



**ColeJenest&Stone**  
BOLTON & MENK, INC.

**Traffic Impact Study**

# **Pineville Mixed Use**

## Pineville, NC

**Submitted by:**

**ColeJenest & Stone | Bolton & Menk, Inc.**  
**200 S Tryon Street, Suite 1400**  
**Charlotte, NC 28202**  
**P: 704-376-1555**

# Certification

Traffic Impact Study

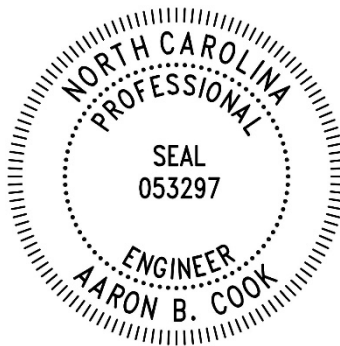
for

Pineville Mixed Use

Pineville, NC

CJS Project No. – 4909

May 2023



*Aaron Cook*  
May 10<sup>th</sup>, 2023

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## I. Executive Summary

Blue Heron Asset Management, LLC plans to develop the Pineville Mixed Use development located on the northeast corner of Cranford Drive and NC 51 in Pineville, North Carolina. The site is currently undeveloped, and the development is proposed to include 294 multifamily units and 8,596 SF of retail. The development is proposed to have one access on Cranford Drive. The site is expected to be constructed by 2025.

The purpose of this traffic impact study is to evaluate the impacts on the surrounding transportation infrastructure as a result of the proposed Pineville Mixed Use development.

The study analyzes traffic conditions during the weekday AM and PM peak hours for the following scenarios:

- 2023 Existing Conditions
- 2025 Build Conditions

Through coordination with NCDOT and Town of Pineville staff, the study was determined to consist of the following intersections:

1. Main Street (NC-51) & Cranford Drive
2. Main Street (NC-51) & Jack Hughes Lane
3. Main Street (NC-51) & Franklin Street
4. Cranford Drive & Site Access A

The traffic generation potential of the proposed development was determined using the ITE Trip Generation Manual (Institute of Transportation Engineers, 11th Edition). The estimated trip generation for the proposed development during the AM and PM peak hours as well as during an average weekday is summarized in Table E-1.

**Table E-1: Trip Generation**

LUC	Proposed Land Use	Size	Unit	Total Generated Trips						
				Daily Trips	AM Hour			PM Hour		
					In	Out	Total	In	Out	Total
822	Retail (<40K SF)	8.6	KSF	893	16	10	26	35	35	70
221	Multifamily (Mid-Rise)	294	Dwellings	1356	27	91	118	70	45	115
ITE Subtotal				2249	43	101	144	105	80	185
Internal Capture					2	2	4	11	11	22
Pass By Trips (31% AM, 40% PM)					3	3	6	10	10	20
Net External Trips					38	96	134	84	59	143

The traffic impact analysis concluded that the addition of site traffic will have minimal impact on the transportation network during the AM and PM peak hours. The site access is to be constructed as a full movement driveway and no additional off-site improvements are recommended.



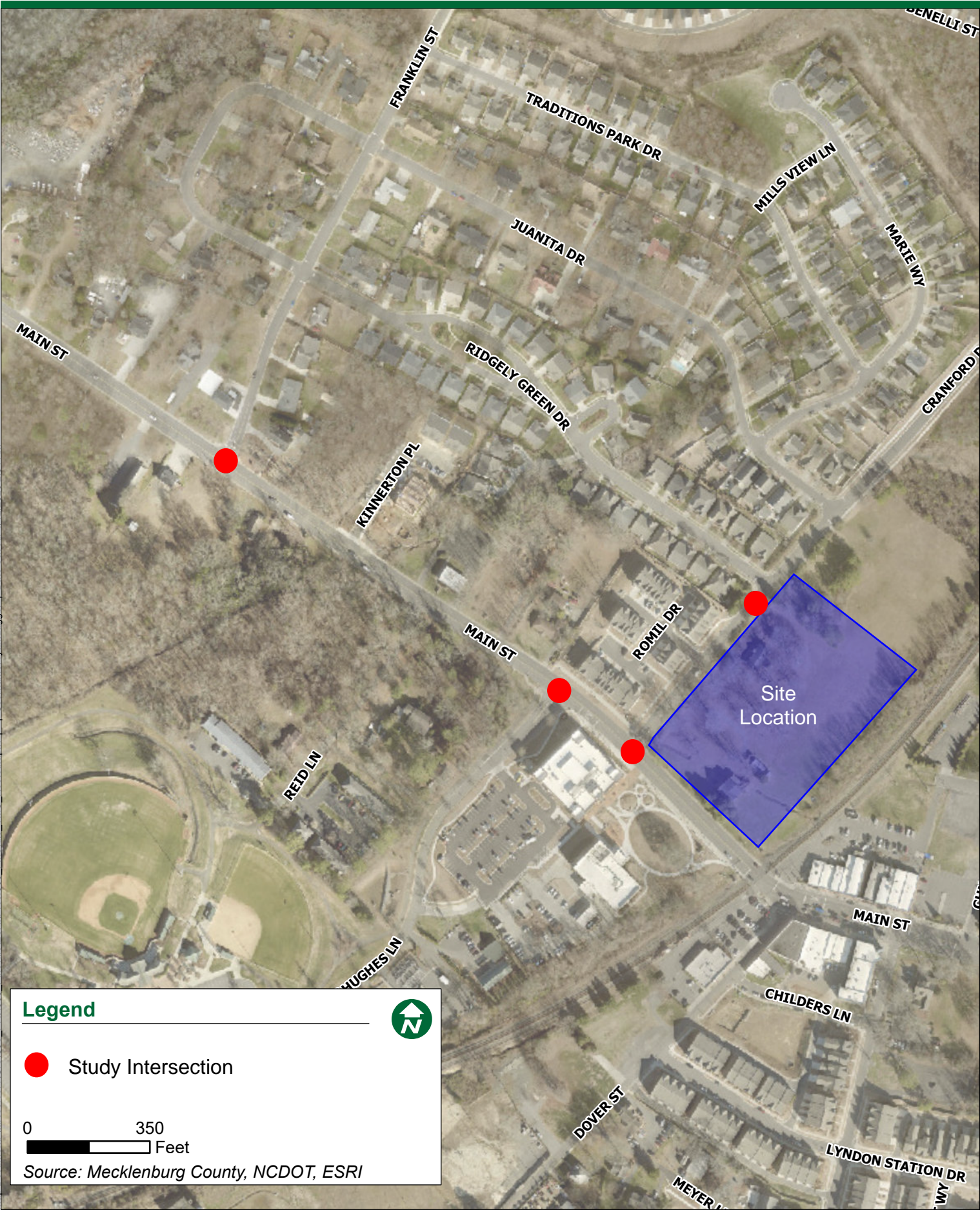
## II. Introduction

Blue Heron Asset Management, LLC plans to develop the Pineville Mixed Use development located on the northeast corner of Cranford Drive and NC 51 in Pineville, North Carolina. The site is currently undeveloped, and the development is proposed to include 294 multifamily units and 8,596 SF of retail. The development is proposed to have one access on Cranford Drive. The site is expected to be constructed by 2025. The conceptual site plan can be found on page 4. The site location and study intersections are displayed on **Figure 1**. For purposes of the analysis, the build-out year is assumed to be 2025.

The purpose of this traffic impact study is to evaluate the impacts on the surrounding transportation infrastructure as a result of the proposed Pineville Mixed Use development. The project scoping document was submitted to the Town of Pineville and NCDOT on March 16<sup>th</sup> and is provided in **Appendix A**.

The study analyzes traffic conditions during the weekday AM and PM peak hours for the following scenarios:

- 2023 Existing Conditions
- 2025 Build Conditions







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RALEIGH, NC 27604

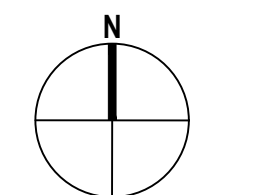
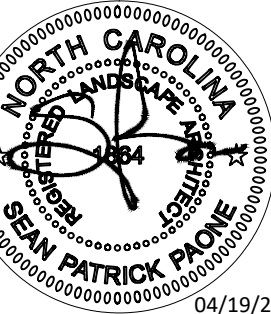
404 MAIN  
CONDITIONAL  
REZONING

404 MAIN STREET  
PINEVILLE, NC 28134


# REZONING SKETCH PLAN

PROJECT NO:  
4909.01

## REVISIONS



**SCALE: 1"=40'**

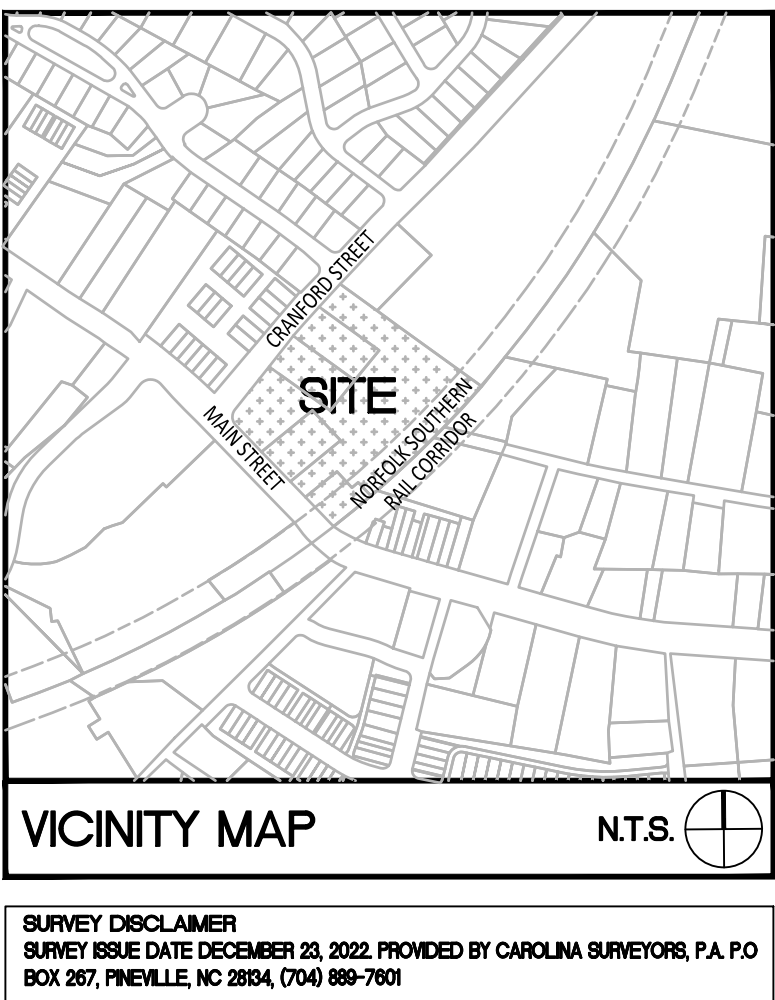


A horizontal scale bar with alternating black and white segments. It is marked with '0', '20'', '40'', and '80'' at the bottom.

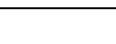
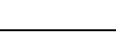

SCALE:	
DATE:	03/03/23
DESIGNED BY:	
DRAWN BY:	
CHECKED BY:	

## RZ - 200

FILE NO.



## LEGEND

SYMBOL	
	PROPERTY LINE/RIGHT-OF-WAY
	NORFOLK SOUTHERN RAILROAD RIGHT-OF-WAY/ SETBACK
	PROPOSED BUILDING

### REZONING SUMMARY:

PETITIONER:	BH4 ACQUISITIONS LLC
PROPERTY OWNER:	PAUL BROCK GROSS AND MICHAEL GROSS
REZONING SITE AREA:	4.80 ± AC
TAX PARCEL #:	20501102, 20501103, 20501104, 20501105, 20501106
EXISTING ZONING:	DC (DOWNTOWN CORE DISTRICT – DOWNTOWN OVERLAY DISTRICT)
EXISTING USE:	RESIDENTIAL
PROPOSED ZONING:	DC-C (DOWNTOWN CORE DISTRICT CONDITIONAL – DOWNTOWN OVERLAY DISTRICT)
PROPOSED USE:	MULTI-FAMILY, RETAIL, ACCESSORY AMENITY, PARKING FACILITY AND UTILITY USES
MAXIMUM DEVELOPMENT:	294 MULTI-FAMILY RESIDENTIAL UNITS, 8,500 SQUARE FEET OF RETAIL/ EDEE/ PERSONAL SERVICE USES
BUILDING SETBACK:	23 FEET MINIMUM FROM BACK OF CURB
MULTIFAMILY BEDROOMS:	159 – 1 BEDROOM UNITS 119 – 2 BEDROOM UNITS 16 – 3 BEDROOM UNITS
MIN. SIDE YARD:	NONE
MIN. REAR YARD:	NONE
MAX. HEIGHT:	5 STORIES
PROPOSED PARKING:	526 SPACES 424 STRUCTURED PARKING 102 ON AND OFF-STREET PARKING
PROPOSED PARKING RATIOS:	RESIDENTIAL = 424 SPACES 1.5 SPACES PER UNIT NON-RESIDENTIAL = 67 SPACES OR 5 SPACES PER 1,000 SF
OPEN SPACE REQUIRED:	AS REQUIRED BY CODE
*REQUIRED OPEN SPACE MAY BE LOCATED WITHIN INTERIOR COURTYARDS	
LANDSCAPING REQUIRED:	35' O.C. STREET TREES ALONG HWY 51/MAIN STREET AND CRAWFORD DRIVE  PARKING LOT SCREENING FROM ADJACENT PROPERTIES AND PUBLIC RIGHT OF WAYS



1. CONTRACTOR IS FULLY RESPONSIBLE FOR CONTACTING APPROPRIATE PARTIES AND ASSURING THAT EXISTING UTILITIES ARE LOCATED PRIOR TO CONSTRUCTION.
2. CONTRACTOR IS RESPONSIBLE FOR PLACING BARRICADES USING FLAG MEN, ETC. AS NECESSARY TO INSURE SAFETY TO THE PUBLIC.
3. ALL PAVEMENT CUTS, CONCRETE OR ASPHALT, ARE TO BE REPLACED ACCORDING TO STANDARDS OF THE NORTH CAROLINA DEPARTMENT OF TRANSPORTATION, TOWN OF HUNTERSVILLE AND CHARLOTTE-MECKLENBURG UTILITIES SPECIFICATIONS.
4. SHORING WILL BE ACCORDING TO OSHA TRENCHING STANDARDS PART 1926 SUBPART P, OR AS AMENDED.



### III. Analysis of Existing Conditions

Through coordination with NCDOT and the Town of Pineville staff, the study was determined to consist of the following intersections:

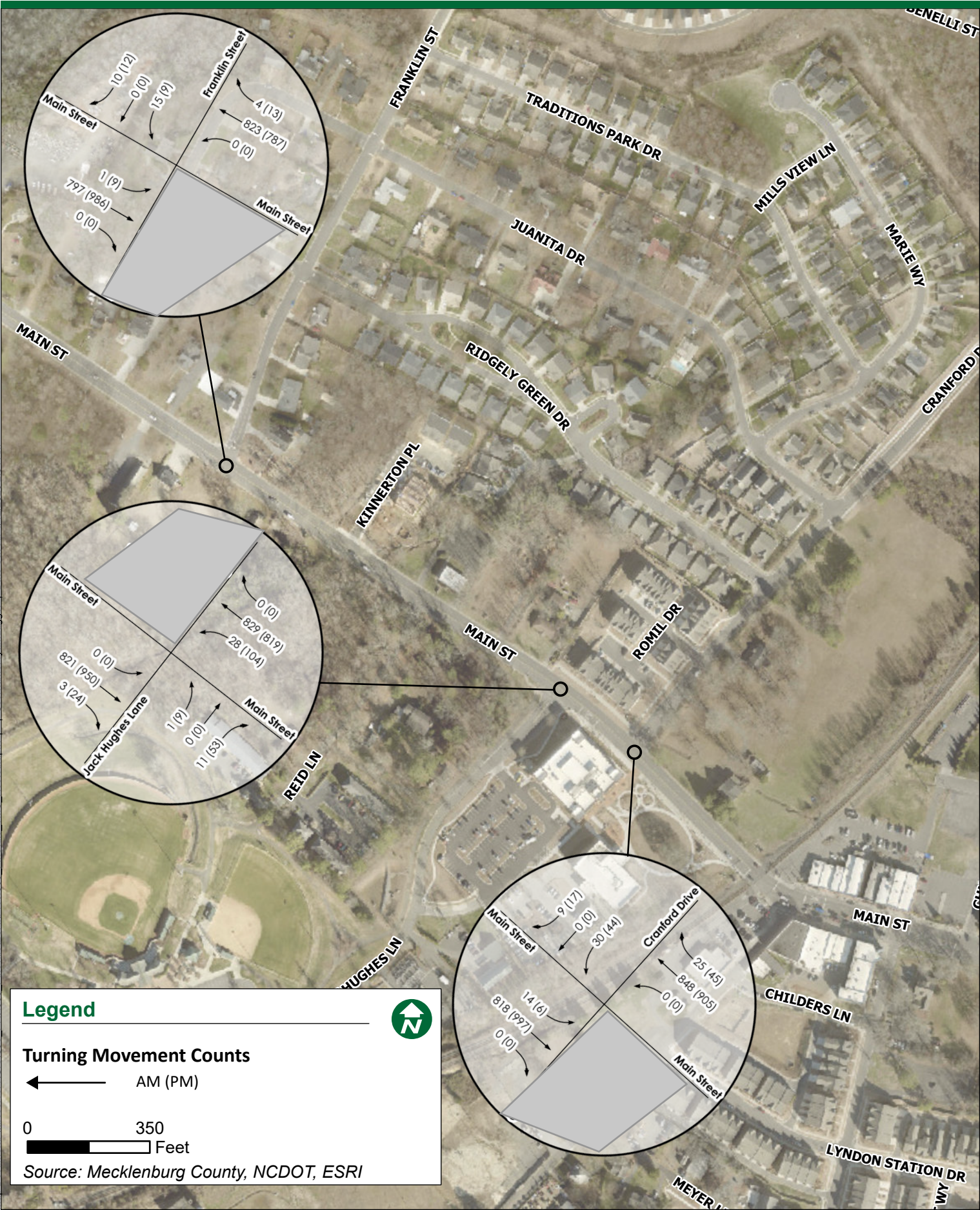
1. Main Street (NC-51) & Cranford Drive
2. Main Street (NC-51) & Jack Hughes Lane
3. Main Street (NC-51) & Franklin Street
4. Cranford Drive & Site Access A

See **Appendix A** for the approved scoping document. The characteristics of the existing roadways within the study area are summarized in **Table 1**.

**Table 1: Existing Roadway Inventory**

Road Name	Route Number	Typical Cross Section	Functional Classification	Speed limit	Maintained By	2021 AADT
Main Street	NC-51	4-lane undivided	Minor Arterial	35 mph	NCDOT	12,500
Cranford Drive	N/A	2-3 lane undivided	Local	Unposted	Pineville	-
Jack Hughes Lanes	N/A	2-3 lane undivided	Local	Unposted	Pineville	-
Franklin Street	N/A	2-3 lane undivided	Local	20 mph	Pineville	-

AM (7:00-9:00) and PM (4:00-6:00) peak hour turning movement counts for the study intersections were performed on Thursday, March 23, 2023. The 2023 Existing peak hour traffic volumes are displayed on **Figure 2**. See **Appendix B** for peak hour count information.





The traffic operations analysis for the intersections considers control delay and Level of Service (LOS) to determine the adequacy of the intersection design to meet acceptable operations. An explanation of each of these measures is provided below.

The operational analysis results are described as a Level of Service (LOS) ranging from A to F. These letters serve to describe a range of operating conditions for different types of facilities. Levels of Service are calculated based on the Highway Capacity Manual 6<sup>th</sup> edition, which defines the level of service, based on control delay. Control delay is the delay experienced by vehicles slowing down as they are approaching the intersection, the wait time at the intersection, and the time for the vehicle to speed up through the intersection and enter the traffic stream. The average intersection control delay is a volume-weighted average of delay experienced by all motorists entering the intersection on all intersection approaches. The control delay is modeled within the analysis software, Trafficware Synchro. Level of Service D or higher is commonly taken as acceptable design year LOS. The level of service and its associated intersection delay for a signalized and unsignalized intersection is presented below. The delay threshold for unsignalized intersections is lower for each LOS compared to signalized intersections, which accounts for the fact that people expect a higher quality of service when at a stop-controlled intersection.

**Table 2: Level of Service Criteria**

	<b>Signalized Intersection</b>	<b>Unsignalized Intersection</b>
<b>LOS</b>	<b>Control Delay per Vehicle (sec.)</b>	<b>Control Delay per Vehicle (sec.)</b>
A	≤ 10	≤ 10
B	>10 and ≤ 20	>10 and ≤ 15
C	>20 and ≤ 35	>15 and ≤ 25
D	>35 and ≤ 55	>25 and ≤ 35
E	>55 and ≤ 80	>35 and ≤ 50
F	>80	>50

Assumptions for the capacity analysis include the following:

- A peak hour factor (PHF) of .9 was applied for all movements.
- 2% heavy vehicles were used for all movements for each scenario.

The capacity analysis results for the 2023 Existing conditions can be found in **Table 3**. The Main Street left turn movements operate at an acceptable LOS B or better during both peak hours at all three study intersections. The stop-controlled approaches at each intersection operate at an acceptable LOS C or better during both peak hours.

**Table 3: 2023 Existing Conditions Operations Results**

		AM Peak				PM Peak			
		Traffic Delay (sec/veh)				Traffic Delay (sec/veh)			
Intersection	Approach	Movement (Delay - LOS)			Approach (Delay - LOS)	Movement (Delay - LOS)			Approach (Delay - LOS)
		L	T	R		L	T	R	
Main Street & Cranford Drive	EB	7 - A	0 - A	-	1 - A	11 - B	0 - A	-	1 - A
	WB	-	1 - A	0 - A	1 - A	-	1 - A	0 - A	1 - A
	SB	18 - C	-	4 - A	15 - C	28 - D	-	4 - A	21 - C
Jack Hughes Lane & Main Street	EB	-	1 - A	0 - A	1 - A	-	1 - A	0 - A	1 - A
	WB	6 - A	1 - A	-	2 - A	8 - A	2 - A	-	3 - A
	NB	-	-	4 - A	4 - A	43 - E	-	5 - A	11 - B
Main Street & Franklin Street	EB	8 - A	0 - A	-	1 - A	7 - A	1 - A	-	2 - A
	WB	-	1 - A	0 - A	1 - A	-	1 - A	0 - A	1 - A
	SB	17 - C	-	4 - A	12 - B	23 - C	-	4 - A	14 - B

## IV. Proposed Development

### A. Background Traffic

The annual average daily traffic (AADT) volumes were reviewed along Main Street to determine a background growth rate. The AADT along the corridor has decreased over the past 5 years; therefore, no growth rate was applied to the existing 2023 traffic volumes to determine the future traffic volumes. This was documented in the TIA scoping checklist submitted to the Town and NCDOT on March 16<sup>th</sup>, 2023. Since no growth was identified, the 2025 Build conditions were compared with the 2023 Existing conditions to determine the impact of the proposed development.

### B. Pineville Mixed Use Development

The trip generation summary for the Pineville Mixed Use development is presented in **Table 4**. The trip generation was completed using the Trip Generation Manual, 11<sup>th</sup> Edition, Institute of Transportation Engineers. The site is expected to generate 2,249 trips per day, 134 new trips during the AM peak hour, and 143 new trips during the PM peak hour.

**Table 4: Trip Generation Summary**

LUC	Proposed Land Use	Size	Unit	Total Generated Trips						
				Daily Trips	AM Hour			PM Hour		
					In	Out	Total	In	Out	Total
822	Retail (<40K SF)	8.6	KSF	893	16	10	26	35	35	70
221	Multifamily (Mid-Rise)	294	Dwellings	1356	27	91	118	70	45	115
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Internal Capture					2	2	4	11	11	22
Pass By Trips (31% AM, 40% PM)					3	3	6	10	10	20
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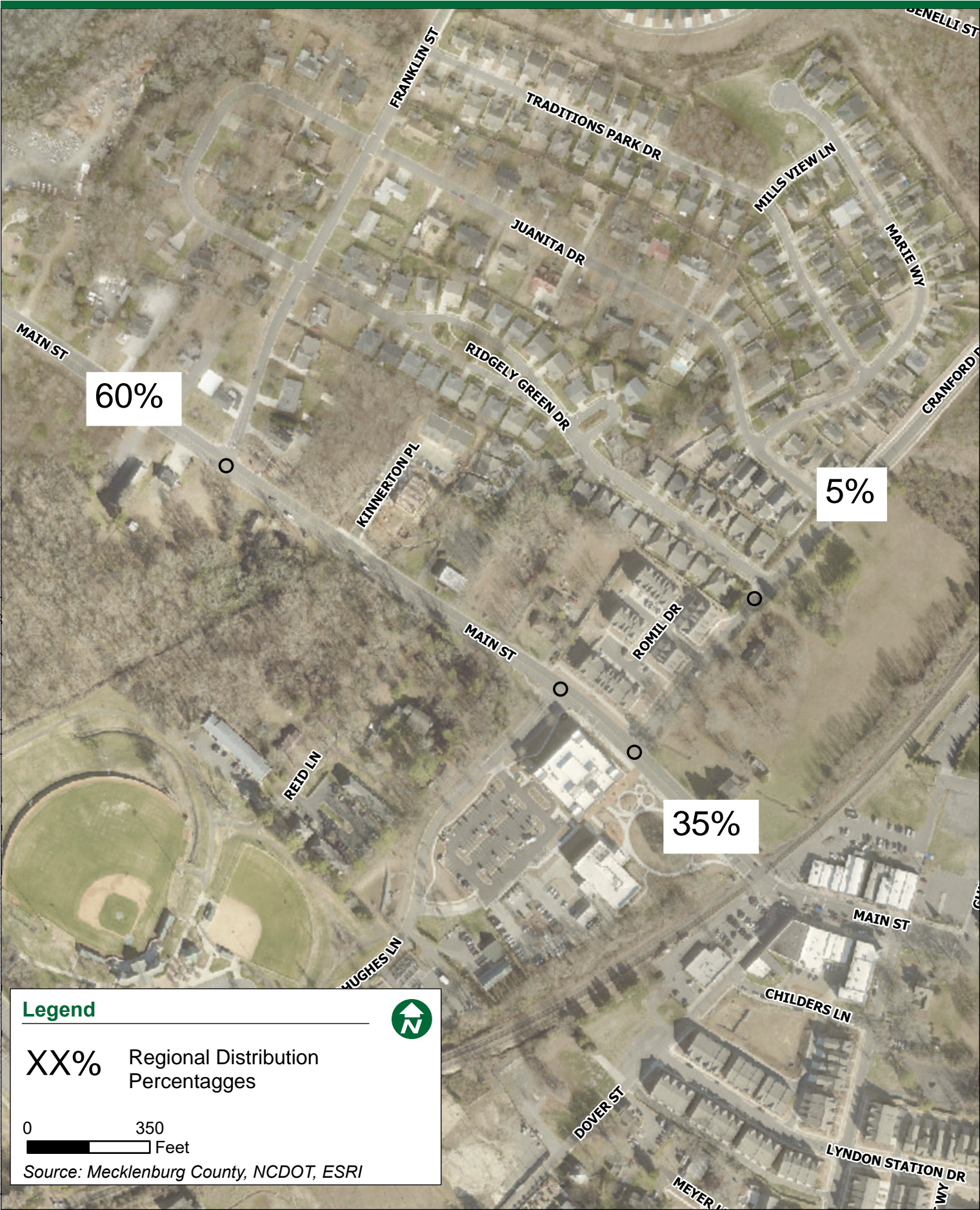
Trip distribution percentages used in assigning site traffic for the proposed development were estimated based on existing traffic patterns, population centers, and engineering judgement. The following regional distribution percentages were used and are displayed in **Figure 3**:

- 5% to/from the north on Cranford Road
- 35% to/from the east on Main Street
- 60% to/from the west on Main Street

The approved distribution percentages were applied to the trip generation in Table 4 to determine the AM and PM peak hour trip assignments. The trip assignments were then added to the 2025 No-Build peak hour traffic volumes, which were the same as the 2023 existing peak hour traffic volumes due to the 0% growth rate, to determine the 2025 Build peak hour traffic volumes.

The trip assignment is displayed in **Figure 4** and 2025 Build peak hour traffic volumes are displayed in **Figure 5**.





**Legend**

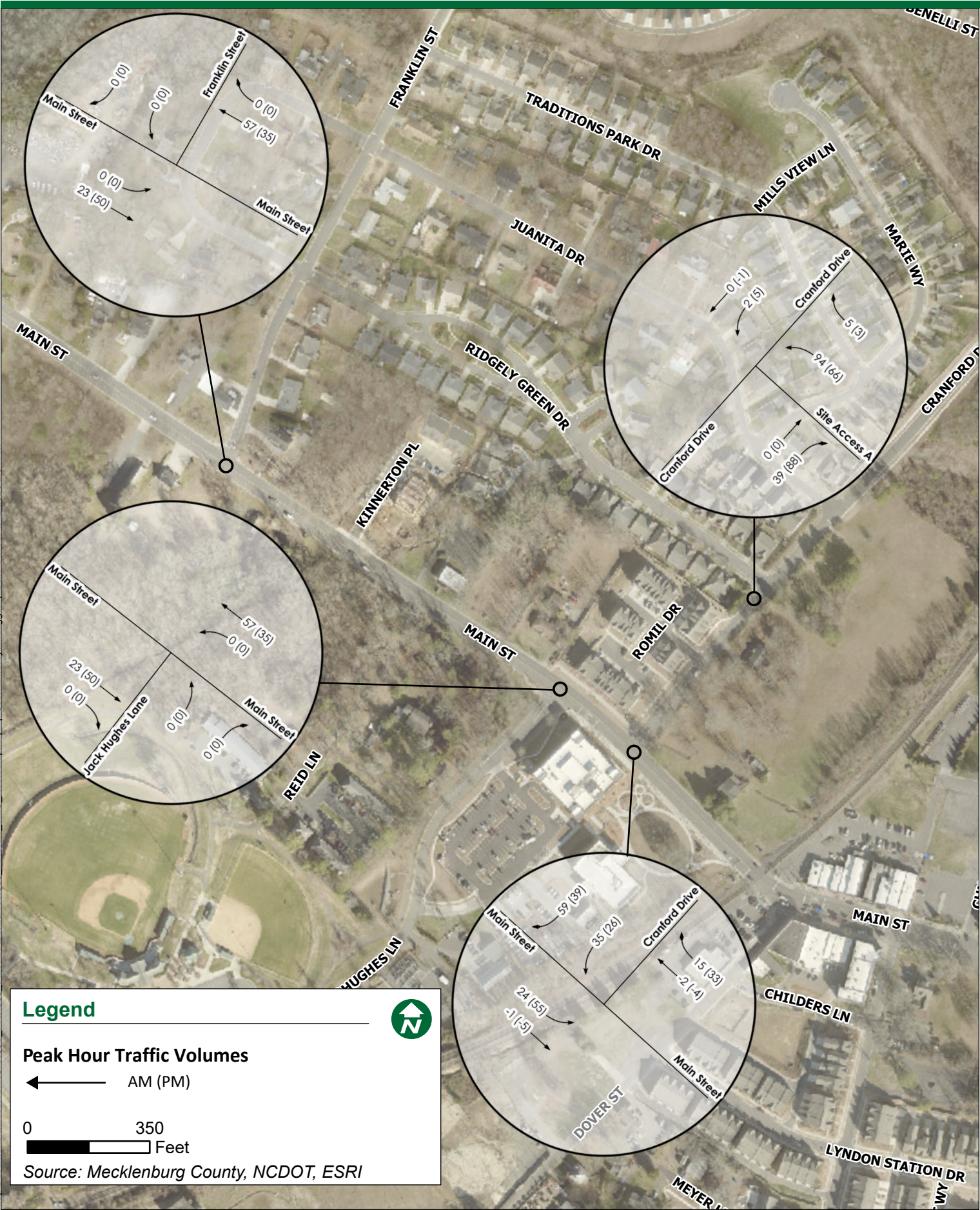
XX% Regional Distribution Percentages

0 350 Feet

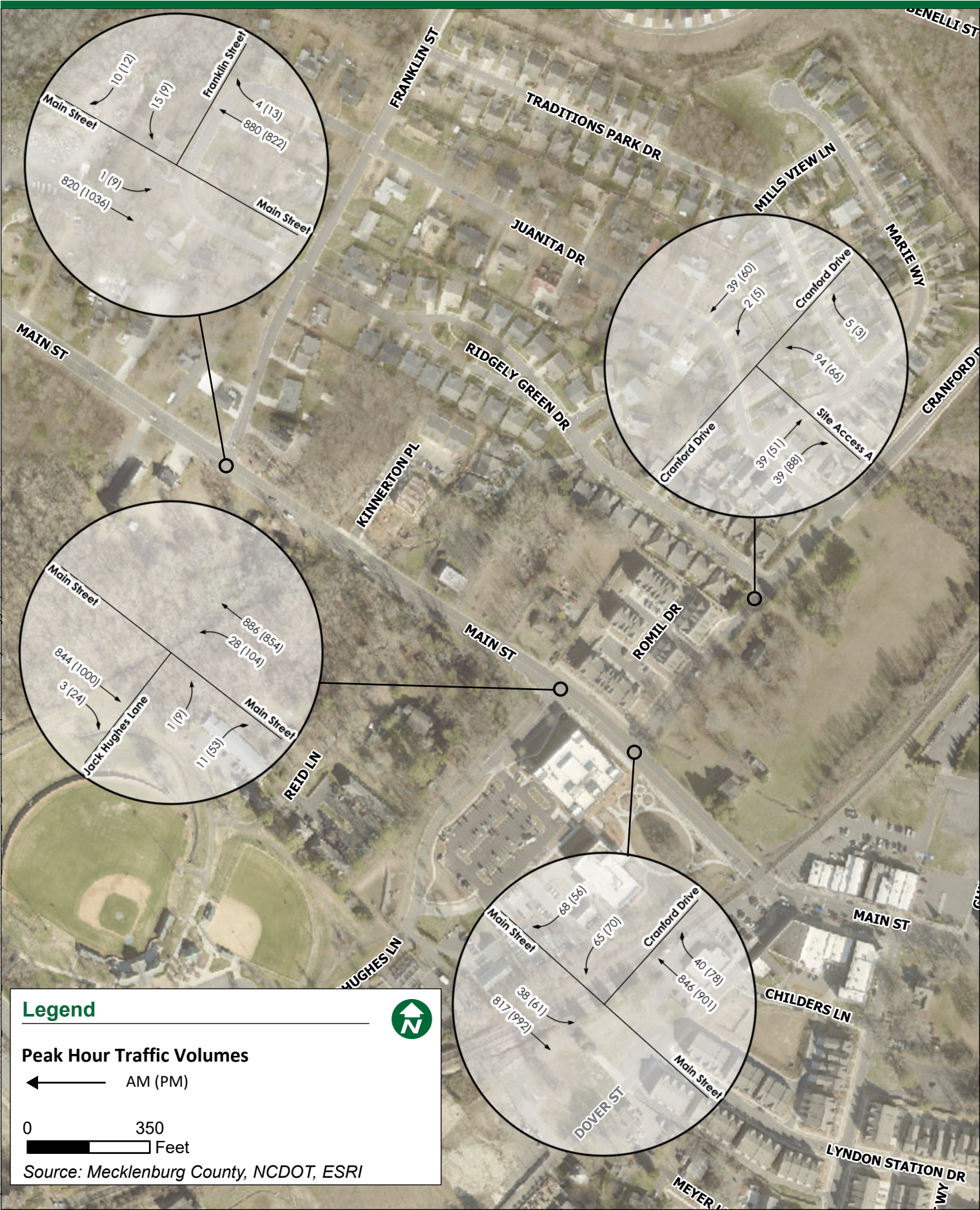
Source: Mecklenburg County, NCDOT, ESRI











Map Document: \larcserver\GIS\Projects\Pineville\_TMC\_Nested.aprx | User: ryan.dugger | Date Saved: 4/12/2023 2:54 AM



## V. Analysis of Future Conditions

Capacity analysis was conducted 2025 Build scenario, and the results were compared to the existing operations in **Table 3** to determine the impact that could be anticipated by the Pineville Mixed Use development traffic.

The capacity results are summarized in **Table 5**.

**Table 5: 2025 Build Conditions Operations Results**

		AM Peak				PM Peak			
		Traffic Delay (sec/veh)				Traffic Delay (sec/veh)			
Intersection	Approach	Movement (Delay - LOS)			Approach (Delay - LOS)	Movement (Delay - LOS)			Approach (Delay - LOS)
		L	T	R		L	T	R	
Main Street & Cranford Drive	EB	7 - A	0 - A	-	1 - A	9 - A	1 - A	-	2 - A
	WB	-	1 - A	0 - A	1 - A	-	1 - A	1 - A	1 - A
	SB	28 - D	0 - A	5 - A	16 - C	70 - F	-	6 - A	44 - E
Jack Hughes Lane & Main Street	EB	-	1 - A	0 - A	1 - A	-	1 - A	1 - A	1 - A
	WB	8 - A	1 - A	-	2 - A	10 - B	2 - A	-	3 - A
	NB	34 - D	-	4 - A	7 - A	46 - E	-	5 - A	13 - B
Main Street & Franklin Street	EB	-	0 - A	-	0 - A	7 - A	1 - A	-	2 - A
	WB	-	1 - A	0 - A	1 - A	-	1 - A	0 - A	1 - A
	SB	23 - C	-	4 - A	15 - C	31 - D	-	4 - A	15 - C
Cranford Drive & Site Access A	WB	4 - A	-	3 - A	4 - A	5 - A	-	3 - A	5 - A
	NB	-	0 - A	0 - A	0 - A	-	1 - A	0 - A	1 - A
	SB	2 - A	0 - A	-	1 - A	2 - A	0 - A	-	1 - A

### Main Street & Cranford Drive

Under 2025 Build conditions the southbound stop-controlled approach at the intersection of Main Street and Cranford Drive operates at an acceptable LOS C during the AM peak and LOS E during the PM peak hour. The eastbound left turn movement on Main Street operates at LOS A during both peak hours. It is common for side street approaches at unsignalized intersections to experience higher delays when there is a heavy main street movement. The exclusive southbound right turn lane allows right turning vehicles to experience minimal delay and not be blocked by the left turn queue.

The future traffic volumes at the intersection are not expected to warrant a traffic signal. An installation of a traffic signal could enhance safety; however, it would increase the delay for all vehicles that traverse the intersection.

Although the addition of site traffic is expected to increase the delay for the southbound approach, no improvements are recommended.

### **Main Street & Jack Hughes Lane**

Under 2025 Build conditions the northbound stop-controlled approach at the intersection of Main Street and Jack Hughes Lane operates at an acceptable LOS B or better during both peak hours. The westbound left turn movement on Main Street operates at LOS A during both peak hours.

The addition of site traffic is expected to have minimal impact on the operations of the intersection; therefore, no improvements are recommended.

### **Main Street & Franklin Street**

Under 2025 Build conditions the southbound stop-controlled approach at the intersection of Main Street and Franklin Street operates at an acceptable LOS C during both peak hours. The eastbound left turn movement on Main Street operates at LOS A during both peak hours.

The addition of site traffic is expected to have minimal impact on the operations of the intersection; therefore, no improvements are recommended. As development increases on Jack Hughes Lane, this intersection shall be monitored for signalization. A traffic signal at this intersection would provide a network benefit and is a less circuitous route to Industrial Drive than Cranford Drive.

### **Cranford Drive & Site Access**

Under 2025 Build conditions the westbound stop-controlled approach at the intersection of Cranford Drive and the Site Access operates at an acceptable LOS A during both peak hours. It is recommended to construct the driveway with one ingress lane and one egress lane.

### **Main Street (NC-51)**

As reported on NCDOT's Traffic Volume Map, the existing AADT on Main Street from Cranford Drive to Jack Hughes Lane is 12,500 vehicles per day. The existing four-lane cross section of the roadway provides more than enough capacity for that number of vehicles but at the detriment of vehicular, pedestrian, and bicycle safety.

The Federal Highway Administration (FHWA) advises that four-lane roadways with less than 20,000 vehicles per day may be good candidates for a road diet. A road diet is a term used to change a four-lane roadway to a 3-lane roadway with a center two-way left turn lane with the potential addition of separated bike lanes.

Proven benefits of road diets include slower speeds, better sight distance, reduced conflict points, and an almost 50% reduction in crashes. More information regarding road diets is provided in **Appendix D**. It is recommended that the Town of Pineville and NCDOT evaluate Main Street, from the railroad crossing downtown to Downs Road, for a road diet to enhance the safety and walkability of the facility.

## VI. Conclusions & Recommendations

Blue Heron Asset Management, LLC plans to develop the Pineville Mixed Use development located on the northeast corner of Cranford Drive and NC 51 in Pineville, North Carolina. The site is currently undeveloped, and the development is proposed to include 294 multifamily units and 8,596 SF of retail. The development is proposed to have one access on Cranford Drive. The site is expected to be constructed by 2025.

The purpose of this traffic impact study was to evaluate the impacts on the surrounding transportation infrastructure as a result of the proposed Pineville Mixed Use development.

The study analyzed traffic conditions during the weekday AM and PM peak hours for the following scenarios:

- 2023 Existing Conditions
- 2025 Build Conditions

Through coordination with NCDOT and Town of Pineville staff, the study was determined to consist of the following intersections:

5. Main Street (NC-51) & Cranford Drive
6. Main Street (NC-51) & Jack Hughes Lane
7. Main Street (NC-51) & Franklin Street
8. Cranford Drive & Site Access A

The traffic impact analysis concluded that the addition of site traffic will have minimal impact on the transportation network during the AM and PM peak hours. The site access is to be constructed as full movement driveway and no additional off-site improvements are recommended.

It is also recommended for the Town and NCDOT to evaluate the benefits and feasibility of a road diet along Main Street (NC-51).

## Appendix A: Approved Scoping Document



# NCDOT Traffic Impact Analysis Need Screening / Scoping Request



TIA Need  
Screening



TIA  
Scoping



TIA  
Submittal

A Traffic Impact Analysis (TIA) may be required for developments based on the site trip generation estimates, site context, or at the discretion of the NCDOT District Engineer. The Applicant or the TIA Consultant shall submit this form along with the site plan to the District Engineer to determine the TIA need and, if a TIA is required, initiate the TIA scoping process. Without an approved scope, the TIA is incomplete and will be rejected until the study is revised to conform to NCDOT's TIA requirements.

**Project Name:** Blue Heron Pineville Mixed Use

**Previous Name:** If Applicable \_\_\_\_\_

**Location:** 404 Main St, Pineville, NC 28134

**County:** Mecklenburg

**Municipality:** Pineville

**Project Description:** Mixed-Use development

**Project Contact:**

**Applicant**

Company Name Blue Heron Asset Management LLC  
 Contact Person \_\_\_\_\_  
 Phone Number \_\_\_\_\_  
 Email \_\_\_\_\_  
 Mailing Address 1111 Haynes St  
Raleigh, NC 27604

**TIA Consultant**

Bolton & Menk, Inc.

Aaron Cook, PE

(704)376-1555 ext. 3938

aaron.cook@bolton-menk.com

200 South Tryon St Ste 1400

Charlotte, NC 28202

**Site Plan Prepared By:** Finley Design

See site plan/vicinity map requirements on page 2.

**Site Plan Date:** 02/10/2023

**Parcel Size:** 4.75 Acre(s)

**Anticipated Build-Out Year:** 2025

**Weekday Site Trip Generation - Do NOT adjust for mode split, pass-by, internal capture, or diverted trips.**

ITE LUC	Proposed Land Use	Size	Unit	Daily Trips	Peak Hour Type	AM Peak Hour Trips			PM Peak Hour Trips			Data Source
						Enter	Exit	Total	Enter	Exit	Total	
221	Multifamily	294	DU	1356	Adj. Street	27	91	118	70	45	115	ITE Equation
822	Retail	8596	SF	893	Adj. Street	16	10	26	35	35	70	ITE Equation
Total				2249		43	101	144	105	80	185	

Refer to the current [NCDOT Congestion Management Capacity Analysis Guidelines](#) for acceptable trip calculation methods and data sources.

\*\*Explain local or other data sources, if used: \_\_\_\_\_

☐ The estimated site trips meet NCDOT's TIA trip threshold of 3,000 daily trips.

☒ The estimated site trips meet the municipal TIA trip threshold of \_\_\_\_\_

☐ This project is located in a known [STIP](#) and/ or local CIP project # \_\_\_\_\_

☒ This project includes a rezoning request.





# NCDOT Traffic Impact Analysis Need Screening / Scoping Request

TIA Need  
Screening



TIA  
Scoping



TIA  
Submittal



- ☐ The proposed site access is located within 1,000 feet of an interchange.
- ☐ The Applicant requests for a new or modified control-of-access break.
- ☐ The Applicant requests for a new or modified median break.

Applicant's Signature

Blue Heron Multifamily

Print Name

Date

**Site Plan/Vicinity Map Requirement for TIA Need Screening:** While the site plan may not be finalized during the TIA scoping stage, the graphic representation of the proposed development shall provide adequate details on the development scope and context. More specifically, the site plan/map shall clearly show the location and type of each access point, spacing to adjacent and opposing driveways or intersections, internal street network, proposed buildings/parcels with their anticipated uses and sizes at full build-out and, if applicable, any nearby interstate, US, NC or Secondary Roads (SR).

**Project Name:** \_\_\_\_\_ **Project Reference Number:** \_\_\_\_\_

- ☐ **A TIA is Required by the Local Government.** In addition, the study area is expected to include NCDOT maintained transportation facilities.
- ☐ **A TIA is Required by NCDOT,** per the [Policy on Street and Driveway Access to North Carolina Highways](#).

If either or both of the boxes above are checked, the Applicant/TIA Consultant is hereby requested to fill out as much as possible of the following TIA scoping checklist, and return it along with the supporting documents to NCDOT prior to the scoping meeting.

- ☐ **A TIA is NOT required.** This decision is based on the development information presented above. Changes in the development plan will require re-evaluation of the TIA need, and may necessitate a TIA. The Applicant should inform the District Engineer of any significant changes in a timely fashion to avoid delays or rejections of the driveway permit / encroachment agreement applications.



# NCDOT Traffic Impact Analysis Need Screening / Scoping Request

TIA Need  
Screening



TIA  
Scoping



TIA  
Submittal



## Additional Comments:

The TIA need decision is made by the NCDOT Division \_\_\_\_\_ District \_\_\_\_\_ on \_\_\_\_\_.

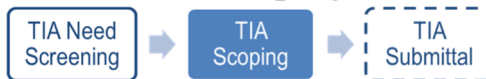
\_\_\_\_\_  
NCDOT District Representative's Signature

Email concurrence may be used in lieu of the signature.

\_\_\_\_\_  
Print Name



# NCDOT TIA Scoping Checklist



**Project Name:** Blue Heron Pineville Mixed Use

**TIA Scoping Date:** 3/10/23

☒ **TIA Need Screening Forms are Attached.** Project Reference #: \_\_\_\_\_ Decision Date: \_\_\_\_\_

☒ **Site Plan and Access**

☒ Provide a site plan illustrating site access, internal and external roadways, buildings and land uses.

Refer to NCDOT's [Policy on Street and Driveway Access to North Carolina Highways](#) pages 14 and 15 for site plan requirements.

☒ Identify site access.

New Access	On Road	Access Type		Driveway Spacing		
	Road Name	Permitted Movements	Traffic Control	Distance (ft)	Direction	Nearest Intersection / Access
Access A	Main Street	Conventional Full-Mvmt	2-Way Stop	140	East	RR
Access B	Cranford Drive	Conventional Full-Mvmt	2-Way Stop	30	North	Cannamela Dr
Access C						
Access D						
Access E						
Access F						
Access G						
Access H						
Existing Access	Existing Intersection of		Access	Proposed Interconnectivity (If Applicable)		
	Road A	Road B	Modification	Connector #	Road Connected	Adjacent Development
Access 1			Please Select	Connector 1		
Access 2				Connector 2		
Access 3				Connector 3		
Access 4				Connector 4		

☐ Additional access clarifications and provisions (e.g., proposed control-of-access or median breaks, modifications of existing access, loading/unloading area access, bike/pedestrian accommodation).

☐

## Proposed K-12 School Site

- ☐ NCDOT [MSTA School Traffic Calculator](#) for Select School Type shall be used.
- ☐ Peak Hour Factors (PHFs) shall be adjusted/weighted for new school trips (0.5 PHF by default).
- ☐ Internal school circulation analysis is required, and should be submitted in advance or concurrent with the TIA submittal.
- ☐ Clarify traffic operation plans (e.g. traffic circulation pattern, pedestrian access, drop-off/pick-up zone location and configuration, queue storage area and, if applicable, staggered start times).



# NCDOT TIA Scoping Checklist

TIA Need  
Screening



TIA  
Scoping



TIA  
Submittal



## ☒ Trip Generation

The TIA Consultant shall prepare trip generation estimates following the current [NCDOT Congestion Management Capacity Analysis Guidelines](#), and submit the calculation sheets and supporting information to the District Engineer for approval prior to capacity analysis.

ITE LUC	Proposed Land Use	Size	Unit	Daily Trips	Peak Hour Type	AM Peak Hour Trips			PM Peak Hour Trips			Data Source
						Enter	Exit	Total	Enter	Exit	Total	
822	Retail	8596	SF	893	Adj. Street	16	10	26	35	35	70	ITE Equation
221	Multifamily	294	Dwellings	1356	Adj. Street	27	91	118	70	45	115	ITE Equation
Unadjusted Site Trips				2249		43	101	144	105	80	185	
Internal Capture Trips (Attach Calculation Sheets)				26		2	2	2	11	11	22	NCHRP 684
Internal Capture % of Unadjusted Site Trips				%		2 %			12 %			
LUC	Proposed Land Use	Any Internal Trips?		Pass-By % of External Trips								
822	Retail	Yes - Adjust External Trips		%		31 %			40 %			ITE Rate
				%		%			%			
				%		%			%			
				%		%			%			
				%		%			%			
Pass-By Trips (Attach Calculation Sheets)				58		3	3	6	10	10	20	
Adjacent Street Volumes				12500								Local Data**
Non-Pass-By Primary Trips				2165		38	96	134	84	59	143	
Diverted Trips, if Applicable and Justifiable												Please Select

\*\*Explain local or other data sources, if used:

NCDOT AADT map

## ☐ Existing Site Trip Information for Redevelopment Projects (Attach separate sheets as needed)

ITE LUC	Existing Land Use	Size	Unit	Daily Trips	Peak Hour Type	AM Peak Hour Trips			PM Peak Hour Trips			Data Source
						Enter	Exit	Total	Enter	Exit	Total	
					Please Select							Please Select
Total Existing Site Trips												



## NCDOT TIA Scoping Checklist



### ☒ Trip Distribution

- ☒ Trip distribution diagrams are submitted concurrently with this document (attach separate sheets).
- ☐ Trip distribution diagrams will be submitted separately, along with supporting information, to the District Engineer for review and approval prior to capacity analysis. The trip distribution shall be based on the current and anticipated traffic patterns, as well as instructions noted below.

If required by the District Engineer, the following additional diagrams shall also be submitted:

- ☐ Mixed-Use Developments (separate diagrams for residential, commercial, and office trips)
- ☐ Inter-Development Trips (if 'internal' trips cross public streets)
- ☐ Pass-By Trips
- ☐ Diverted Trips
- ☐ Each Analysis Period

### ☐ Mode Split

- ☐ Provide Data Source and Justification

Mode Period	Auto		
AM Peak	%	%	%
PM Peak	%	%	%
Daily	%	%	%
	%	%	%

- ☐ Identify proper infrastructure and accommodation for other modes of travel.

### ☒ Analysis Peak Periods:

- ☒ Weekday AM Peak \_\_\_\_\_
- ☒ Weekday PM Peak \_\_\_\_\_
- ☐ Weekday Midday Peak \_\_\_\_\_
- ☐ Weekday PM School Peak \_\_\_\_\_
- ☐ Weekend \_\_\_\_\_ Peak \_\_\_\_\_
- ☐ Other \_\_\_\_\_



# NCDOT TIA Scoping Checklist



## ☒ Study Area Intersections and Data Collection

The study area shall include the site access intersections (both new and existing) identified under “Site Plan and Access” on page 1, as well as the following external and, if applicable, internal intersections.

External Intersection	Intersection of		Traffic Control	Intersection Turning Movement Counts			Notes
	Road A	Road B		New / Existing	Date of Counts	Growth Adjustment	
#1	Main St	Cranford Dr	2-Way Stop	Require New Counts			
#2							
#3							
#4							
#5							
#6							
#7							
#8							
#9							
#10							
#11							
#12							

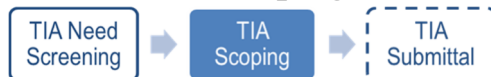
Internal Intersection	Intersection of		Access Type		Intersection Spacing		
	Road A	Road B	Traffic Control	Permitted Movements	Distance (ft)	Direction	Nearest Intersection
#101			Please Select	Please Select		Please Select	
#102							
#103							
#104							
#105							

The following data will be collected:

- ☒ New traffic turning movement counts in ☒ 15-min intervals ☐ 5-min intervals (near schools)  
 Unless otherwise noted above, new traffic counts shall be collected at the existing study intersections during the analysis periods. Weekday counts shall avoid Mondays, Fridays, holidays, school breaks, road closures, and major weather events.
- ☐ To account for the impact of existing and/or proposed school traffic, PHFs will be adjusted for:  
     intersections numbered: \_\_\_\_\_  
     and access points numbered: \_\_\_\_\_
- ☐ Traffic Forecast Data for TIP: \_\_\_\_\_
- ☒ Roadway/Intersection Configuration & Traffic Control
- ☒ Traffic Signal Phasing & Timing Data
- ☐ Crash Data: \_\_\_\_\_ Period: \_\_\_\_\_
- ☐ Other: \_\_\_\_\_



## NCDOT TIA Scoping Checklist



### ☒ Future Year Conditions

☒ Project Build-Out Year: 2025

☒ Future Analysis Year(s): 2025

- ☐ Identify below any funded/committed future transportation improvements, as well as any approved but incomplete developments near the site.

Funded STIP / Local CIP Project	Project Description		Year Complete
HS-2010G	NC 51 and Polk St. Install Pedestrian Signals		2024
Nearby Approved Development	Location	Future Land Use (exclude any completed phases)	Committed Improvements
Please Advise			

☐ Annual Growth Factor: 0 %

Justification/Data Source: AADT on corridor shows -6% growth, Engineering Judgment

### ☐ Local Comprehensive Transportation Plan Compliance

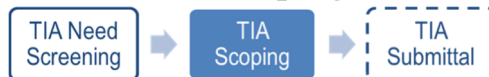
- ☐ Identify Applicable Local Transportation Planning Documents

- ☐ Identify Applicable Roadways inside the Study Area

Road Name	Classification	Speed Limit	Proposed Cross-Section	Proposed Right-of-Way	Compliance Requirements	Affect Study Intersection #
Main St	Minor Arterial	35	4 lane undivided + sidewalk	80'		1&2
Cranford Dr	Local	25	2 lane undivided + sidewalk	50'		1&3



## NCDOT TIA Scoping Checklist



### ☒ Study Method

The traffic analysis shall follow the current [NCDOT Congestion Management Capacity Analysis Guidelines](#), [Policy on Street and Driveway Access to North Carolina Highways](#), and use the current approved version of analysis software (e.g. Synchro/SimTraffic, HCS, Sidra Intersection, TransModeler).

The study shall include the following analysis scenarios for each analysis period.

1. Existing Conditions
2. Future No-Build Conditions (existing + background growth + approved developments + committed or funded improvements)
3. Future Build Conditions (future no-build + site trips)
4. Future Build with Improvements Conditions (future build traffic with improvements to mitigate the proposed development's impacts) and, if applicable:
- ☐ 5. TIP Design Year Analysis \_\_\_\_\_
- ☐ 6. Alternative Access Scenario (without proposed control-of-access or median break / modification)

The following additional analysis/outputs should be provided as warranted:

- ☐ Signal Warrant Analysis for accesses/intersections \_\_\_\_\_
- ☐ Multi-Modal Level of Service Analysis
- ☐ School Loading Zone Traffic Simulation
- ☐ Phasing Analysis (scope separately as needed)
- ☐ Safety/Crash Analysis
- ☐ Control-of-Access Modification Justification
- ☐ Median Break / Modification Justification
- ☐ Other \_\_\_\_\_

### ☒ Submittals

In addition to the hardcopies required below, the TIA Consultant shall provide the District Engineer and, if required, the local government an electronic copy of the study documents, including the latest site plan, figures and appendices, in searchable PDF files and the original traffic analysis files (e.g., Synchro, HCS). To expedite review, the NCDOT electronic submittals shall also be delivered concurrently to:

☐ Div. Traffic Engr ☐ Regional Traffic Engr ☐ Congestion Management ☐ Other \_\_\_\_\_

Submittals	NCDOT		Local Government	
	Electronic	Hardcopy	Electronic	Hardcopy
Trip Generation & Distribution	Required		Please Select	
Draft TIA Report	Required			
Final Sealed TIA Report	Required			

☐ **Additional Comments** (municipal TIA requirements, approved variations from NCDOT guidelines)





## NCDOT TIA Scoping Checklist



### Agreement by All Parties

The undersigned agree to the contents and methodology described above for completing the required traffic impact analysis for the proposed development identified herein. Any changes to the above methodology contemplated by the Applicant or the TIA Consultant must be submitted to the District Engineer in writing. If approved by NCDOT, then such changes may be accepted for the TIA report. Subsequent revisions to the development plan (e.g. land use, density, site access, or schedule) may require additional scoping and analysis, and may modify the TIA requirements.

This agreement shall become effective on the date approved by NCDOT, and shall expire \_\_\_\_ months after the effective date or upon significant changes to the roadway network and/or development assumptions, whichever occurs first. Once expired, renewal or re-scoping will be required for subsequent TIA submittals.

### APPLICANT

_____ Signature	_____ Print Name	_____ Date
--------------------	---------------------	---------------

### TIA CONSULTANT

_____ Signature	Aaron Cook, PE _____ Print Name	_____ Date
--------------------	---------------------------------------	---------------

### LOCAL GOVERNMENT REPRESENTATIVE (If Applicable)

_____ Signature	_____ Print Name	_____ Date
--------------------	---------------------	---------------

Email concurrence may be used in lieu of the signature.

### NCDOT DISTRICT REPRESENTATIVE

Reviewed and approved by the NCDOT Division 9 District      on           .

_____ Signature	_____ Print Name
--------------------	---------------------

Email concurrence may be used in lieu of the signature.



## NCDOT TIA Submittal Checklist



**Submittal:** Trip Generation & Distribution

**Document Date:** 03/02/2023

**Project Name:** Blue Heron Pineville Mixed Use

**Previous Name:** If Applicable \_\_\_\_\_

**NCDOT Division:** 10

**District:** \_\_\_\_\_

**County:** Mecklenburg

**Municipality:** Pineville

**TIA Consultant:** Bolton & Menk, Inc

**Submitted By:** Aaron Cook, PE

**Phone Number:** (704)376-1555 Ext. 3938

**Email:** Aaron.Cook@Bolton-Menk.Com

**TIA Scoping Checklist Approval Date:** \_\_\_\_\_

**Unadjusted Daily Site Trips:** 2249

- ☒ The approved TIA Scoping Checklist is included in this submittal.
- ☒ LOS D or better is expected at all study intersections after proposed mitigations.
- ☒ The study report is sealed by a NC Professional Engineer with expertise in traffic engineering.
- ☒ This study has identified all known deficiencies with and without the proposed development.
- ☒ This study has identified mitigation measures to adequately accommodate the site trips.

Explain here if any of the boxes above are unchecked:

The undersigned affirms that, except for the deviations noted below, the TIA submittal conforms to the current [NCDOT Congestion Management Capacity Analysis Guidelines](#), [Policy on Street and Driveway Access to North Carolina Highways](#), and the TIA Scoping Checklist approved by the NCDOT District Office. The undersigned also acknowledges that the TIA will be rejected if the deviations and justifications are not properly documented and approved by NCDOT.

**Deviations and Justifications** (e.g., changes in site plan, development schedule, site trip and off-site trip estimates, study area, data collection, analysis period and method. Attached separate sheets if needed.)



## NCDOT TIA Submittal Checklist



---

TIA Consultant's Signature  
(Professional Engineer of TIA Record)

---

Print Name

---

Date



SITE PLAN CONCEPT 4  
FIRST FLOOR LAYOUT PLAN

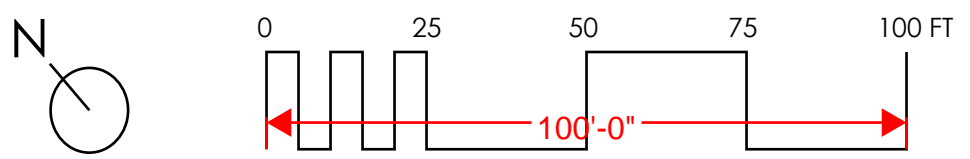
Site Plan Summary

**Building Total**  
5 Stories

**Retail:** 8,596 sf  
**Residential:** 384,016

Apartments: **294 units**  
Studio: 18 units  
1 Bedroom: 141 units  
2 Bedroom: 119 units  
3 Bedroom: 16 units

**Parking**  
Surface Parking: 102 spaces  
Parking Deck: 424 spaces  
Total Parking: **526 spaces**  
Parking at 1.5 spaces per unit: **441**  
Retail parking spaces: **73**  
(5 per 1,000 sf)  
Excess Parking: 42 spaces





SITE PLAN CONCEPT 4  
THIRD FLOOR LAYOUT PLAN

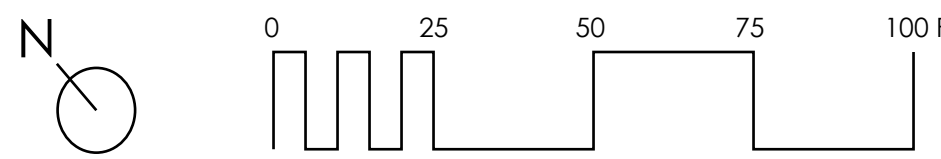
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Retail parking spaces: **73**  
(5 per 1,000 sf)  
Excess Parking: 42 spaces





LUC	Proposed Land Use	Size	Unit	Total Generated Trips						Peak Hour Type	Data Source	
				Daily Trips	AM Hour			PM Hour				
					In	Out	Total	In	Out	Total		
822	Retail (<40K SF)	8.6	KSF	893	16	10	26	35	35	70	Adjacent	EQN
221	Multifamily (Mid-Rise)	294	Dwellings	1356	27	91	118	70	45	115	Adjacent	EQN
ITE Subtotal				2249	43	101	144	105	80	185		
Internal Capture					2	2	4	11	11	22		
Pass By Trips (31% AM, 40% PM)					3	3	6	10	10	20		
Net External Trips					38	96	134	84	59	143		

NCHRP 684 Internal Trip Capture Estimation Tool					
Project Name:	Blue Heron Pineville Mixed Use			Organization:	Blue Heron Asset Management LLC
Project Location:	Pineville			Performed By:	Bolton & Menk, Inc.
Scenario Description:	Build			Date:	3/1/2023
Analysis Year:	2025			Checked By:	
Analysis Period:	AM Street Peak Hour			Date:	

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips <sup>3</sup>		
	ITE LUCs <sup>1</sup>	Quantity	Units	Total	Entering	Exiting
Office				0		
Retail	820	9	KSF	26	16	10
Restaurant				0		
Cinema/Entertainment				0		
Residential	221	294	DU	118	27	91
Hotel				0		
All Other Land Uses <sup>2</sup>				0		
				144	43	101

Table 2-A: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ. <sup>4</sup>	% Transit	% Non-Motorized	Veh. Occ. <sup>4</sup>	% Transit	% Non-Motorized
Office	1.10	0%	0%	1.10	0%	0%
Retail	1.10	0%	0%	1.10	0%	0%
Restaurant	1.10	0%	0%	1.10	0%	0%
Cinema/Entertainment	1.10	0%	0%	1.10	0%	0%
Residential	1.10	0%	0%	1.10	0%	0%
Hotel	1.10	0%	0%	1.10	0%	0%
All Other Land Uses <sup>2</sup>	1.10	0%	0%	1.10	0%	0%

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	1	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	1	0	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	159	48	111
Internal Capture Percentage	3%	4%	2%
External Vehicle-Trips <sup>5</sup>	140	41	99
External Transit-Trips <sup>6</sup>	0	0	0
External Non-Motorized Trips <sup>6</sup>	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	6%	9%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	3%	1%
Hotel	N/A	N/A

<sup>1</sup>Land Use Codes (LUCs) from *Trip Generation Manual*, published by the Institute of Transportation Engineers.

<sup>2</sup>Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.

<sup>3</sup>Enter trips assuming no transit or non-motorized trips (as assumed in ITE *Trip Generation Manual*).

<sup>4</sup>Enter vehicle occupancy assumed in Table 1-A vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made to Tables 5-A, 9-A (O and D). Enter transit, non-motorized percentages that will result with proposed mixed-use project complete.

<sup>5</sup>Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A.

<sup>6</sup>Person-Trips

\*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas A&M Transportation Institute - Version 2013.1

<b>Project Name:</b>	Blue Heron Pineville Mixed Use
<b>Analysis Period:</b>	AM Street Peak Hour

Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-A (D): Entering Trips			Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.10	0	0	1.10	0	0
Retail	1.10	16	18	1.10	10	11
Restaurant	1.10	0	0	1.10	0	0
Cinema/Entertainment	1.10	0	0	1.10	0	0
Residential	1.10	27	30	1.10	91	100
Hotel	1.10	0	0	1.10	0	0

Table 8-A (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	3		1	0	2	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	2	1	20	0		0
Hotel	0	0	0	0	0	

Table 8-A (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		6	0	0	0	0
Retail	0		0	0	1	0
Restaurant	0	1		0	2	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	3	0	0		0
Hotel	0	1	0	0	0	

Table 9-A (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles <sup>1</sup>	Transit <sup>2</sup>	Non-Motorized <sup>2</sup>
Office	0	0	0	0	0	0
Retail	1	17	18	15	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	1	29	30	26	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses <sup>3</sup>	0	0	0	0	0	0

Table 9-A (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles <sup>1</sup>	Transit <sup>2</sup>	Non-Motorized <sup>2</sup>
Office	0	0	0	0	0	0
Retail	1	10	11	9	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	1	99	100	90	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses <sup>3</sup>	0	0	0	0	0	0

<sup>1</sup>Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A

<sup>2</sup>Person-Trips

<sup>3</sup>Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator

\*Indicates computation that has been rounded to the nearest whole number.



NCHRP 684 Internal Trip Capture Estimation Tool					
Project Name:	Blue Heron Pineville Mixed Use			Organization:	Blue Heron Asset Management LLC
Project Location:	Pineville			Performed By:	Bolton & Menk, Inc. - APW
Scenario Description:	Build			Date:	3/1/2023
Analysis Year:	2025			Checked By:	
Analysis Period:	PM Street Peak Hour			Date:	

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips <sup>3</sup>		
	ITE LUCs <sup>1</sup>	Quantity	Units	Total	Entering	Exiting
Office				0		
Retail				70	35	35
Restaurant				0		
Cinema/Entertainment				0		
Residential				115	70	45
Hotel				0		
All Other Land Uses <sup>2</sup>				0		
				185	105	80

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ. <sup>4</sup>	% Transit	% Non-Motorized	Veh. Occ. <sup>4</sup>	% Transit	% Non-Motorized
Office	1.10	0%	0%	1.10	0%	0%
Retail	1.10	0%	0%	1.10	0%	0%
Restaurant	1.10	0%	0%	1.10	0%	0%
Cinema/Entertainment	1.10	0%	0%	1.10	0%	0%
Residential	1.10	0%	0%	1.10	0%	0%
Hotel	1.10	0%	0%	1.10	0%	0%
All Other Land Uses <sup>2</sup>	1.10	0%	0%	1.10	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail					550	
Restaurant						
Cinema/Entertainment						
Residential		550				
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	10	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	3	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	205	116	89
Internal Capture Percentage	13%	11%	15%
External Vehicle-Trips <sup>5</sup>	163	94	69
External Transit-Trips <sup>6</sup>	0	0	0
External Non-Motorized Trips <sup>6</sup>	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	8%	26%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	13%	6%
Hotel	N/A	N/A

<sup>1</sup> Land Use Codes (LUCs) from <i>Trip Generation Manual</i> , published by the Institute of Transportation Engineers.
<sup>2</sup> Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.
<sup>3</sup> Enter trips assuming no transit or non-motorized trips (as assumed in ITE <i>Trip Generation Manual</i> ).
<sup>4</sup> Enter vehicle occupancy assumed in Table 1-P vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be
<sup>5</sup> Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P.
<sup>6</sup> Person-Trips
*Indicates computation that has been rounded to the nearest whole number.
Estimation Tool Developed by the Texas A&M Transportation Institute - Version 2013.1

<b>Project Name:</b>	Blue Heron Pineville Mixed Use
<b>Analysis Period:</b>	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.10	0	0	1.10	0	0
Retail	1.10	35	39	1.10	35	39
Restaurant	1.10	0	0	1.10	0	0
Cinema/Entertainment	1.10	0	0	1.10	0	0
Residential	1.10	70	77	1.10	45	50
Hotel	1.10	0	0	1.10	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	1		11	2	10	2
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	2	19	11	0		2
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		3	0	0	3	0
Retail	0		0	0	35	0
Restaurant	0	20		0	12	0
Cinema/Entertainment	0	2	0		3	0
Residential	0	3	0	0		0
Hotel	0	1	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles <sup>1</sup>	Transit <sup>2</sup>	Non-Motorized <sup>2</sup>
Office	0	0	0	0	0	0
Retail	3	36	39	33	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	10	67	77	61	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses <sup>3</sup>	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles <sup>1</sup>	Transit <sup>2</sup>	Non-Motorized <sup>2</sup>
Office	0	0	0	0	0	0
Retail	10	29	39	26	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	3	47	50	43	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses <sup>3</sup>	0	0	0	0	0	0

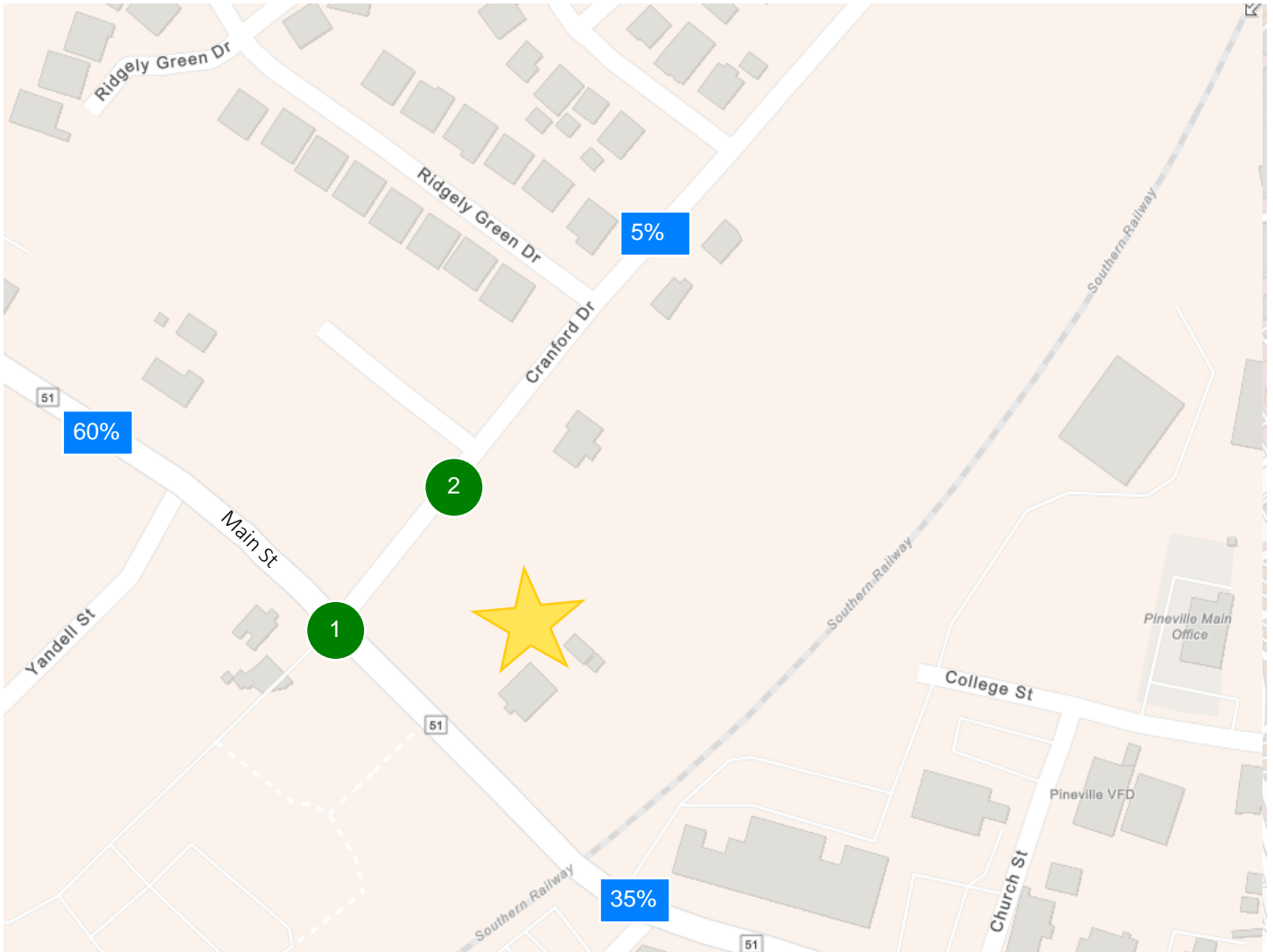
<sup>1</sup>Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

<sup>2</sup>Person-Trips

<sup>3</sup>Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator

\*Indicates computation that has been rounded to the nearest whole number.

## Blue Heron Pineville Mixed-Use Development -- Trip Distribution



### Legend

- 1 Main St & Cranford Dr
- 2 Cranford Drive & Site Access

★ Site Location

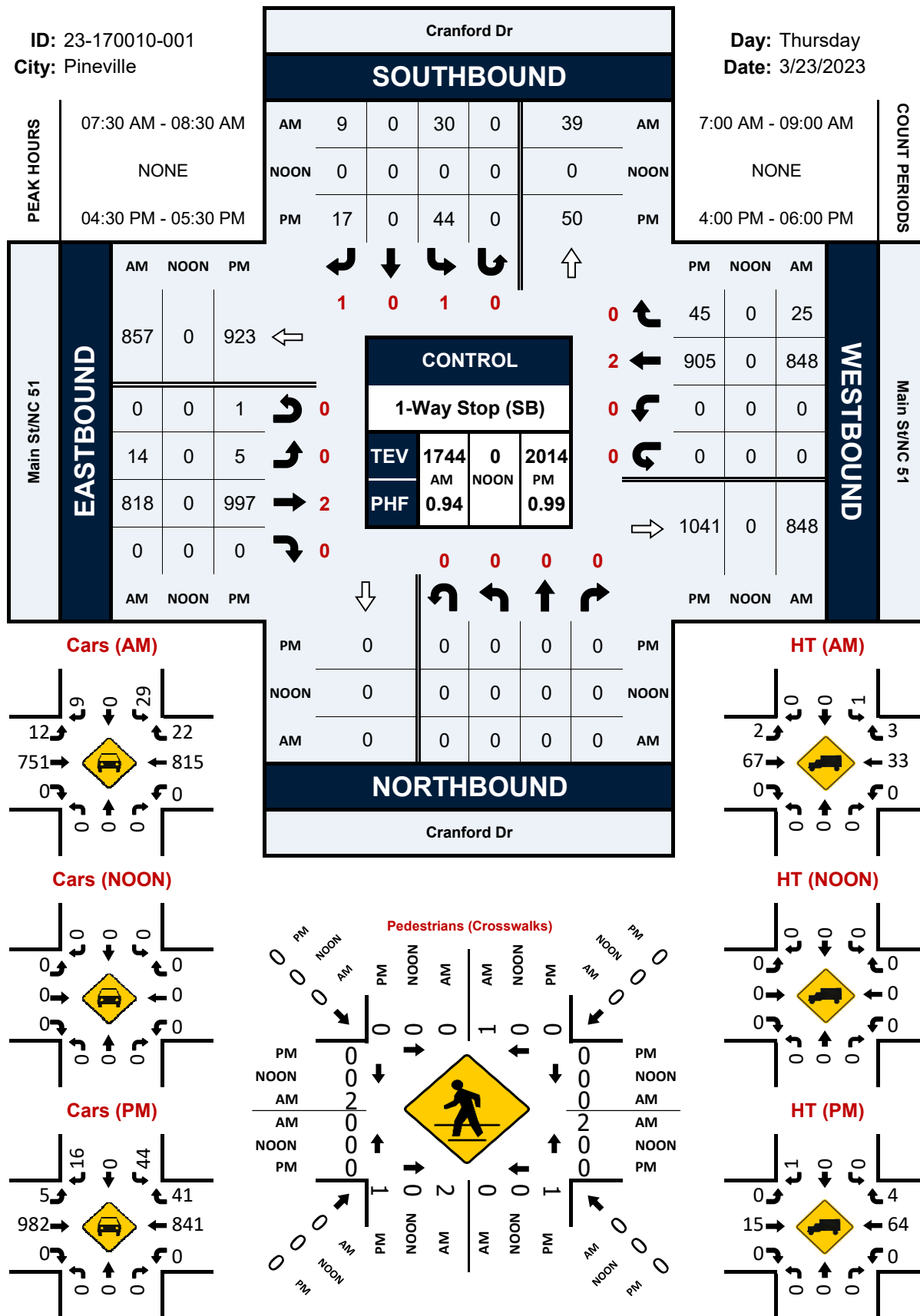
X % Trip Distribution

## Appendix B: Peak Hour Count Information

### Peak Hour Turning Movement Count

**City:** Pineville

**Date:** 3/23/2023

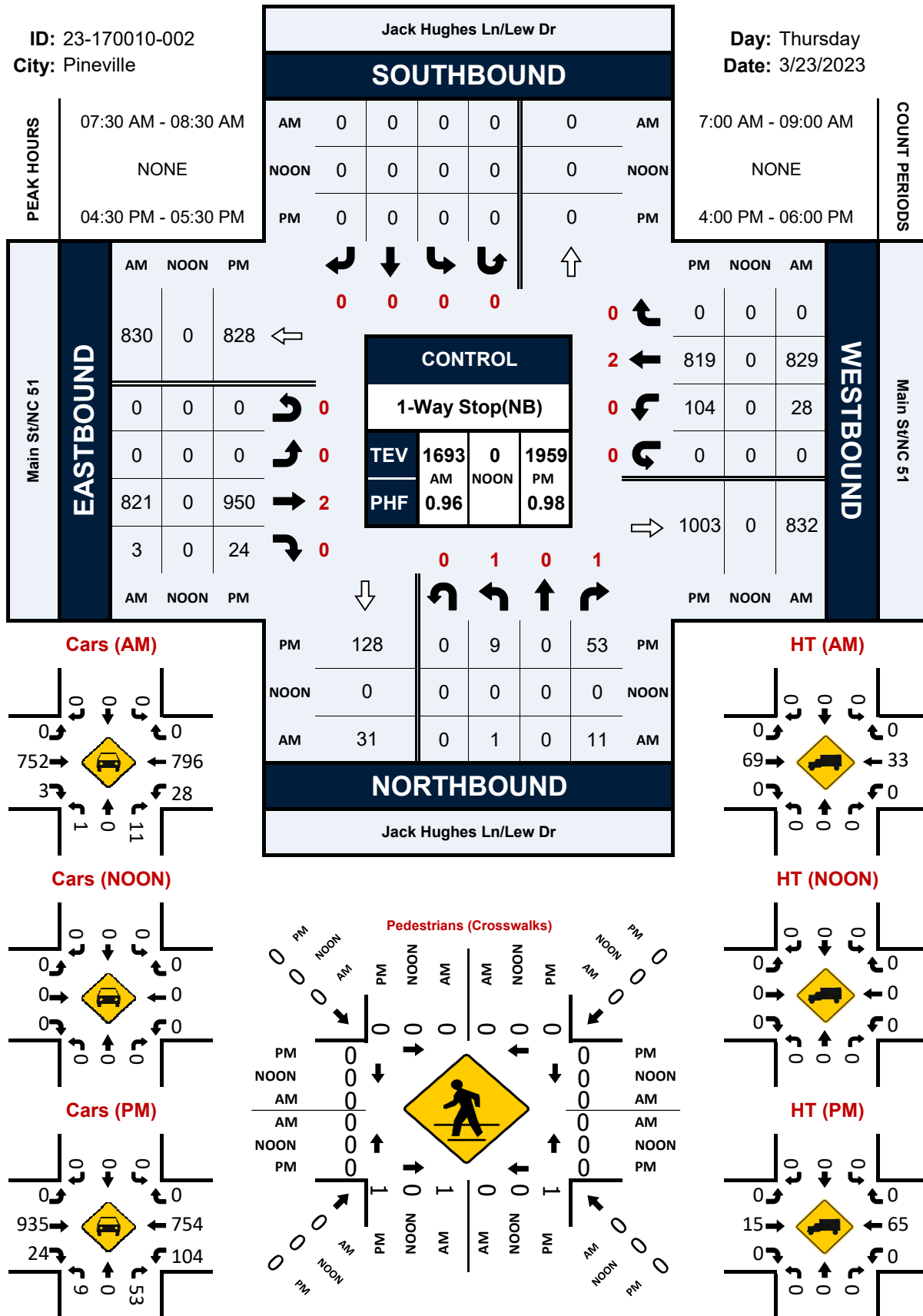


# Jack Hughes Ln/Lew Dr & Main St/NC 51

## Peak Hour Turning Movement Count

ID: 23-170010-002  
City: Pineville

Day: Thursday  
Date: 3/23/2023



## Franklin St &amp; Main St/NC 51

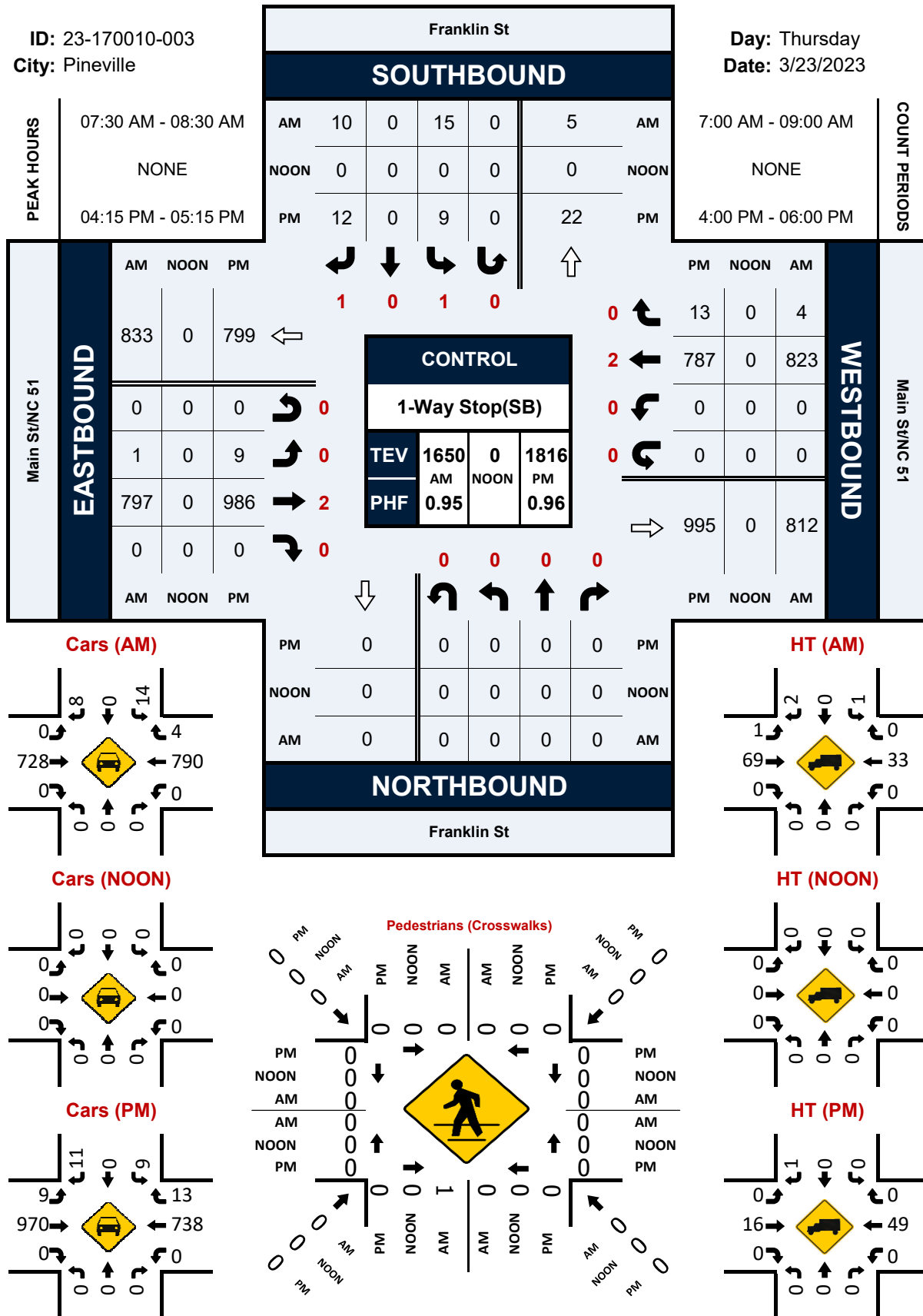
## Peak Hour Turning Movement Count

ID: 23-170010-003

City: Pineville

Day: Thursday

Date: 3/23/2023



## Appendix C: Capacity Analysis and SimTraffic Reports



### Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	6:40	6:40	6:40	6:40	6:40	6:40
End Time	7:50	7:50	7:50	7:50	7:50	7:50
Total Time (min)	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	1778	1859	1728	1649	1724	1747
Vehs Exited	1802	1847	1736	1645	1732	1752
Starting Vehs	40	20	29	33	34	30
Ending Vehs	16	32	21	37	26	26
Travel Distance (mi)	955	999	926	884	927	938
Travel Time (hr)	30.0	30.9	28.7	27.3	28.9	29.2
Total Delay (hr)	1.8	1.7	1.6	1.3	1.5	1.6
Total Stops	148	123	131	101	126	127
Fuel Used (gal)	27.9	28.9	26.9	25.2	26.6	27.1

### Interval #0 Information Seeding

Start Time	6:40
End Time	6:50
Total Time (min)	10
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

### Interval #1 Information Recording

Start Time	6:50
End Time	7:50
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	1778	1859	1728	1649	1724	1747
Vehs Exited	1802	1847	1736	1645	1732	1752
Starting Vehs	40	20	29	33	34	30
Ending Vehs	16	32	21	37	26	26
Travel Distance (mi)	955	999	926	884	927	938
Travel Time (hr)	30.0	30.9	28.7	27.3	28.9	29.2
Total Delay (hr)	1.8	1.7	1.6	1.3	1.5	1.6
Total Stops	148	123	131	101	126	127
Fuel Used (gal)	27.9	28.9	26.9	25.2	26.6	27.1

### 1: Main Street & Cranford Drive Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.2	0.2	0.0	0.0	0.1
Total Delay (hr)	0.0	0.1	0.1	0.0	0.1	0.0	0.4
Total Del/Veh (s)	6.8	0.4	0.6	0.3	18.2	4.3	0.8
Vehicles Entered	15	806	848	26	29	11	1735
Vehicles Exited	15	806	848	26	29	11	1735
Hourly Exit Rate	15	806	848	26	29	11	1735
Input Volume	14	818	848	25	30	9	1744
% of Volume	107	99	100	104	97	122	99

### 2: Jack Hughes Lane & Main Street Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0		4.3	0.0
Total Delay (hr)	0.2	0.0	0.0	0.1	0.0	0.0	0.4
Total Del/Veh (s)	0.8	0.3	6.3	0.6		3.9	0.8
Vehicles Entered	807	2	27	833	0	12	1681
Vehicles Exited	808	2	27	834	0	13	1684
Hourly Exit Rate	808	2	27	834	0	13	1684
Input Volume	821	3	28	830	1	11	1694
% of Volume	98	67	96	100	0	118	99

### 3: Main Street & Franklin Street Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.4	0.1	0.0	0.0	0.1	3.9	0.1
Total Delay (hr)	0.0	0.1	0.2	0.0	0.1	0.0	0.4
Total Del/Veh (s)	8.4	0.5	0.8	0.4	16.7	4.3	0.8
Vehicles Entered	1	779	828	5	16	10	1639
Vehicles Exited	1	779	829	5	16	10	1640
Hourly Exit Rate	1	779	829	5	16	10	1640
Input Volume	1	797	826	4	15	10	1653
% of Volume	100	98	100	125	107	100	99

#### 4: Cranford Drive & Site Access A Performance by movement

Movement	NBT	SBT	All
Denied Delay (hr)	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.1	0.1
Total Delay (hr)	0.0	0.0	0.0
Total Del/Veh (s)	0.3	0.0	0.2
Vehicles Entered	41	40	81
Vehicles Exited	41	40	81
Hourly Exit Rate	41	40	81
Input Volume	39	39	78
% of Volume	105	103	104

#### Total Network Performance

Denied Delay (hr)	0.1
Denied Del/Veh (s)	0.2
Total Delay (hr)	1.5
Total Del/Veh (s)	3.0
Vehicles Entered	1747
Vehicles Exited	1752
Hourly Exit Rate	1752
Input Volume	6925
% of Volume	25

Intersection: 1: Main Street & Cranford Drive

Movement	EB	EB	WB	SB	SB
Directions Served	LT	T	T	L	R
Maximum Queue (ft)	74	44	24	56	31
Average Queue (ft)	12	2	1	22	10
95th Queue (ft)	44	27	12	51	33
Link Distance (ft)	154	154	727	168	
Upstream Blk Time (%)		0			
Queuing Penalty (veh)		0			
Storage Bay Dist (ft)				100	
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 2: Jack Hughes Lane & Main Street

Movement	WB	WB	NB	NB
Directions Served	LT	T	L	R
Maximum Queue (ft)	115	42	6	30
Average Queue (ft)	25	3	0	8
95th Queue (ft)	80	28	5	28
Link Distance (ft)	154	154	426	
Upstream Blk Time (%)	0			
Queuing Penalty (veh)	0			
Storage Bay Dist (ft)			100	
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 3: Main Street & Franklin Street

Movement	EB	SB	SB
Directions Served	LT	L	R
Maximum Queue (ft)	26	27	33
Average Queue (ft)	1	10	8
95th Queue (ft)	16	28	30
Link Distance (ft)	952	725	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			75
Storage Blk Time (%)			
Queuing Penalty (veh)			



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Intersection: 4: Cranford Drive & Site Access A

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Movement

Directions Served

Maximum Queue (ft)

Average Queue (ft)

95th Queue (ft)

Link Distance (ft)

Upstream Blk Time (%)

Queuing Penalty (veh)

Storage Bay Dist (ft)

Storage Blk Time (%)

Queuing Penalty (veh)

---

Network Summary

---

Network wide Queuing Penalty: 0



### Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	6:40	6:40	6:40	6:40	6:40	6:40
End Time	7:50	7:50	7:50	7:50	7:50	7:50
Total Time (min)	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	2082	2165	2019	1998	1964	2048
Vehs Exited	2093	2154	2033	1994	1972	2049
Starting Vehs	43	37	40	33	39	39
Ending Vehs	32	48	26	37	31	34
Travel Distance (mi)	1073	1116	1034	1024	1008	1051
Travel Time (hr)	35.0	36.4	33.9	33.4	32.8	34.3
Total Delay (hr)	3.0	3.2	3.1	2.7	2.6	2.9
Total Stops	304	306	336	269	274	297
Fuel Used (gal)	32.4	33.6	31.3	30.7	30.1	31.6

### Interval #0 Information Seeding

Start Time	6:40
End Time	6:50
Total Time (min)	10
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

### Interval #1 Information Recording

Start Time	6:50
End Time	7:50
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	2082	2165	2019	1998	1964	2048
Vehs Exited	2093	2154	2033	1994	1972	2049
Starting Vehs	43	37	40	33	39	39
Ending Vehs	32	48	26	37	31	34
Travel Distance (mi)	1073	1116	1034	1024	1008	1051
Travel Time (hr)	35.0	36.4	33.9	33.4	32.8	34.3
Total Delay (hr)	3.0	3.2	3.1	2.7	2.6	2.9
Total Stops	304	306	336	269	274	297
Fuel Used (gal)	32.4	33.6	31.3	30.7	30.1	31.6

### 1: Main Street & Cranford Drive Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.2	0.2	0.0	0.0	0.1
Total Delay (hr)	0.0	0.1	0.3	0.0	0.3	0.0	0.7
Total Del/Veh (s)	10.6	0.3	1.1	0.4	28.0	4.2	1.3
Vehicles Entered	6	975	891	46	41	18	1977
Vehicles Exited	6	974	891	46	42	18	1977
Hourly Exit Rate	6	974	891	46	42	18	1977
Input Volume	6	997	905	45	44	17	2014
% of Volume	100	98	98	102	95	106	98

### 2: Jack Hughes Lane & Main Street Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.3	4.1	0.1
Total Delay (hr)	0.3	0.0	0.2	0.4	0.1	0.1	1.1
Total Del/Veh (s)	1.0	0.4	8.4	1.9	43.1	4.7	2.1
Vehicles Entered	948	20	100	809	10	54	1941
Vehicles Exited	949	21	101	810	10	54	1945
Hourly Exit Rate	949	21	101	810	10	54	1945
Input Volume	971	24	104	819	9	53	1980
% of Volume	98	88	97	99	111	102	98

### 3: Main Street & Franklin Street Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Denied Del/Veh (s)	0.3	0.2	0.0	0.0	0.1	4.0	0.1
Total Delay (hr)	0.0	0.2	0.2	0.0	0.1	0.0	0.5
Total Del/Veh (s)	6.6	0.7	1.0	0.5	23.0	4.2	1.0
Vehicles Entered	10	956	805	15	10	11	1807
Vehicles Exited	10	957	804	15	11	11	1808
Hourly Exit Rate	10	957	804	15	11	11	1808
Input Volume	9	986	815	13	9	12	1844
% of Volume	111	97	99	115	122	92	98

#### 4: Cranford Drive & Site Access A Performance by movement

Movement	NBT	SBT	All
Denied Delay (hr)	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.1	0.1
Total Delay (hr)	0.0	0.0	0.0
Total Del/Veh (s)	0.2	0.1	0.1
Vehicles Entered	52	59	111
Vehicles Exited	52	59	111
Hourly Exit Rate	52	59	111
Input Volume	51	61	112
% of Volume	102	97	99

#### Total Network Performance

Denied Delay (hr)	0.2
Denied Del/Veh (s)	0.3
Total Delay (hr)	2.7
Total Del/Veh (s)	4.7
Vehicles Entered	2048
Vehicles Exited	2049
Hourly Exit Rate	2049
Input Volume	7991
% of Volume	26



Intersection: 1: Main Street & Cranford Drive

Movement	EB	WB	WB	SB	SB
Directions Served	LT	T	TR	L	R
Maximum Queue (ft)	53	50	8	77	31
Average Queue (ft)	6	3	0	32	15
95th Queue (ft)	32	23	4	65	40
Link Distance (ft)	154	727	727	168	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)					100
Storage Blk Time (%)				0	
Queuing Penalty (veh)				0	

Intersection: 2: Jack Hughes Lane & Main Street

Movement	EB	WB	WB	NB	NB
Directions Served	TR	LT	T	L	R
Maximum Queue (ft)	8	161	106	49	49
Average Queue (ft)	0	67	17	9	23
95th Queue (ft)	4	139	83	34	42
Link Distance (ft)	879	154	154	426	
Upstream Blk Time (%)		0	0		
Queuing Penalty (veh)		2	0		
Storage Bay Dist (ft)					100
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 3: Main Street & Franklin Street

Movement	EB	EB	WB	SB	SB
Directions Served	LT	T	TR	L	R
Maximum Queue (ft)	104	27	4	32	28
Average Queue (ft)	10	1	0	8	8
95th Queue (ft)	51	19	3	26	29
Link Distance (ft)	952	952	879	725	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)					75
Storage Blk Time (%)					
Queuing Penalty (veh)					

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Intersection: 4: Cranford Drive & Site Access A

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Movement

Directions Served

Maximum Queue (ft)

Average Queue (ft)

95th Queue (ft)

Link Distance (ft)

Upstream Blk Time (%)

Queuing Penalty (veh)

Storage Bay Dist (ft)

Storage Blk Time (%)

Queuing Penalty (veh)

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Network Summary

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Network wide Queuing Penalty: 2



### Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	6:40	6:40	6:40	6:40	6:40	6:40
End Time	7:50	7:50	7:50	7:50	7:50	7:50
Total Time (min)	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	1893	1945	1820	1856	1860	1873
Vehs Exited	1896	1945	1839	1857	1854	1878
Starting Vehs	29	27	52	28	32	33
Ending Vehs	26	27	33	27	38	30
Travel Distance (mi)	1000	1022	957	976	980	987
Travel Time (hr)	32.2	33.6	30.7	31.1	31.2	31.7
Total Delay (hr)	2.3	3.0	2.1	2.0	2.1	2.3
Total Stops	323	370	366	323	311	338
Fuel Used (gal)	29.8	31.0	28.5	28.7	28.8	29.4

### Interval #0 Information Seeding

Start Time	6:40
End Time	6:50
Total Time (min)	10
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

### Interval #1 Information Recording

Start Time	6:50
End Time	7:50
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	1893	1945	1820	1856	1860	1873
Vehs Exited	1896	1945	1839	1857	1854	1878
Starting Vehs	29	27	52	28	32	33
Ending Vehs	26	27	33	27	38	30
Travel Distance (mi)	1000	1022	957	976	980	987
Travel Time (hr)	32.2	33.6	30.7	31.1	31.2	31.7
Total Delay (hr)	2.3	3.0	2.1	2.0	2.1	2.3
Total Stops	323	370	366	323	311	338
Fuel Used (gal)	29.8	31.0	28.5	28.7	28.8	29.4

### 1: Main Street & Cranford Drive Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.1
Total Delay (hr)	0.1	0.1	0.2	0.0	0.5	0.0	0.1	0.9
Total Del/Veh (s)	6.7	0.5	0.7	0.4	27.6	0.5	4.6	1.7
Vehicles Entered	36	800	841	40	60	1	75	1853
Vehicles Exited	36	801	843	40	60	1	75	1856
Hourly Exit Rate	36	801	843	40	60	1	75	1856
Input Volume	38	817	846	40	65	1	68	1875
% of Volume	95	98	100	100	92	100	110	99

### 2: Jack Hughes Lane & Main Street Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.1	4.2	0.0
Total Delay (hr)	0.2	0.0	0.1	0.2	0.0	0.0	0.4
Total Del/Veh (s)	0.8	0.1	7.7	0.6	34.1	3.6	0.9
Vehicles Entered	825	3	26	892	1	9	1756
Vehicles Exited	827	3	26	892	1	9	1758
Hourly Exit Rate	827	3	26	892	1	9	1758
Input Volume	844	3	28	887	1	11	1774
% of Volume	98	100	93	101	100	82	99

### 3: Main Street & Franklin Street Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)		0.1	0.0	0.0	0.2	3.3	0.1
Total Delay (hr)	0.0	0.1	0.2	0.0	0.1	0.0	0.4
Total Del/Veh (s)		0.5	0.8	0.2	23.1	4.4	0.8
Vehicles Entered	0	800	888	4	14	11	1717
Vehicles Exited	0	801	887	4	14	11	1717
Hourly Exit Rate	0	801	887	4	14	11	1717
Input Volume	1	820	883	4	15	10	1733
% of Volume	0	98	100	100	93	110	99

#### 4: Cranford Drive & Site Access A Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.2	0.0	0.0	0.1	0.1	0.1
Total Delay (hr)	0.1	0.0	0.0	0.0	0.0	0.0	0.1
Total Del/Veh (s)	4.5	3.1	0.4	0.3	1.5	0.1	2.2
Vehicles Entered	93	7	42	34	2	42	220
Vehicles Exited	93	7	41	34	2	42	219
Hourly Exit Rate	93	7	41	34	2	42	219
Input Volume	94	5	39	39	2	39	218
% of Volume	99	140	105	87	100	108	100

#### Total Network Performance

Denied Delay (hr)	0.1
Denied Del/Veh (s)	0.2
Total Delay (hr)	2.2
Total Del/Veh (s)	4.2
Vehicles Entered	1873
Vehicles Exited	1878
Hourly Exit Rate	1878
Input Volume	7493
% of Volume	25



Intersection: 1: Main Street & Cranford Drive

Movement	EB	EB	WB	SB	SB
Directions Served	LT	T	T	L	R
Maximum Queue (ft)	75	15	46	94	80
Average Queue (ft)	21	1	2	37	32
95th Queue (ft)	58	15	20	81	59
Link Distance (ft)	154	154	727	168	
Upstream Blk Time (%)				0	0
Queuing Penalty (veh)				0	0
Storage Bay Dist (ft)					100
Storage Blk Time (%)				2	
Queuing Penalty (veh)				1	

Intersection: 2: Jack Hughes Lane & Main Street

Movement	EB	WB	WB	NB	NB
Directions Served	T	LT	T	L	R
Maximum Queue (ft)	4	146	114	21	26
Average Queue (ft)	0	24	4	1	7
95th Queue (ft)	3	82	39	10	25
Link Distance (ft)	879	154	154	426	
Upstream Blk Time (%)		0	0		
Queuing Penalty (veh)		1	0		
Storage Bay Dist (ft)					100
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 3: Main Street & Franklin Street

Movement	EB	SB	SB
Directions Served	LT	L	R
Maximum Queue (ft)	12	35	33
Average Queue (ft)	0	10	9
95th Queue (ft)	6	31	30
Link Distance (ft)	952	725	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			75
Storage Blk Time (%)			
Queuing Penalty (veh)			

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Intersection: 4: Cranford Drive & Site Access A

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Movement	WB	SB
Directions Served	LR	LT
Maximum Queue (ft)	56	6
Average Queue (ft)	35	0
95th Queue (ft)	52	4
Link Distance (ft)	196	849
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

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Network Summary

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Network wide Queuing Penalty: 2
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### Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	6:40	6:40	6:40	6:40	6:40	6:40
End Time	7:50	7:50	7:50	7:50	7:50	7:50
Total Time (min)	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	2208	2269	2242	2229	2207	2231
Vehs Exited	2219	2268	2253	2238	2207	2238
Starting Vehs	42	41	39	43	32	37
Ending Vehs	31	42	28	34	32	33
Travel Distance (mi)	1120	1140	1126	1126	1121	1127
Travel Time (hr)	38.0	39.4	38.2	39.5	39.5	38.9
Total Delay (hr)	4.1	4.9	4.2	5.5	5.6	4.9
Total Stops	452	570	509	493	506	507
Fuel Used (gal)	34.7	36.0	35.3	35.4	34.7	35.2

### Interval #0 Information Seeding

Start Time	6:40
End Time	6:50
Total Time (min)	10
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

### Interval #1 Information Recording

Start Time	6:50
End Time	7:50
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	2208	2269	2242	2229	2207	2231
Vehs Exited	2219	2268	2253	2238	2207	2238
Starting Vehs	42	41	39	43	32	37
Ending Vehs	31	42	28	34	32	33
Travel Distance (mi)	1120	1140	1126	1126	1121	1127
Travel Time (hr)	38.0	39.4	38.2	39.5	39.5	38.9
Total Delay (hr)	4.1	4.9	4.2	5.5	5.6	4.9
Total Stops	452	570	509	493	506	507
Fuel Used (gal)	34.7	36.0	35.3	35.4	34.7	35.2

### 1: Main Street & Cranford Drive Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Denied Del/Veh (s)	0.0	0.0	0.2	0.2	0.0	0.0	0.1
Total Delay (hr)	0.1	0.3	0.4	0.0	1.4	0.1	2.2
Total Del/Veh (s)	9.2	1.0	1.4	0.6	70.2	6.2	3.7
Vehicles Entered	57	974	921	77	69	50	2148
Vehicles Exited	57	975	921	77	70	50	2150
Hourly Exit Rate	57	975	921	77	70	50	2150
Input Volume	61	992	901	78	70	56	2158
% of Volume	93	98	102	99	100	89	100

### 2: Jack Hughes Lane & Main Street Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.2	4.1	0.1
Total Delay (hr)	0.4	0.0	0.3	0.5	0.1	0.1	1.4
Total Del/Veh (s)	1.3	0.7	9.7	2.1	45.8	5.4	2.4
Vehicles Entered	1000	24	104	868	10	48	2054
Vehicles Exited	1003	24	104	867	10	48	2056
Hourly Exit Rate	1003	24	104	867	10	48	2056
Input Volume	1021	24	104	854	9	53	2065
% of Volume	98	100	100	102	111	91	100

### 3: Main Street & Franklin Street Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Denied Del/Veh (s)	0.4	0.2	0.0	0.0	0.1	3.8	0.1
Total Delay (hr)	0.0	0.2	0.2	0.0	0.1	0.0	0.6
Total Del/Veh (s)	7.2	0.8	1.0	0.5	30.7	4.1	1.1
Vehicles Entered	9	1014	863	14	9	14	1923
Vehicles Exited	9	1015	864	14	9	14	1925
Hourly Exit Rate	9	1015	864	14	9	14	1925
Input Volume	9	1036	850	13	9	12	1929
% of Volume	100	98	102	108	100	117	100



#### 4: Cranford Drive & Site Access A Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.2	0.2	0.1
Total Delay (hr)	0.1	0.0	0.0	0.0	0.0	0.0	0.1
Total Del/Veh (s)	5.0	2.9	0.6	0.4	2.3	0.4	1.5
Vehicles Entered	58	4	52	82	5	61	262
Vehicles Exited	58	4	52	82	5	61	262
Hourly Exit Rate	58	4	52	82	5	61	262
Input Volume	66	3	51	88	5	60	273
% of Volume	88	133	102	93	100	102	96

#### Total Network Performance

Denied Delay (hr)	0.2
Denied Del/Veh (s)	0.3
Total Delay (hr)	4.7
Total Del/Veh (s)	7.4
Vehicles Entered	2231
Vehicles Exited	2238
Hourly Exit Rate	2238
Input Volume	8618
% of Volume	26

Intersection: 1: Main Street & Cranford Drive

Movement	EB	EB	WB	WB	SB	SB
Directions Served	LT	T	T	TR	L	R
Maximum Queue (ft)	96	78	74	45	155	121
Average Queue (ft)	39	6	8	2	63	37
95th Queue (ft)	84	44	46	24	132	93
Link Distance (ft)	154	154	727	727	168	
Upstream Blk Time (%)		0			1	0
Queuing Penalty (veh)		0			1	0
Storage Bay Dist (ft)						100
Storage Blk Time (%)					10	0
Queuing Penalty (veh)					6	0

Intersection: 2: Jack Hughes Lane & Main Street

Movement	EB	WB	WB	NB	NB
Directions Served	TR	LT	T	L	R
Maximum Queue (ft)	9	163	145	41	57
Average Queue (ft)	0	73	22	9	23
95th Queue (ft)	6	150	102	32	47
Link Distance (ft)	879	154	154	426	
Upstream Blk Time (%)		1	0		
Queuing Penalty (veh)		4	0		
Storage Bay Dist (ft)				100	
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 3: Main Street & Franklin Street

Movement	EB	SB	SB
Directions Served	LT	L	R
Maximum Queue (ft)	97	31	28
Average Queue (ft)	11	7	11
95th Queue (ft)	53	25	33
Link Distance (ft)	952	725	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			75
Storage Blk Time (%)			
Queuing Penalty (veh)			

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Intersection: 4: Cranford Drive & Site Access A

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Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (ft)	62	4	28
Average Queue (ft)	30	0	2
95th Queue (ft)	54	3	15
Link Distance (ft)	196	168	849
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

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Network Summary

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Network wide Queuing Penalty: 12

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## Appendix D: Road Diet Information

# How We Approach a Road Diet to Create Safer Communities

## What is a Road Diet?

- The change from a 4-lane undivided roadway to a 3-lane roadway with a center turn lane, which allows communities to repurpose their limited right-of-way to better serve all users.

## Why is it Important?

- The Federal Highway Administration (FHWA) lists a 4- to 3-lane conversion as a proven safety countermeasure.
- Road diets, also known as 4- to 3-lane conversions, are installed on existing pavement within the right-of-way and offer a low cost solution with big safety benefits as listed by the FHWA.

## Road Diet Benefits



19-47% Reduction in Crashes



Reduced Conflict Points



Better Sight Distance



Safer Street Crossings



Fewer Lanes to Cross



Slower Overall Speeds



Eliminates Passing

## History of Road Design

1970s

First widening of roadways from 2- to 3-lanes

1990s

First 4- to 3-lane conversion of roadways

2020s

Road diets continue to gain momentum as a proven safety measure

STEP 1

## Defining the Need and Feasibility

Help to identify objectives; collect crash, volume, and speed data; and identify road user type to determine if road diet is a good corridor alternative. The FHWA advises that roadways with ADT of 20,000 veh/day or less may be good road diet candidates.

STEP 2

## Educating the Public

Proactively educate council, business owners, and residents with road diet facts early in the process to mitigate concerns. We work with you to define performance measures to help your community determine project success.

STEP 3

## Creating Design Plans

Design plans include signing and striping changes, bike facility or sidewalk design, signal modifications, and revised signal timings. Our design plans always include an aspect of community involvement. We want what's best for the community.

STEP 4

## Addressing Public Concern

We can help test a road diet through a pilot project before it's permanent. Speed, travel time, volume, and crash data are compared to the performance measures before and after pilot implementation to understand overall project benefits.

STEP 5

## Executing the Project

It's important to communicate with affected property owners, city council, and the public about upcoming implementation and how the roadway will function afterward, including how to properly use the two-way left turn lane.

To learn more about Road Diets, contact Jennifer McCoy  
[Jennifer.McCoy@bolton-menk.com](mailto:Jennifer.McCoy@bolton-menk.com)

