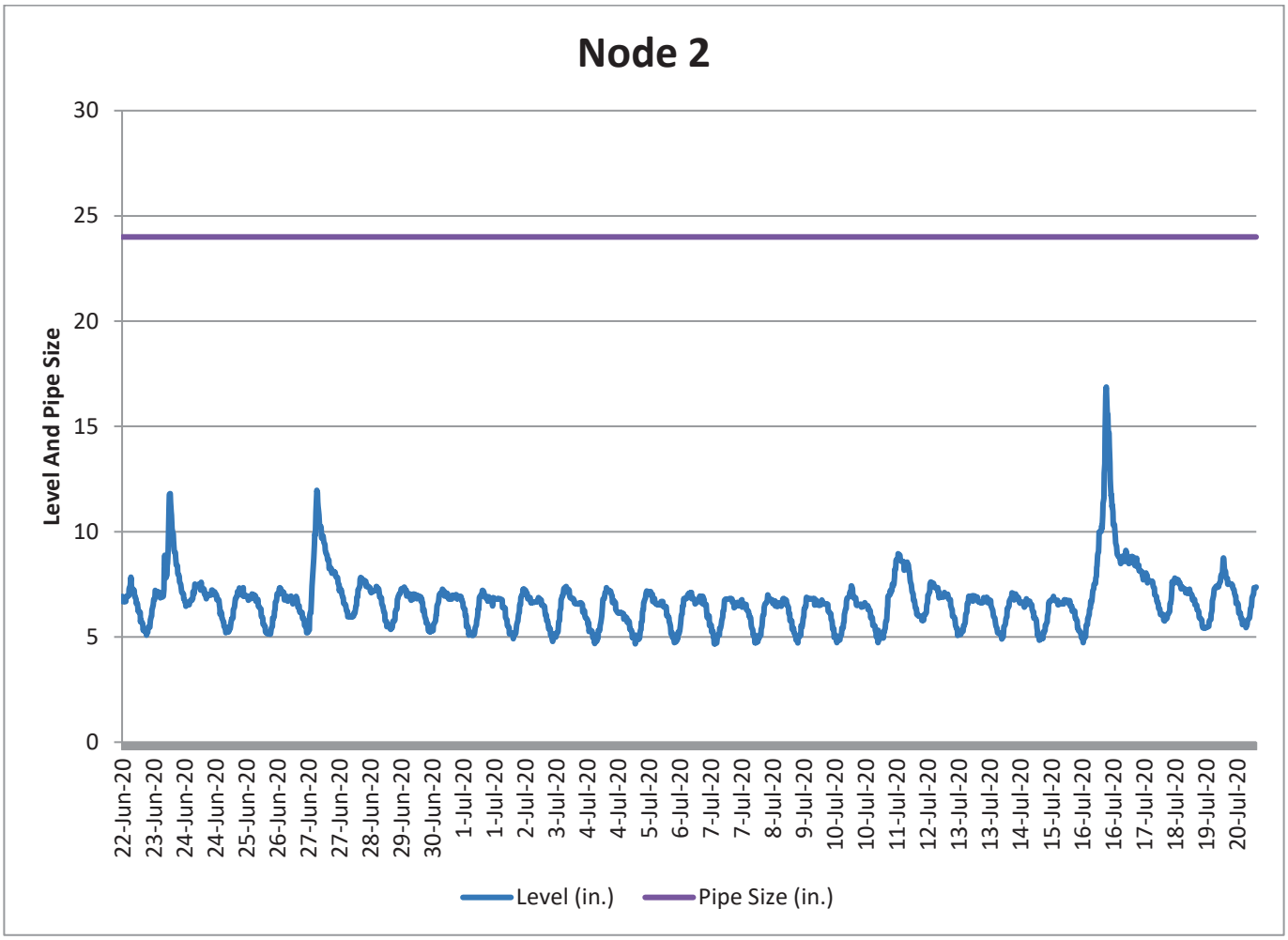
Depth of flow capacity is based on diameter of pipe. See graphs below.

- At no time during the monitoring period did depth of flow exceed pipe diameter at Node 1.



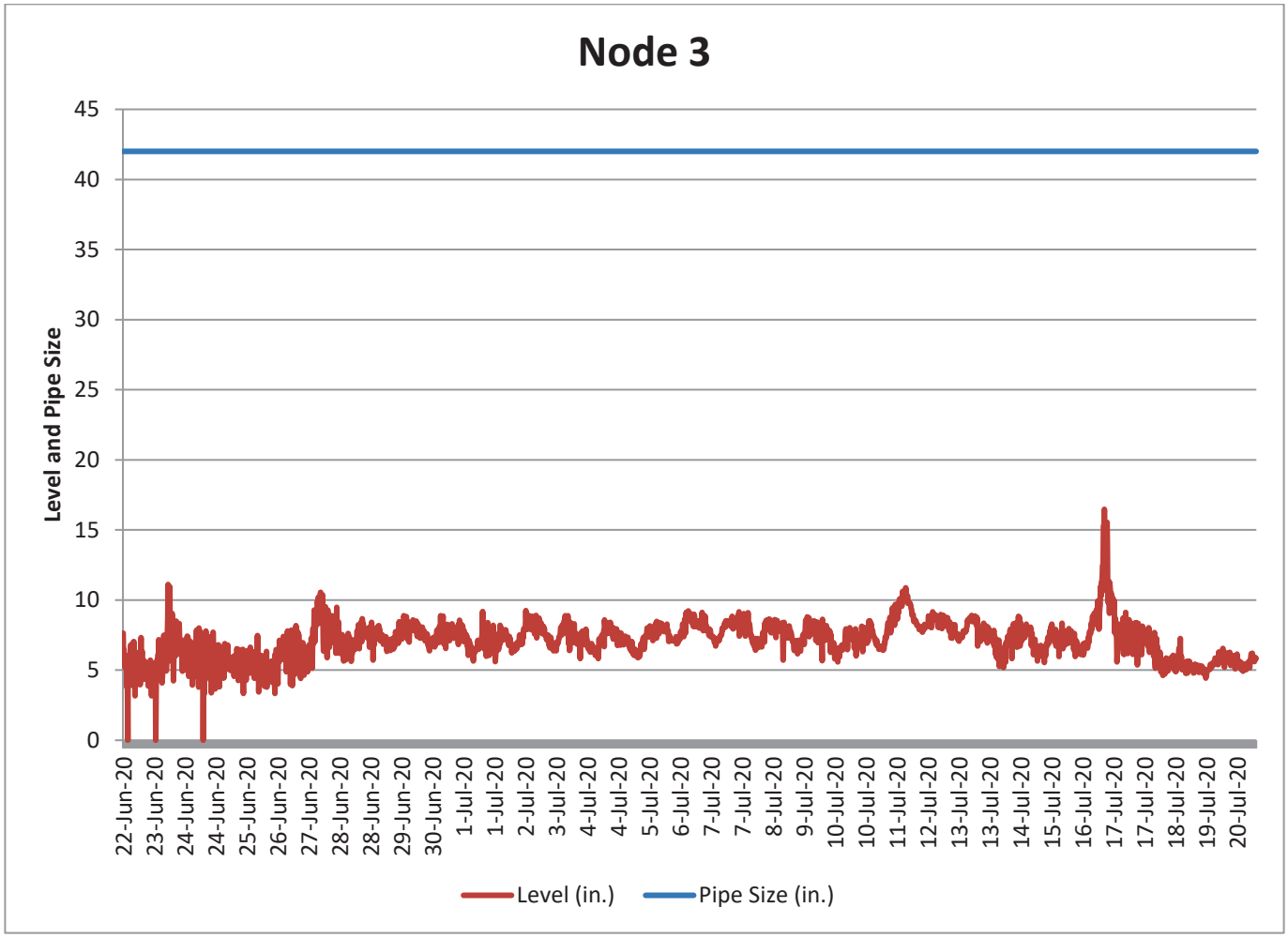
TECSMITH, Inc.
PO Box 383
Elma, New York 14059-0383
Tel: 716-462-0382
Fax: 716-687-1418

- At no time during the monitoring period did depth of flow exceed pipe diameter at Node 2.

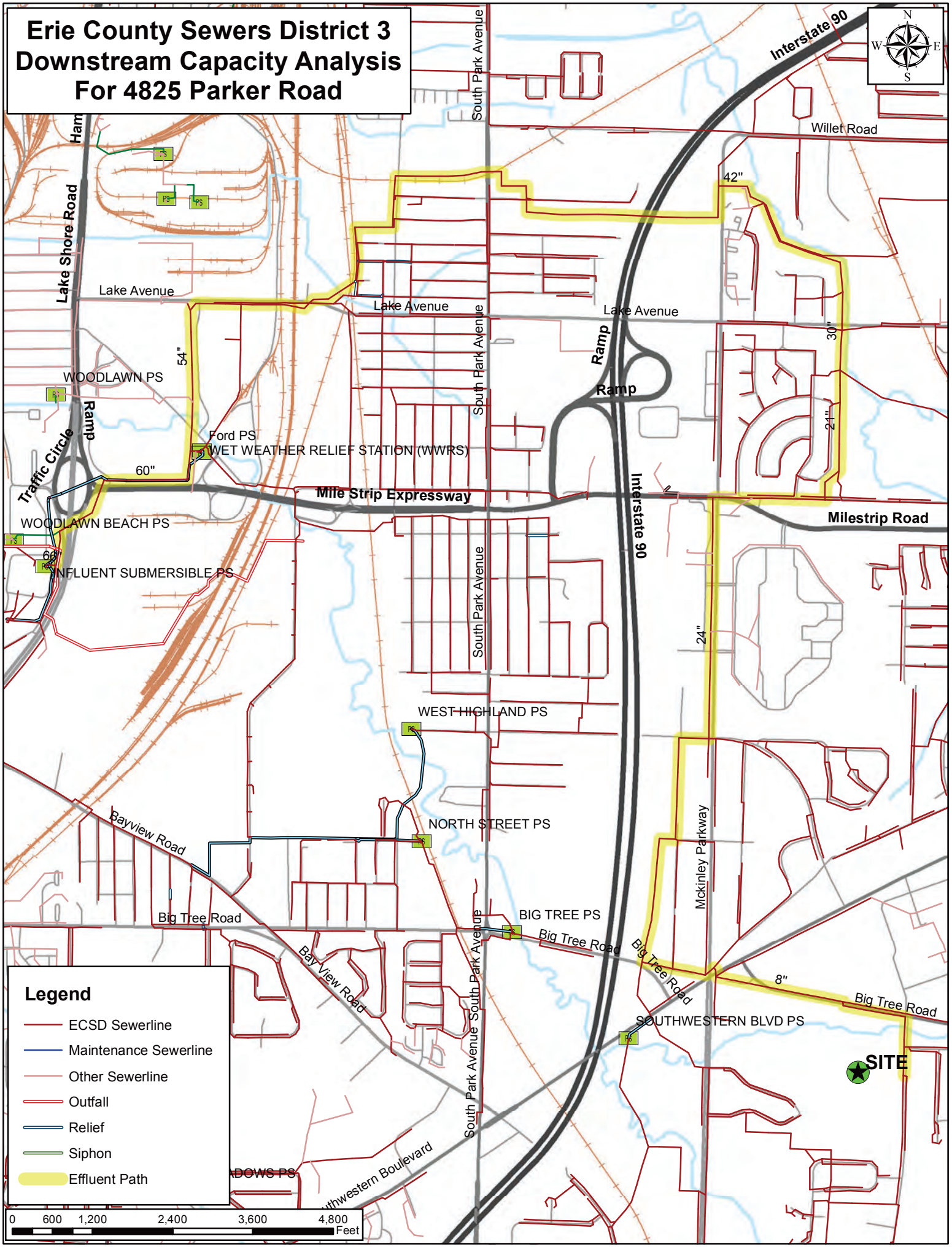


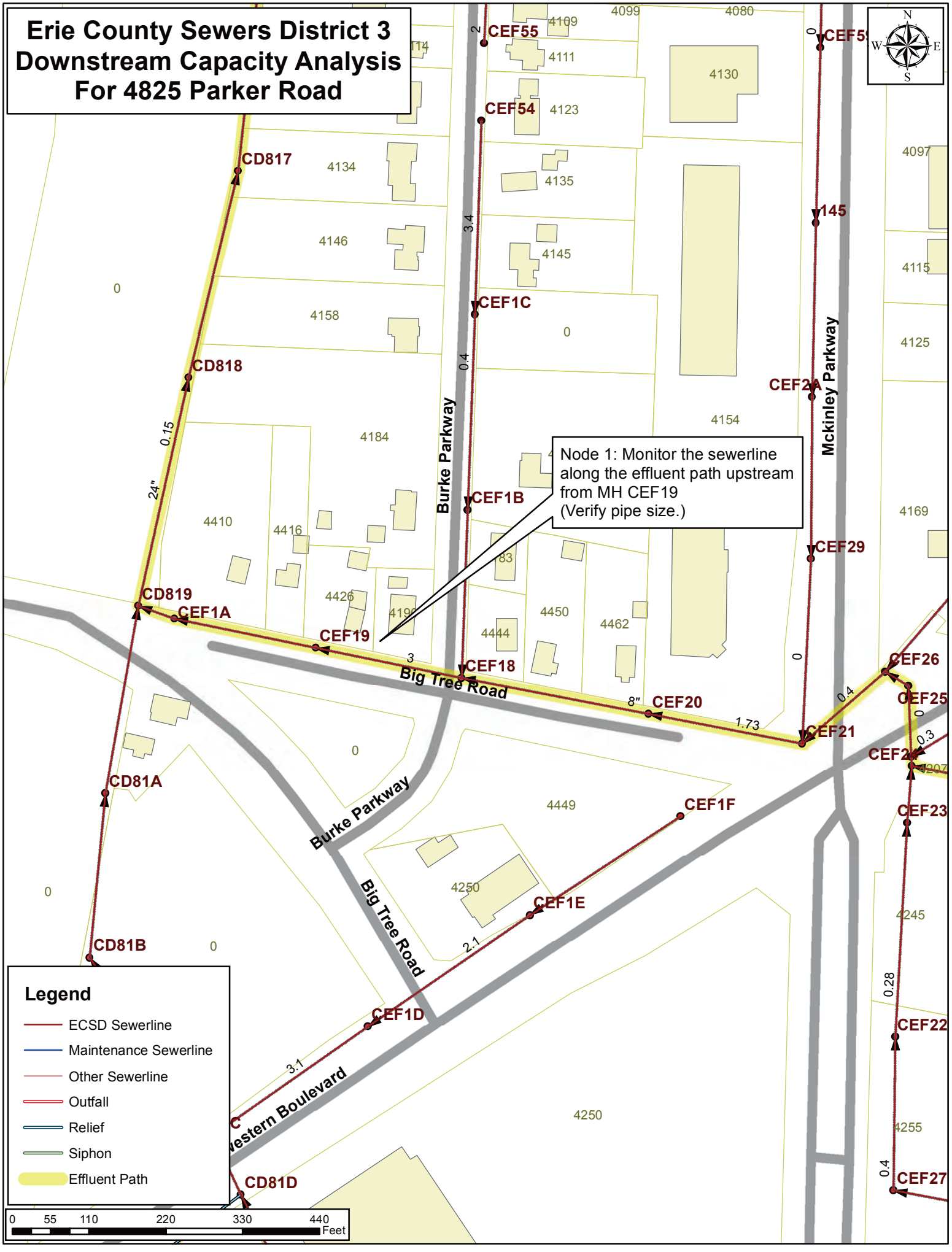
TECSMITH, Inc.
PO Box 383
Elma, New York 14059-0383
Tel: 716-462-0382
Fax: 716-687-1418

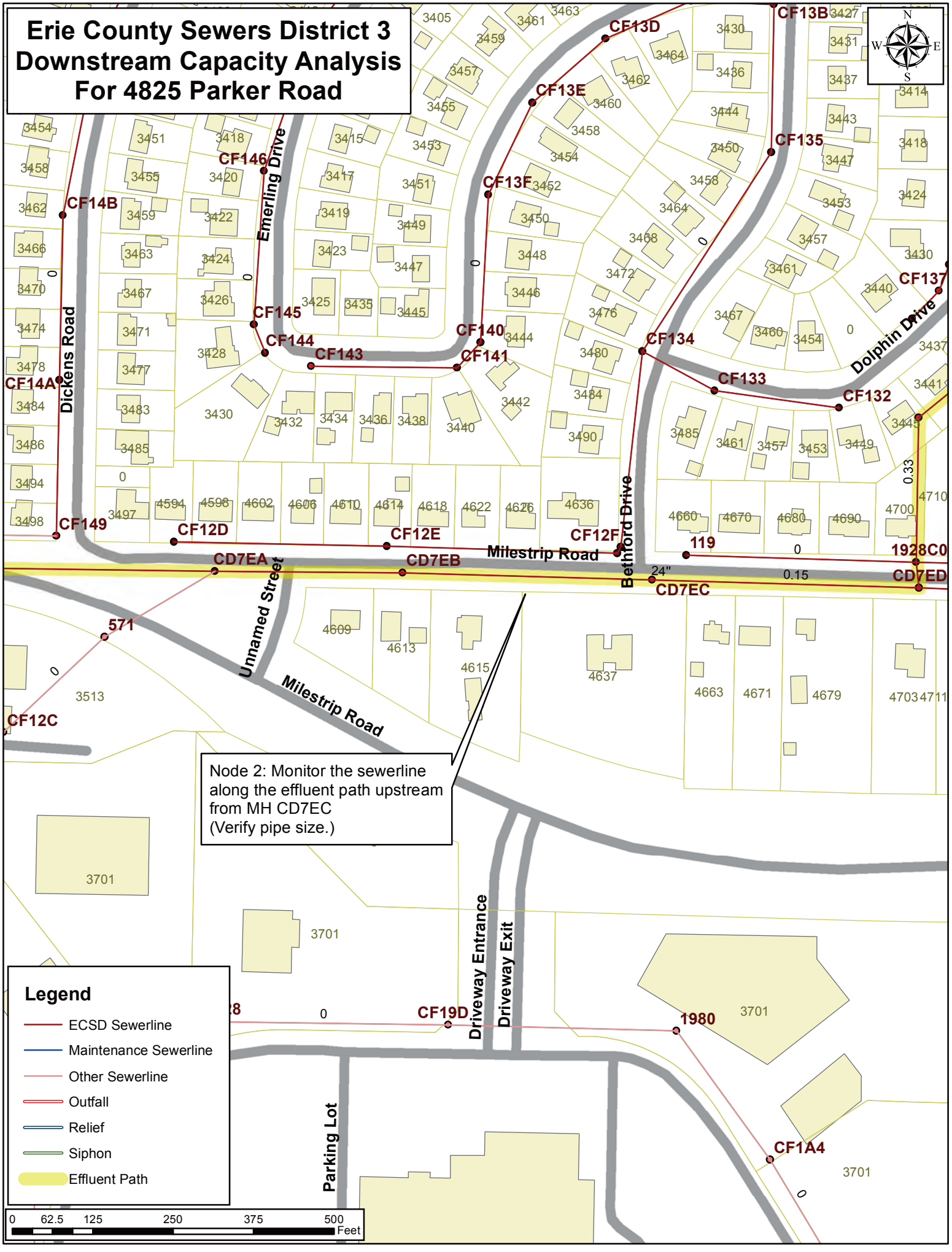
- At no time during the monitoring period did depth of flow exceed pipe diameter at Node 3.

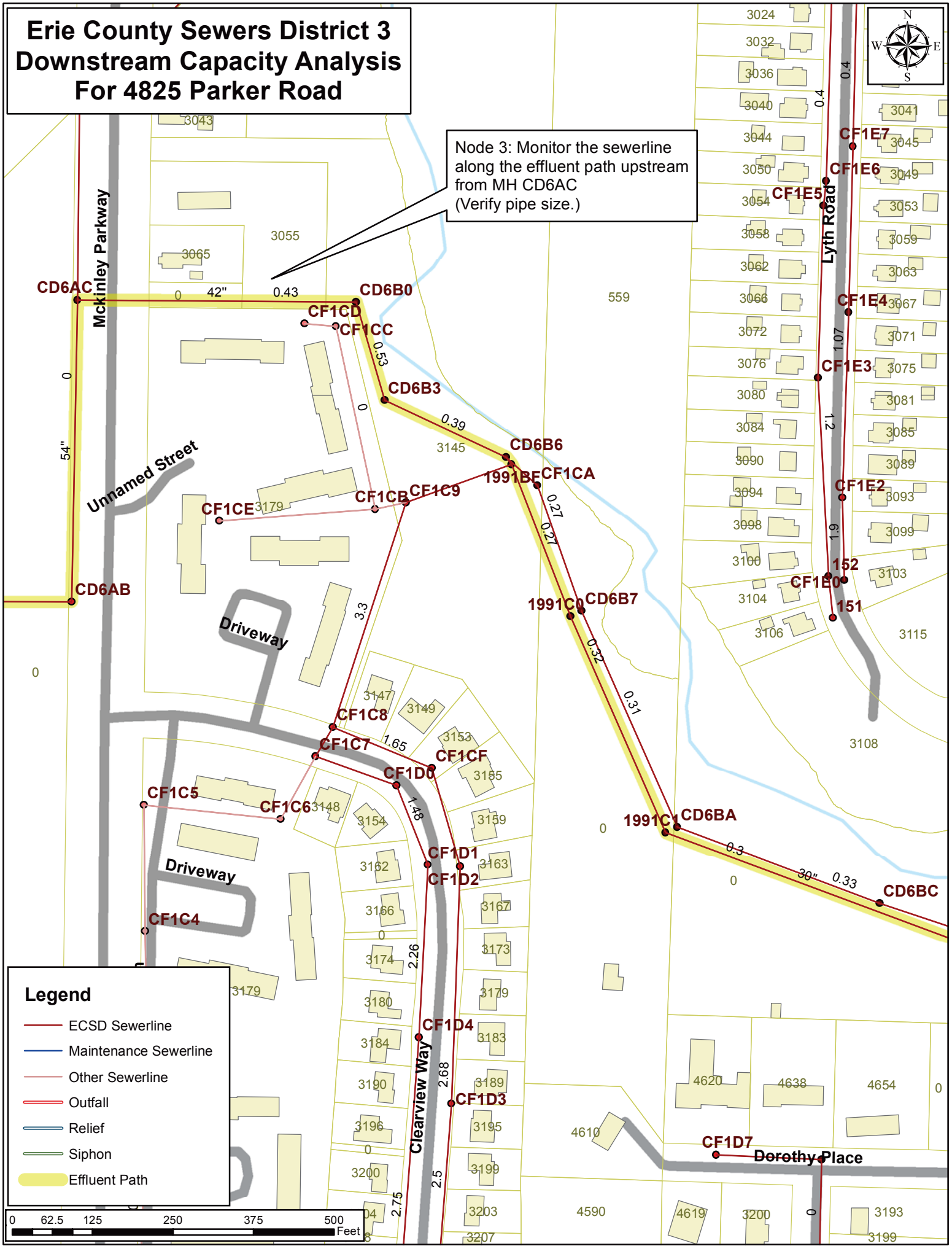


ECSD #3 Node Map


Erie County Sewers District 3
Downstream Capacity Analysis
For 4825 Parker Road
N
W
E
S
Interstate 90
South Park Avenue
Willet Road
42"
Lake Shore Road
Lake Avenue
Lake Avenue
Lake Avenue
30"
54"
WOODLAWN PS
Ramp
Ramp
Traffic Circle
Ford PS
WET WEATHER RELIEF STATION (WWRS)
60"
21"
Mile Strip Expressway
Milestrip Road
WOODLAWN BEACH PS
60"
INFLUENT SUBMERSIBLE PS
South Park Avenue
Interstate 90
24"
WEST HIGHLAND PS
Bayview Road
NORTH STREET PS
Mckinley Parkway
Big Tree Road
BIG TREE PS
Big Tree Road
Bay View Road
Big Tree Road
8"
Big Tree Road
South Park Avenue
SOUTHWESTERN BLVD PS
SITE
Legend
ECSD Sewerline
Maintenance Sewerline
Other Sewerline
Outfall
Relief
Siphon
Effluent Path
0
600
1,200
2,400
3,600
4,800
Feet


Erie County Sewers District 3
Downstream Capacity Analysis
For 4825 Parker Road
CD817
CD818
CD819
CD81A
CD81B
CD81C
CD81D
CEF55
CEF54
CEF1C
CEF1B
CEF1A
CEF19
CEF18
CEF20
CEF21
CEF1F
CEF1E
CEF1D
CEF2A
CEF29
CEF26
CEF25
CEF24
CEF23
CEF22
CEF27
145
Burke Parkway
Mckinley Parkway
Big Tree Road
Big Tree Road
Burke Parkway
Western Boulevard
Node 1: Monitor the sewerline along the effluent path upstream from MH CEF19 (Verify pipe size.)
Legend
ECSD Sewerline
Maintenance Sewerline
Other Sewerline
Outfall
Relief
Siphon
Effluent Path
0 55 110 220 330 440 Feet
N
S
E
W


Erie County Sewers District 3
Downstream Capacity Analysis
For 4825 Parker Road
CF13B
CF13D
CF13E
CF13F
CF135
CF146
Emerling Drive
CF14B
Dickens Road
CF145
CF144
CF143
CF140
CF141
CF134
CF137
Dolphin Drive
CF133
CF132
CF14A
CF149
CF12D
CF12E
CF12F
Bethford Drive
Milestrip Road
CD7EA
CD7EB
CD7EC
CD7ED
119
1928C0
571
Unnamed Street
Milestrip Road
CF12C
Node 2: Monitor the sewerline along the effluent path upstream from MH CD7EC (Verify pipe size.)
Driveway Entrance
Driveway Exit
CF19D
1980
Parking Lot
CF1A4
Legend
ECSD Sewerline
Maintenance Sewerline
Other Sewerline
Outfall
Relief
Siphon
Effluent Path
0 62.5 125 250 375 500 Feet


Erie County Sewers District 3
Downstream Capacity Analysis
For 4825 Parker Road
Node 3: Monitor the sewerline along the effluent path upstream from MH CD6AC (Verify pipe size.)
CD6AC
CD6B0
CF1CD
CF1CC
CD6B3
CD6B6
1991BF
CF1CA
CF1CB
CF1C9
CF1CE
CD6AB
1991C0
CD6B7
CF1C8
CF1C7
CF1CF
CF1D0
CF1C5
CF1C6
1991C1
CD6BA
CD6BC
CF1D1
CF1D2
CF1C4
CF1D4
CF1D3
CF1D7
CF1E7
CF1E6
CF1E5
CF1E4
CF1E3
CF1E2
CF1E0
152
151
Mckinley Parkway
Unnamed Street
Driveway
Driveway
Clearview Way
Lyth Road
Dorothy Place
42"
0.43
0.53
0.39
0.27
0.27
0.32
0.31
0.3
30"
0.33
3.3
1.65
1.48
2.26
2.68
2.5
2.75
0.4
0.4
1.07
1.2
1.9
54"
Legend
ECSD Sewerline
Maintenance Sewerline
Other Sewerline
Outfall
Relief
Siphon
Effluent Path
0 62.5 125 250 375 500
Feet
N
W
E
S

COUNTY OF ERIE

MARK C. POLONCARZ
COUNTY EXECUTIVE
DEPARTMENT OF ENVIRONMENT & PLANNING

THOMAS R. HERSEY, JR.
COMMISSIONER

JOSEPH L. FIEGL, P.E.
DEPUTY COMMISSIONER

December 18, 2020

Rami Herzellah, EIT
Carmina Wood Morris
487 Main St., Suite 500
Buffalo, NY 14203

RE: Erie County Sewer District No. 3 (ECSD #3) – DSCA Review
4825 Parker Road, near Route 20A in the Town of Hamburg

Dear Mr. Herzellah,

The Erie County Department of Environment and Planning - Division of Sewerage Management (ECDEP-DSM) reviewed the Downstream Capacity Analysis (DSCA) submitted for the above mentioned project in the Town of Hamburg and concurs with your analysis that there is sufficient capacity in the system for the proposed peak flow of approximately 92,000 gallons per day.

The required I&I remedial work for this development is 9 lateral replacements.

The DSM will forward the Engineer's Certification and this letter to the Health Department during the coordinated review process.

The DSCA verifies capacity in the ECSD #3 collection system. This letter does not constitute approval or disapproval of this project. If not already done, please submit for review and approval the Sanitary Sewer Plans and Engineer's Report to Matt Salah, P.E., ECDEP-DSM, 95 Franklin Street, Room 1034, Buffalo, NY 14202.

Please contact me with any questions or concerns at (716) 858-6586.

Sincerely,

Christopher Fiume
Assistant Sanitary Engineer

cc: M. Salah / 3.2.5.Capacity Analysis
Camie Jarrell, P.E. (GHD, Town Engineer)

Water Demand Calculations

CARMINA WOOD DESIGN
487 MAIN STREET, SUITE 500
BUFFALO, NEW YORK, 14203
(716) 842-3165
FAX (716) 842-0263

Project No.: 19.241 Date: 1/24/2024
Project Name: Parker Road Subdivision
Project Address: Parker Road, Hamburg, NY 14075
Subject: Sanitary Sewage Calculations
Sheet: 1 of 1

Domestic Water Demand Calculations:

Milestrip Road Subdivision Typical Demand:

Q = 59 Units @ 400 GPD = 23,600 GPD Typical Depmand

Q = 16.39 gpm * assume 24 hour day

Milestrip Road Subdivision Peak Demand:

Q_{peak} = 59 Units @ 3 gpm = 177 gpm Peak Demand
* use 3 gpm per unit (per ECDOH peak flow)

Headlosses:

Q_{peak} = 177.0 gpm
Pipe = 8 inch ACP C = 140
Length = 2,300 LF (approx. distance from Prop. hyd to hyd G18-HO4)

$$H_L = \frac{10.44\ L\ Q^{1.85}}{C^{1.85}\ D^{4.866}} = \frac{10.44(2300)(177)^{1.85}}{(140)^{1.85}\ (8)^{4.866}} = 1.49 \text{ ft} = 0.65 \text{ psi}$$

Δ elev = -6 ft = -2.60 psi *approximate 6' elev. decrease between ex. Hydrant and prop. Hyrdrant
Total Losses = -1.95 psi
Static Pressure = 60 psi *per ECWA
Residual Pressure in main @ furthest ex. hyd. = 60-(-6.02) = 62.0 psi

CARMINA WOOD DESIGN
487 MAIN STREET, SUITE 500
BUFFALO, NEW YORK, 14203
(716) 842-3165
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Project No.: 19.241 Date: 1/24/2024
Project Name: Parker Road Subdivision
Project Address: Parker Road, Hamburg, NY 14075
Subject: Sanitary Sewage Calculations
Sheet: 1 of 1

Peak Domestic Demand:

Road A

59 Units @ 3 gpm = 177 gpm Peak Domestic Demand

* use 3 gpm per unit (per ECDOH peak flow)

Water Demand Calculations (fire):

Fire Flow, Q	=	1000	gpm		* per ISO Guidelines
Elev. @ ex. residual hyd.	=	744	ft		* estimated
Static pressure @ ex. hyd.	=	80	psi		* per ECWA
Elev. @ connection: ex. hyd	=	733	ft		
Δ elev ex. hyd.	=	11	=	4.76 psi	(positive is decrease in pressure from static) (negative is increase in pressure from static)
Residual pressure @ ex. hyd G18-HO4	=	60.00	psi		* (90 psi per ECWA)
Elev. @ furthest pro. hydrant	=	731	ft		
Δ elev connection point to furthest hydrant	=	-2	=	-0.9 psi	(positive is decrease in pressure from static) (negative is increase in pressure from static)

Find residual at furthest hydrant using fire flow:

Headlosses:

Q_{peak} = 1000 gpm
Pipe = 8 inch C-900 PVC C = 140
Length = 2,300 LF (approx. distance from Prop. hyd to hyd G18-HO4)

$$H_L = \frac{10.44\ L\ Q^{1.85}}{C^{1.85}\ D^{4.866}} = \frac{10.44(2300)(1000)^{1.85}}{(140)^{1.85}\ (8)^{4.866}} = 36.78 \text{ ft} = 15.9 \text{ psi}$$

Residual pressure at furthest pro. Hydrant = Static pressure at ex. valve G18-HO4 - headloss - Δ elev
= 60.0 - 15.9 - -0.9
= 44.9 psi

Find residual at furthest hydrant using total flow:

Total flow = Fire Flow + Peak Domestic Flow = 1177 gpm

Headlosses:

Q_{peak} = 1177 gpm
Pipe = 8 inch C-900 PVC C = 140
Length = 2,300 LF (approx. distance from Prop. hyd to ex. hyd)

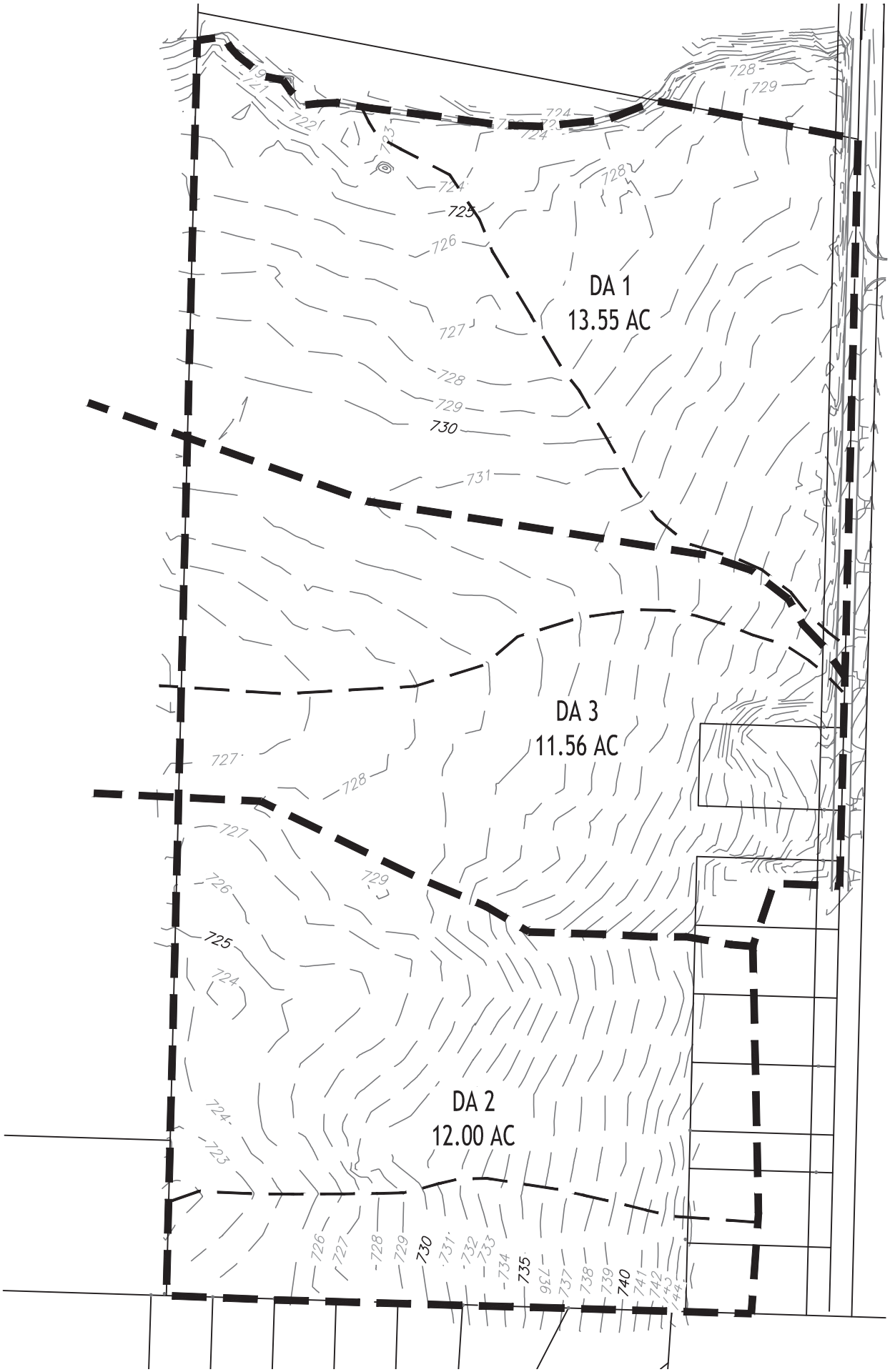
$$H_L = \frac{10.44\ L\ Q^{1.85}}{C^{1.85}\ D^{4.866}} = \frac{10.44(2300)(1177)^{1.85}}{(140)^{1.85}\ (8)^{4.866}} = 49.73 \text{ ft} = 21.5 \text{ psi}$$

Residual pressure at furthest pro. Hydrant = Static pressure at ex. valve G18-HO4 - headloss - Δ elev
= 60.0 - 21.5 - -0.9
= 39.3 psi

Appendix B

Storm System Drainage Calculations

Existing Runoff



PRE-DEVELOPMENT DRAINAGE MAP

SCALE: 1"=200'

NOTE: BOUNDARY AND TOPOGRAPHIC INFORMATION PROVIDED BY OTHERS, CARMINA WOOD DESIGN, D.P.C. ASSUMES NO RESPONSIBILITY FOR ITS ACCURACY.

200' 200 0 200 400Ft.

Subcat Reach Pond Link

Routing Diagram for 19.241 HYDROLOGY - PONDS COMBINED
Prepared by Carmina Wood Morris, PC, Printed 1/24/2024

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-YEAR	Type II 24-hr		Default	24.00	1	1.90	2
2	10-YEAR	Type II 24-hr		Default	24.00	1	3.46	2
3	25-YEAR	Type II 24-hr		Default	24.00	1	4.18	2
4	100-YEAR	Type II 24-hr		Default	24.00	1	5.30	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
35.060	89	Row crops, straight row, Good, HSG D (1S, 2S, 3S)
2.050	77	Woods, Good, HSG D (1S, 2S, 3S)
37.110	**88**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
37.110	HSG D	1S, 2S, 3S
0.000	Other	
37.110		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	35.060	0.000	35.060	Row crops, straight row, Good	1S, 2S, 3S
0.000	0.000	0.000	2.050	0.000	2.050	Woods, Good	1S, 2S, 3S
0.000	**0.000**	**0.000**	**37.110**	**0.000**	**37.110**	**TOTAL AREA**	

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: DA 1 PRE Runoff Area=13.550 ac 0.00% Impervious Runoff Depth>0.81"
Flow Length=1,070' Tc=16.0 min CN=88 Runoff=14.88 cfs 0.914 af

Subcatchment2S: DA 2 PRE Runoff Area=12.000 ac 0.00% Impervious Runoff Depth>0.81"
Flow Length=970' Tc=15.2 min CN=88 Runoff=13.50 cfs 0.810 af

Subcatchment3S: DA 3 PRE Runoff Area=11.560 ac 0.00% Impervious Runoff Depth>0.87"
Flow Length=1,050' Tc=15.8 min CN=89 Runoff=13.67 cfs 0.835 af

Total Runoff Area = 37.110 ac Runoff Volume = 2.559 af Average Runoff Depth = 0.83"
100.00% Pervious = 37.110 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: DA 1 PRE

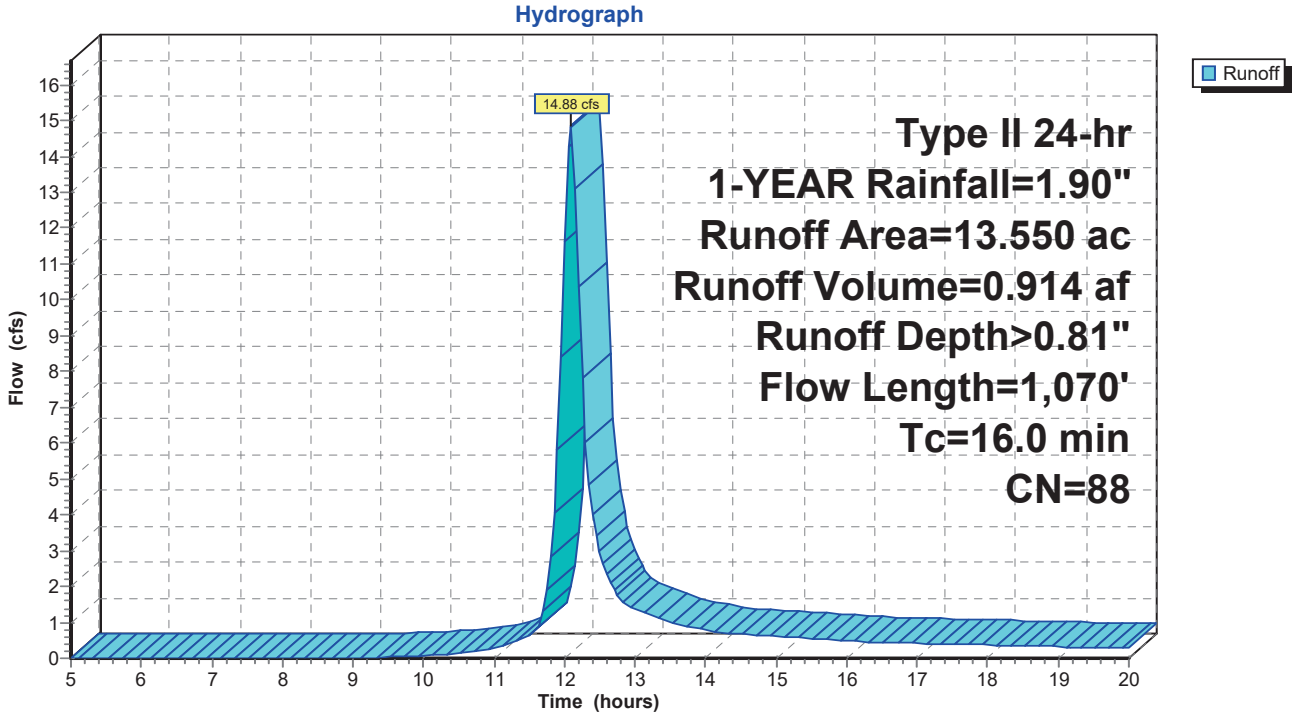
Runoff = 14.88 cfs @ 12.09 hrs, Volume= 0.914 af, Depth> 0.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-YEAR Rainfall=1.90"

Area (ac)	CN	Description
12.750	89	Row crops, straight row, Good, HSG D
0.800	77	Woods, Good, HSG D
13.550	88	Weighted Average
13.550		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	100	0.0500	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"
8.2	970	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.0	1,070	Total			

Subcatchment 1S: DA 1 PRE



Summary for Subcatchment 2S: DA 2 PRE

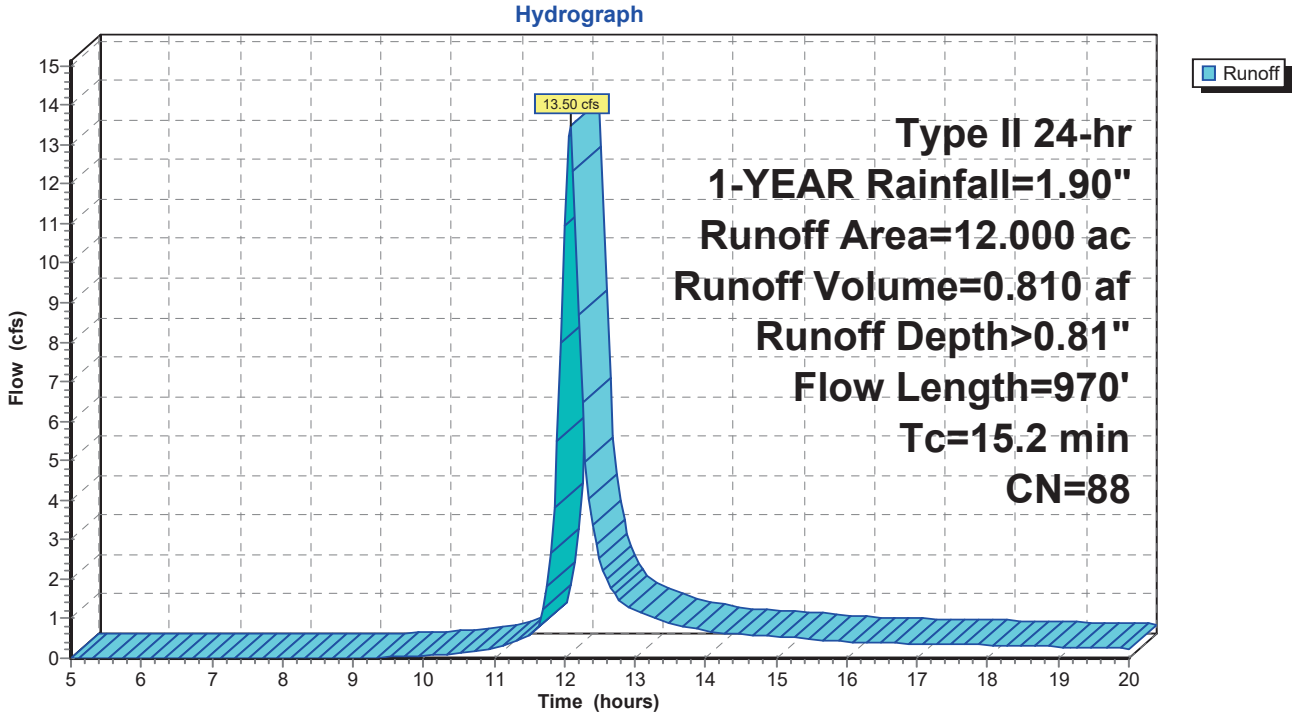
Runoff = 13.50 cfs @ 12.08 hrs, Volume= 0.810 af, Depth> 0.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-YEAR Rainfall=1.90"

Area (ac)	CN	Description
11.200	89	Row crops, straight row, Good, HSG D
0.800	77	Woods, Good, HSG D
12.000	88	Weighted Average
12.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	100	0.0500	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"
7.4	870	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
15.2	970	Total			

Subcatchment 2S: DA 2 PRE



Summary for Subcatchment 3S: DA 3 PRE

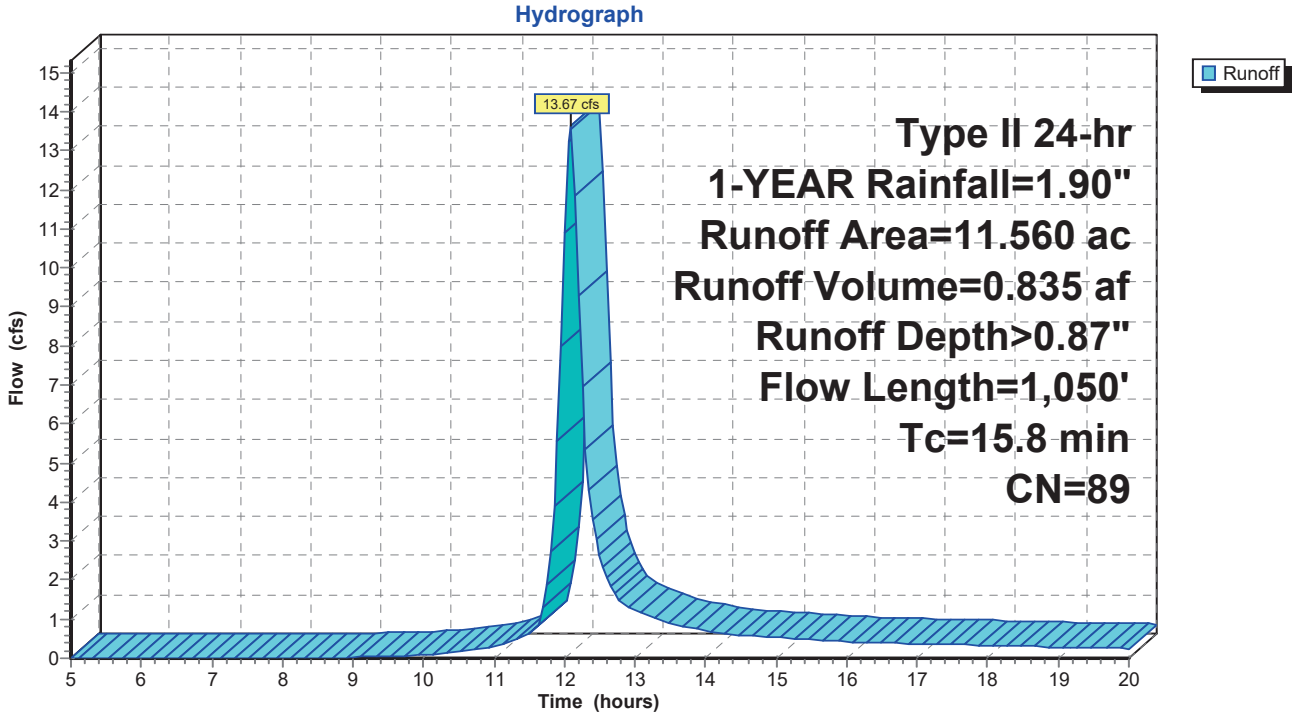
Runoff = 13.67 cfs @ 12.08 hrs, Volume= 0.835 af, Depth> 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-YEAR Rainfall=1.90"

Area (ac)	CN	Description
11.110	89	Row crops, straight row, Good, HSG D
0.450	77	Woods, Good, HSG D
11.560	89	Weighted Average
11.560		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	100	0.0500	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"
8.0	950	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
15.8	1,050	Total			

Subcatchment 3S: DA 3 PRE



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: DA 1 PRE Runoff Area=13.550 ac 0.00% Impervious Runoff Depth>2.07"
Flow Length=1,070' Tc=16.0 min CN=88 Runoff=37.32 cfs 2.340 af

Subcatchment2S: DA 2 PRE Runoff Area=12.000 ac 0.00% Impervious Runoff Depth>2.07"
Flow Length=970' Tc=15.2 min CN=88 Runoff=33.89 cfs 2.073 af

Subcatchment3S: DA 3 PRE Runoff Area=11.560 ac 0.00% Impervious Runoff Depth>2.16"
Flow Length=1,050' Tc=15.8 min CN=89 Runoff=33.13 cfs 2.079 af

Total Runoff Area = 37.110 ac Runoff Volume = 6.492 af Average Runoff Depth = 2.10"
100.00% Pervious = 37.110 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: DA 1 PRE

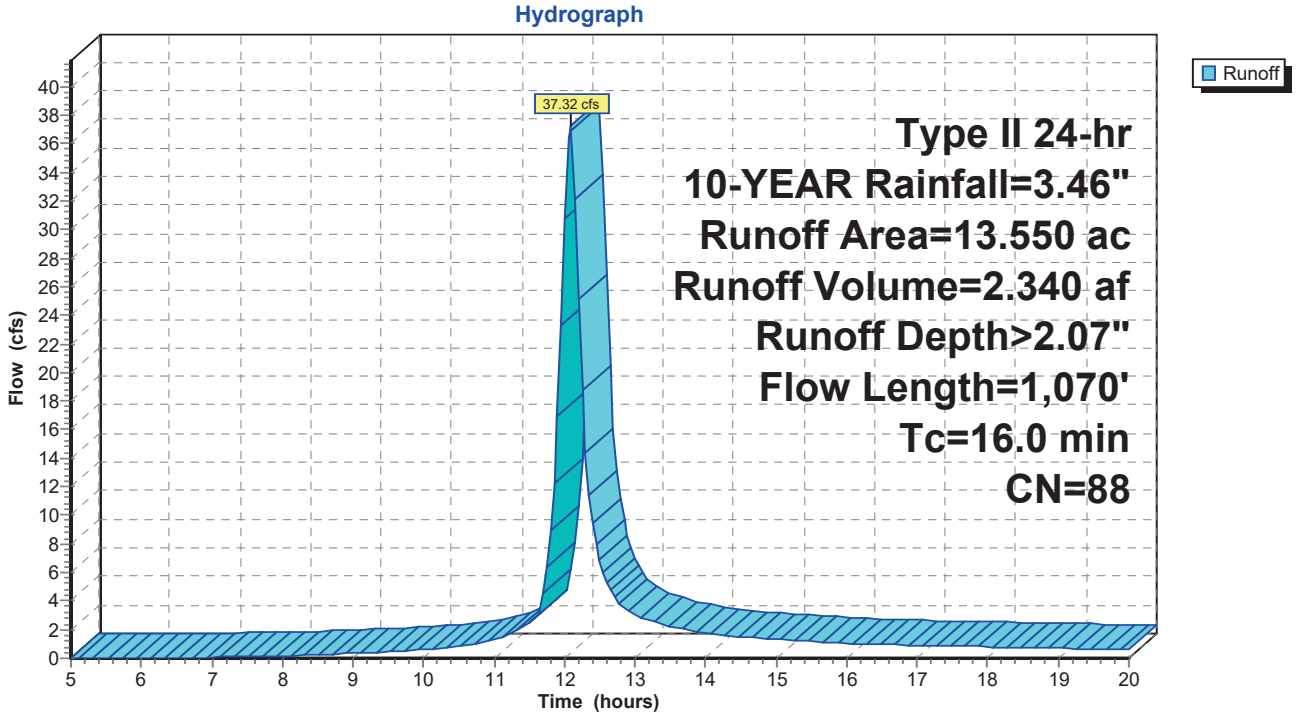
Runoff = 37.32 cfs @ 12.08 hrs, Volume= 2.340 af, Depth> 2.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-YEAR Rainfall=3.46"

Area (ac)	CN	Description
12.750	89	Row crops, straight row, Good, HSG D
0.800	77	Woods, Good, HSG D
13.550	88	Weighted Average
13.550		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	100	0.0500	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"
8.2	970	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.0	1,070	Total			

Subcatchment 1S: DA 1 PRE



Summary for Subcatchment 2S: DA 2 PRE

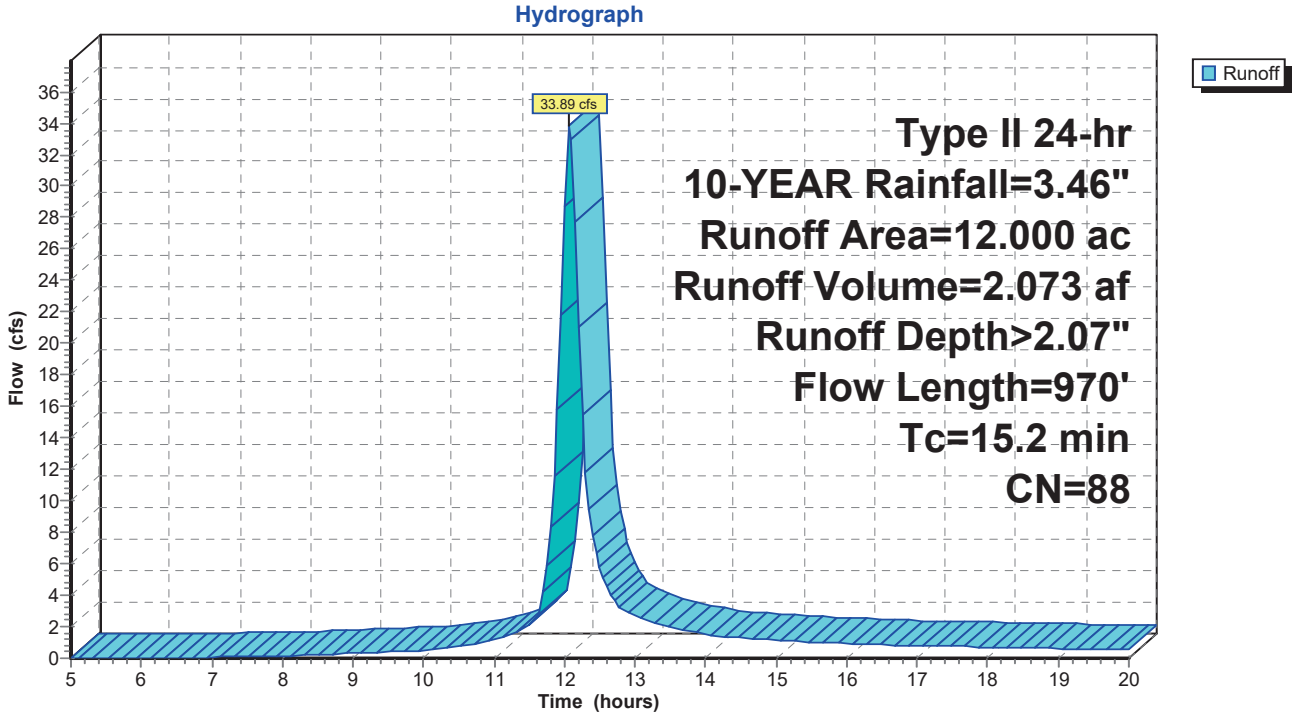
Runoff = 33.89 cfs @ 12.07 hrs, Volume= 2.073 af, Depth> 2.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-YEAR Rainfall=3.46"

Area (ac)	CN	Description
11.200	89	Row crops, straight row, Good, HSG D
0.800	77	Woods, Good, HSG D
12.000	88	Weighted Average
12.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	100	0.0500	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"
7.4	870	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
15.2	970	Total			

Subcatchment 2S: DA 2 PRE



Summary for Subcatchment 3S: DA 3 PRE

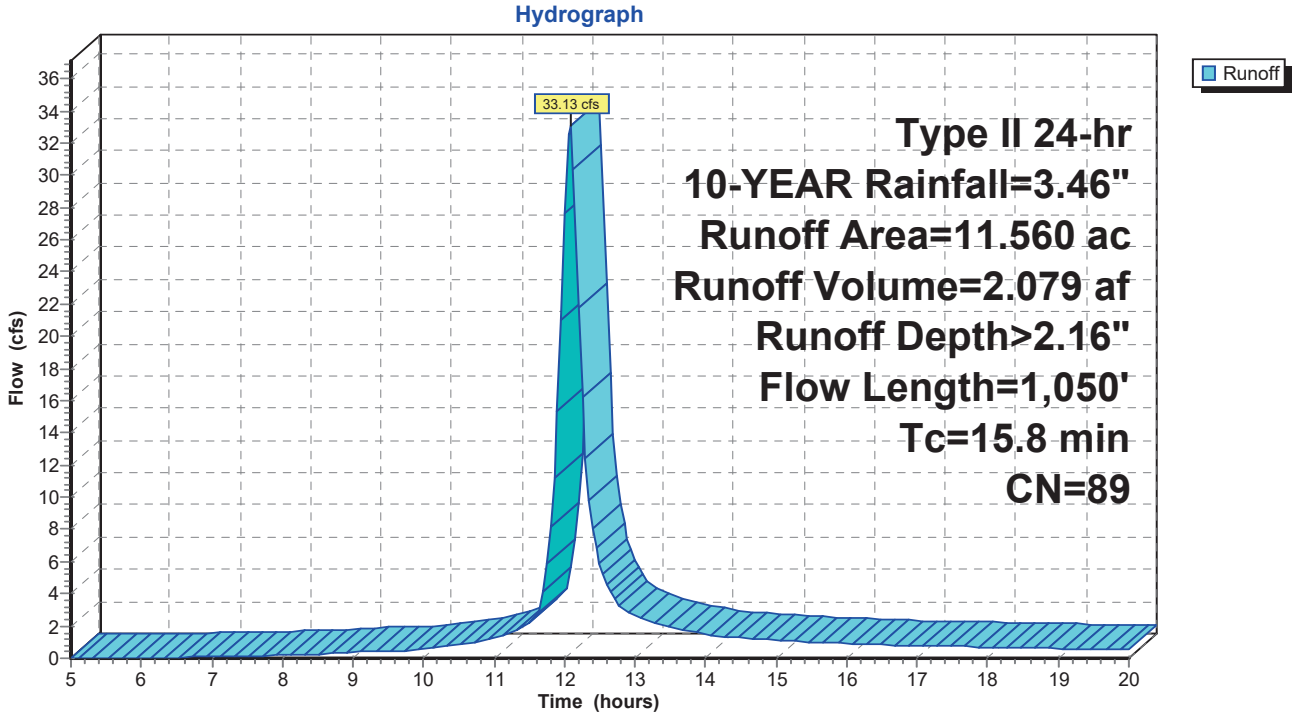
Runoff = 33.13 cfs @ 12.08 hrs, Volume= 2.079 af, Depth> 2.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-YEAR Rainfall=3.46"

Area (ac)	CN	Description
11.110	89	Row crops, straight row, Good, HSG D
0.450	77	Woods, Good, HSG D
11.560	89	Weighted Average
11.560		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	100	0.0500	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"
8.0	950	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
15.8	1,050	Total			

Subcatchment 3S: DA 3 PRE



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: DA 1 PRE Runoff Area=13.550 ac 0.00% Impervious Runoff Depth>2.70"
Flow Length=1,070' Tc=16.0 min CN=88 Runoff=48.01 cfs 3.047 af

Subcatchment2S: DA 2 PRE Runoff Area=12.000 ac 0.00% Impervious Runoff Depth>2.70"
Flow Length=970' Tc=15.2 min CN=88 Runoff=43.60 cfs 2.699 af

Subcatchment3S: DA 3 PRE Runoff Area=11.560 ac 0.00% Impervious Runoff Depth>2.79"
Flow Length=1,050' Tc=15.8 min CN=89 Runoff=42.35 cfs 2.690 af

Total Runoff Area = 37.110 ac Runoff Volume = 8.435 af Average Runoff Depth = 2.73"
100.00% Pervious = 37.110 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: DA 1 PRE

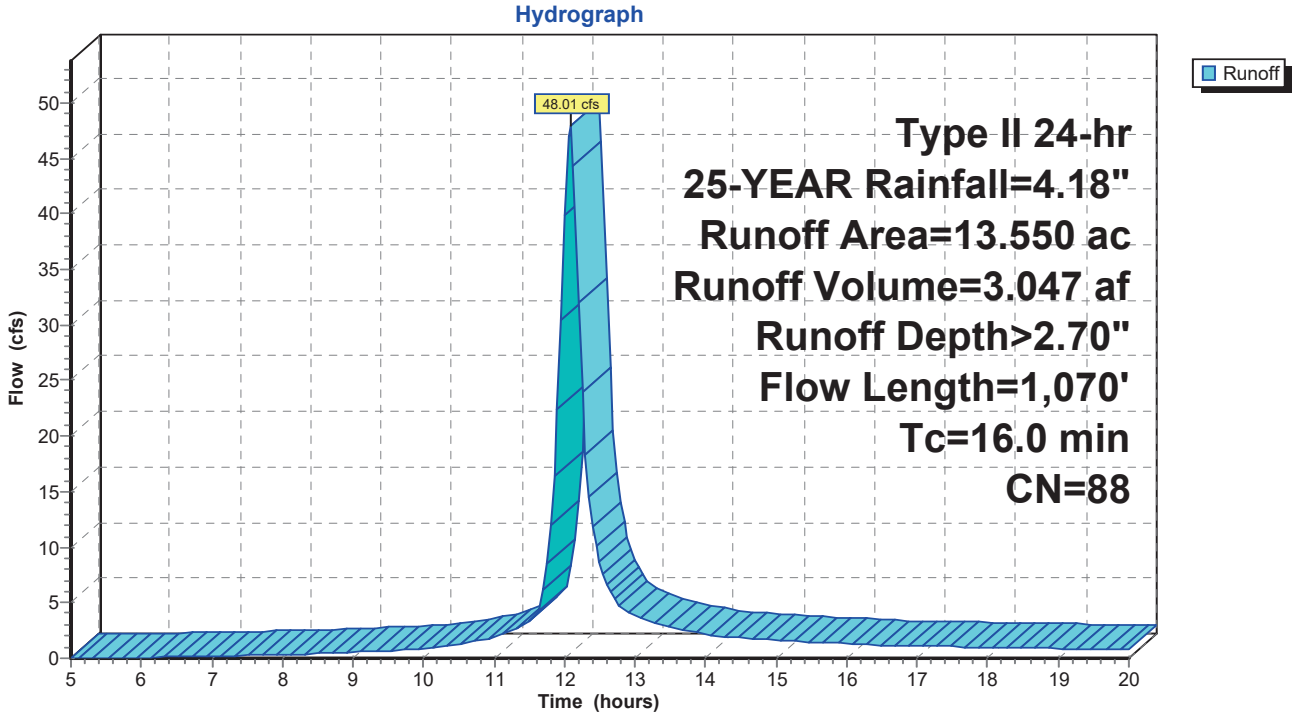
Runoff = 48.01 cfs @ 12.08 hrs, Volume= 3.047 af, Depth> 2.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-YEAR Rainfall=4.18"

Area (ac)	CN	Description
12.750	89	Row crops, straight row, Good, HSG D
0.800	77	Woods, Good, HSG D
13.550	88	Weighted Average
13.550		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	100	0.0500	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"
8.2	970	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.0	1,070	Total			

Subcatchment 1S: DA 1 PRE



Summary for Subcatchment 2S: DA 2 PRE

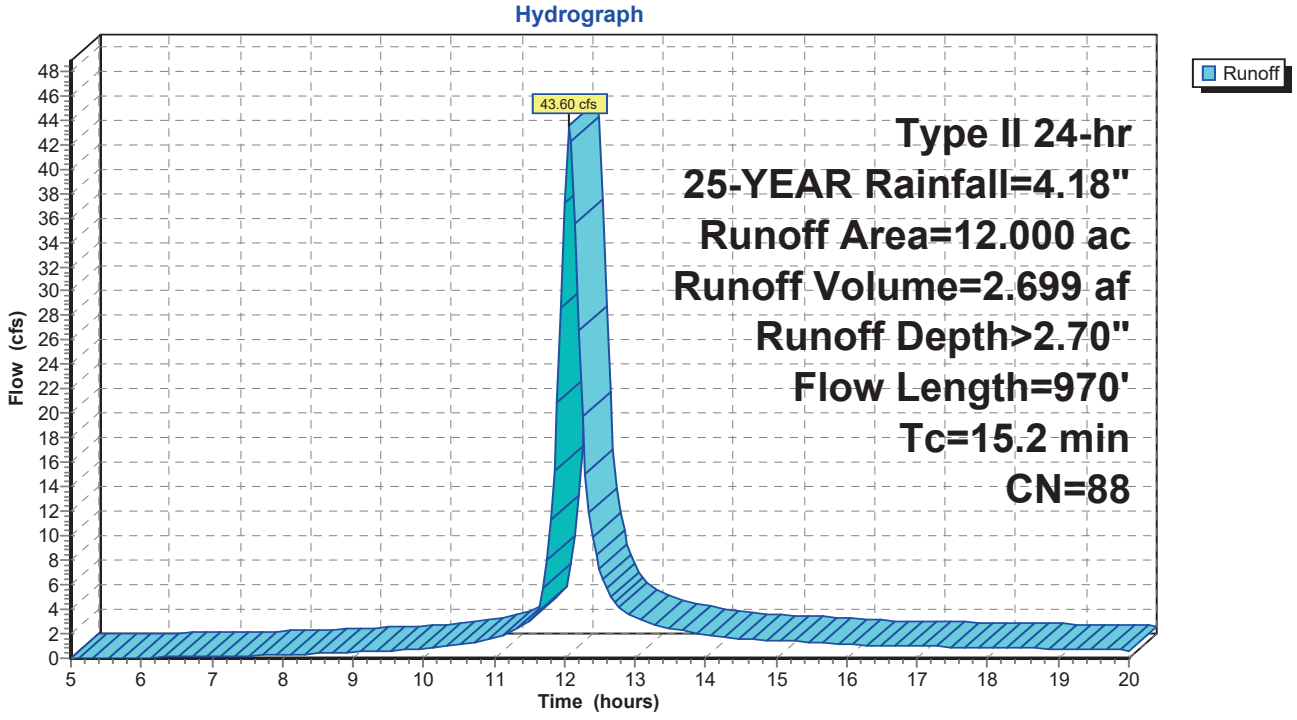
Runoff = 43.60 cfs @ 12.07 hrs, Volume= 2.699 af, Depth> 2.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-YEAR Rainfall=4.18"

Area (ac)	CN	Description
11.200	89	Row crops, straight row, Good, HSG D
0.800	77	Woods, Good, HSG D
12.000	88	Weighted Average
12.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	100	0.0500	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"
7.4	870	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
15.2	970	Total			

Subcatchment 2S: DA 2 PRE



Summary for Subcatchment 3S: DA 3 PRE

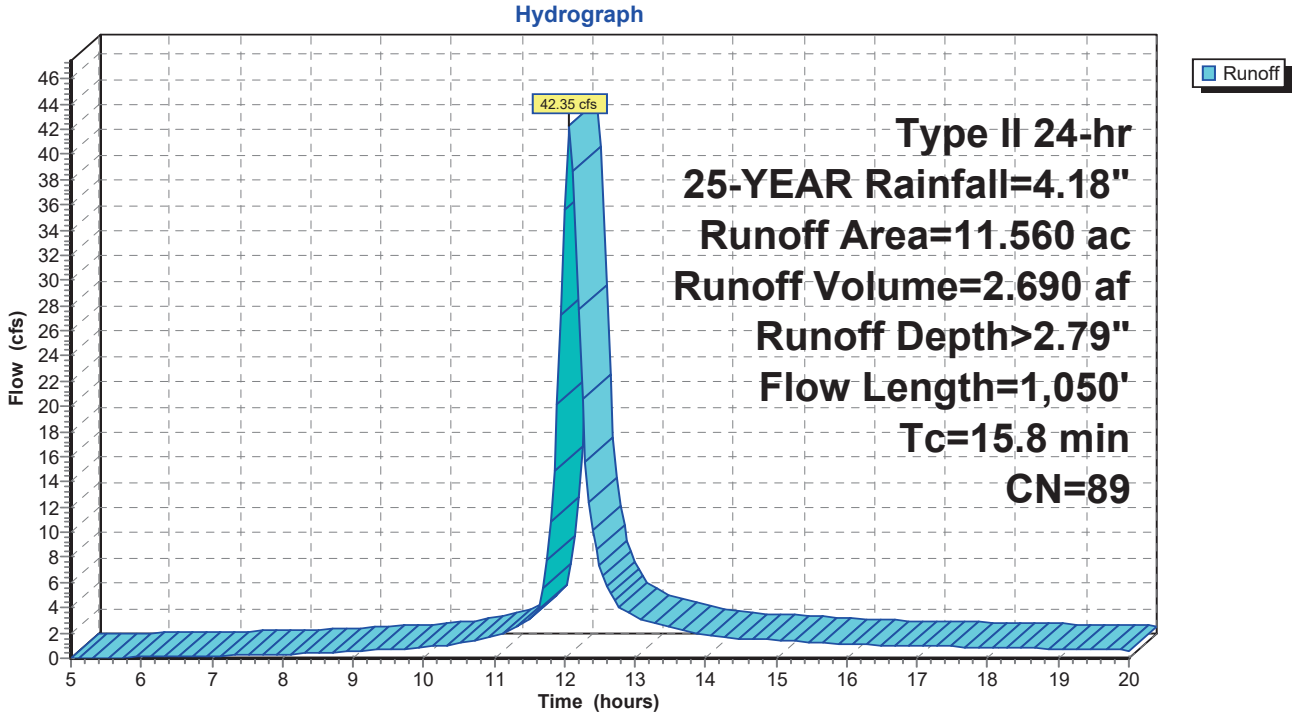
Runoff = 42.35 cfs @ 12.07 hrs, Volume= 2.690 af, Depth> 2.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-YEAR Rainfall=4.18"

Area (ac)	CN	Description
11.110	89	Row crops, straight row, Good, HSG D
0.450	77	Woods, Good, HSG D
11.560	89	Weighted Average
11.560		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	100	0.0500	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"
8.0	950	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
15.8	1,050	Total			

Subcatchment 3S: DA 3 PRE



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: DA 1 PRE Runoff Area=13.550 ac 0.00% Impervious Runoff Depth>3.70"
Flow Length=1,070' Tc=16.0 min CN=88 Runoff=64.69 cfs 4.174 af

Subcatchment2S: DA 2 PRE Runoff Area=12.000 ac 0.00% Impervious Runoff Depth>3.70"
Flow Length=970' Tc=15.2 min CN=88 Runoff=58.73 cfs 3.697 af

Subcatchment3S: DA 3 PRE Runoff Area=11.560 ac 0.00% Impervious Runoff Depth>3.80"
Flow Length=1,050' Tc=15.8 min CN=89 Runoff=56.65 cfs 3.658 af

Total Runoff Area = 37.110 ac Runoff Volume = 11.529 af Average Runoff Depth = 3.73"
100.00% Pervious = 37.110 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: DA 1 PRE

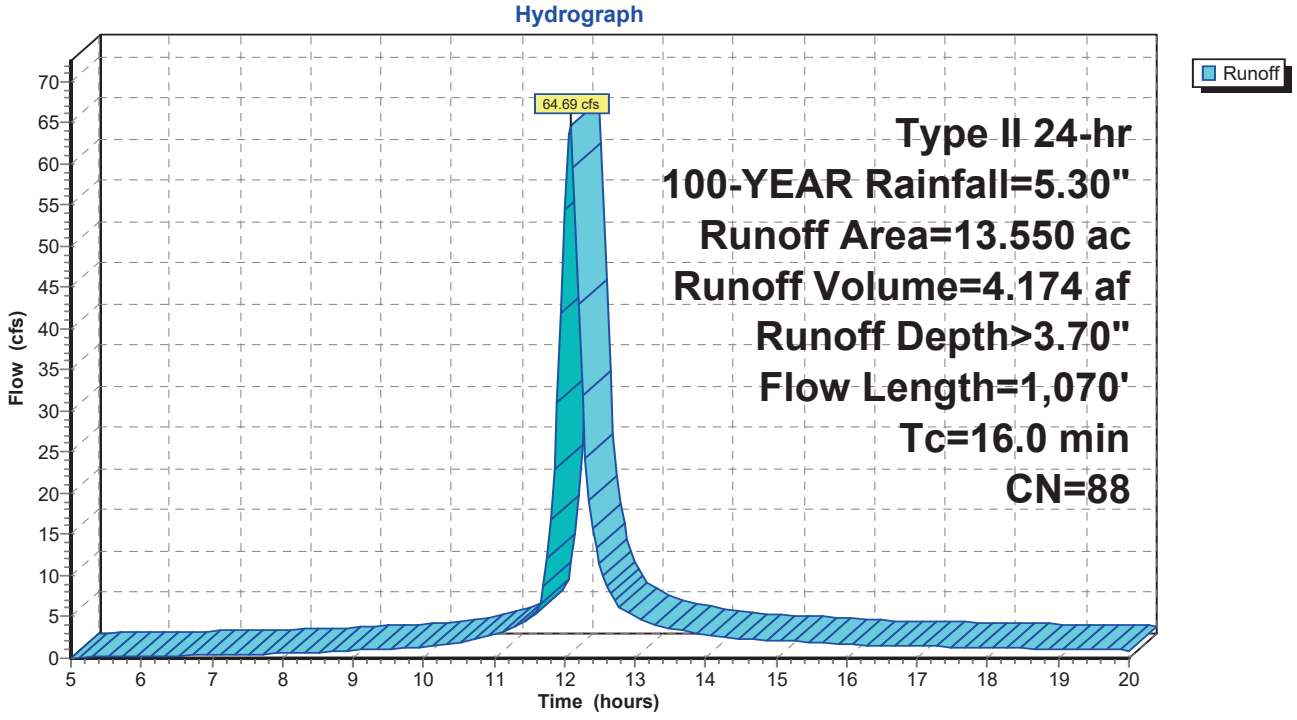
Runoff = 64.69 cfs @ 12.08 hrs, Volume= 4.174 af, Depth> 3.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-YEAR Rainfall=5.30"

Area (ac)	CN	Description
12.750	89	Row crops, straight row, Good, HSG D
0.800	77	Woods, Good, HSG D
13.550	88	Weighted Average
13.550		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	100	0.0500	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"
8.2	970	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.0	1,070	Total			

Subcatchment 1S: DA 1 PRE



Summary for Subcatchment 2S: DA 2 PRE

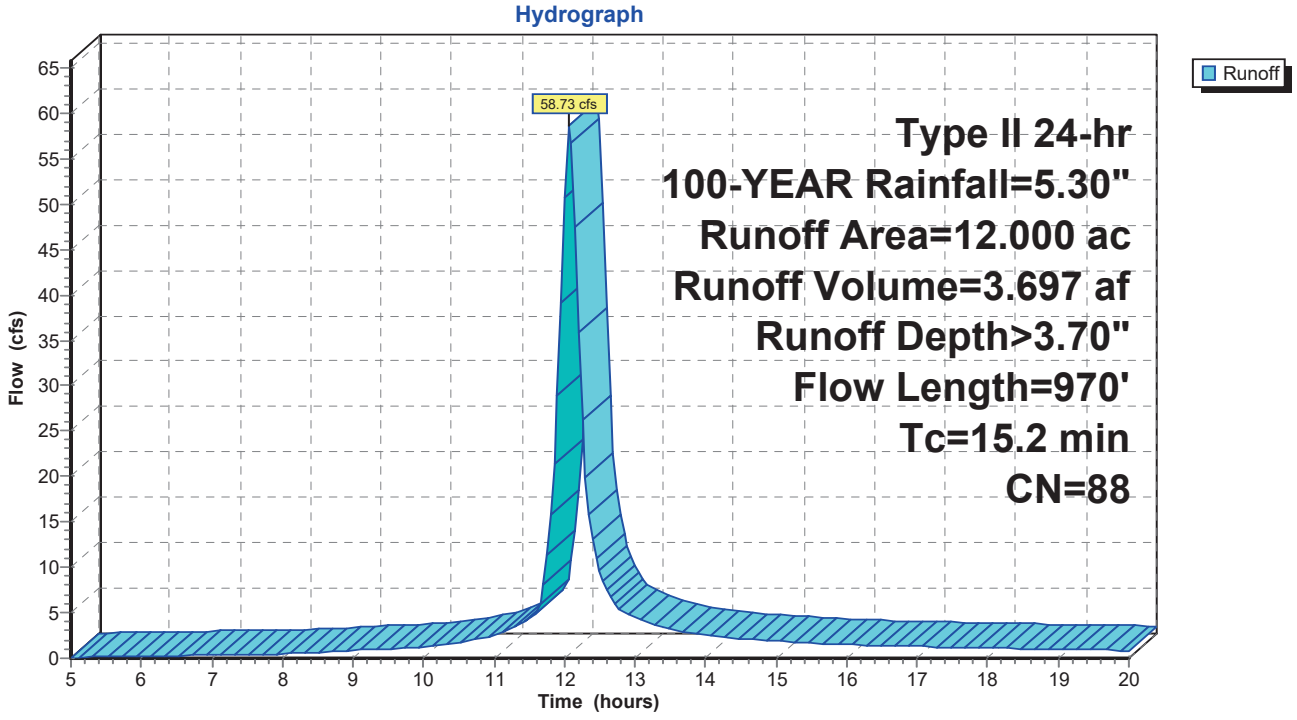
Runoff = 58.73 cfs @ 12.07 hrs, Volume= 3.697 af, Depth> 3.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-YEAR Rainfall=5.30"

Area (ac)	CN	Description
11.200	89	Row crops, straight row, Good, HSG D
0.800	77	Woods, Good, HSG D
12.000	88	Weighted Average
12.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	100	0.0500	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"
7.4	870	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
15.2	970	Total			

Subcatchment 2S: DA 2 PRE



Summary for Subcatchment 3S: DA 3 PRE

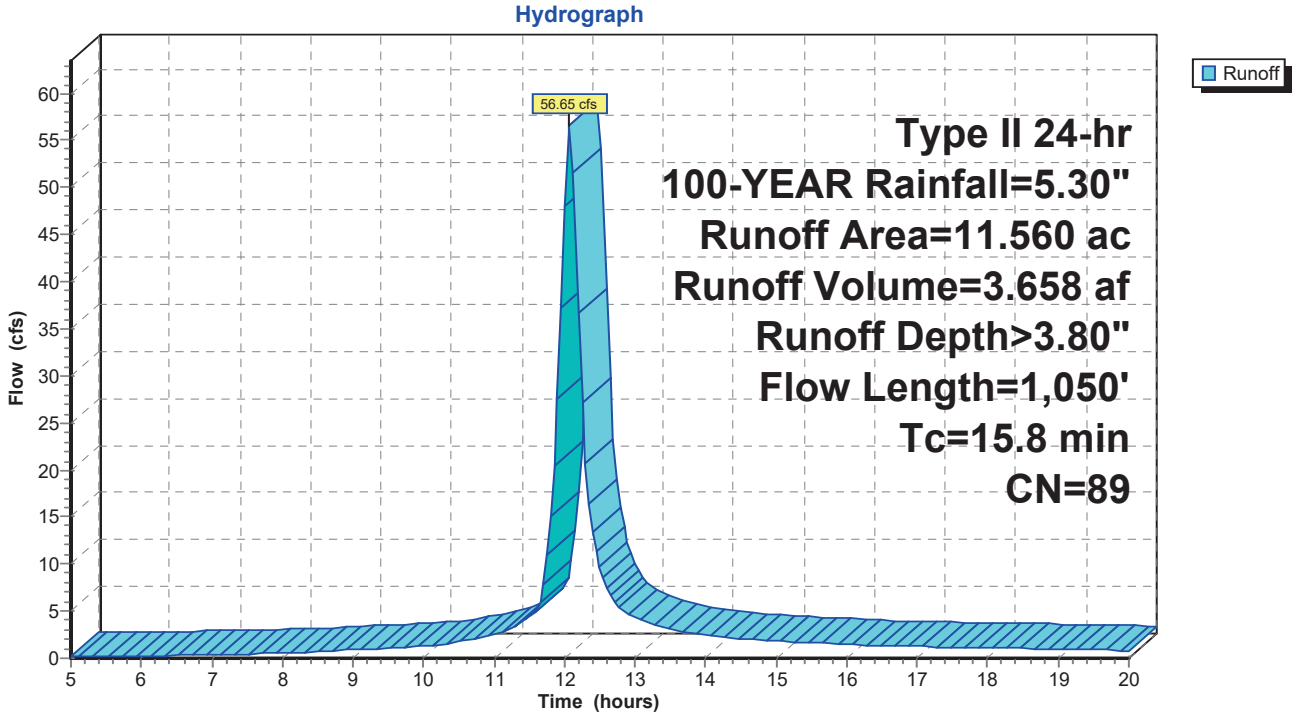
Runoff = 56.65 cfs @ 12.07 hrs, Volume= 3.658 af, Depth> 3.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-YEAR Rainfall=5.30"

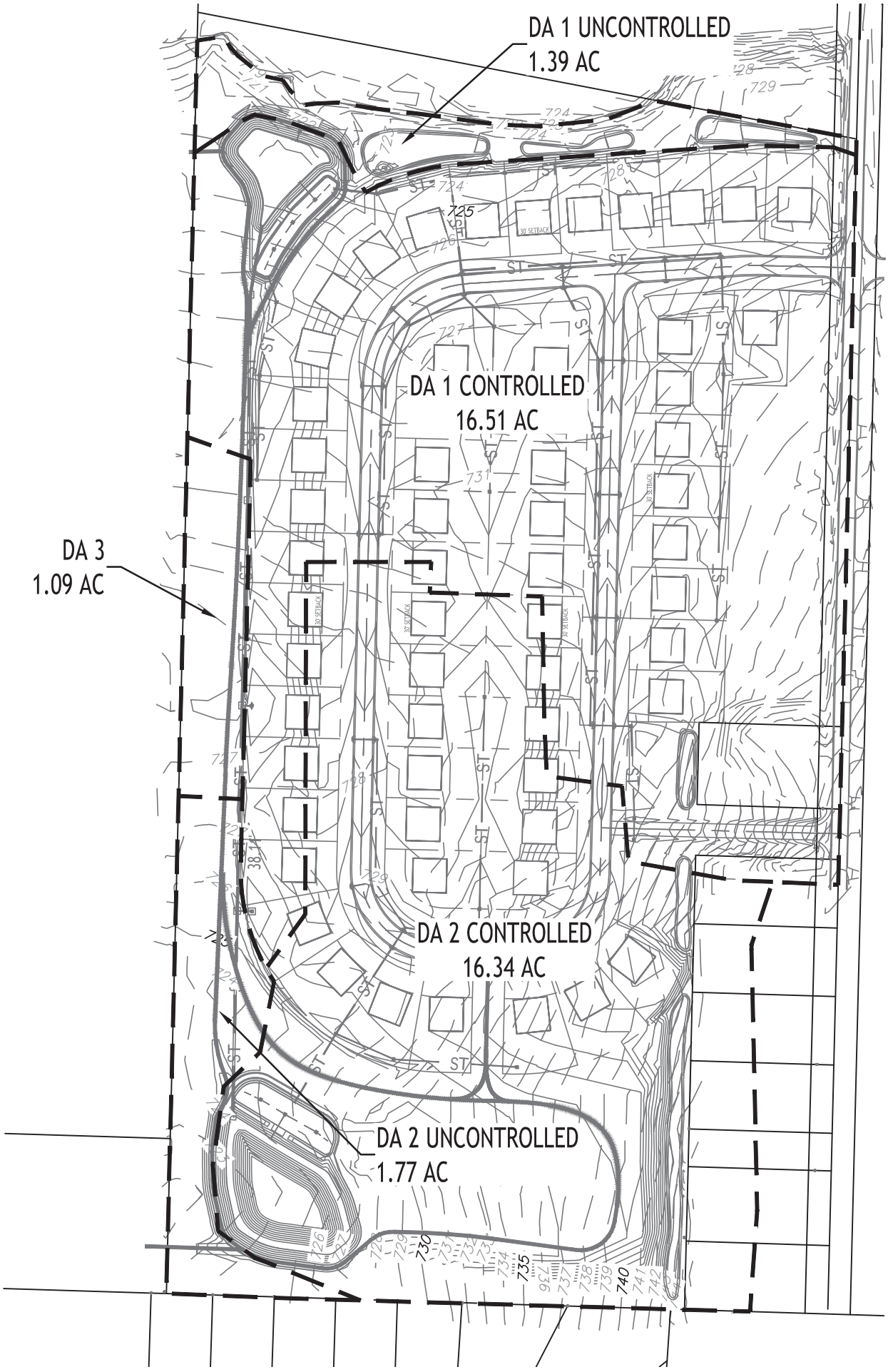
Area (ac)	CN	Description
11.110	89	Row crops, straight row, Good, HSG D
0.450	77	Woods, Good, HSG D
11.560	89	Weighted Average
11.560		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	100	0.0500	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"
8.0	950	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
15.8	1,050	Total			

Subcatchment 3S: DA 3 PRE



Proposed Runoff



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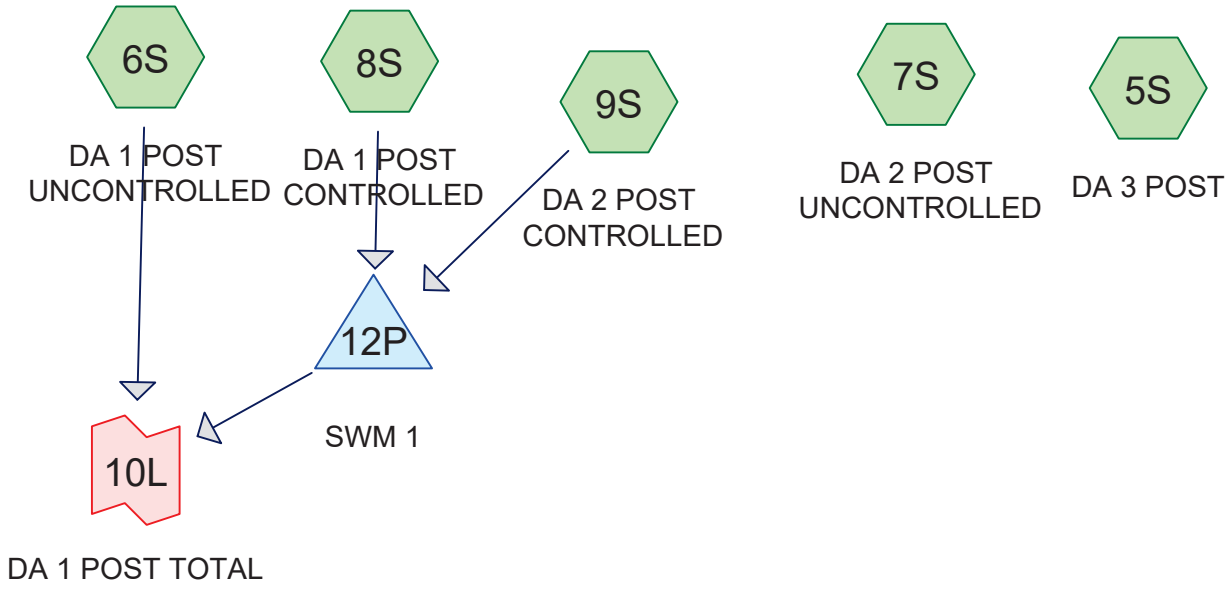
POST-DEVELOPMENT DRAINAGE MAP

SCALE: 1"=200'

NOTE: BOUNDARY AND TOPOGRAPHIC INFORMATION PROVIDED BY OTHERS, CARMINA WOOD DESIGN, D.P.C. ASSUMES NO RESPONSIBILITY FOR ITS ACCURACY.

200' 200 0 200 400Ft.



Subcat Reach Pond Link

Routing Diagram for 19.241 HYDROLOGY - PONDS COMBINED
Prepared by Carmina Wood Morris, PC, Printed 1/24/2024

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-YEAR	Type II 24-hr		Default	24.00	1	1.90	2
2	10-YEAR	Type II 24-hr		Default	24.00	1	3.46	2
3	25-YEAR	Type II 24-hr		Default	24.00	1	4.18	2
4	100-YEAR	Type II 24-hr		Default	24.00	1	5.30	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
32.850	87	1/4 acre lots, 38% imp, HSG D (8S, 9S)
12.430	80	>75% Grass cover, Good, HSG D (5S, 6S, 7S)
2.050	77	Woods, Good, HSG D (5S, 6S, 7S)
47.330	**85**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
47.330	HSG D	5S, 6S, 7S, 8S, 9S
0.000	Other	
47.330		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	32.850	0.000	32.850	1/4 acre lots, 38% imp	8S, 9S
0.000	0.000	0.000	12.430	0.000	12.430	>75% Grass cover, Good	5S, 6S, 7S
0.000	0.000	0.000	2.050	0.000	2.050	Woods, Good	5S, 6S, 7S
0.000	**0.000**	**0.000**	**47.330**	**0.000**	**47.330**	**TOTAL AREA**	

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	8S	0.00	0.00	600.0	0.0050	0.013	0.0	12.0	0.0
2	9S	0.00	0.00	600.0	0.0050	0.013	0.0	12.0	0.0
3	12P	720.50	720.00	50.0	0.0100	0.013	0.0	24.0	0.0
4	12P	721.00	720.60	12.0	0.0333	0.013	0.0	12.0	0.0

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment5S: DA 3 POST Runoff Area=1.090 ac 0.00% Impervious Runoff Depth>0.41"
Flow Length=100' Slope=0.0500 '/' Tc=7.8 min CN=79 Runoff=0.79 cfs 0.038 af

Subcatchment6S: DA 1 POST Runoff Area=1.390 ac 0.00% Impervious Runoff Depth>0.38"
Flow Length=1,070' Tc=16.0 min CN=78 Runoff=0.65 cfs 0.044 af

Subcatchment7S: DA 2 POST Runoff Area=12.000 ac 0.00% Impervious Runoff Depth>0.45"
Flow Length=970' Tc=15.2 min CN=80 Runoff=7.08 cfs 0.447 af

Subcatchment8S: DA 1 POST Runoff Area=16.510 ac 38.00% Impervious Runoff Depth>0.75"
Flow Length=900' Tc=15.9 min CN=87 Runoff=16.94 cfs 1.038 af

Subcatchment9S: DA 2 POST Runoff Area=16.340 ac 38.00% Impervious Runoff Depth>0.75"
Flow Length=900' Tc=15.9 min CN=87 Runoff=16.77 cfs 1.028 af

Pond 12P: SWM 1 Peak Elev=722.33' Storage=47,347 cf Inflow=33.71 cfs 2.066 af
Outflow=3.45 cfs 1.613 af

Link 10L: DA 1 POST TOTAL Inflow=3.55 cfs 1.656 af
Primary=3.55 cfs 1.656 af

Total Runoff Area = 47.330 ac Runoff Volume = 2.594 af Average Runoff Depth = 0.66"
73.63% Pervious = 34.847 ac 26.37% Impervious = 12.483 ac

Summary for Subcatchment 5S: DA 3 POST

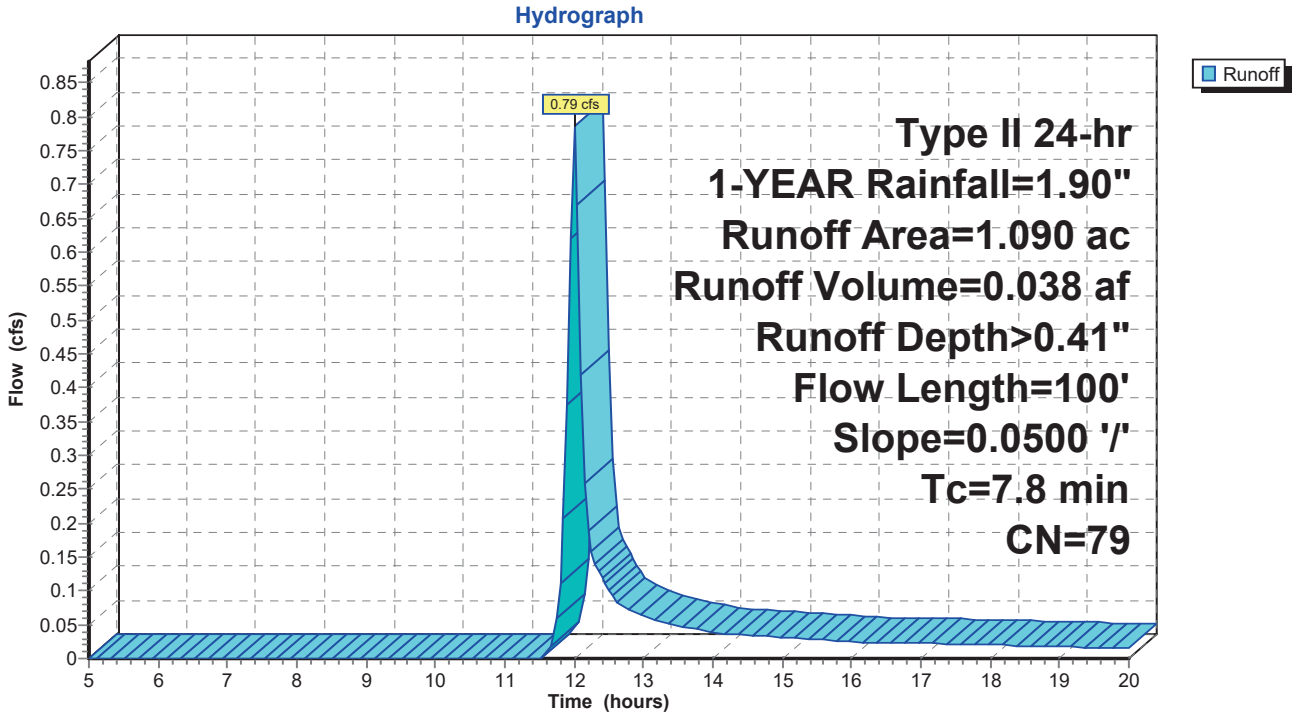
Runoff = 0.79 cfs @ 12.00 hrs, Volume= 0.038 af, Depth> 0.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-YEAR Rainfall=1.90"

Area (ac)	CN	Description
0.640	80	>75% Grass cover, Good, HSG D
0.450	77	Woods, Good, HSG D
1.090	79	Weighted Average
1.090		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	100	0.0500	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"

Subcatchment 5S: DA 3 POST



Summary for Subcatchment 6S: DA 1 POST UNCONTROLLED

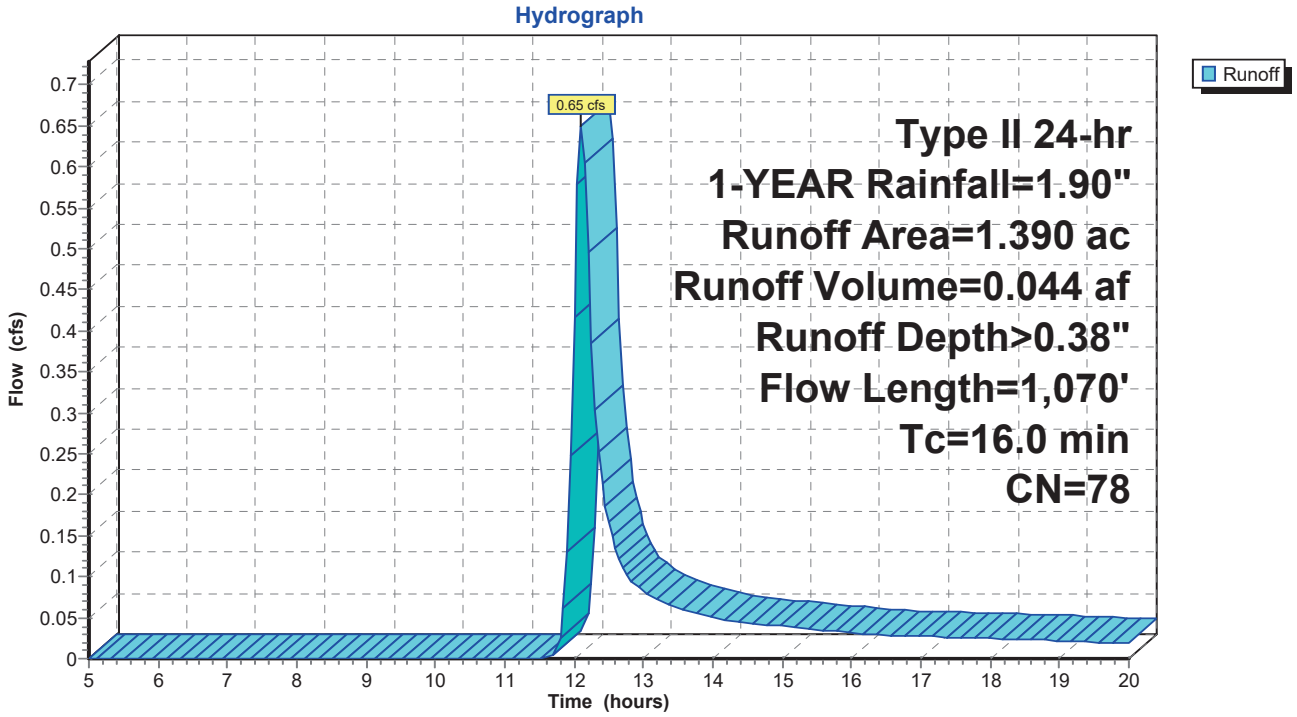
Runoff = 0.65 cfs @ 12.11 hrs, Volume= 0.044 af, Depth> 0.38"
Routed to Link 10L : DA 1 POST TOTAL

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-YEAR Rainfall=1.90"

Area (ac)	CN	Description
0.590	80	>75% Grass cover, Good, HSG D
0.800	77	Woods, Good, HSG D
1.390	78	Weighted Average
1.390		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	100	0.0500	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"
8.2	970	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.0	1,070	Total			

Subcatchment 6S: DA 1 POST UNCONTROLLED



Summary for Subcatchment 7S: DA 2 POST UNCONTROLLED

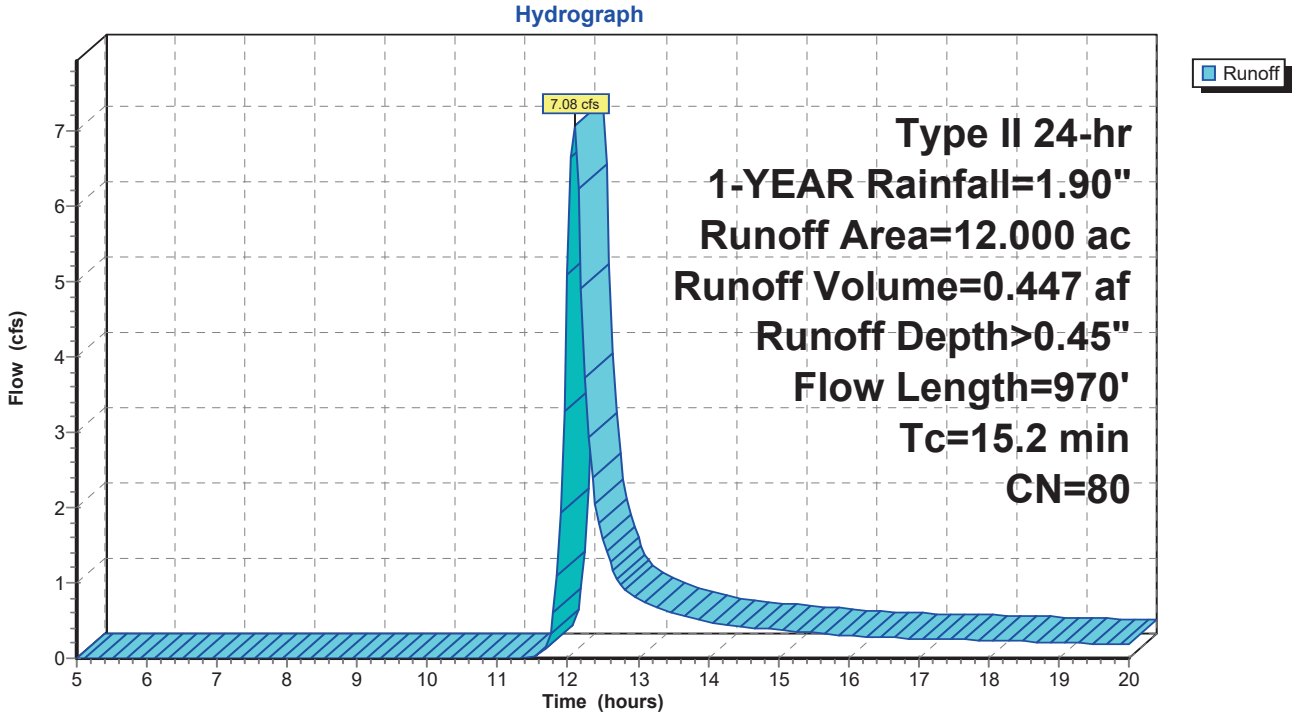
Runoff = 7.08 cfs @ 12.09 hrs, Volume= 0.447 af, Depth> 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-YEAR Rainfall=1.90"

Area (ac)	CN	Description
11.200	80	>75% Grass cover, Good, HSG D
0.800	77	Woods, Good, HSG D
12.000	80	Weighted Average
12.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	100	0.0500	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"
7.4	870	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
15.2	970	Total			

Subcatchment 7S: DA 2 POST UNCONTROLLED



Summary for Subcatchment 8S: DA 1 POST CONTROLLED

[47] Hint: Peak is 673% of capacity of segment #3

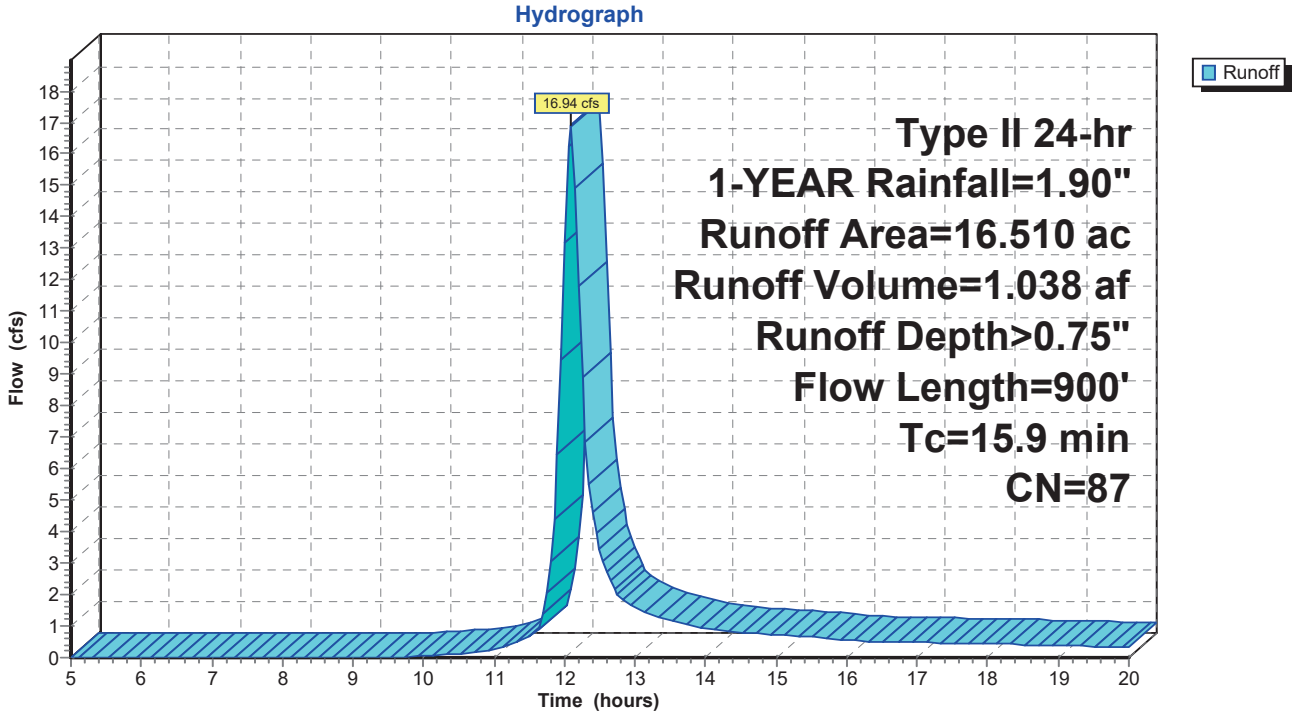
Runoff = 16.94 cfs @ 12.09 hrs, Volume= 1.038 af, Depth> 0.75"
Routed to Pond 12P : SWM 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-YEAR Rainfall=1.90"

Area (ac)	CN	Description
16.510	87	1/4 acre lots, 38% imp, HSG D
10.236		62.00% Pervious Area
6.274		38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	100	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"
1.5	200	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.1	600	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
15.9	900	Total			

Subcatchment 8S: DA 1 POST CONTROLLED



Summary for Subcatchment 9S: DA 2 POST CONTROLLED

[47] Hint: Peak is 666% of capacity of segment #3

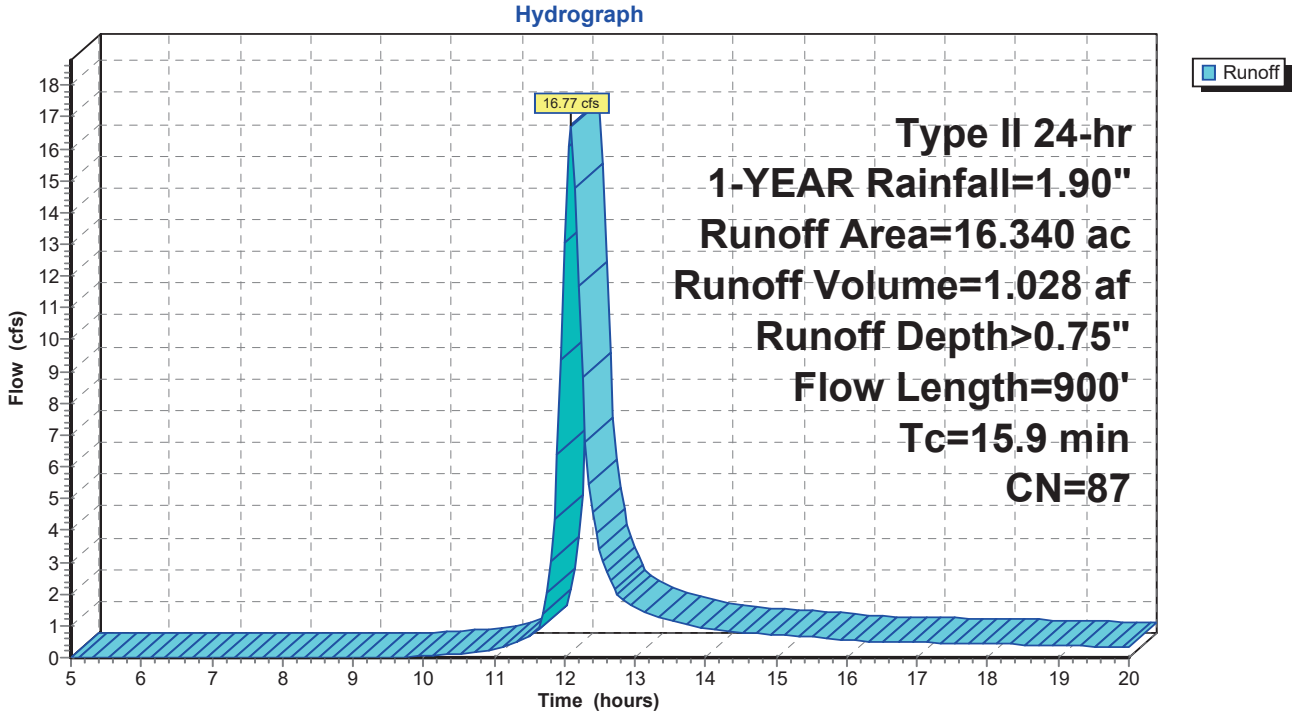
Runoff = 16.77 cfs @ 12.09 hrs, Volume= 1.028 af, Depth> 0.75"
Routed to Pond 12P : SWM 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-YEAR Rainfall=1.90"

Area (ac)	CN	Description
16.340	87	1/4 acre lots, 38% imp, HSG D
10.131		62.00% Pervious Area
6.209		38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	100	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"
1.5	200	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.1	600	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
15.9	900	Total			

Subcatchment 9S: DA 2 POST CONTROLLED



Summary for Pond 12P: SWM 1

Inflow Area = 32.850 ac, 38.00% Impervious, Inflow Depth > 0.75" for 1-YEAR event
Inflow = 33.71 cfs @ 12.09 hrs, Volume= 2.066 af
Outflow = 3.45 cfs @ 12.89 hrs, Volume= 1.613 af, Atten= 90%, Lag= 48.3 min
Primary = 3.45 cfs @ 12.89 hrs, Volume= 1.613 af
Routed to Link 10L : DA 1 POST TOTAL

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 722.33' @ 12.89 hrs Surf.Area= 37,713 sf Storage= 47,347 cf

Plug-Flow detention time= 177.7 min calculated for 1.613 af (78% of inflow)
Center-of-Mass det. time= 118.7 min (921.3 - 802.6)

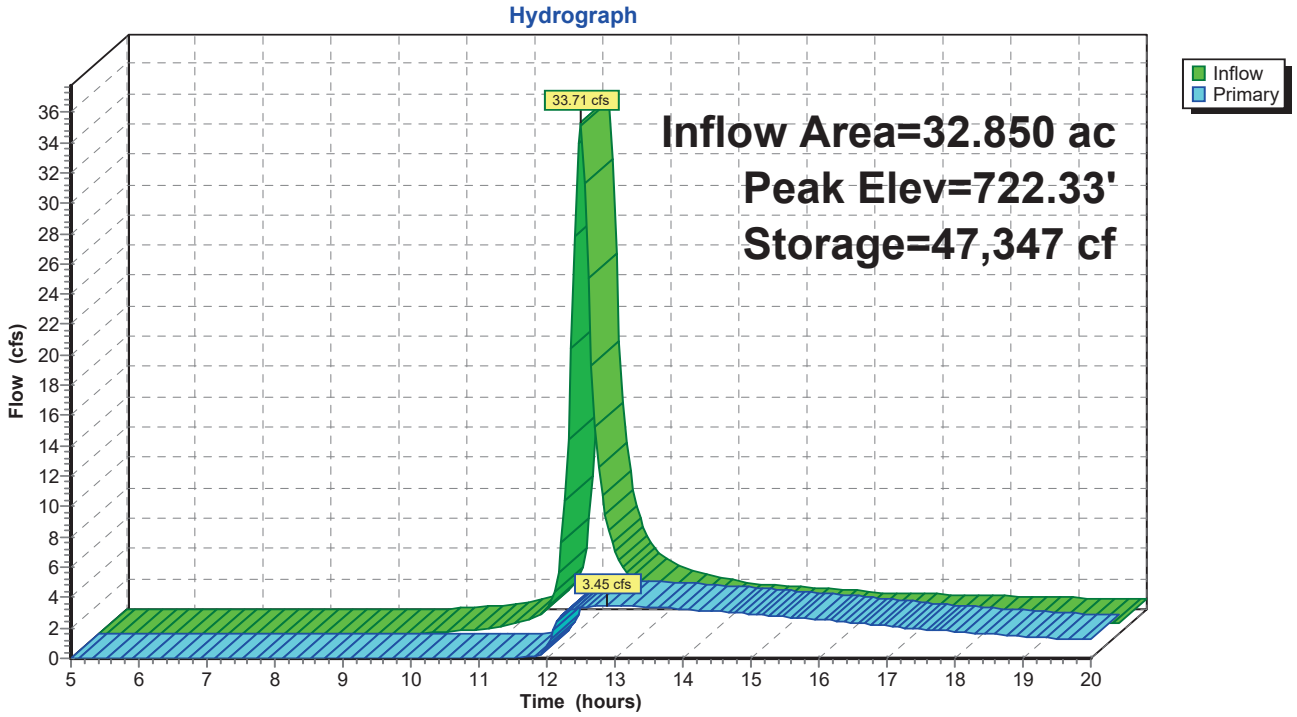
Volume	Invert	Avail.Storage	Storage Description
#1	721.00'	243,150 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
721.00	33,400	0	0
722.00	36,600	35,000	35,000
723.00	39,950	38,275	73,275
724.00	54,400	47,175	120,450
725.00	62,050	58,225	178,675
726.00	66,900	64,475	243,150

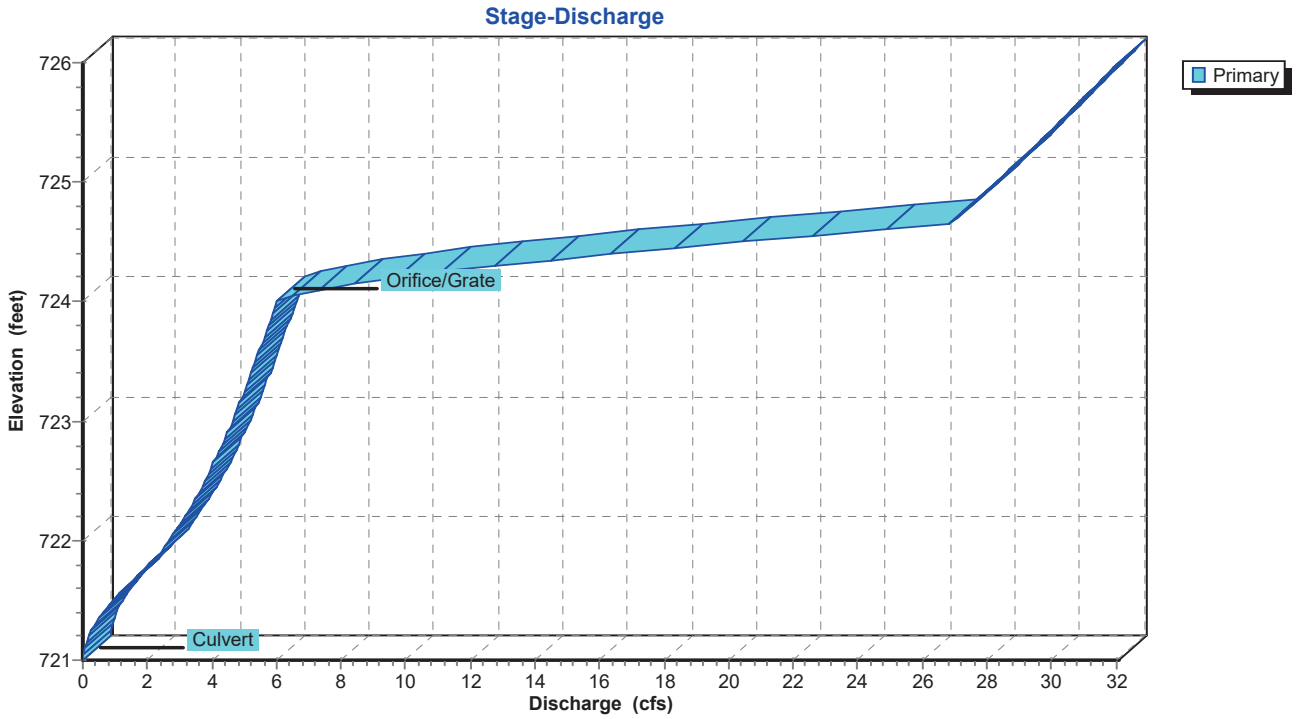
Device	Routing	Invert	Outlet Devices
#1	Primary	720.50'	**24.0" Round Culvert** L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 720.50' / 720.00' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	724.00'	**36.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	721.00'	**12.0" Round Culvert** L= 12.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 721.00' / 720.60' S= 0.0333 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=3.45 cfs @ 12.89 hrs HW=722.33' (Free Discharge)
└**1=Culvert** (Passes 3.45 cfs of 12.78 cfs potential flow)
  ├**2=Orifice/Grate** (Controls 0.00 cfs)
  └**3=Culvert** (Inlet Controls 3.45 cfs @ 4.39 fps)

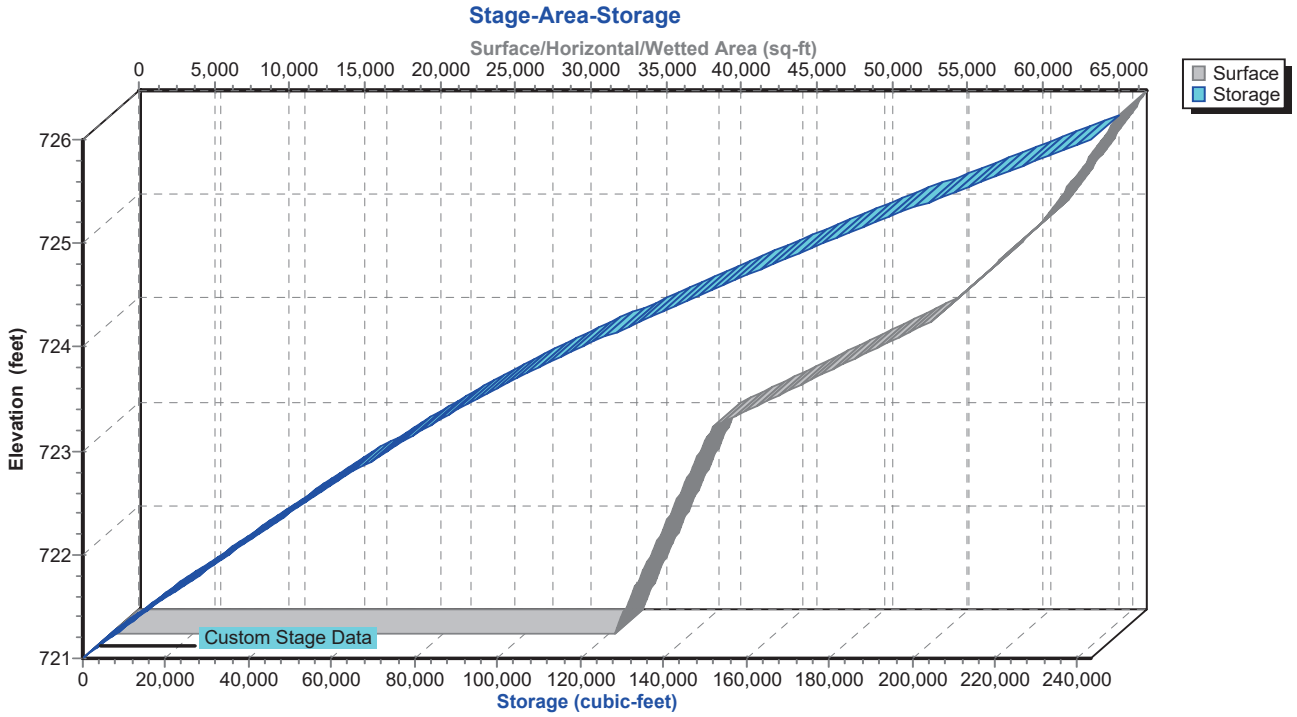
Pond 12P: SWM 1



Pond 12P: SWM 1



Pond 12P: SWM 1



Stage-Discharge for Pond 12P: SWM 1

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
721.00	0.00	723.60	5.48
721.05	0.01	723.65	5.55
721.10	0.04	723.70	5.61
721.15	0.10	723.75	5.67
721.20	0.17	723.80	5.74
721.25	0.26	723.85	5.80
721.30	0.37	723.90	5.86
721.35	0.49	723.95	5.92
721.40	0.63	724.00	5.98
721.45	0.78	724.05	6.48
721.50	0.95	724.10	7.34
721.55	1.12	724.15	8.44
721.60	1.30	724.20	9.72
721.65	1.48	724.25	11.18
721.70	1.67	724.30	12.78
721.75	1.86	724.35	14.51
721.80	2.05	724.40	16.37
721.85	2.23	724.45	18.34
721.90	2.40	724.50	20.42
721.95	2.56	724.55	22.61
722.00	2.67	724.60	24.90
722.05	2.80	724.65	26.85
722.10	2.93	724.70	27.06
722.15	3.05	724.75	27.27
722.20	3.16	724.80	27.48
722.25	3.28	724.85	27.69
722.30	3.38	724.90	27.89
722.35	3.49	724.95	28.10
722.40	3.59	725.00	28.30
722.45	3.69	725.05	28.50
722.50	3.78	725.10	28.70
722.55	3.88	725.15	28.90
722.60	3.97	725.20	29.10
722.65	4.06	725.25	29.29
722.70	4.14	725.30	29.49
722.75	4.23	725.35	29.68
722.80	4.31	725.40	29.87
722.85	4.39	725.45	30.06
722.90	4.47	725.50	30.25
722.95	4.55	725.55	30.44
723.00	4.63	725.60	30.63
723.05	4.71	725.65	30.82
723.10	4.78	725.70	31.00
723.15	4.86	725.75	31.18
723.20	4.93	725.80	31.37
723.25	5.00	725.85	31.55
723.30	5.07	725.90	31.73
723.35	5.14	725.95	31.91
723.40	5.21	726.00	**32.09**
723.45	5.28		
723.50	5.35		
723.55	5.41		

Stage-Area-Storage for Pond 12P: SWM 1

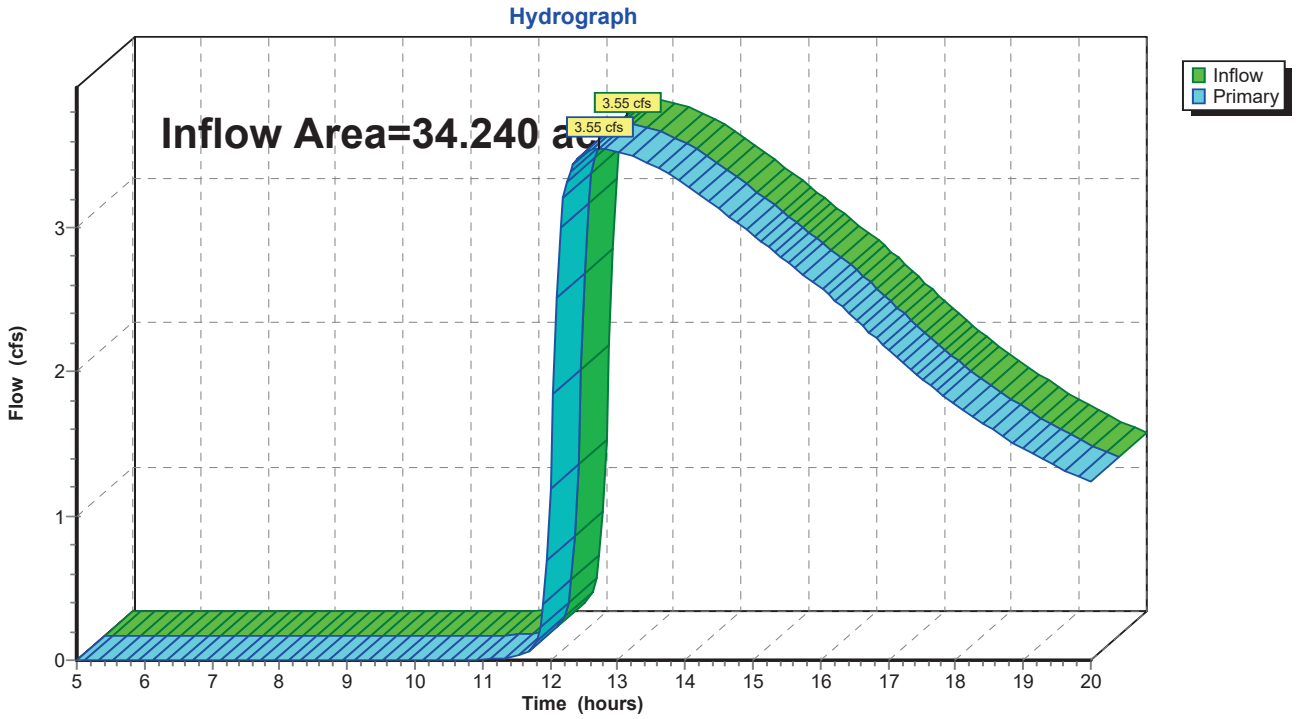
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
721.00	33,400	0
721.05	33,560	1,674
721.10	33,720	3,356
721.15	33,880	5,046
721.20	34,040	6,744
721.25	34,200	8,450
721.30	34,360	10,164
721.35	34,520	11,886
721.40	34,680	13,616
721.45	34,840	15,354
721.50	35,000	17,100
721.55	35,160	18,854
721.60	35,320	20,616
721.65	35,480	22,386
721.70	35,640	24,164
721.75	35,800	25,950
721.80	35,960	27,744
721.85	36,120	29,546
721.90	36,280	31,356
721.95	36,440	33,174
722.00	36,600	35,000
722.05	36,767	36,834
722.10	36,935	38,677
722.15	37,102	40,528
722.20	37,270	42,387
722.25	37,438	44,255
722.30	37,605	46,131
722.35	37,773	48,015
722.40	37,940	49,908
722.45	38,108	51,809
722.50	38,275	53,719
722.55	38,442	55,637
722.60	38,610	57,563
722.65	38,777	59,498
722.70	38,945	61,441
722.75	39,113	63,392
722.80	39,280	65,352
722.85	39,448	67,320
722.90	39,615	69,297
722.95	39,783	71,282
723.00	39,950	73,275
723.05	40,672	75,291
723.10	41,395	77,342
723.15	42,117	79,430
723.20	42,840	81,554
723.25	43,563	83,714
723.30	44,285	85,910
723.35	45,008	88,143
723.40	45,730	90,411
723.45	46,453	92,716
723.50	47,175	95,056
723.55	47,897	97,433
723.60	48,620	99,846
723.65	49,342	102,295
723.70	50,065	104,780
723.75	50,788	107,302
723.80	51,510	109,859
723.85	52,233	112,453
723.90	52,955	115,082
723.95	53,678	117,748
724.00	54,400	120,450
724.05	54,782	123,180
724.10	55,165	125,928
724.15	55,547	128,696
724.20	55,930	131,483
724.25	56,313	134,289
724.30	56,695	137,114
724.35	57,078	139,959
724.40	57,460	142,822
724.45	57,843	145,705
724.50	58,225	148,606
724.55	58,607	151,527
724.60	58,990	154,467
724.65	59,372	157,426
724.70	59,755	160,404
724.75	60,138	163,402
724.80	60,520	166,418
724.85	60,903	169,454
724.90	61,285	172,508
724.95	61,668	175,582
725.00	62,050	178,675
725.05	62,292	181,784
725.10	62,535	184,904
725.15	62,777	188,037
725.20	63,020	191,182
725.25	63,263	194,339
725.30	63,505	197,508
725.35	63,748	200,690
725.40	63,990	203,883
725.45	64,233	207,089
725.50	64,475	210,306
725.55	64,717	213,536
725.60	64,960	216,778
725.65	65,202	220,032
725.70	65,445	223,298
725.75	65,688	226,577
725.80	65,930	229,867
725.85	66,173	233,170
725.90	66,415	236,484
725.95	66,658	239,811
726.00	**66,900**	**243,150**

Summary for Link 10L: DA 1 POST TOTAL

Inflow Area = 34.240 ac, 36.46% Impervious, Inflow Depth > 0.58" for 1-YEAR event
Inflow = 3.55 cfs @ 12.71 hrs, Volume= 1.656 af
Primary = 3.55 cfs @ 12.71 hrs, Volume= 1.656 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 10L: DA 1 POST TOTAL



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment5S: DA 3 POST Runoff Area=1.090 ac 0.00% Impervious Runoff Depth>1.40"
Flow Length=100' Slope=0.0500 '/' Tc=7.8 min CN=79 Runoff=2.76 cfs 0.128 af

Subcatchment6S: DA 1 POST Runoff Area=1.390 ac 0.00% Impervious Runoff Depth>1.33"
Flow Length=1,070' Tc=16.0 min CN=78 Runoff=2.51 cfs 0.155 af

Subcatchment7S: DA 2 POST Runoff Area=12.000 ac 0.00% Impervious Runoff Depth>1.47"
Flow Length=970' Tc=15.2 min CN=80 Runoff=24.47 cfs 1.467 af

Subcatchment8S: DA 1 POST Runoff Area=16.510 ac 38.00% Impervious Runoff Depth>1.99"
Flow Length=900' Tc=15.9 min CN=87 Runoff=43.98 cfs 2.737 af

Subcatchment9S: DA 2 POST Runoff Area=16.340 ac 38.00% Impervious Runoff Depth>1.99"
Flow Length=900' Tc=15.9 min CN=87 Runoff=43.53 cfs 2.708 af

Pond 12P: SWM 1 Peak Elev=724.24' Storage=133,573 cf Inflow=87.51 cfs 5.445 af
Outflow=10.81 cfs 4.067 af

Link 10L: DA 1 POST TOTAL Inflow=11.16 cfs 4.221 af
Primary=11.16 cfs 4.221 af

Total Runoff Area = 47.330 ac Runoff Volume = 7.194 af Average Runoff Depth = 1.82"
73.63% Pervious = 34.847 ac 26.37% Impervious = 12.483 ac

Summary for Subcatchment 5S: DA 3 POST

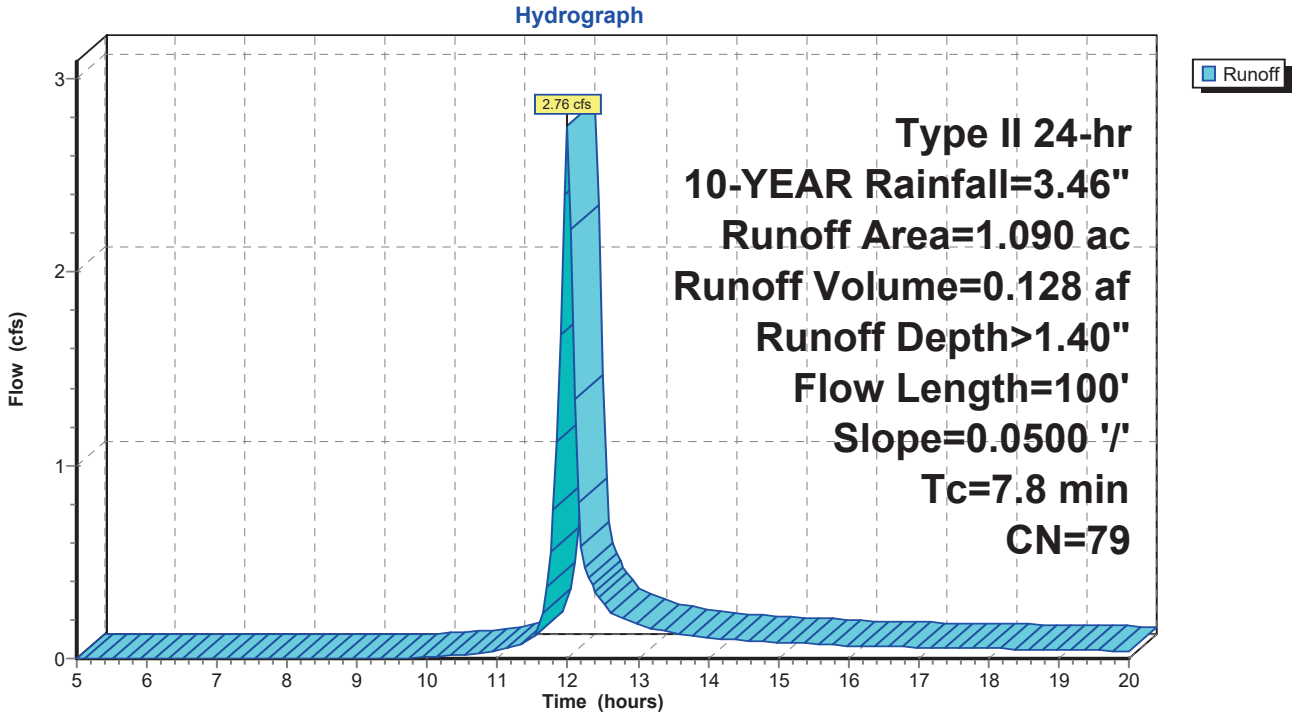
Runoff = 2.76 cfs @ 12.00 hrs, Volume= 0.128 af, Depth> 1.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-YEAR Rainfall=3.46"

Area (ac)	CN	Description
0.640	80	>75% Grass cover, Good, HSG D
0.450	77	Woods, Good, HSG D
1.090	79	Weighted Average
1.090		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	100	0.0500	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"

Subcatchment 5S: DA 3 POST



Summary for Subcatchment 6S: DA 1 POST UNCONTROLLED

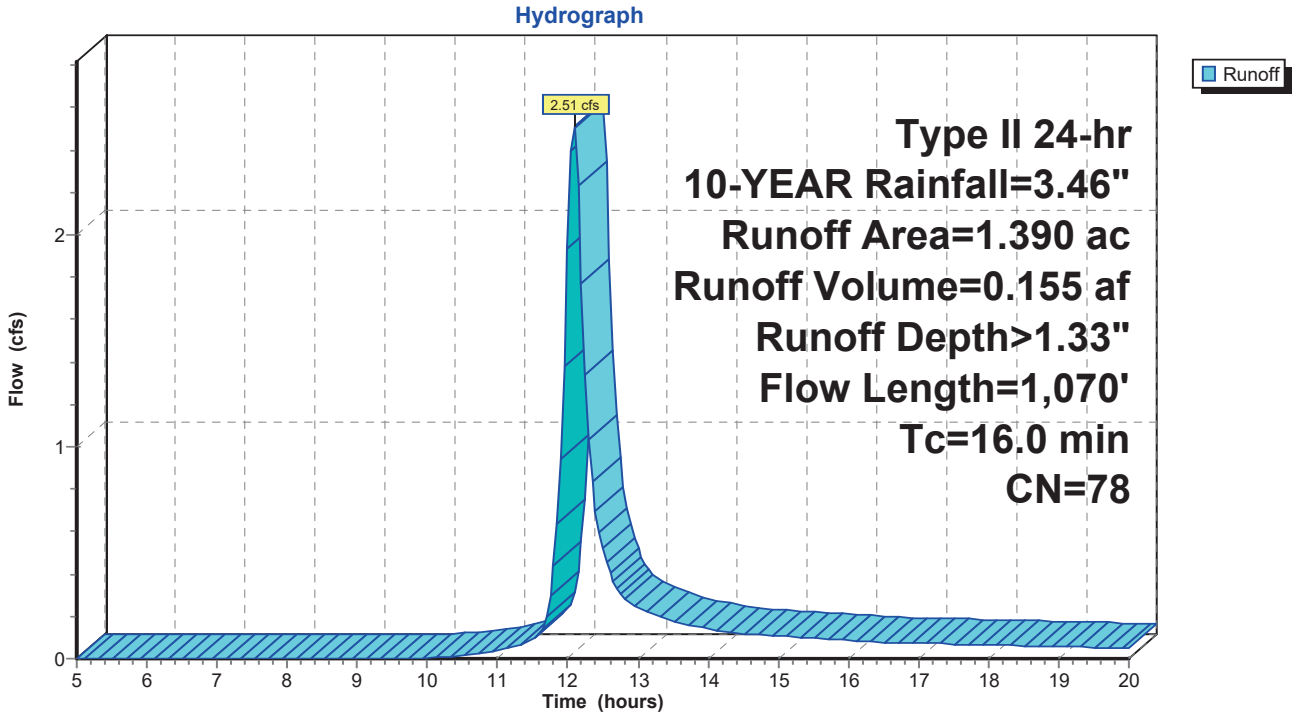
Runoff = 2.51 cfs @ 12.09 hrs, Volume= 0.155 af, Depth> 1.33"
Routed to Link 10L : DA 1 POST TOTAL

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-YEAR Rainfall=3.46"

Area (ac)	CN	Description
0.590	80	>75% Grass cover, Good, HSG D
0.800	77	Woods, Good, HSG D
1.390	78	Weighted Average
1.390		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	100	0.0500	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"
8.2	970	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.0	1,070	Total			

Subcatchment 6S: DA 1 POST UNCONTROLLED



Summary for Subcatchment 7S: DA 2 POST UNCONTROLLED

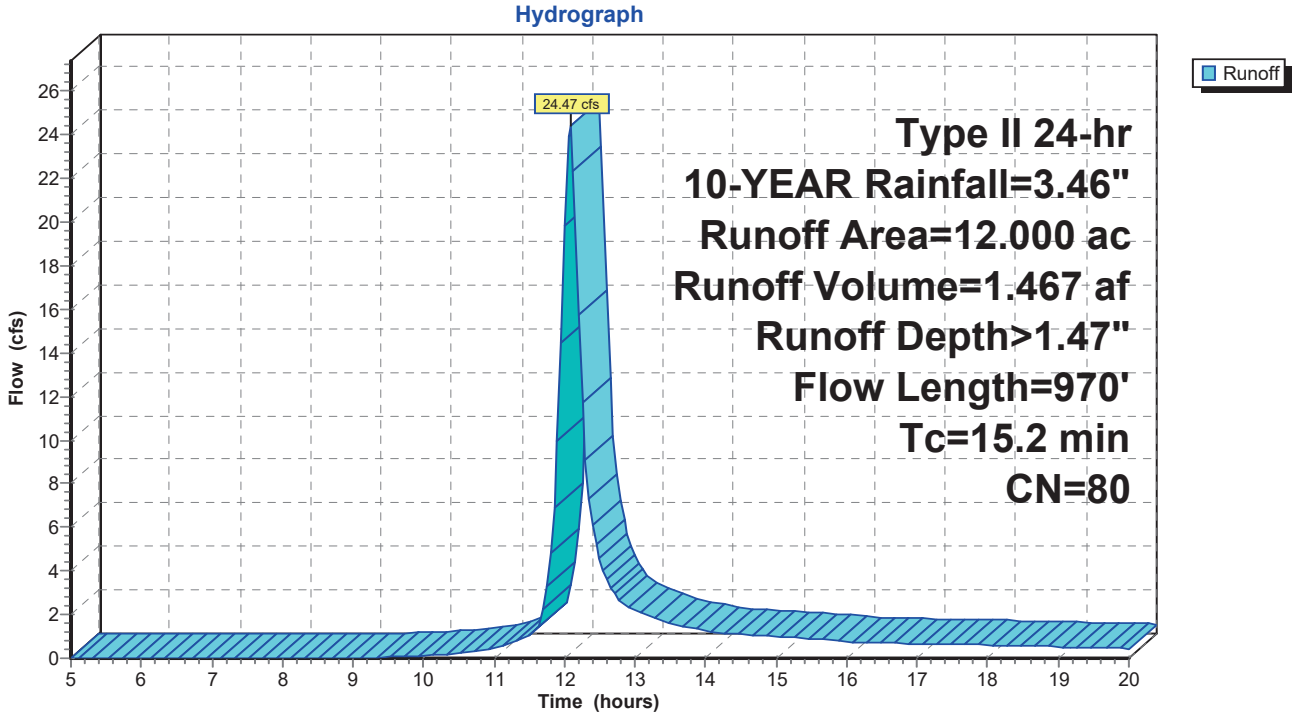
Runoff = 24.47 cfs @ 12.08 hrs, Volume= 1.467 af, Depth> 1.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-YEAR Rainfall=3.46"

Area (ac)	CN	Description
11.200	80	>75% Grass cover, Good, HSG D
0.800	77	Woods, Good, HSG D
12.000	80	Weighted Average
12.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	100	0.0500	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"
7.4	870	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
15.2	970	Total			

Subcatchment 7S: DA 2 POST UNCONTROLLED



Summary for Subcatchment 8S: DA 1 POST CONTROLLED

[47] Hint: Peak is 1746% of capacity of segment #3

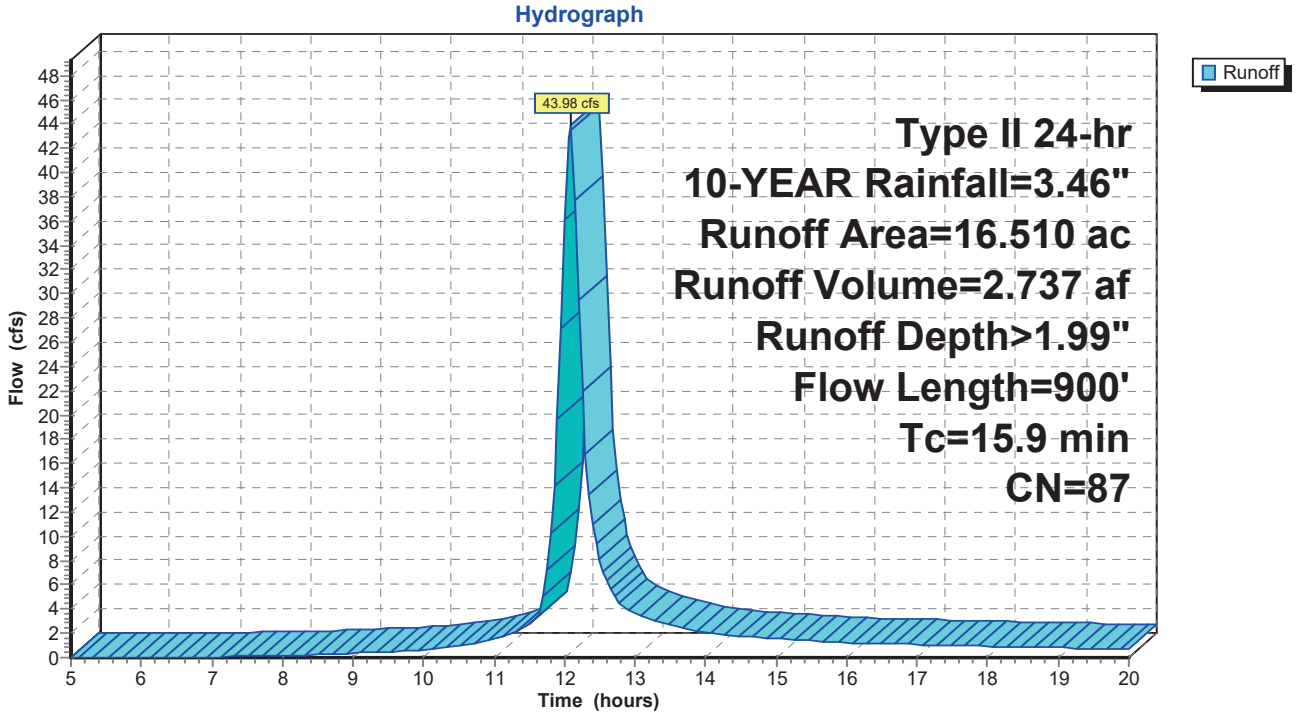
Runoff = 43.98 cfs @ 12.08 hrs, Volume= 2.737 af, Depth> 1.99"
Routed to Pond 12P : SWM 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-YEAR Rainfall=3.46"

Area (ac)	CN	Description
16.510	87	1/4 acre lots, 38% imp, HSG D
10.236		62.00% Pervious Area
6.274		38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	100	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"
1.5	200	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.1	600	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
15.9	900	Total			

Subcatchment 8S: DA 1 POST CONTROLLED



Summary for Subcatchment 9S: DA 2 POST CONTROLLED

[47] Hint: Peak is 1728% of capacity of segment #3

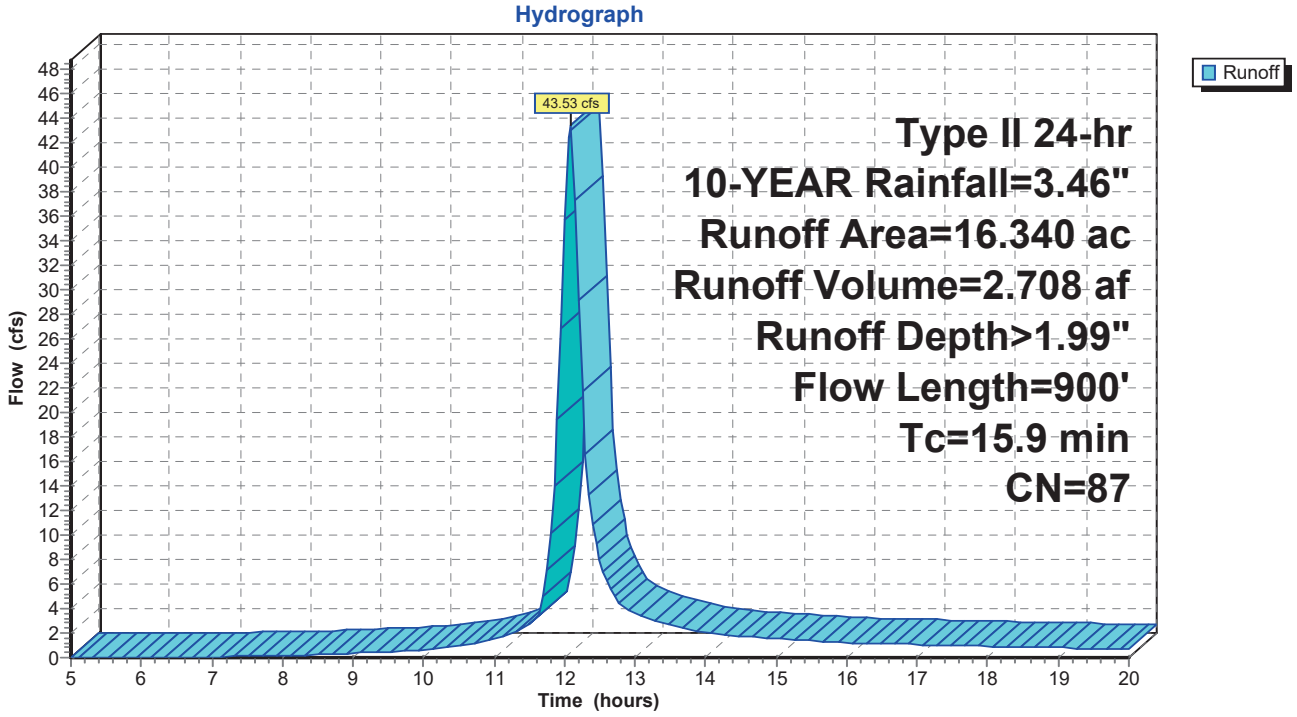
Runoff = 43.53 cfs @ 12.08 hrs, Volume= 2.708 af, Depth> 1.99"
Routed to Pond 12P : SWM 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-YEAR Rainfall=3.46"

Area (ac)	CN	Description
16.340	87	1/4 acre lots, 38% imp, HSG D
10.131		62.00% Pervious Area
6.209		38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	100	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"
1.5	200	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.1	600	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
15.9	900	Total			

Subcatchment 9S: DA 2 POST CONTROLLED



Summary for Pond 12P: SWM 1

Inflow Area = 32.850 ac, 38.00% Impervious, Inflow Depth > 1.99" for 10-YEAR event
Inflow = 87.51 cfs @ 12.08 hrs, Volume= 5.445 af
Outflow = 10.81 cfs @ 12.67 hrs, Volume= 4.067 af, Atten= 88%, Lag= 35.4 min
Primary = 10.81 cfs @ 12.67 hrs, Volume= 4.067 af
Routed to Link 10L : DA 1 POST TOTAL

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 724.24' @ 12.67 hrs Surf.Area= 56,215 sf Storage= 133,573 cf

Plug-Flow detention time= 201.8 min calculated for 4.067 af (75% of inflow)
Center-of-Mass det. time= 140.8 min (922.7 - 781.9)

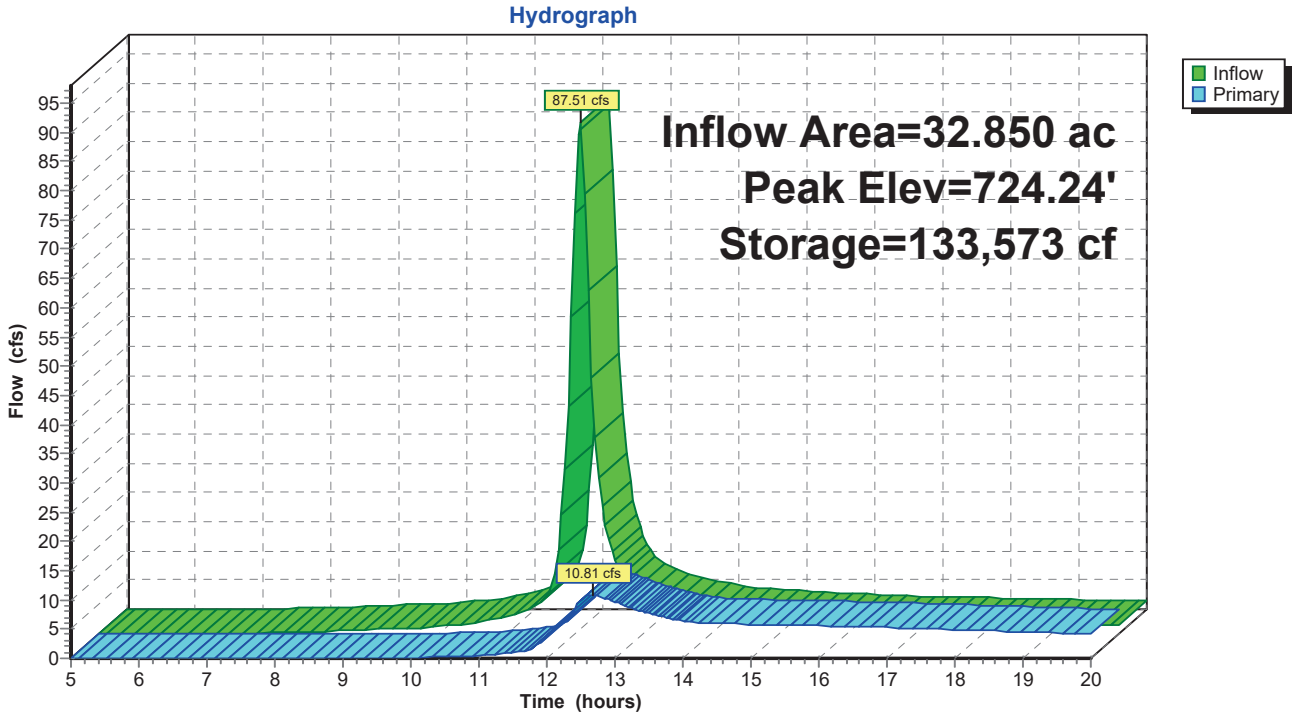
Volume	Invert	Avail.Storage	Storage Description
#1	721.00'	243,150 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
721.00	33,400	0	0
722.00	36,600	35,000	35,000
723.00	39,950	38,275	73,275
724.00	54,400	47,175	120,450
725.00	62,050	58,225	178,675
726.00	66,900	64,475	243,150

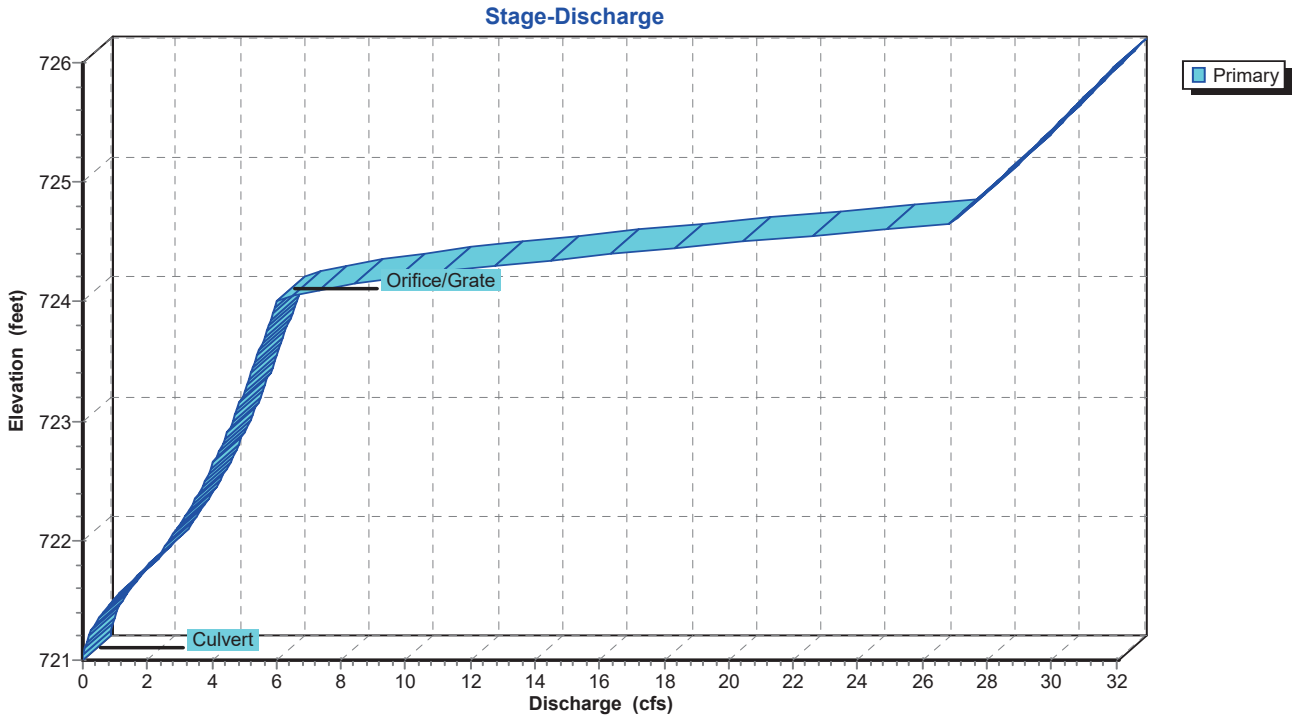
Device	Routing	Invert	Outlet Devices
#1	Primary	720.50'	**24.0" Round Culvert** L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 720.50' / 720.00' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	724.00'	**36.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	721.00'	**12.0" Round Culvert** L= 12.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 721.00' / 720.60' S= 0.0333 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=10.78 cfs @ 12.67 hrs HW=724.24' (Free Discharge)
└**1=Culvert** (Passes 10.78 cfs of 25.02 cfs potential flow)
  ├**2=Orifice/Grate** (Weir Controls 4.52 cfs @ 1.59 fps)
  └**3=Culvert** (Inlet Controls 6.26 cfs @ 7.97 fps)

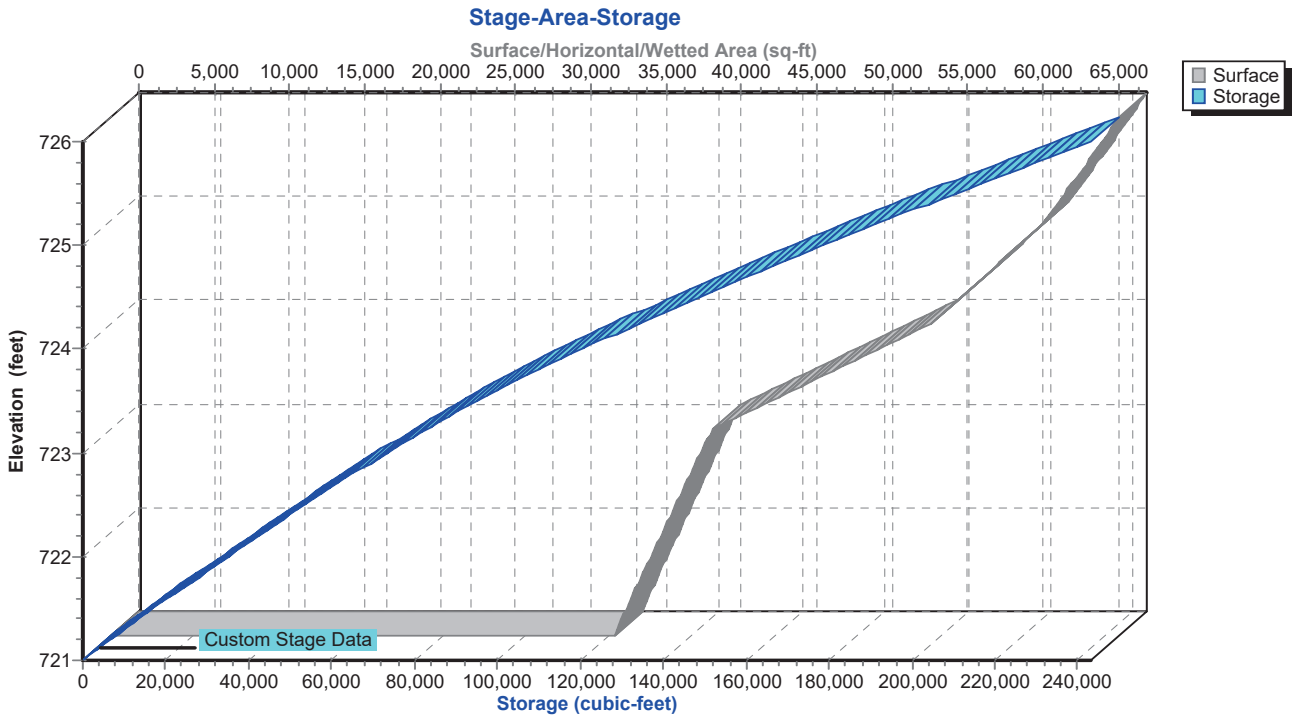
Pond 12P: SWM 1



Pond 12P: SWM 1



Pond 12P: SWM 1



Stage-Discharge for Pond 12P: SWM 1

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
721.00	0.00	723.60	5.48
721.05	0.01	723.65	5.55
721.10	0.04	723.70	5.61
721.15	0.10	723.75	5.67
721.20	0.17	723.80	5.74
721.25	0.26	723.85	5.80
721.30	0.37	723.90	5.86
721.35	0.49	723.95	5.92
721.40	0.63	724.00	5.98
721.45	0.78	724.05	6.48
721.50	0.95	724.10	7.34
721.55	1.12	724.15	8.44
721.60	1.30	724.20	9.72
721.65	1.48	724.25	11.18
721.70	1.67	724.30	12.78
721.75	1.86	724.35	14.51
721.80	2.05	724.40	16.37
721.85	2.23	724.45	18.34
721.90	2.40	724.50	20.42
721.95	2.56	724.55	22.61
722.00	2.67	724.60	24.90
722.05	2.80	724.65	26.85
722.10	2.93	724.70	27.06
722.15	3.05	724.75	27.27
722.20	3.16	724.80	27.48
722.25	3.28	724.85	27.69
722.30	3.38	724.90	27.89
722.35	3.49	724.95	28.10
722.40	3.59	725.00	28.30
722.45	3.69	725.05	28.50
722.50	3.78	725.10	28.70
722.55	3.88	725.15	28.90
722.60	3.97	725.20	29.10
722.65	4.06	725.25	29.29
722.70	4.14	725.30	29.49
722.75	4.23	725.35	29.68
722.80	4.31	725.40	29.87
722.85	4.39	725.45	30.06
722.90	4.47	725.50	30.25
722.95	4.55	725.55	30.44
723.00	4.63	725.60	30.63
723.05	4.71	725.65	30.82
723.10	4.78	725.70	31.00
723.15	4.86	725.75	31.18
723.20	4.93	725.80	31.37
723.25	5.00	725.85	31.55
723.30	5.07	725.90	31.73
723.35	5.14	725.95	31.91
723.40	5.21	726.00	**32.09**
723.45	5.28		
723.50	5.35		
723.55	5.41		

Stage-Area-Storage for Pond 12P: SWM 1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
721.00	33,400	0
721.05	33,560	1,674
721.10	33,720	3,356
721.15	33,880	5,046
721.20	34,040	6,744
721.25	34,200	8,450
721.30	34,360	10,164
721.35	34,520	11,886
721.40	34,680	13,616
721.45	34,840	15,354
721.50	35,000	17,100
721.55	35,160	18,854
721.60	35,320	20,616
721.65	35,480	22,386
721.70	35,640	24,164
721.75	35,800	25,950
721.80	35,960	27,744
721.85	36,120	29,546
721.90	36,280	31,356
721.95	36,440	33,174
722.00	36,600	35,000
722.05	36,767	36,834
722.10	36,935	38,677
722.15	37,102	40,528
722.20	37,270	42,387
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722.30	37,605	46,131
722.35	37,773	48,015
722.40	37,940	49,908
722.45	38,108	51,809
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722.80	39,280	65,352
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723.00	39,950	73,275
723.05	40,672	75,291
723.10	41,395	77,342
723.15	42,117	79,430
723.20	42,840	81,554
723.25	43,563	83,714
723.30	44,285	85,910
723.35	45,008	88,143
723.40	45,730	90,411
723.45	46,453	92,716
723.50	47,175	95,056
723.55	47,897	97,433
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723.65	49,342	102,295
723.70	50,065	104,780
723.75	50,788	107,302
723.80	51,510	109,859
723.85	52,233	112,453
723.90	52,955	115,082
723.95	53,678	117,748
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724.30	56,695	137,114
724.35	57,078	139,959
724.40	57,460	142,822
724.45	57,843	145,705
724.50	58,225	148,606
724.55	58,607	151,527
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724.65	59,372	157,426
724.70	59,755	160,404
724.75	60,138	163,402
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725.20	63,020	191,182
725.25	63,263	194,339
725.30	63,505	197,508
725.35	63,748	200,690
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725.45	64,233	207,089
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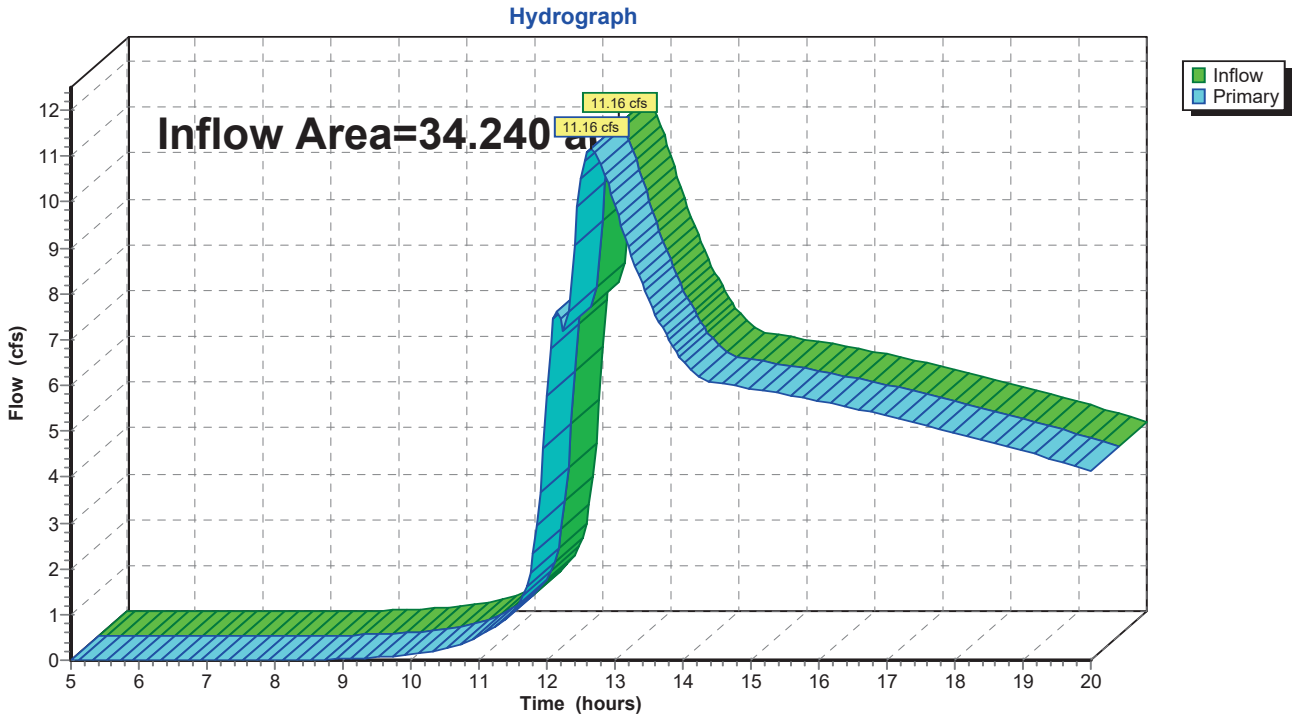
725.60	64,960	216,778
725.65	65,202	220,032
725.70	65,445	223,298
725.75	65,688	226,577
725.80	65,930	229,867
725.85	66,173	233,170
725.90	66,415	236,484
725.95	66,658	239,811
726.00	**66,900**	**243,150**

Summary for Link 10L: DA 1 POST TOTAL

Inflow Area = 34.240 ac, 36.46% Impervious, Inflow Depth > 1.48" for 10-YEAR event
Inflow = 11.16 cfs @ 12.65 hrs, Volume= 4.221 af
Primary = 11.16 cfs @ 12.65 hrs, Volume= 4.221 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 10L: DA 1 POST TOTAL



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment5S: DA 3 POST Runoff Area=1.090 ac 0.00% Impervious Runoff Depth>1.94"
Flow Length=100' Slope=0.0500 '/' Tc=7.8 min CN=79 Runoff=3.79 cfs 0.176 af

Subcatchment6S: DA 1 POST Runoff Area=1.390 ac 0.00% Impervious Runoff Depth>1.86"
Flow Length=1,070' Tc=16.0 min CN=78 Runoff=3.51 cfs 0.216 af

Subcatchment7S: DA 2 POST Runoff Area=12.000 ac 0.00% Impervious Runoff Depth>2.01"
Flow Length=970' Tc=15.2 min CN=80 Runoff=33.56 cfs 2.015 af

Subcatchment8S: DA 1 POST Runoff Area=16.510 ac 38.00% Impervious Runoff Depth>2.61"
Flow Length=900' Tc=15.9 min CN=87 Runoff=57.00 cfs 3.586 af

Subcatchment9S: DA 2 POST Runoff Area=16.340 ac 38.00% Impervious Runoff Depth>2.61"
Flow Length=900' Tc=15.9 min CN=87 Runoff=56.41 cfs 3.549 af

Pond 12P: SWM 1 Peak Elev=724.67' Storage=158,491 cf Inflow=113.41 cfs 7.135 af
Outflow=26.92 cfs 5.531 af

Link 10L: DA 1 POST TOTAL Inflow=28.08 cfs 5.746 af
Primary=28.08 cfs 5.746 af

Total Runoff Area = 47.330 ac Runoff Volume = 9.542 af Average Runoff Depth = 2.42"
73.63% Pervious = 34.847 ac 26.37% Impervious = 12.483 ac

Summary for Subcatchment 5S: DA 3 POST

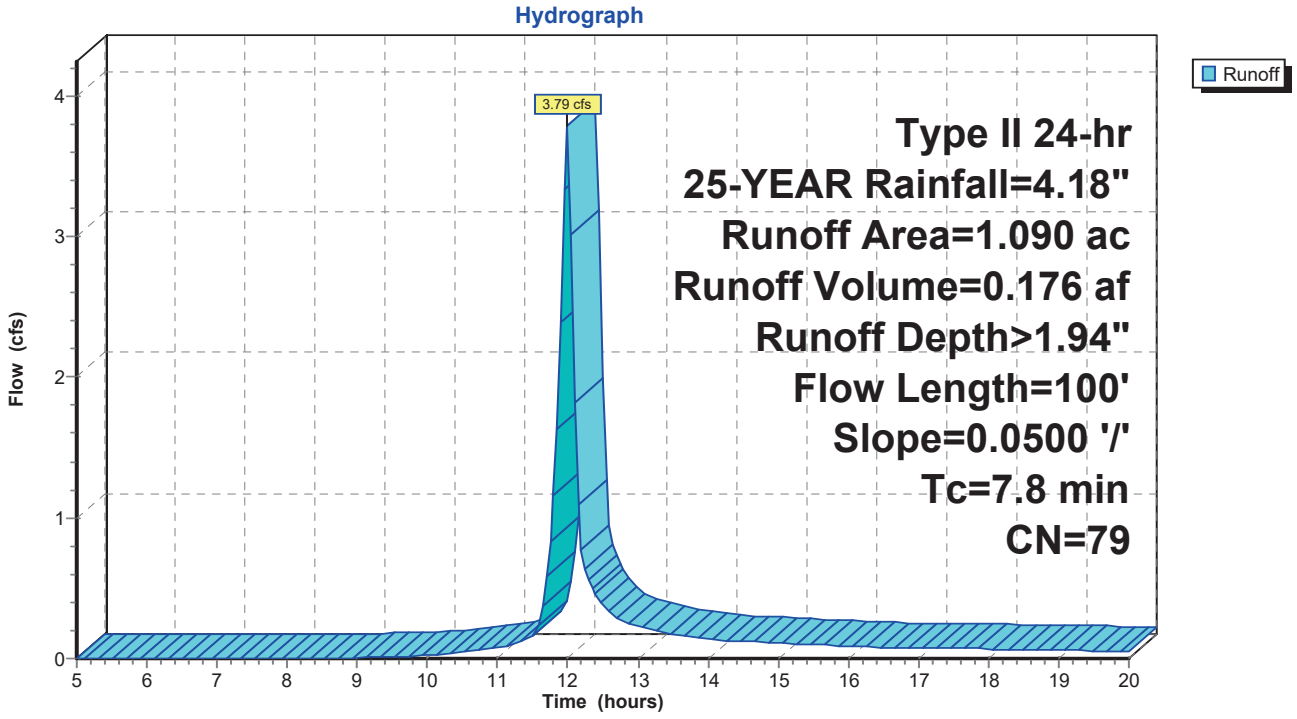
Runoff = 3.79 cfs @ 11.99 hrs, Volume= 0.176 af, Depth> 1.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-YEAR Rainfall=4.18"

Area (ac)	CN	Description
0.640	80	>75% Grass cover, Good, HSG D
0.450	77	Woods, Good, HSG D
1.090	79	Weighted Average
1.090		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	100	0.0500	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"

Subcatchment 5S: DA 3 POST



Summary for Subcatchment 6S: DA 1 POST UNCONTROLLED

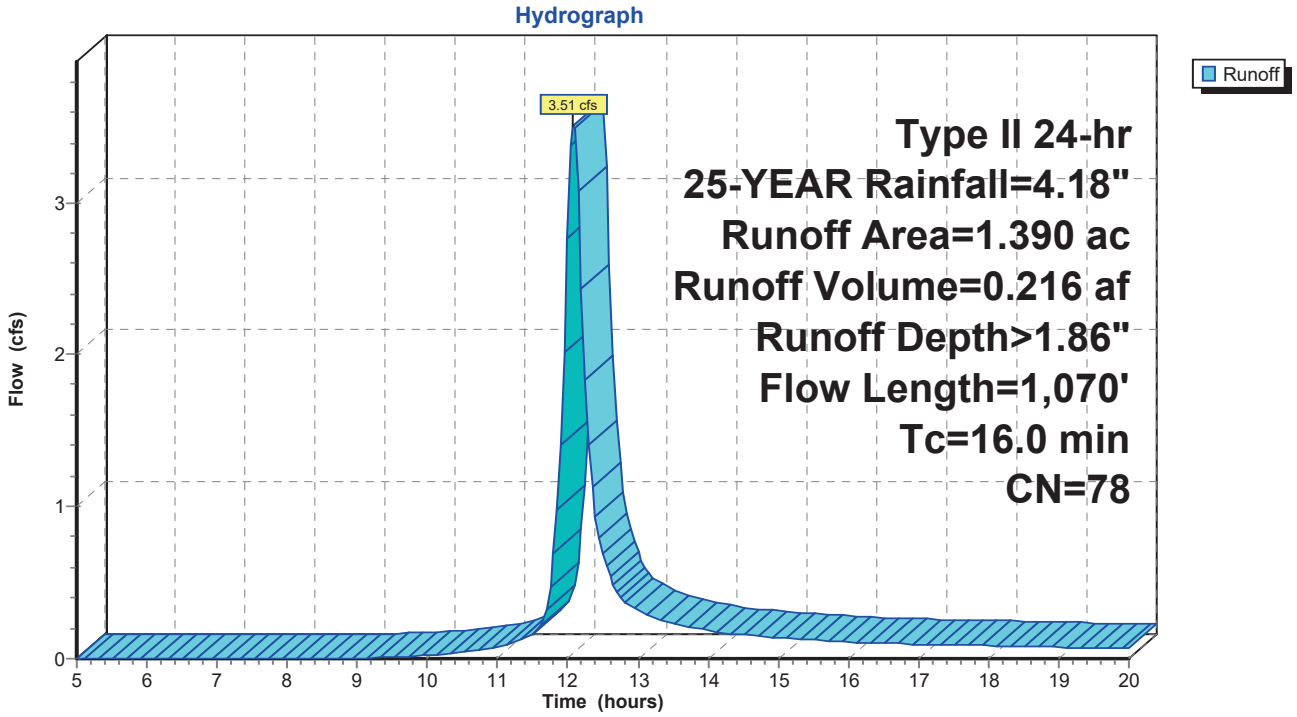
Runoff = 3.51 cfs @ 12.09 hrs, Volume= 0.216 af, Depth> 1.86"
Routed to Link 10L : DA 1 POST TOTAL

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-YEAR Rainfall=4.18"

Area (ac)	CN	Description
0.590	80	>75% Grass cover, Good, HSG D
0.800	77	Woods, Good, HSG D
1.390	78	Weighted Average
1.390		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	100	0.0500	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"
8.2	970	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.0	1,070	Total			

Subcatchment 6S: DA 1 POST UNCONTROLLED



Summary for Subcatchment 7S: DA 2 POST UNCONTROLLED

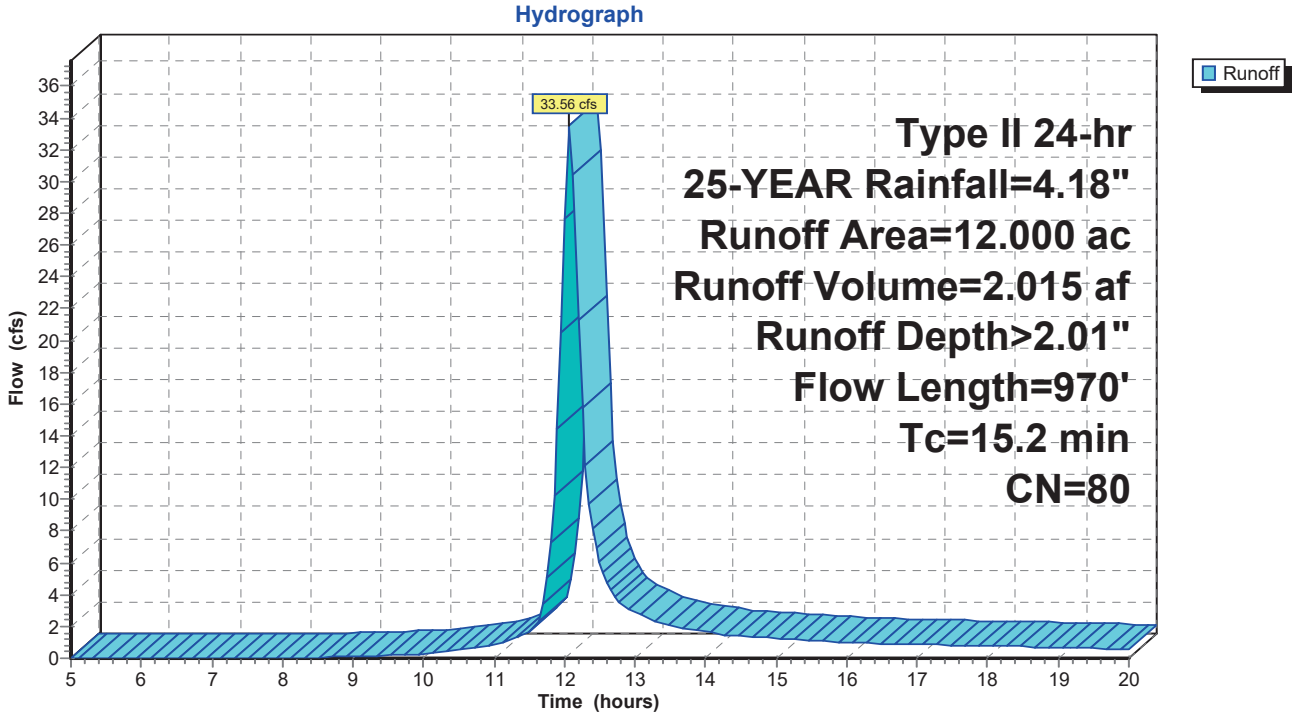
Runoff = 33.56 cfs @ 12.07 hrs, Volume= 2.015 af, Depth> 2.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-YEAR Rainfall=4.18"

Area (ac)	CN	Description
11.200	80	>75% Grass cover, Good, HSG D
0.800	77	Woods, Good, HSG D
12.000	80	Weighted Average
12.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	100	0.0500	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"
7.4	870	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
15.2	970	Total			

Subcatchment 7S: DA 2 POST UNCONTROLLED



Summary for Subcatchment 8S: DA 1 POST CONTROLLED

[47] Hint: Peak is 2262% of capacity of segment #3

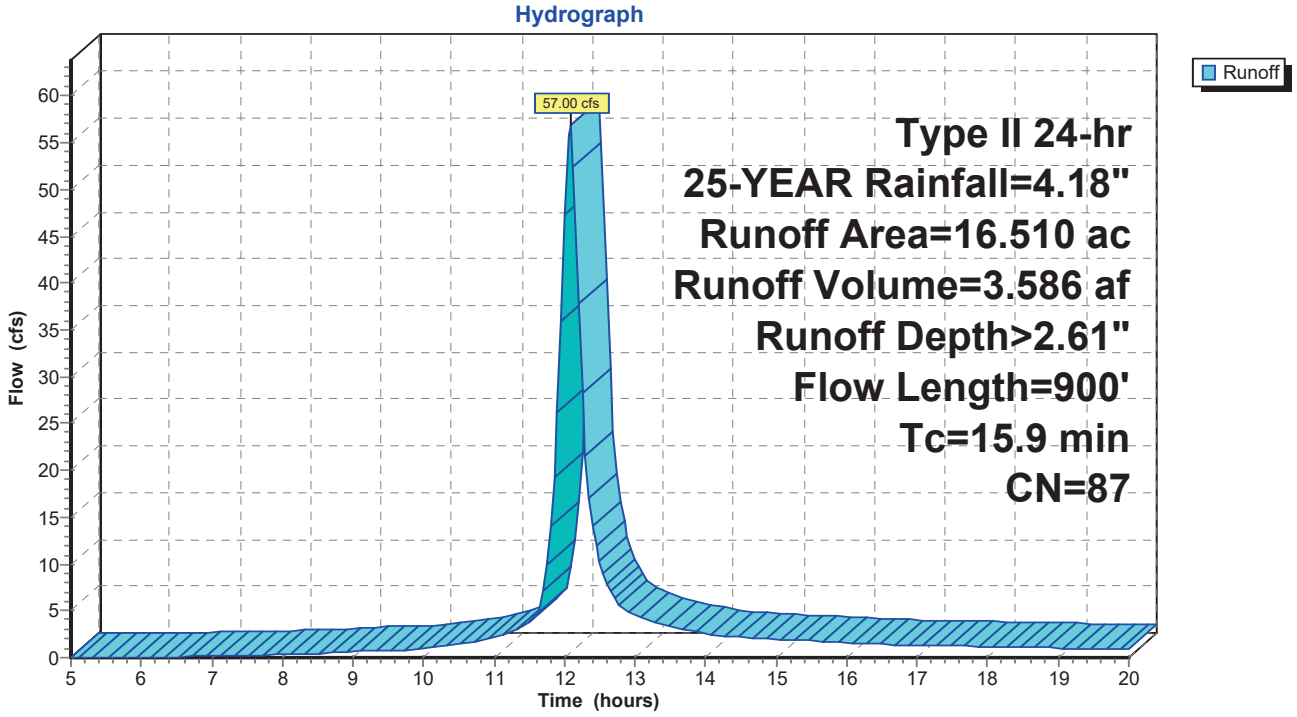
Runoff = 57.00 cfs @ 12.08 hrs, Volume= 3.586 af, Depth> 2.61"
Routed to Pond 12P : SWM 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-YEAR Rainfall=4.18"

Area (ac)	CN	Description
16.510	87	1/4 acre lots, 38% imp, HSG D
10.236		62.00% Pervious Area
6.274		38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	100	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"
1.5	200	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.1	600	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
15.9	900	Total			

Subcatchment 8S: DA 1 POST CONTROLLED



Summary for Subcatchment 9S: DA 2 POST CONTROLLED

[47] Hint: Peak is 2239% of capacity of segment #3

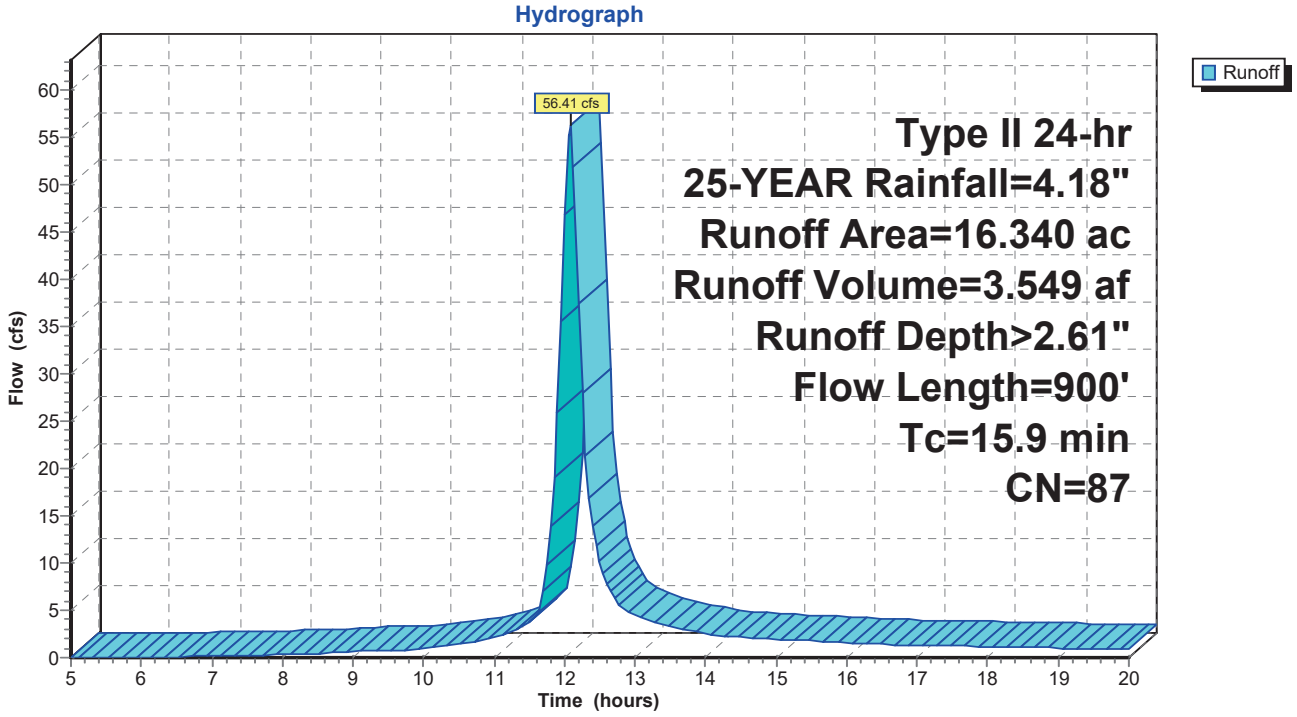
Runoff = 56.41 cfs @ 12.08 hrs, Volume= 3.549 af, Depth> 2.61"
Routed to Pond 12P : SWM 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-YEAR Rainfall=4.18"

Area (ac)	CN	Description
16.340	87	1/4 acre lots, 38% imp, HSG D
10.131		62.00% Pervious Area
6.209		38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	100	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"
1.5	200	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.1	600	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
15.9	900	Total			

Subcatchment 9S: DA 2 POST CONTROLLED



Summary for Pond 12P: SWM 1

Inflow Area = 32.850 ac, 38.00% Impervious, Inflow Depth > 2.61" for 25-YEAR event
Inflow = 113.41 cfs @ 12.08 hrs, Volume= 7.135 af
Outflow = 26.92 cfs @ 12.41 hrs, Volume= 5.531 af, Atten= 76%, Lag= 20.2 min
Primary = 26.92 cfs @ 12.41 hrs, Volume= 5.531 af
Routed to Link 10L : DA 1 POST TOTAL

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 724.67' @ 12.41 hrs Surf.Area= 59,510 sf Storage= 158,491 cf

Plug-Flow detention time= 166.1 min calculated for 5.512 af (77% of inflow)
Center-of-Mass det. time= 109.7 min (885.5 - 775.8)

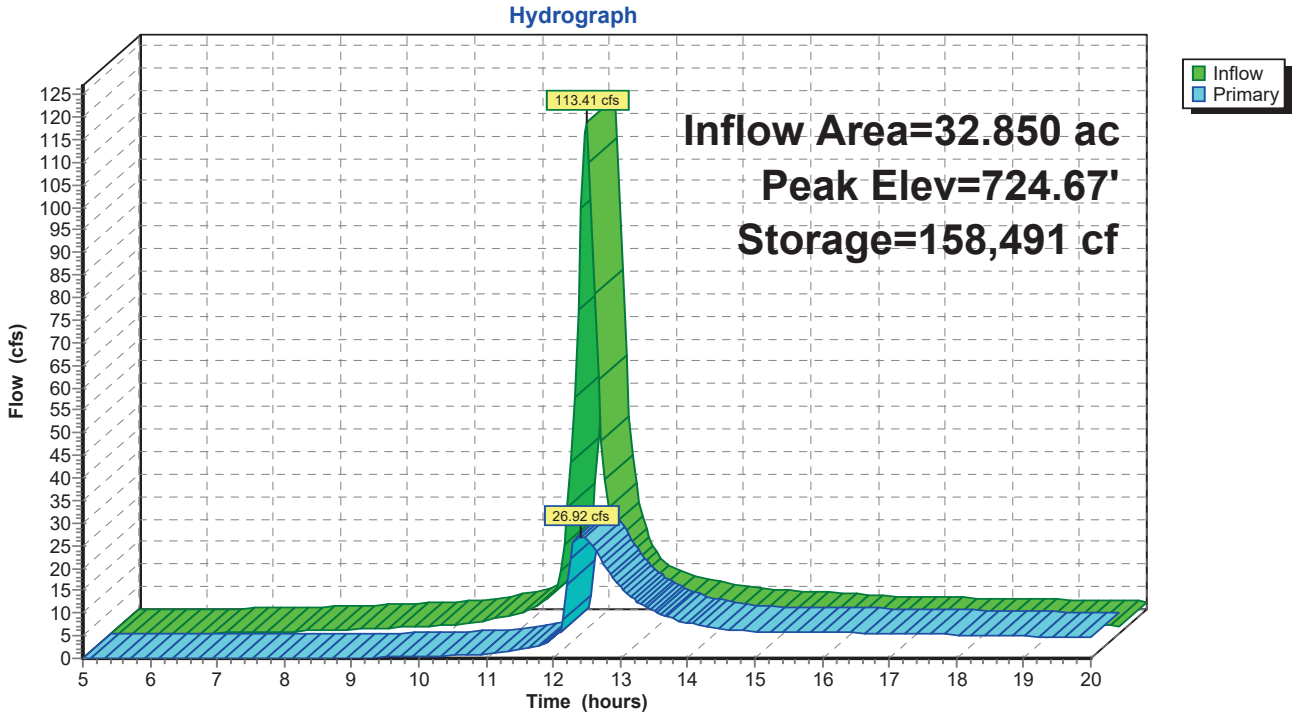
Volume	Invert	Avail.Storage	Storage Description
#1	721.00'	243,150 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
721.00	33,400	0	0
722.00	36,600	35,000	35,000
723.00	39,950	38,275	73,275
724.00	54,400	47,175	120,450
725.00	62,050	58,225	178,675
726.00	66,900	64,475	243,150

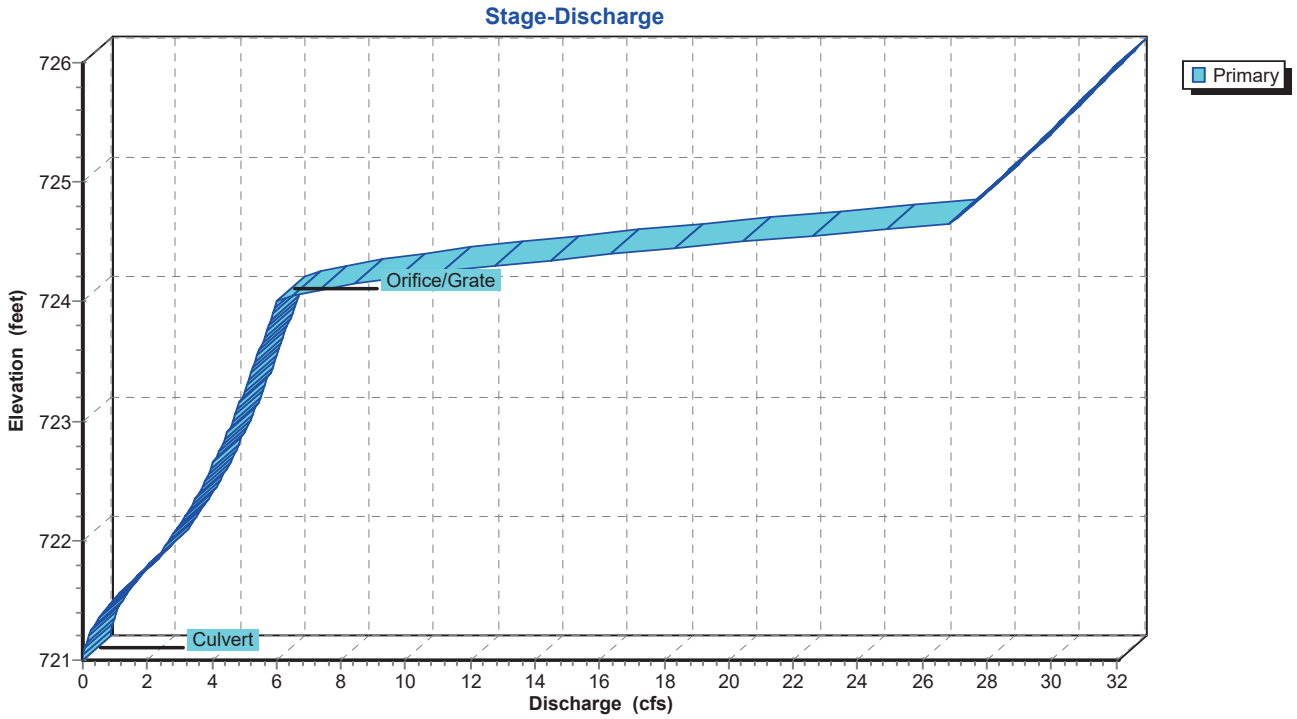
Device	Routing	Invert	Outlet Devices
#1	Primary	720.50'	**24.0" Round Culvert** L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 720.50' / 720.00' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	724.00'	**36.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	721.00'	**12.0" Round Culvert** L= 12.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 721.00' / 720.60' S= 0.0333 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=26.92 cfs @ 12.41 hrs HW=724.67' (Free Discharge)
└**1=Culvert** (Inlet Controls 26.92 cfs @ 8.57 fps)
  ├**2=Orifice/Grate** (Passes < 21.34 cfs potential flow)
  └**3=Culvert** (Passes < 6.73 cfs potential flow)

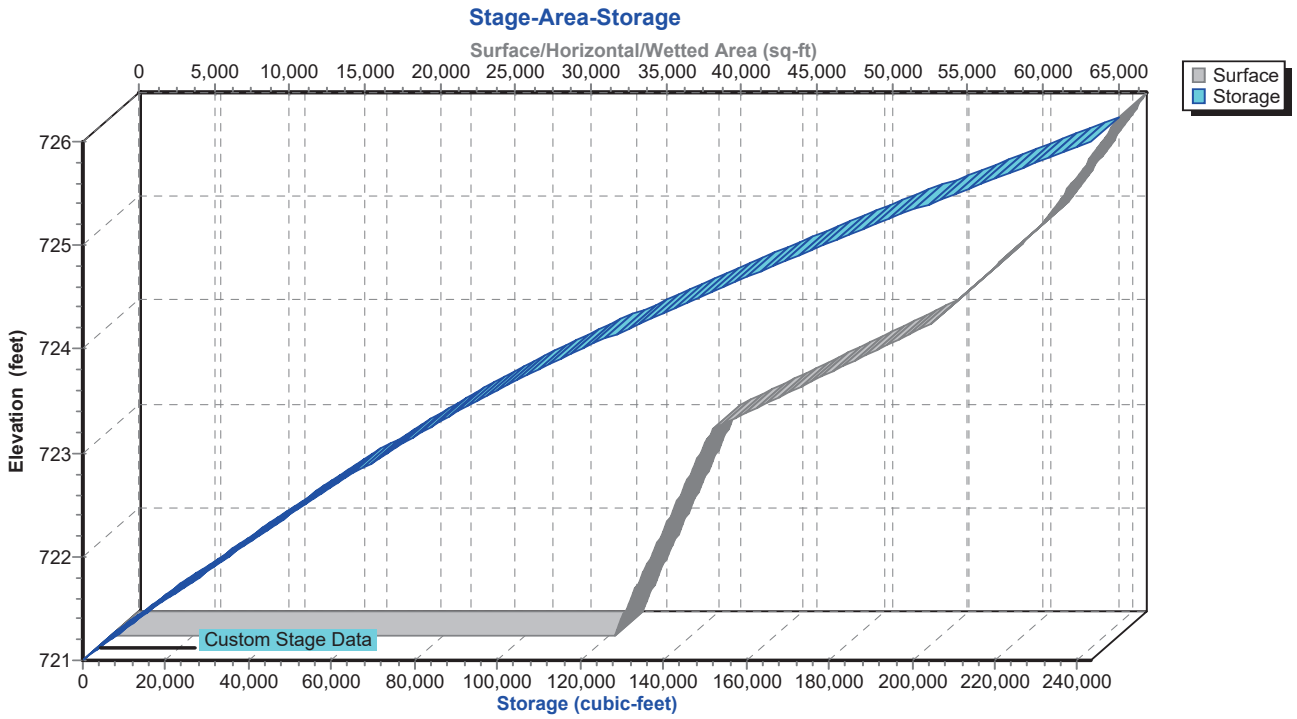
Pond 12P: SWM 1



Pond 12P: SWM 1



Pond 12P: SWM 1



Stage-Discharge for Pond 12P: SWM 1

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
721.00	0.00	723.60	5.48
721.05	0.01	723.65	5.55
721.10	0.04	723.70	5.61
721.15	0.10	723.75	5.67
721.20	0.17	723.80	5.74
721.25	0.26	723.85	5.80
721.30	0.37	723.90	5.86
721.35	0.49	723.95	5.92
721.40	0.63	724.00	5.98
721.45	0.78	724.05	6.48
721.50	0.95	724.10	7.34
721.55	1.12	724.15	8.44
721.60	1.30	724.20	9.72
721.65	1.48	724.25	11.18
721.70	1.67	724.30	12.78
721.75	1.86	724.35	14.51
721.80	2.05	724.40	16.37
721.85	2.23	724.45	18.34
721.90	2.40	724.50	20.42
721.95	2.56	724.55	22.61
722.00	2.67	724.60	24.90
722.05	2.80	724.65	26.85
722.10	2.93	724.70	27.06
722.15	3.05	724.75	27.27
722.20	3.16	724.80	27.48
722.25	3.28	724.85	27.69
722.30	3.38	724.90	27.89
722.35	3.49	724.95	28.10
722.40	3.59	725.00	28.30
722.45	3.69	725.05	28.50
722.50	3.78	725.10	28.70
722.55	3.88	725.15	28.90
722.60	3.97	725.20	29.10
722.65	4.06	725.25	29.29
722.70	4.14	725.30	29.49
722.75	4.23	725.35	29.68
722.80	4.31	725.40	29.87
722.85	4.39	725.45	30.06
722.90	4.47	725.50	30.25
722.95	4.55	725.55	30.44
723.00	4.63	725.60	30.63
723.05	4.71	725.65	30.82
723.10	4.78	725.70	31.00
723.15	4.86	725.75	31.18
723.20	4.93	725.80	31.37
723.25	5.00	725.85	31.55
723.30	5.07	725.90	31.73
723.35	5.14	725.95	31.91
723.40	5.21	726.00	**32.09**
723.45	5.28		
723.50	5.35		
723.55	5.41		

Stage-Area-Storage for Pond 12P: SWM 1

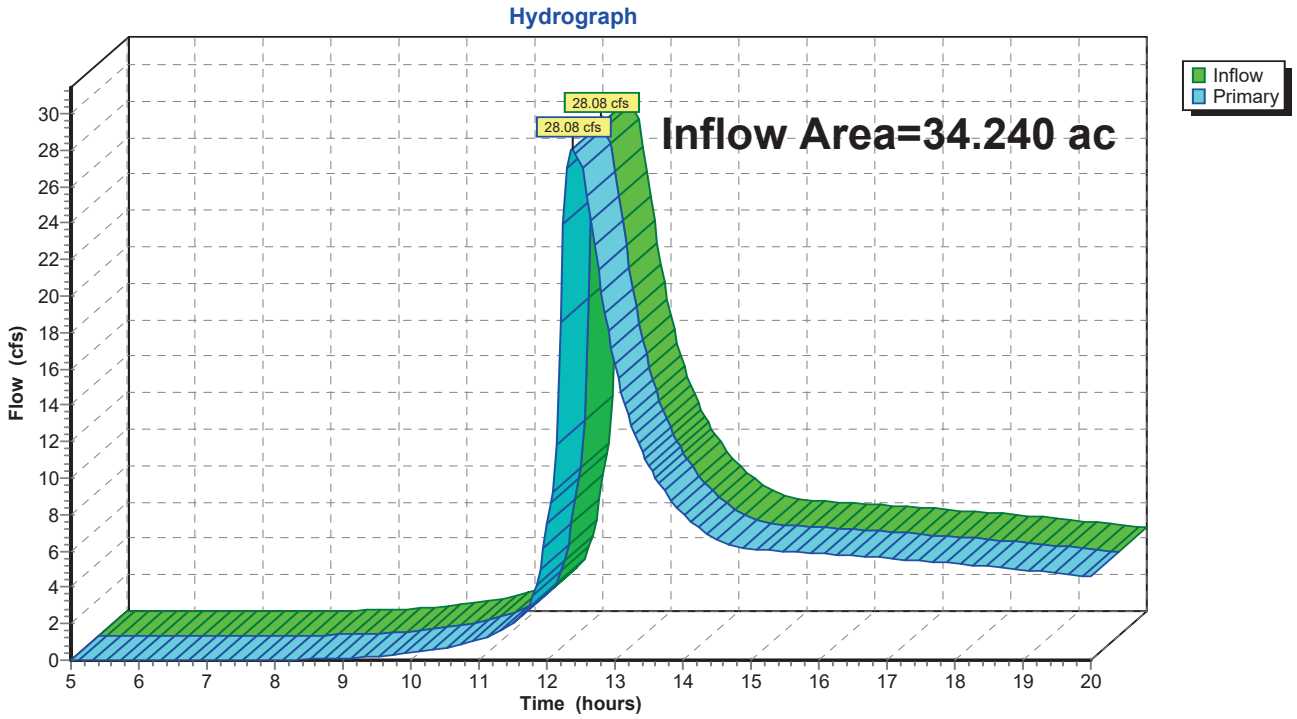
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
721.00	33,400	0
721.05	33,560	1,674
721.10	33,720	3,356
721.15	33,880	5,046
721.20	34,040	6,744
721.25	34,200	8,450
721.30	34,360	10,164
721.35	34,520	11,886
721.40	34,680	13,616
721.45	34,840	15,354
721.50	35,000	17,100
721.55	35,160	18,854
721.60	35,320	20,616
721.65	35,480	22,386
721.70	35,640	24,164
721.75	35,800	25,950
721.80	35,960	27,744
721.85	36,120	29,546
721.90	36,280	31,356
721.95	36,440	33,174
722.00	36,600	35,000
722.05	36,767	36,834
722.10	36,935	38,677
722.15	37,102	40,528
722.20	37,270	42,387
722.25	37,438	44,255
722.30	37,605	46,131
722.35	37,773	48,015
722.40	37,940	49,908
722.45	38,108	51,809
722.50	38,275	53,719
722.55	38,442	55,637
722.60	38,610	57,563
722.65	38,777	59,498
722.70	38,945	61,441
722.75	39,113	63,392
722.80	39,280	65,352
722.85	39,448	67,320
722.90	39,615	69,297
722.95	39,783	71,282
723.00	39,950	73,275
723.05	40,672	75,291
723.10	41,395	77,342
723.15	42,117	79,430
723.20	42,840	81,554
723.25	43,563	83,714
723.30	44,285	85,910
723.35	45,008	88,143
723.40	45,730	90,411
723.45	46,453	92,716
723.50	47,175	95,056
723.55	47,897	97,433
723.60	48,620	99,846
723.65	49,342	102,295
723.70	50,065	104,780
723.75	50,788	107,302
723.80	51,510	109,859
723.85	52,233	112,453
723.90	52,955	115,082
723.95	53,678	117,748
724.00	54,400	120,450
724.05	54,782	123,180
724.10	55,165	125,928
724.15	55,547	128,696
724.20	55,930	131,483
724.25	56,313	134,289
724.30	56,695	137,114
724.35	57,078	139,959
724.40	57,460	142,822
724.45	57,843	145,705
724.50	58,225	148,606
724.55	58,607	151,527
724.60	58,990	154,467
724.65	59,372	157,426
724.70	59,755	160,404
724.75	60,138	163,402
724.80	60,520	166,418
724.85	60,903	169,454
724.90	61,285	172,508
724.95	61,668	175,582
725.00	62,050	178,675
725.05	62,292	181,784
725.10	62,535	184,904
725.15	62,777	188,037
725.20	63,020	191,182
725.25	63,263	194,339
725.30	63,505	197,508
725.35	63,748	200,690
725.40	63,990	203,883
725.45	64,233	207,089
725.50	64,475	210,306
725.55	64,717	213,536
725.60	64,960	216,778
725.65	65,202	220,032
725.70	65,445	223,298
725.75	65,688	226,577
725.80	65,930	229,867
725.85	66,173	233,170
725.90	66,415	236,484
725.95	66,658	239,811
726.00	**66,900**	**243,150**

Summary for Link 10L: DA 1 POST TOTAL

Inflow Area = 34.240 ac, 36.46% Impervious, Inflow Depth > 2.01" for 25-YEAR event
Inflow = 28.08 cfs @ 12.37 hrs, Volume= 5.746 af
Primary = 28.08 cfs @ 12.37 hrs, Volume= 5.746 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 10L: DA 1 POST TOTAL



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment5S: DA 3 POST Runoff Area=1.090 ac 0.00% Impervious Runoff Depth>2.84"
Flow Length=100' Slope=0.0500 '/' Tc=7.8 min CN=79 Runoff=5.45 cfs 0.258 af

Subcatchment6S: DA 1 POST Runoff Area=1.390 ac 0.00% Impervious Runoff Depth>2.74"
Flow Length=1,070' Tc=16.0 min CN=78 Runoff=5.13 cfs 0.317 af

Subcatchment7S: DA 2 POST Runoff Area=12.000 ac 0.00% Impervious Runoff Depth>2.92"
Flow Length=970' Tc=15.2 min CN=80 Runoff=48.20 cfs 2.920 af

Subcatchment8S: DA 1 POST Runoff Area=16.510 ac 38.00% Impervious Runoff Depth>3.60"
Flow Length=900' Tc=15.9 min CN=87 Runoff=77.36 cfs 4.947 af

Subcatchment9S: DA 2 POST Runoff Area=16.340 ac 38.00% Impervious Runoff Depth>3.60"
Flow Length=900' Tc=15.9 min CN=87 Runoff=76.56 cfs 4.896 af

Pond 12P: SWM 1 Peak Elev=725.59' Storage=216,387 cf Inflow=153.92 cfs 9.842 af
Outflow=30.61 cfs 7.926 af

Link 10L: DA 1 POST TOTAL Inflow=32.72 cfs 8.243 af
Primary=32.72 cfs 8.243 af

Total Runoff Area = 47.330 ac Runoff Volume = 13.337 af Average Runoff Depth = 3.38"
73.63% Pervious = 34.847 ac 26.37% Impervious = 12.483 ac

Summary for Subcatchment 5S: DA 3 POST

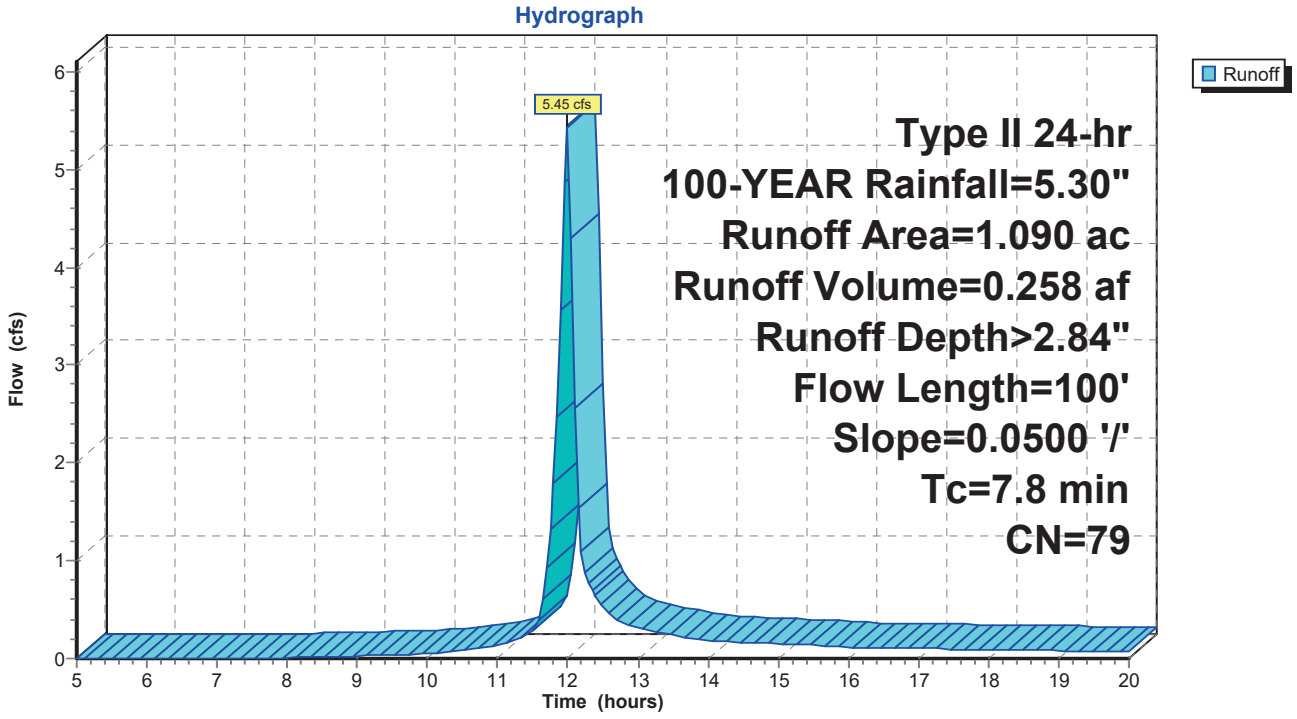
Runoff = 5.45 cfs @ 11.99 hrs, Volume= 0.258 af, Depth> 2.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-YEAR Rainfall=5.30"

Area (ac)	CN	Description
0.640	80	>75% Grass cover, Good, HSG D
0.450	77	Woods, Good, HSG D
1.090	79	Weighted Average
1.090		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	100	0.0500	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"

Subcatchment 5S: DA 3 POST



Summary for Subcatchment 6S: DA 1 POST UNCONTROLLED

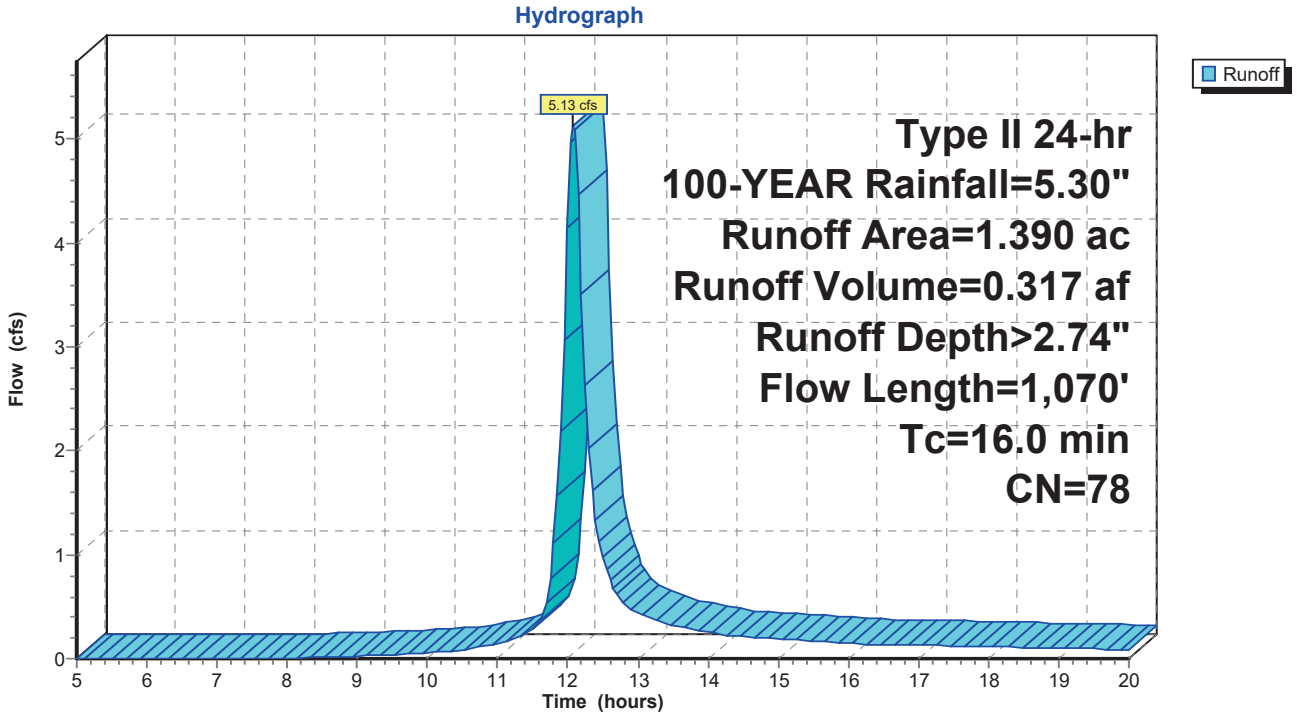
Runoff = 5.13 cfs @ 12.08 hrs, Volume= 0.317 af, Depth> 2.74"
Routed to Link 10L : DA 1 POST TOTAL

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-YEAR Rainfall=5.30"

Area (ac)	CN	Description
0.590	80	>75% Grass cover, Good, HSG D
0.800	77	Woods, Good, HSG D
1.390	78	Weighted Average
1.390		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	100	0.0500	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"
8.2	970	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.0	1,070	Total			

Subcatchment 6S: DA 1 POST UNCONTROLLED



Summary for Subcatchment 7S: DA 2 POST UNCONTROLLED

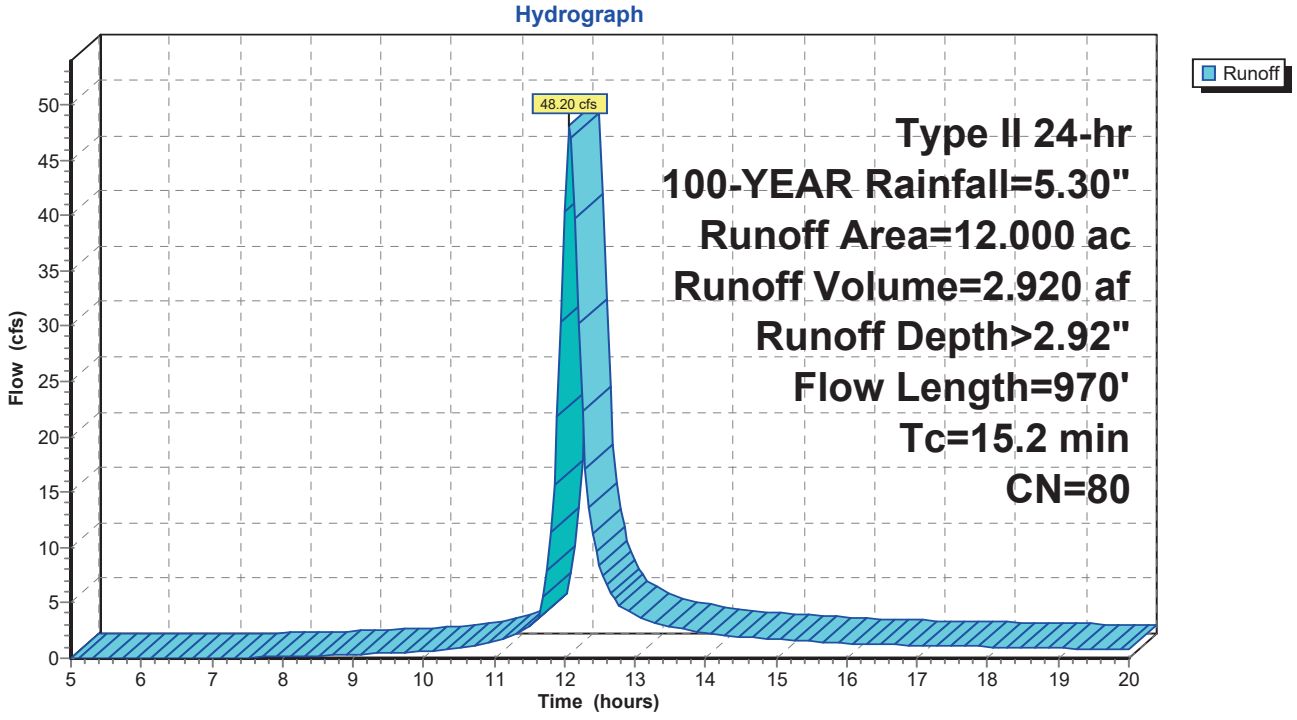
Runoff = 48.20 cfs @ 12.07 hrs, Volume= 2.920 af, Depth> 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-YEAR Rainfall=5.30"

Area (ac)	CN	Description
11.200	80	>75% Grass cover, Good, HSG D
0.800	77	Woods, Good, HSG D
12.000	80	Weighted Average
12.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	100	0.0500	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"
7.4	870	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
15.2	970	Total			

Subcatchment 7S: DA 2 POST UNCONTROLLED



Summary for Subcatchment 8S: DA 1 POST CONTROLLED

[47] Hint: Peak is 3071% of capacity of segment #3

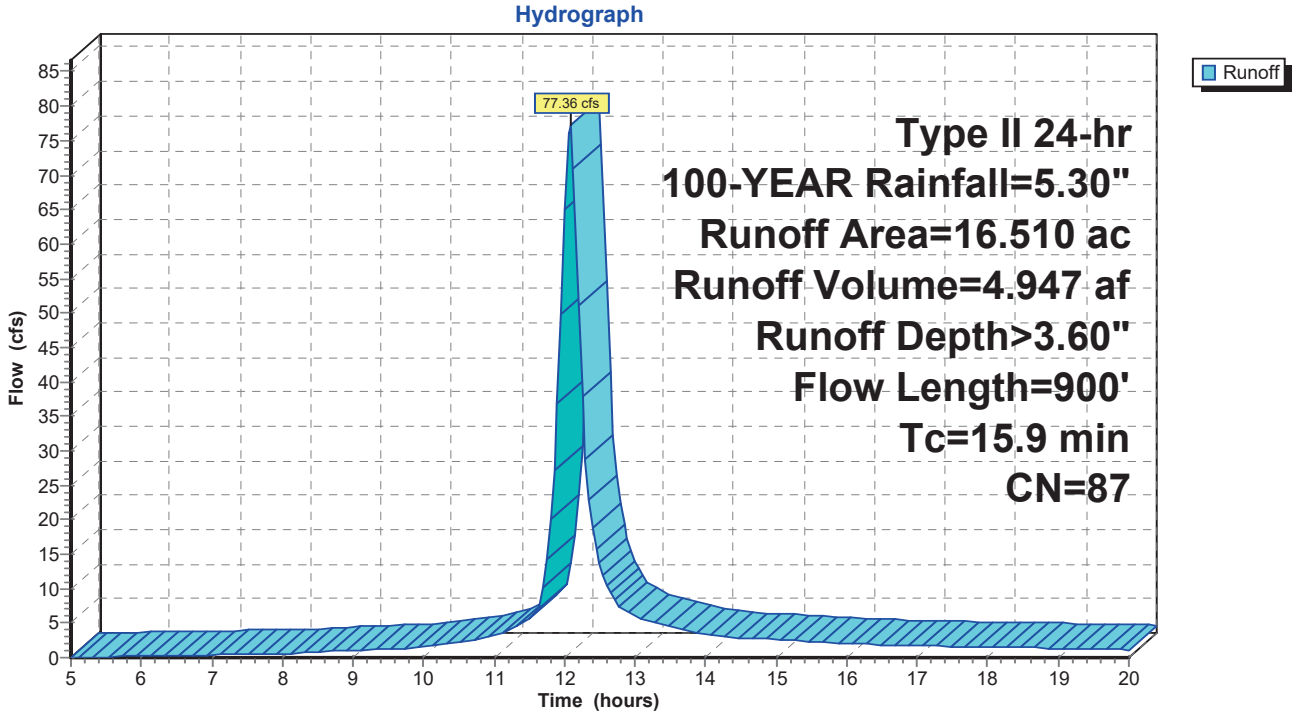
Runoff = 77.36 cfs @ 12.08 hrs, Volume= 4.947 af, Depth> 3.60"
Routed to Pond 12P : SWM 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-YEAR Rainfall=5.30"

Area (ac)	CN	Description
16.510	87	1/4 acre lots, 38% imp, HSG D
10.236		62.00% Pervious Area
6.274		38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	100	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"
1.5	200	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.1	600	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
15.9	900	Total			

Subcatchment 8S: DA 1 POST CONTROLLED



Summary for Subcatchment 9S: DA 2 POST CONTROLLED

[47] Hint: Peak is 3039% of capacity of segment #3

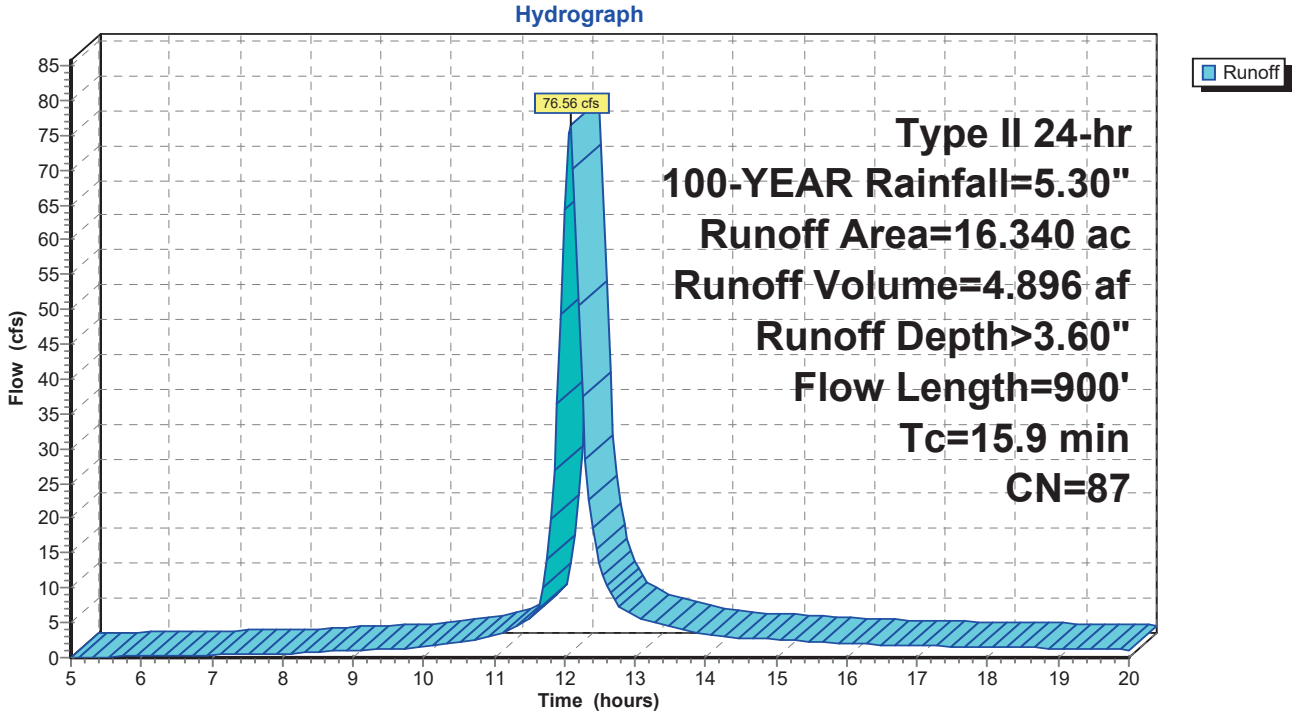
Runoff = 76.56 cfs @ 12.08 hrs, Volume= 4.896 af, Depth> 3.60"
Routed to Pond 12P : SWM 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-YEAR Rainfall=5.30"

Area (ac)	CN	Description
16.340	87	1/4 acre lots, 38% imp, HSG D
10.131		62.00% Pervious Area
6.209		38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	100	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"
1.5	200	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.1	600	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
15.9	900	Total			

Subcatchment 9S: DA 2 POST CONTROLLED



Summary for Pond 12P: SWM 1

Inflow Area = 32.850 ac, 38.00% Impervious, Inflow Depth > 3.60" for 100-YEAR event
Inflow = 153.92 cfs @ 12.08 hrs, Volume= 9.842 af
Outflow = 30.61 cfs @ 12.46 hrs, Volume= 7.926 af, Atten= 80%, Lag= 23.2 min
Primary = 30.61 cfs @ 12.46 hrs, Volume= 7.926 af
Routed to Link 10L : DA 1 POST TOTAL

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 725.59' @ 12.46 hrs Surf.Area= 64,931 sf Storage= 216,387 cf

Plug-Flow detention time= 142.7 min calculated for 7.925 af (81% of inflow)
Center-of-Mass det. time= 89.8 min (858.1 - 768.3)

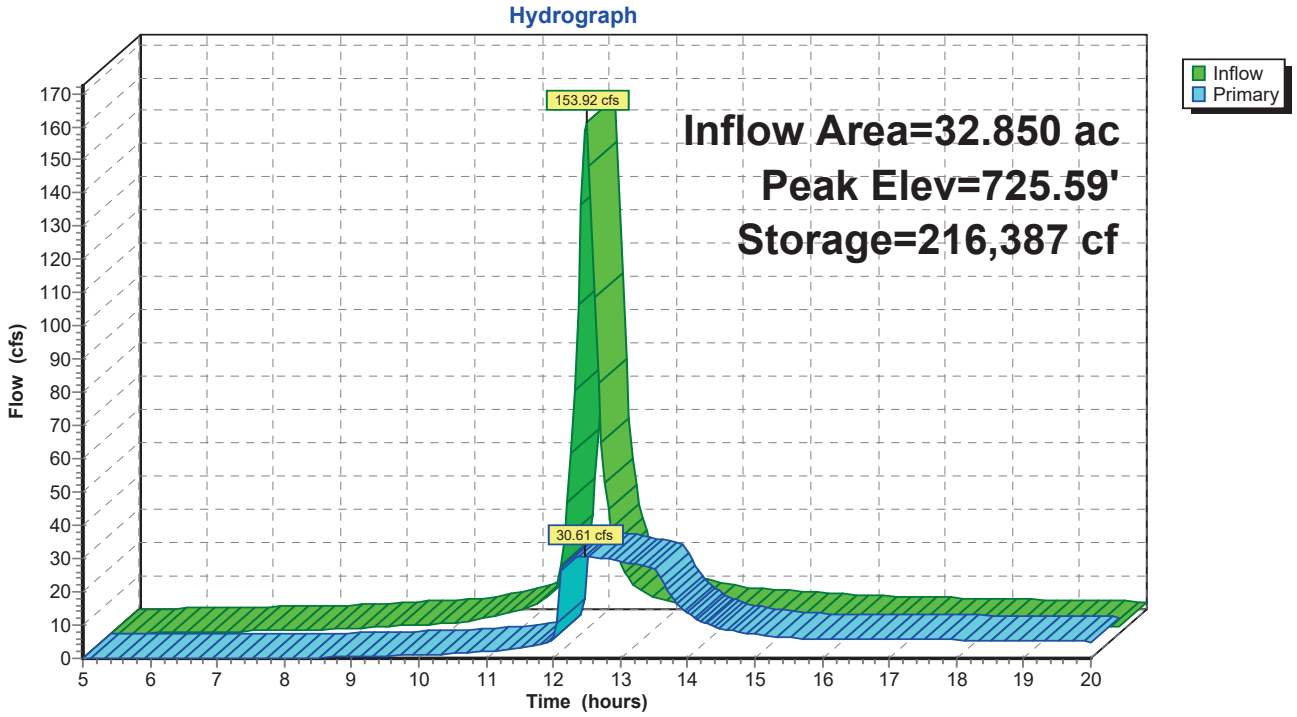
Volume	Invert	Avail.Storage	Storage Description
#1	721.00'	243,150 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
721.00	33,400	0	0
722.00	36,600	35,000	35,000
723.00	39,950	38,275	73,275
724.00	54,400	47,175	120,450
725.00	62,050	58,225	178,675
726.00	66,900	64,475	243,150

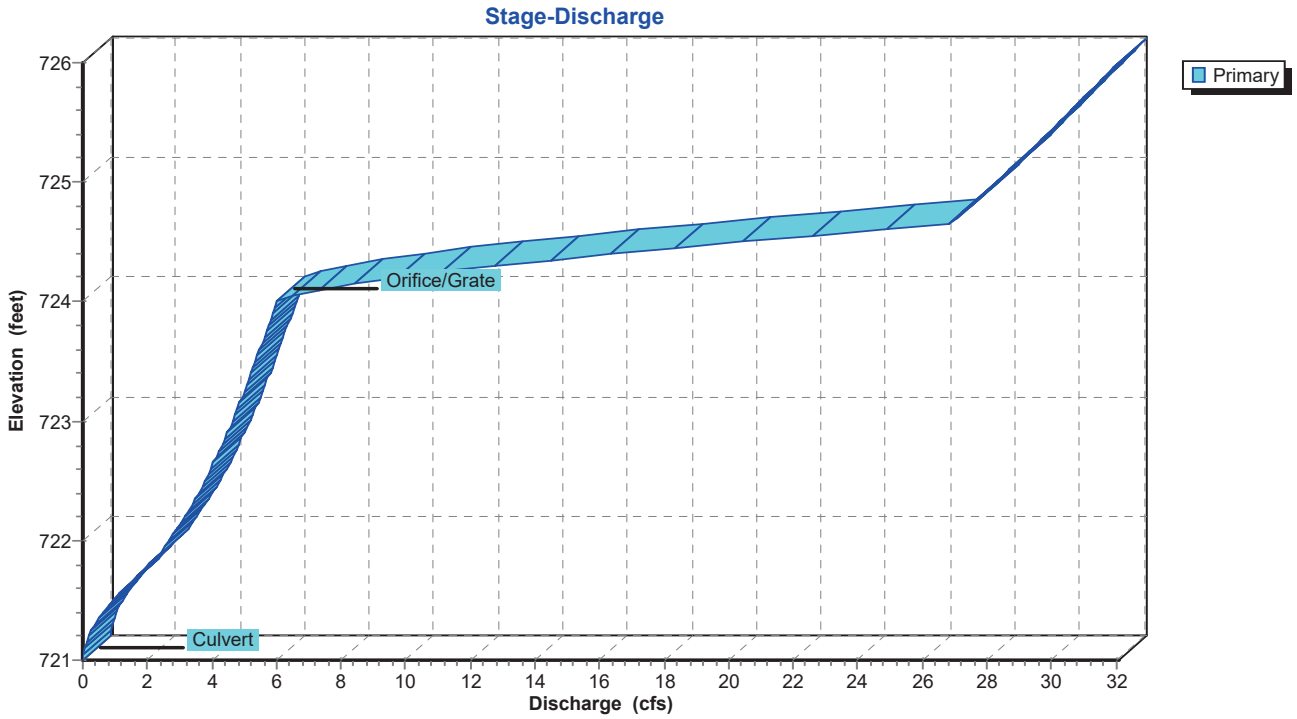
Device	Routing	Invert	Outlet Devices
#1	Primary	720.50'	**24.0" Round Culvert** L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 720.50' / 720.00' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	724.00'	**36.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	721.00'	**12.0" Round Culvert** L= 12.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 721.00' / 720.60' S= 0.0333 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=30.60 cfs @ 12.46 hrs HW=725.59' (Free Discharge)
└**1=Culvert** (Inlet Controls 30.60 cfs @ 9.74 fps)
  ├**2=Orifice/Grate** (Passes < 54.69 cfs potential flow)
  └**3=Culvert** (Passes < 7.65 cfs potential flow)

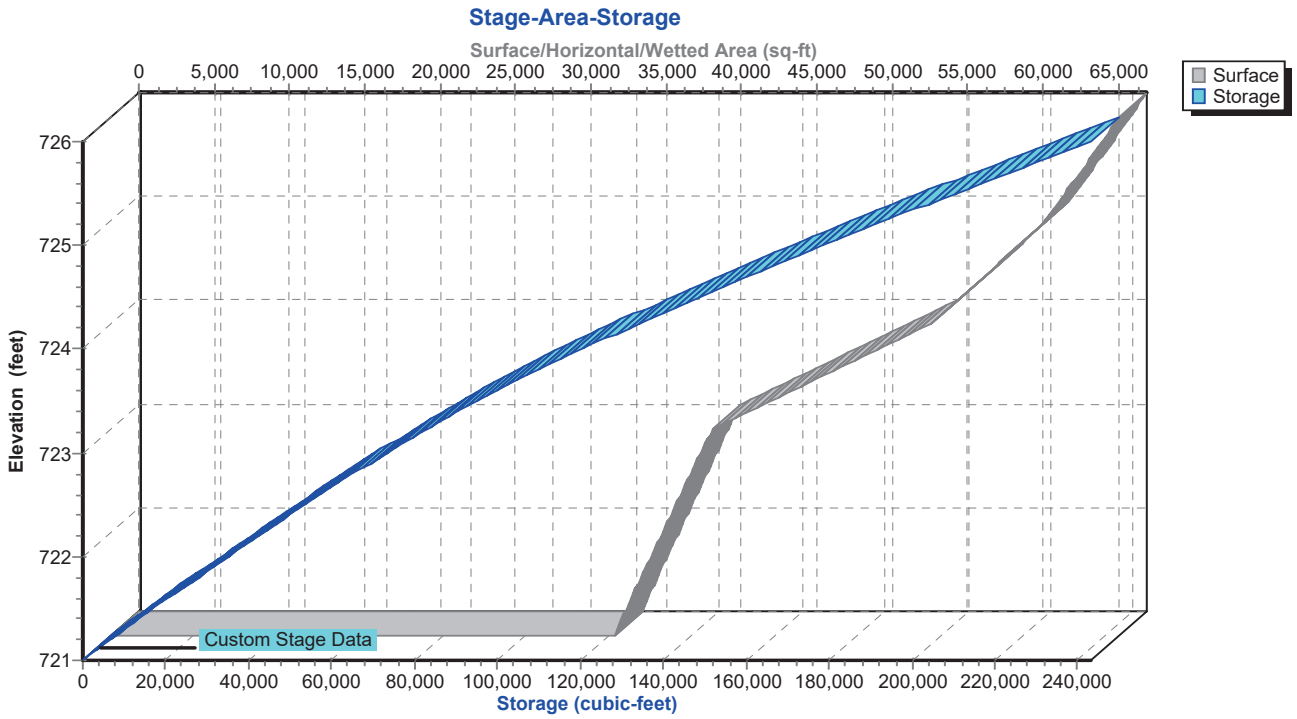
Pond 12P: SWM 1



Pond 12P: SWM 1



Pond 12P: SWM 1



Stage-Discharge for Pond 12P: SWM 1

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
721.00	0.00	723.60	5.48
721.05	0.01	723.65	5.55
721.10	0.04	723.70	5.61
721.15	0.10	723.75	5.67
721.20	0.17	723.80	5.74
721.25	0.26	723.85	5.80
721.30	0.37	723.90	5.86
721.35	0.49	723.95	5.92
721.40	0.63	724.00	5.98
721.45	0.78	724.05	6.48
721.50	0.95	724.10	7.34
721.55	1.12	724.15	8.44
721.60	1.30	724.20	9.72
721.65	1.48	724.25	11.18
721.70	1.67	724.30	12.78
721.75	1.86	724.35	14.51
721.80	2.05	724.40	16.37
721.85	2.23	724.45	18.34
721.90	2.40	724.50	20.42
721.95	2.56	724.55	22.61
722.00	2.67	724.60	24.90
722.05	2.80	724.65	26.85
722.10	2.93	724.70	27.06
722.15	3.05	724.75	27.27
722.20	3.16	724.80	27.48
722.25	3.28	724.85	27.69
722.30	3.38	724.90	27.89
722.35	3.49	724.95	28.10
722.40	3.59	725.00	28.30
722.45	3.69	725.05	28.50
722.50	3.78	725.10	28.70
722.55	3.88	725.15	28.90
722.60	3.97	725.20	29.10
722.65	4.06	725.25	29.29
722.70	4.14	725.30	29.49
722.75	4.23	725.35	29.68
722.80	4.31	725.40	29.87
722.85	4.39	725.45	30.06
722.90	4.47	725.50	30.25
722.95	4.55	725.55	30.44
723.00	4.63	725.60	30.63
723.05	4.71	725.65	30.82
723.10	4.78	725.70	31.00
723.15	4.86	725.75	31.18
723.20	4.93	725.80	31.37
723.25	5.00	725.85	31.55
723.30	5.07	725.90	31.73
723.35	5.14	725.95	31.91
723.40	5.21	726.00	**32.09**
723.45	5.28		
723.50	5.35		
723.55	5.41		

Stage-Area-Storage for Pond 12P: SWM 1

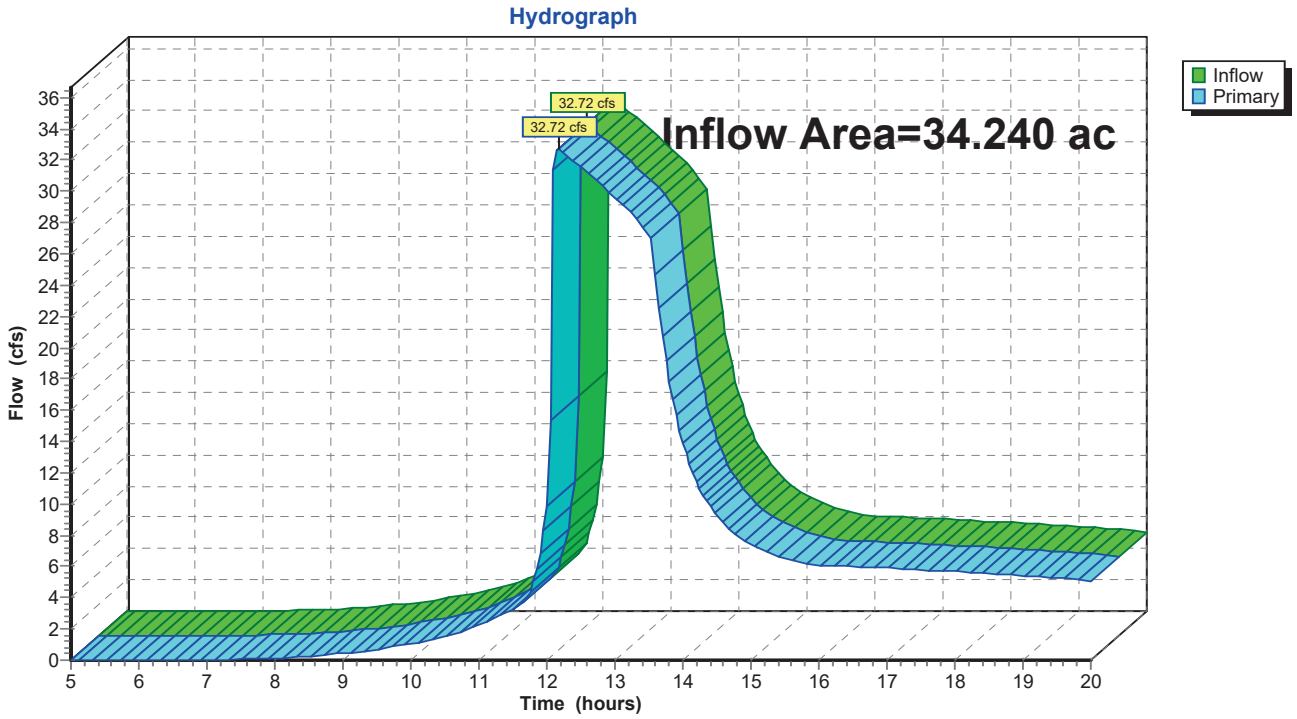
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
721.00	33,400	0
721.05	33,560	1,674
721.10	33,720	3,356
721.15	33,880	5,046
721.20	34,040	6,744
721.25	34,200	8,450
721.30	34,360	10,164
721.35	34,520	11,886
721.40	34,680	13,616
721.45	34,840	15,354
721.50	35,000	17,100
721.55	35,160	18,854
721.60	35,320	20,616
721.65	35,480	22,386
721.70	35,640	24,164
721.75	35,800	25,950
721.80	35,960	27,744
721.85	36,120	29,546
721.90	36,280	31,356
721.95	36,440	33,174
722.00	36,600	35,000
722.05	36,767	36,834
722.10	36,935	38,677
722.15	37,102	40,528
722.20	37,270	42,387
722.25	37,438	44,255
722.30	37,605	46,131
722.35	37,773	48,015
722.40	37,940	49,908
722.45	38,108	51,809
722.50	38,275	53,719
722.55	38,442	55,637
722.60	38,610	57,563
722.65	38,777	59,498
722.70	38,945	61,441
722.75	39,113	63,392
722.80	39,280	65,352
722.85	39,448	67,320
722.90	39,615	69,297
722.95	39,783	71,282
723.00	39,950	73,275
723.05	40,672	75,291
723.10	41,395	77,342
723.15	42,117	79,430
723.20	42,840	81,554
723.25	43,563	83,714
723.30	44,285	85,910
723.35	45,008	88,143
723.40	45,730	90,411
723.45	46,453	92,716
723.50	47,175	95,056
723.55	47,897	97,433
723.60	48,620	99,846
723.65	49,342	102,295
723.70	50,065	104,780
723.75	50,788	107,302
723.80	51,510	109,859
723.85	52,233	112,453
723.90	52,955	115,082
723.95	53,678	117,748
724.00	54,400	120,450
724.05	54,782	123,180
724.10	55,165	125,928
724.15	55,547	128,696
724.20	55,930	131,483
724.25	56,313	134,289
724.30	56,695	137,114
724.35	57,078	139,959
724.40	57,460	142,822
724.45	57,843	145,705
724.50	58,225	148,606
724.55	58,607	151,527
724.60	58,990	154,467
724.65	59,372	157,426
724.70	59,755	160,404
724.75	60,138	163,402
724.80	60,520	166,418
724.85	60,903	169,454
724.90	61,285	172,508
724.95	61,668	175,582
725.00	62,050	178,675
725.05	62,292	181,784
725.10	62,535	184,904
725.15	62,777	188,037
725.20	63,020	191,182
725.25	63,263	194,339
725.30	63,505	197,508
725.35	63,748	200,690
725.40	63,990	203,883
725.45	64,233	207,089
725.50	64,475	210,306
725.55	64,717	213,536
725.60	64,960	216,778
725.65	65,202	220,032
725.70	65,445	223,298
725.75	65,688	226,577
725.80	65,930	229,867
725.85	66,173	233,170
725.90	66,415	236,484
725.95	66,658	239,811
726.00	**66,900**	**243,150**

Summary for Link 10L: DA 1 POST TOTAL

Inflow Area = 34.240 ac, 36.46% Impervious, Inflow Depth > 2.89" for 100-YEAR event
Inflow = 32.72 cfs @ 12.18 hrs, Volume= 8.243 af
Primary = 32.72 cfs @ 12.18 hrs, Volume= 8.243 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 10L: DA 1 POST TOTAL



Green Infrastructure & Water Quality Calculations

Version 1.6
Last Updated: 03/28/2014

Total Water Quality Volume Calculation
WQv(acre-feet) = [(P)(Rv)(A)] /12

Is this project subject to Chapter 10 of the NYS Design Manual (i.e. WQv is equal to post-development 1 year runoff volume)?.....	No

Design Point:		
P=	1.00	*inch*

Manually enter P, Total Area and Impervious Cover.

Breakdown of Subcatchments

Catchment Number	Total Area *(Acres)*	Impervious Area *(Acres)*	Percent Impervious *%*	Rv	WQv *(ft^3)*	Description
1	16.51	4.70	28%	0.31	18,351	
2	16.34	2.80	17%	0.20	12,113	
3						
4						
5						
6						
7						
8						
9						
10						
Subtotal (1-30)	32.85	7.50	23%	0.26	**30,465**	**Subtotal 1**
Total	32.85	7.50	23%	0.26	**30,465**	**Initial WQv**

Identify Runoff Reduction Techniques By Area

Technique	Total Contributing Area *(Acre)*	Contributing Impervious Area *(Acre)*	Notes
Conservation of Natural Areas	0.00	0.00	*minimum 10,000 sf*
Riparian Buffers	0.00	0.00	*maximum contributing length 75 feet to 150 feet*
Filter Strips	0.00	0.00	
Tree Planting	0.00	0.00	*Up to 100 sf directly connected impervious area may be subtracted per tree*
Total	**0.00**	**0.00**	

Recalculate WQv after application of Area Reduction Techniques

	Total Area *(Acres)*	Impervious Area *(Acres)*	Percent Impervious *%*	Runoff Coefficient Rv	WQv *(ft^3)*
"<<Initial WQv"	32.85	7.50	23%	0.26	30,465
Subtract Area	0.00	0.00			
WQv adjusted after Area Reductions	**32.85**	**7.50**	23%	0.26	30,465
Disconnection of Rooftops		0.00			
Adjusted WQv after Area Reduction and Rooftop Disconnect	32.85	7.50	23%	0.26	**30,465**
WQv reduced by Area Reduction techniques					0

Version 1.6
Last Updated: 03/28/2014

Total Water Quality Volume Calculation
WQv(acre-feet) = [(P)(Rv)(A)] /12

0.70	**af**

0.70	**af**
0.00	**af**

Runoff Reduction Volume and Treated volumes						
	Runoff Reduction Techiques/Standard SMPs		**Total Contributing Area**	**Total Contributing Impervious Area**	**WQv Reduced (RRv)**	**WQv Treated**
			(acres)	**(acres)**	**cf**	**cf**
Area/Volume Reduction	Conservation of Natural Areas	RR-1	0.00	0.00		
	Sheetflow to Riparian Buffers/Filter Strips	RR-2	0.00	0.00		
	Tree Planting/Tree Pit	RR-3	0.00	0.00		
	Disconnection of Rooftop Runoff	RR-4		0.00		
	Vegetated Swale	RR-5	0.00	0.00	0	
	Rain Garden	RR-6	0.00	0.00	0	
	Stormwater Planter	RR-7	0.00	0.00	0	
	Rain Barrel/Cistern	RR-8	0.00	0.00	0	
	Porous Pavement	RR-9	0.00	0.00	0	
	Green Roof (Intensive & Extensive)	RR-10	0.00	0.00	0	
Standard SMPs w/RRv Capacity	Infiltration Trench	I-1	0.00	0.00	0	0
	Infiltration Basin	I-2	0.00	0.00	0	0
	Dry Well	I-3	0.00	0.00	0	0
	Underground Infiltration System	I-4	0.00			
	Bioretention & Infiltration Bioretention	F-5	32.85	7.50	5333	25131
	Dry swale	O-1	0.00	0.00	0	0
Standard SMPs	Micropool Extended Detention (P-1)	P-1				
	Wet Pond (P-2)	P-2				
	Wet Extended Detention (P-3)	P-3				
	Multiple Pond system (P-4)	P-4				
	Pocket Pond (p-5)	P-5				
	Surface Sand filter (F-1)	F-1				
	Underground Sand filter (F-2)	F-2				
	Perimeter Sand Filter (F-3)	F-3				
	Organic Filter (F-4	F-4				
	Shallow Wetland (W-1)	W-1				
	Extended Detention Wetland (W-2	W-2				
	Pond/Wetland System (W-3)	W-3				
	Pocket Wetland (W-4)	W-4				
	Wet Swale (O-2)	O-2				
Totals by Area Reduction →			0.00	0.00	0	
Totals by Volume Reduction →			0.00	0.00	0	
Totals by Standard SMP w/RRV →			32.85	7.50	5333	25131
Totals by Standard SMP →			0.00	0.00		0
Totals (Area + Volume + all SMPs) →			32.85	7.50	5,333	25,131
	Impervious Cover √	okay				

	Total Area √	okay				

Bioretention Worksheet

(For use on HSG C or D Soils with underdrains)

Af=WQv*(df)/[k*(hf+df)(tf)]

Af	Required Surface Area (ft2)
WQv	Water Quality Volume (ft3)
df	Depth of the Soil Medium (feet)
hf	Average height of water above the planter bed
tf	Volume Through the Filter Media (days)

k — The hydraulic conductivity [ft/day], can be varied depending on the properties of the soil media. Some reported conductivity values are: ***Sand*** - 3.5 ft/day (City of Austin 1988); ***Peat*** - 2.0 ft/day (Galli 1990); ***Leaf Compost*** - 8.7 ft/day (Claytor and Schueler, 1996); ***Bioretention Soil*** (0.5 ft/day (Claytor &

Design Point:

Enter Site Data For Drainage Area to be Treated by Practice							
Catchment Number	**Total Area** *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Rv**	**WQv** *(ft^3)*	**Precipitation** *(in)*	**Description**
1	16.51	4.70	0.28	0.31	18351.47	1.00	
Enter Impervious Area Reduced by Disconnection of Rooftops			28%	0.31	18,351	<<WQv after adjusting for Disconnected Rooftops	
Enter the portion of the WQv that is not reduced for all practices routed to this practice.						*ft^3*	

Soil Information			
Soil Group	D		
Soil Infiltration Rate	0.00	*in/hour*	*Okay*
Using Underdrains?	Yes	*Okay*	

Calculate the Minimum Filter Area				
		Value	Units	Notes
WQv		18,351	*ft^3*	
Enter Depth of Soil Media	*df*	1.5	*ft*	*2.5-4 ft*
Enter Hydraulic Conductivity	*k*	0.5	*ft/day*	
Enter Average Height of Ponding	*hf*	0.5	*ft*	*6 inches max.*
Enter Filter Time	*tf*	2	*days*	
Required Filter Area	***Af***	**13764**	***ft^2***	

Determine Actual Bio-Retention Area			
Filter Width	20	*ft*	
Filter Length	200	*ft*	
Filter Area	4000	*ft^2*	
Actual Volume Provided	5333	*ft^3*	

Determine Runoff Reduction				
Is the Bioretention contributing flow to another practice?			Select Practice	
RRv	2,133			
RRv applied	**2,133**	***ft^3***	***This is 40% of the storage provided or WQv whichever is less.***	
Volume Treated	16,218	*ft^3*	*This is the portion of the WQv that is not reduced in the practice.*	
Volume Directed	0	*ft^3*	This volume is directed another practice	
Sizing √	Error		*Check to be sure Area provided ≥ Af*	

Bioretention Worksheet

(For use on HSG C or D Soils with underdrains)

Af=WQv*(df)/[k*(hf+df)(tf)]

Af	Required Surface Area (ft2)
WQv	Water Quality Volume (ft3)
df	Depth of the Soil Medium (feet)
hf	Average height of water above the planter bed
tf	Volume Through the Filter Media (days)

k — The hydraulic conductivity [ft/day], can be varied depending on the properties of the soil media. Some reported conductivity values are: ***Sand*** - 3.5 ft/day (City of Austin 1988); ***Peat*** - 2.0 ft/day (Galli 1990); ***Leaf Compost*** - 8.7 ft/day (Claytor and Schueler, 1996); ***Bioretention Soil*** (0.5 ft/day (Claytor & Schueler, 1996)

Design Point:

Enter Site Data For Drainage Area to be Treated by Practice							
Catchment Number	**Total Area** *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Rv**	**WQv** *(ft^3)*	**Precipitation** *(in)*	**Description**
2	16.34	2.80	0.17	0.20	12113.31	1.00	
Enter Impervious Area Reduced by Disconnection of Rooftops			17%	0.20	12,113	<<WQv after adjusting for Disconnected Rooftops	
Enter the portion of the WQv that is not reduced for all practices routed to this practice.						*ft^3*	

Soil Information			
Soil Group	D		
Soil Infiltration Rate	0.00	*in/hour*	*Okay*
Using Underdrains?	Yes	*Okay*	

Calculate the Minimum Filter Area				
		Value	Units	Notes
WQv		12,113	*ft^3*	
Enter Depth of Soil Media	*df*	1.5	*ft*	*2.5-4 ft*
Enter Hydraulic Conductivity	*k*	0.5	*ft/day*	
Enter Average Height of Ponding	*hf*	0.5	*ft*	*6 inches max.*
Enter Filter Time	*tf*	2	*days*	
Required Filter Area	***Af***	**9085**	***ft^2***	

Determine Actual Bio-Retention Area			
Filter Width	30	*ft*	
Filter Length	200	*ft*	
Filter Area	6000	*ft^2*	
Actual Volume Provided	8000	*ft^3*	

Determine Runoff Reduction				
Is the Bioretention contributing flow to another practice?			Select Practice	
RRv	3,200			
RRv applied	**3,200**	***ft^3***	***This is 40% of the storage provided or WQv whichever is less.***	
Volume Treated	8,913	*ft^3*	*This is the portion of the WQv that is not reduced in the practice.*	
Volume Directed	0	*ft^3*	This volume is directed another practice	
Sizing √	Error		*Check to be sure Area provided ≥ Af*	

Bioretention Worksheet

(For use on HSG C or D Soils with underdrains)

Af=WQv*(df)/[k*(hf+df)(tf)]

Af	Required Surface Area (ft2)
WQv	Water Quality Volume (ft3)
df	Depth of the Soil Medium (feet)
hf	Average height of water above the planter bed
tf	Volume Through the Filter Media (days)

k — The hydraulic conductivity [ft/day], can be varied depending on the properties of the soil media. Some reported conductivity values are: ***Sand*** - 3.5 ft/day (City of Austin 1988); ***Peat*** - 2.0 ft/day (Galli 1990); ***Leaf Compost*** - 8.7 ft/day (Claytor and Schueler, 1996); ***Bioretention Soil*** (0.5 ft/day (Claytor &

Design Point:	

Enter Site Data For Drainage Area to be Treated by Practice							
Catchment Number	**Total Area** *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Rv**	**WQv** *(ft^3)*	**Precipitation** *(in)*	**Description**
Enter Impervious Area Reduced by Disconnection of Rooftops						<<WQv after adjusting for Disconnected Rooftops	
Enter the portion of the WQv that is not reduced for all practices routed to this practice.						*ft^3*	

Soil Information			
Soil Group			
Soil Infiltration Rate		*in/hour*	
Using Underdrains?			

Calculate the Minimum Filter Area				
		Value	Units	Notes
WQv		0	*ft^3*	
Enter Depth of Soil Media	*df*		*ft*	*2.5-4 ft*
Enter Hydraulic Conductivity	*k*		*ft/day*	
Enter Average Height of Ponding	*hf*		*ft*	*6 inches max.*
Enter Filter Time	*tf*		*days*	
Required Filter Area	***Af***	**0**	***ft^2***	

Determine Actual Bio-Retention Area			
Filter Width		*ft*	
Filter Length		*ft*	
Filter Area	0	*ft^2*	
Actual Volume Provided	0	*ft^3*	

Determine Runoff Reduction				
Is the Bioretention contributing flow to another practice?			Select Practice	
RRv	0			
RRv applied	**0**	***ft^3***	***This is 40% of the storage provided or WQv whichever is less.***	
Volume Treated		*ft^3*	*This is the portion of the WQv that is not reduced in the practice.*	
Volume Directed		*ft^3*	This volume is directed another practice	
Sizing √	OK		*Check to be sure Area provided ≥ Af*	

Bioretention Worksheet

(For use on HSG C or D Soils with underdrains)

Af=WQv*(df)/[k*(hf+df)(tf)]

Af	Required Surface Area (ft2)
WQv	Water Quality Volume (ft3)
df	Depth of the Soil Medium (feet)
hf	Average height of water above the planter bed
tf	Volume Through the Filter Media (days)

k — The hydraulic conductivity [ft/day], can be varied depending on the properties of the soil media. Some reported conductivity values are: ***Sand*** - 3.5 ft/day (City of Austin 1988); ***Peat*** - 2.0 ft/day (Galli 1990); ***Leaf Compost*** - 8.7 ft/day (Claytor and Schueler, 1996); ***Bioretention Soil*** (0.5 ft/day (Claytor &

Design Point:	

Enter Site Data For Drainage Area to be Treated by Practice							
Catchment Number	**Total Area** *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Rv**	**WQv** *(ft^3)*	**Precipitation** *(in)*	**Description**
Enter Impervious Area Reduced by Disconnection of Rooftops					<<WQv after adjusting for Disconnected Rooftops		
Enter the portion of the WQv that is not reduced for all practices routed to this practice.						*ft^3*	

Soil Information			
Soil Group			
Soil Infiltration Rate		*in/hour*	
Using Underdrains?			

Calculate the Minimum Filter Area				
		Value	Units	Notes
WQv		0	*ft^3*	
Enter Depth of Soil Media	*df*		*ft*	*2.5-4 ft*
Enter Hydraulic Conductivity	*k*		*ft/day*	
Enter Average Height of Ponding	*hf*		*ft*	*6 inches max.*
Enter Filter Time	*tf*		*days*	
Required Filter Area	***Af***	**0**	***ft^2***	

Determine Actual Bio-Retention Area			
Filter Width		*ft*	
Filter Length		*ft*	
Filter Area	0	*ft^2*	
Actual Volume Provided	0	*ft^3*	

Determine Runoff Reduction				
Is the Bioretention contributing flow to another practice?			Select Practice	
RRv	0			
RRv applied	**0**	***ft^3***	***This is 40% of the storage provided or WQv whichever is less.***	
Volume Treated		*ft^3*	*This is the portion of the WQv that is not reduced in the practice.*	
Volume Directed		*ft^3*	This volume is directed another practice	
Sizing √	OK		*Check to be sure Area provided ≥ Af*	

Bioretention Worksheet

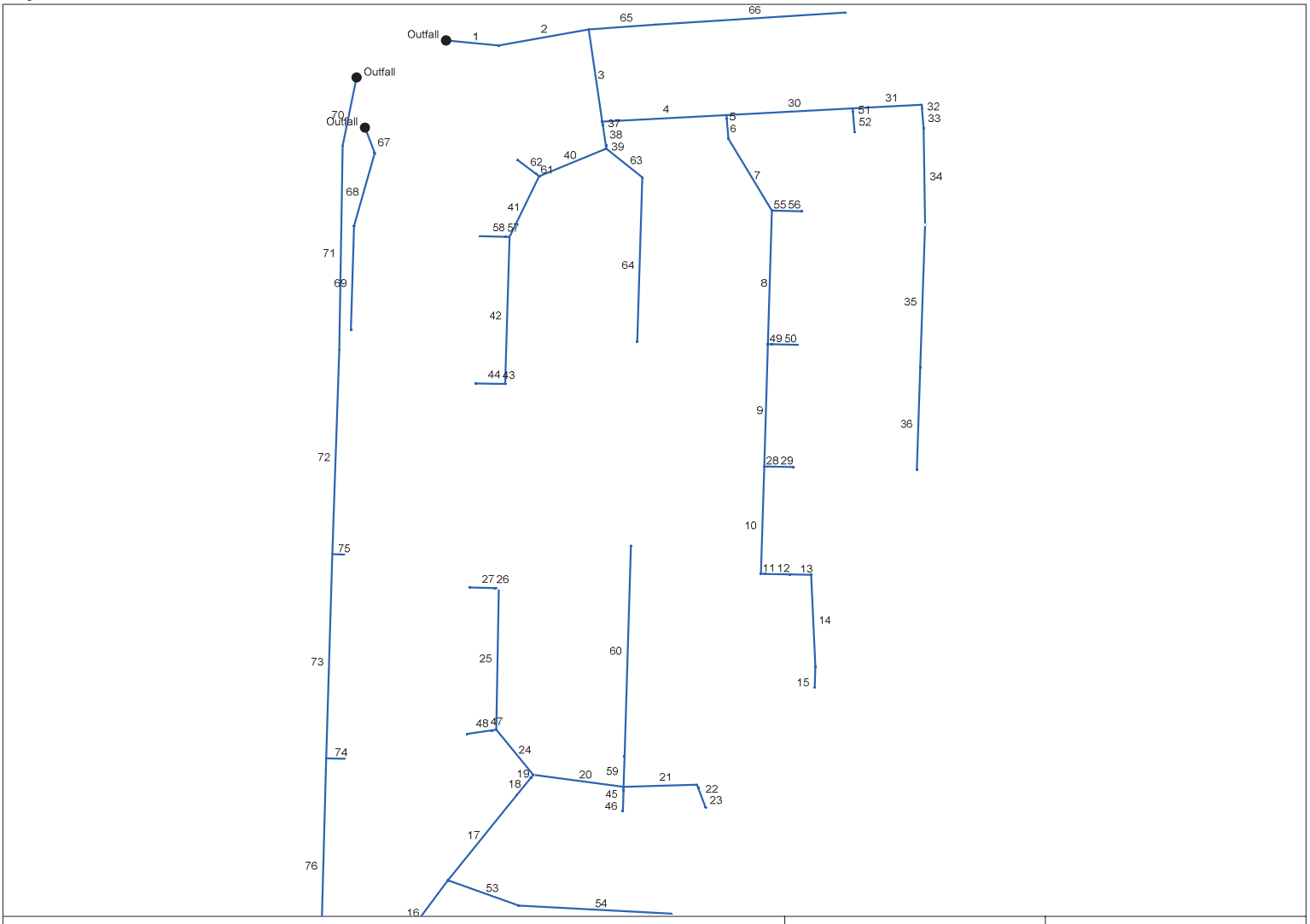
Total RRv Applied	5,333.33
Total Area	32.85
Total Impervious Area	7.50
Total Volume Treated	25,131.44
Rooftop Disconnect Impervious Area Total	0.00

Minimum RRv

Enter the Soils Data for the site		
Soil Group	Acres	S
A		55%
B		40%
C		30%
D	**32.85**	20%
Total Area	32.85	
Calculate the Minimum RRv		
S =	**0.20**	
Impervious =	7.50	*acre*
Precipitation	1	*in*
Rv	0.95	
Minimum RRv	**5,173**	***ft3***
	0.12	af

Storm Sewer Calculations

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: New.stm	Number of lines: 76	Date: 1/23/2024

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
76	73	300.000	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	6.07	13.83	1.33	36	0.04	720.89	721.00	722.77	722.81	726.17	724.10	ES4-MH18
75	72	13.717	0.46	0.46	0.35	0.16	0.16	5.0	5.0	6.2	1.00	4.30	3.83	12	1.24	722.73	722.90	723.06	723.32	726.64	725.90	YI5-MH19
74	73	21.528	0.67	0.67	0.35	0.23	0.23	10.0	10.0	4.5	1.05	2.76	3.26	12	0.51	722.89	723.00	723.32	723.43	726.17	726.00	YI4-MH18
73	72	300.000	0.00	0.67	0.00	0.00	0.23	0.0	10.3	4.4	7.11	14.45	1.55	36	0.04	720.77	720.89	722.66	722.71	726.64	726.17	MH18-MH19
72	71	300.000	0.00	1.13	0.00	0.00	0.40	0.0	15.2	3.6	7.48	14.45	1.63	36	0.04	720.65	720.77	722.53	722.60	724.76	726.64	MH19-MH20
71	70	300.000	0.00	1.13	0.00	0.00	0.40	0.0	19.8	3.1	7.28	13.84	1.55	36	0.04	720.54	720.65	722.46	722.51	724.64	724.76	MH20-MH21
70	End	101.611	0.00	1.13	0.00	0.00	0.40	0.0	24.5	2.7	7.13	14.33	1.50	36	0.04	720.50	720.54	722.42	722.44	723.60	724.64	MH21-ES5
69	68	152.572	0.32	0.32	0.35	0.11	0.11	5.0	5.0	6.2	0.70	2.70	2.16	12	0.49	724.25	725.00	724.83	725.35	726.47	728.00	YI14-YI13
68	67	109.770	0.43	0.75	0.35	0.15	0.26	5.0	7.9	5.1	1.33	2.52	2.85	12	0.50	723.70	724.25	724.41	724.74	726.08	726.47	YI13-YI12
67	End	39.214	0.09	0.84	0.35	0.03	0.29	5.0	8.8	4.8	1.41	2.54	2.53	12	0.51	723.50	723.70	724.25	724.31	724.67	726.08	YI12-ES3
66	65	225.078	0.64	0.64	0.35	0.22	0.22	10.0	10.0	4.5	1.01	2.93	1.28	12	0.68	724.95	726.47	727.58	727.76	727.95	728.47	YI11-YI10
65	2	80.000	0.45	1.09	0.35	0.16	0.38	5.0	12.9	3.9	1.49	2.18	1.90	12	0.37	724.65	724.95	727.41	727.56	729.11	727.95	YI10-YI9
64	63	241.174	0.66	0.66	0.35	0.23	0.23	10.0	10.0	4.5	1.04	2.82	1.32	12	0.63	725.95	727.46	729.25	729.46	728.95	731.36	YI17-YI16
63	39	59.919	1.05	1.71	0.35	0.37	0.60	10.0	13.0	3.9	2.33	6.07	1.32	18	0.33	725.75	725.95	729.19	729.22	729.40	728.95	YI16-MH10
62	61	30.000	0.26	0.26	0.40	0.10	0.10	5.0	5.0	6.2	0.65	2.52	0.82	12	0.50	726.05	726.20	729.31	729.32	729.51	729.51	DI27-MH12
61	40	5.000	0.19	0.45	0.40	0.08	0.18	5.0	5.6	5.9	1.06	5.04	1.36	12	2.00	725.95	726.05	729.29	729.30	730.05	729.51	DI28-MH11
60	59	309.248	1.18	1.18	0.35	0.41	0.41	10.0	10.0	4.5	1.85	1.98	2.36	12	0.31	726.30	727.26	728.28	729.12	729.30	730.26	YI7-YI6
59	20	45.000	0.82	2.00	0.35	0.29	0.70	10.0	12.2	4.0	2.83	2.91	3.60	12	0.67	726.00	726.30	727.90	728.18	729.87	729.30	YI6-MH2
58	57	30.000	0.42	0.42	0.40	0.17	0.17	5.0	5.0	6.2	1.04	3.68	1.33	12	1.07	726.77	727.09	729.74	729.77	730.64	730.64	DI29-DI30
57	41	5.000	0.41	0.83	0.40	0.16	0.33	5.0	5.4	6.0	2.00	5.04	2.55	12	2.00	726.67	726.77	729.67	729.69	731.18	730.64	DI30-MH12
56	55	30.000	0.61	0.61	0.40	0.24	0.24	10.0	10.0	4.5	1.10	2.52	1.40	12	0.50	726.80	726.95	730.72	730.75	729.32	729.32	DI20-DI19
55	7	5.000	0.53	1.14	0.40	0.21	0.46	10.0	10.4	4.4	2.01	5.04	2.56	12	2.00	726.70	726.80	730.66	730.67	729.86	729.32	DI19-MH14

Project File: New.stm | Number of lines: 76 | Run Date: 1/23/2024

NOTES:Intensity = 28.38 / (Inlet time + 3.60) ^ 0.71; Return period =Yrs. 10 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
54	53	180.611	0.19	0.19	0.30	0.06	0.06	10.0	10.0	4.5	0.26	2.47	2.03	12	0.48	726.80	727.67	727.02	727.89	728.43	730.67	YI3-YI2
53	16	91.989	0.39	0.58	0.35	0.14	0.19	5.0	19.2	3.1	0.60	3.32	0.79	12	0.87	724.50	725.30	726.18	726.20	727.50	728.43	YI2-YI1
52	51	30.000	0.06	0.06	0.45	0.03	0.03	5.0	5.0	6.2	0.17	2.91	0.21	12	0.67	726.90	727.10	730.26	730.26	731.23	731.23	DI16-DI15
51	30	5.000	0.14	0.20	0.40	0.06	0.08	5.0	7.3	5.2	0.43	5.04	0.55	12	2.00	726.80	726.90	730.25	730.25	731.77	731.23	DI15-MH8
50	49	30.000	0.32	0.32	0.40	0.13	0.13	5.0	5.0	6.2	0.79	2.91	1.01	12	0.67	727.31	727.51	731.28	731.30	731.24	731.24	DI22-DI21
49	8	5.000	0.37	0.69	0.40	0.15	0.28	5.0	5.5	6.0	1.65	5.04	2.10	12	2.00	727.21	727.31	731.24	731.25	731.45	731.24	DI21-MH15
48	47	30.000	0.41	0.41	0.40	0.16	0.16	5.0	5.0	6.2	1.02	2.91	1.30	12	0.67	727.32	727.52	729.08	729.11	728.86	728.87	DI7-DI8
47	24	5.000	0.36	0.77	0.40	0.14	0.31	5.0	5.4	6.0	1.85	5.04	2.36	12	2.00	727.22	727.32	729.02	729.04	729.40	728.86	DI8-MH4
46	45	30.000	0.17	0.17	0.40	0.07	0.07	5.0	5.0	6.2	0.42	2.91	2.24	12	0.67	727.61	727.81	727.92	728.08	729.33	729.33	DI3-DI4
45	20	5.000	0.07	0.24	0.45	0.03	0.10	5.0	5.9	5.8	0.57	5.04	2.37	12	2.00	727.51	727.61	727.90	727.92	729.87	729.33	DI4-MH2
44	43	30.000	0.13	0.13	0.40	0.05	0.05	5.0	5.0	6.2	0.32	5.08	0.41	12	2.03	727.91	728.52	729.75	729.75	732.79	732.79	DI31-DI32
43	42	5.000	0.12	0.25	0.40	0.05	0.10	5.0	6.2	5.7	0.57	5.04	0.72	12	2.00	727.81	727.91	729.74	729.74	733.33	732.79	DI32-MH13
42	41	216.121	0.00	0.25	0.00	0.00	0.10	0.0	6.3	5.6	0.56	2.68	0.71	12	0.56	726.59	727.81	729.67	729.73	731.18	733.33	MH13-MH12
41	40	95.672	0.00	1.08	0.00	0.00	0.43	0.0	11.0	4.3	1.85	2.94	2.35	12	0.68	725.94	726.59	729.29	729.55	730.05	731.18	MH12-MH11
40	39	89.307	0.00	1.53	0.00	0.00	0.61	0.0	11.5	4.2	2.56	4.97	1.45	18	0.22	725.75	725.95	729.19	729.25	729.40	730.05	MH11-MH10
39	38	5.000	0.00	3.24	0.00	0.00	1.21	0.0	13.7	3.8	4.58	14.85	2.59	18	2.00	725.65	725.75	729.03	729.04	728.86	729.40	MH10-DI12
38	37	30.000	0.32	3.56	0.40	0.13	1.34	5.0	13.8	3.8	5.05	6.06	2.86	18	0.33	725.55	725.65	728.89	728.96	728.87	728.86	DI12-DI11
37	3	5.000	0.54	4.10	0.40	0.22	1.55	5.0	13.9	3.8	5.83	14.85	3.30	18	2.00	725.45	725.55	728.79	728.81	729.41	728.87	DI11-MH6
36	35	150.001	0.76	0.76	0.30	0.23	0.23	10.0	10.0	4.5	1.02	2.25	1.30	12	0.40	728.55	729.15	731.99	732.11	732.80	734.30	YI23-YI22
35	34	209.747	1.01	1.77	0.30	0.30	0.53	10.0	11.9	4.1	2.17	2.27	2.77	12	0.41	727.70	728.55	731.15	731.93	730.70	732.80	YI22-YI21
34	33	141.144	2.00	3.77	0.30	0.60	1.13	10.0	13.1	3.9	4.39	6.56	2.48	18	0.39	727.15	727.70	730.86	731.10	732.05	730.70	YI21-DI18
33	32	30.000	0.37	4.14	0.40	0.15	1.28	5.0	14.0	3.7	4.78	7.43	2.71	18	0.50	727.00	727.15	730.74	730.80	732.05	732.05	DI18-DI17

Project File: New.stm | Number of lines: 76 | Run Date: 1/23/2024

NOTES:Intensity = 28.38 / (Inlet time + 3.60) ^ 0.71; Return period =Yrs. 10 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
32	31	5.000	0.31	4.45	0.40	0.12	1.40	5.0	14.2	3.7	5.21	14.85	2.95	18	2.00	726.90	727.00	730.66	730.67	732.59	732.05	DI17-MH9
31	30	81.994	0.00	4.45	0.00	0.00	1.40	0.0	14.2	3.7	5.20	6.86	2.95	18	0.43	726.55	726.90	730.25	730.46	731.77	732.59	MH9-MH8
30	4	150.000	0.00	4.65	0.00	0.00	1.49	0.0	14.7	3.6	5.42	6.64	3.07	18	0.40	725.95	726.55	729.64	730.03	730.27	731.77	MH8-MH7
29	28	30.000	0.28	0.28	0.40	0.11	0.11	5.0	5.0	6.2	0.70	2.91	0.89	12	0.67	728.57	728.77	731.65	731.66	733.28	733.28	DI24-DI23
28	9	5.000	0.29	0.57	0.40	0.12	0.23	5.0	5.6	5.9	1.35	5.04	1.72	12	2.00	728.47	728.57	731.62	731.63	733.82	733.28	DI23-MH16
27	26	30.000	0.42	0.42	0.40	0.17	0.17	5.0	5.0	6.2	1.04	2.91	2.66	12	0.67	729.15	729.35	729.76	729.78	731.18	731.18	DI9-DI10
26	25	5.000	0.43	0.85	0.40	0.17	0.34	5.0	5.4	6.0	2.05	5.04	3.35	12	2.00	729.05	729.15	730.03	729.76	731.72	731.18	DI10-MH5
25	24	208.012	0.00	0.85	0.00	0.00	0.34	0.0	5.4	6.0	2.04	3.34	3.02	12	0.88	727.22	729.05	729.02	729.76	729.40	731.72	MH5-MH4
24	19	79.398	0.00	1.62	0.00	0.00	0.65	0.0	6.7	5.5	3.54	2.59	4.50	12	0.53	726.80	727.22	727.80	728.58	728.69	729.40	MH4-MH1
23	22	30.000	0.30	0.30	0.40	0.12	0.12	5.0	5.0	6.2	0.74	2.91	2.55	12	0.67	729.62	729.82	730.07	730.18	731.34	731.34	DI5-DI6
22	21	5.000	0.18	0.48	0.40	0.07	0.19	5.0	5.5	6.0	1.14	5.04	3.34	12	2.00	729.52	729.62	729.97	730.07	731.88	731.34	DI6-MH3
21	20	87.081	0.00	0.48	0.00	0.00	0.19	0.0	5.6	5.9	1.14	5.41	3.68	12	2.31	727.51	729.52	727.90	729.97	729.87	731.88	MH3-MH2
20	19	108.652	0.00	2.72	0.00	0.00	0.99	0.0	12.4	4.0	3.97	8.31	2.25	18	0.63	725.32	726.00	727.63	727.78	728.69	729.87	MH2-MH1
19	18	5.000	0.00	4.34	0.00	0.00	1.64	0.0	13.2	3.9	6.35	14.85	3.59	18	2.00	725.22	725.32	727.33	727.34	728.15	728.69	MH1-DI2
18	17	30.000	0.25	4.59	0.40	0.10	1.74	5.0	13.2	3.9	6.73	6.64	3.81	18	0.40	725.10	725.22	727.09	727.21	728.15	728.15	DI2-DI1
17	16	150.000	0.54	5.13	0.40	0.22	1.96	10.0	13.3	3.8	7.52	6.64	4.26	18	0.40	724.50	725.10	726.18	726.95	727.50	728.15	DI1-YI1
16	End	116.697	0.41	6.12	0.35	0.14	2.29	5.0	20.7	3.0	6.83	6.87	4.37	18	0.43	724.00	724.50	725.26	725.73	725.71	727.50	YI1-ES1
15	14	31.240	0.89	0.89	0.30	0.27	0.27	10.0	10.0	4.5	1.20	4.08	1.53	12	1.31	731.54	731.95	732.90	732.93	734.78	734.83	YI20-YI19
14	13	134.625	0.14	1.03	0.40	0.06	0.32	5.0	10.3	4.4	1.43	4.57	1.81	12	1.65	729.32	731.54	732.66	732.88	735.29	734.78	YI19-YI18
13	12	24.776	0.90	1.93	0.30	0.27	0.59	10.0	11.6	4.2	2.47	2.48	3.14	12	0.48	729.20	729.32	732.31	732.43	735.07	735.29	YI18-DI26
12	11	30.000	0.16	2.09	0.45	0.07	0.67	5.0	11.7	4.1	2.75	2.91	3.50	12	0.67	729.00	729.20	732.04	732.22	735.07	735.07	DI26-DI25
11	10	5.000	0.35	2.44	0.40	0.14	0.81	5.0	11.8	4.1	3.31	5.04	4.21	12	2.00	728.90	729.00	731.86	731.90	735.61	735.07	DI25-MH17

Project File: New.stm | Number of lines: 76 | Run Date: 1/23/2024

NOTES:Intensity = 28.38 / (Inlet time + 3.60) ^ 0.71; Return period =Yrs. 10 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
10	9	157.625	0.00	2.44	0.00	0.00	0.81	0.0	11.9	4.1	3.30	7.43	1.87	18	0.50	728.11	728.90	731.62	731.77	733.82	735.61	MH17-MH16
9	8	179.730	0.00	3.01	0.00	0.00	1.03	0.0	13.2	3.9	3.99	7.43	2.26	18	0.50	727.21	728.11	731.24	731.50	731.45	733.82	MH16-MH15
8	7	196.099	0.00	3.70	0.00	0.00	1.31	0.0	14.5	3.7	4.81	5.36	2.72	18	0.26	726.70	727.21	730.66	731.07	729.86	731.45	MH15-MH14
7	6	117.571	0.00	4.84	0.00	0.00	1.77	0.0	15.6	3.5	6.21	6.85	3.51	18	0.43	726.20	726.70	729.99	730.40	730.39	729.86	MH14-DI14
6	5	30.000	0.04	4.88	0.45	0.02	1.78	5.0	16.2	3.4	6.15	7.43	3.48	18	0.50	726.05	726.20	729.76	729.86	729.73	730.39	DI14-DI13
5	4	5.000	0.28	5.16	0.40	0.11	1.90	5.0	16.3	3.4	6.51	14.85	3.68	18	2.00	725.95	726.05	729.64	729.65	730.27	729.73	DI13-MH7
4	3	147.550	0.00	9.81	0.00	0.00	3.38	0.0	16.3	3.4	11.60	14.42	3.69	24	0.41	725.35	725.95	728.79	729.18	729.41	730.27	MH7-MH6
3	2	136.364	0.00	13.91	0.00	0.00	4.94	0.0	16.9	3.4	16.56	16.21	5.27	24	0.51	724.65	725.35	727.41	728.15	729.11	729.41	MH6-YI9
2	1	109.230	0.02	15.02	0.30	0.01	5.32	5.0	17.4	3.3	17.61	17.45	6.33	24	0.60	724.00	724.65	725.66	726.31	728.00	729.11	YI9-YI8
1	End	62.914	0.20	15.22	0.35	0.07	5.39	5.0	17.7	3.3	17.65	20.16	6.48	24	0.79	723.50	724.00	725.26	725.51	725.75	728.00	YI8-ES2

Project File: New.stm | Number of lines: 76 | Run Date: 1/23/2024

NOTES:Intensity = 28.38 / (Inlet time + 3.60) ^ 0.71; Return period =Yrs. 10 ; c = cir e = ellip b = box

Appendix C

Earthwork Calculations

CARMINA WOOD DESIGN, D.P.C.
487 MAIN STREET, SUITE 500
BUFFALO, NEW YORK, 14203
(716) 842-3165
FAX (716) 842-0263

Project No.: 19.241 Date: 1/24/2024
Project Name: Parker Road Subdivision
Project Address: Parker Road, Hamburg, NY
Subject: EARTHWORK CALCULATIONS
Sheet: 1 of 1

TOTAL SITE EARTHWORK CALCULATIONS

INITIAL CUT/FILL NUMBERS COMPARING EX SURFACE AND PROPOSED SURFACE

CUT	65,300	CY
FILL	58,600	CY
NET	6,700	CY

TOPSOIL 15,000 **CY** **(ASSUME 4" OF TOPSOIL)**
TS RESPREAD **6,984**

PAVEMENT VOLUME CALCULATIONS

	DEPTH (INCHES)	AREA (SF)	VOLUME (CF)	
ROAD PAVEMENT	12	78,000	78,000	
DRIVEWAY	8	62,640	41,760	
BUILDING PAD	8	145,000	96,667	
TOTAL			216,427	CF
			8,016	CY

TOTAL ADJUSTED NET VOLUME 6,700 CY OF EXCESS DIRT TO BE USED FOR ONSITE BERMS