

Appendix C-2: Proposed Refinements Traffic Analysis Technical Report

Durham-Orange Light Rail Transit Project



October 2018

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Acronyms and Abbreviations

Acronym/Abbreviation	Definition
D-O LRT	Durham-Orange Light Rail Transit
DEIS	Draft Environmental Impact Statement
EA	Environmental Assessment
LOS	level of service
LRT	light rail transit
MOE	measures of effectiveness
NC	North Carolina
NCDOT	North Carolina Department of Transportation
NCRR	North Carolina Railroad Company
NEPA	National Environmental Policy Act
PM	afternoon
ROD	Record of Decision

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1. Executive Summary

This Traffic Analysis Technical Report has been produced in support of a Durham-Orange Light Rail Transit (D-O LRT) Proposed Refinements Supplemental Environmental Assessment (EA) to document the detailed evaluation of effects of the Proposed Refinements on traffic. This evaluation considers only those intersections where the Proposed Refinements would affect the level of service (LOS) relative to the Previous Design. Proposed Refinements were evaluated for traffic operations in three segments of the Light Rail Transit (LRT) alignment: University Drive (5 intersections), the western part of Erwin Road (2 intersections), and Downtown Durham (15 intersections). Additionally, more basic intersection analysis was conducted for less-intensive changes at 1 intersection at South Square Station and 6 intersections on the eastern part of Erwin Road near the Duke University and VA medical centers.

The traffic analysis documented in this report followed the same methods and used the same general assumptions as the detailed analysis presented in the National Environmental Policy Act (NEPA) documentation for the Previous Design, with a few minor exceptions. The fundamentals of this methodology were described in detail in the Traffic Analysis Methodology report (November 2013), which was provided in Appendix K.3 of the D-O LRT Project Draft Environmental Impact Statement (DEIS). Impacts are only defined for overall intersection LOS. Section 2 of this report contains additional information about impact definitions. Results for each segment are summarized below.

1.1 University Drive

The proposed shift in the LRT trackway from the median of University Drive to the side (north side to the west of Martin Luther King Jr. Parkway and south side to the east) would result in better conditions at some intersections and worse conditions at others. All intersections would operate at LOS E or better during future peak hours with the Proposed Refinements, although queues are expected to be longer than those associated with the Previous Design. The addition of two signals at Larchmont Road and BB&T Plaza Driveway would make University Drive access easier relative to the Previous Design. Afternoon (PM) peak hour delay at the Martin Luther King Jr. Parkway intersection would be about 17 percent higher with the Proposed Refinements than with the Previous Design, but it does not meet any of the three North Carolina Department of Transportation (NCDOT) criteria for an impact requiring mitigation. **Table 1-1** presents overall 2040 peak hour intersection LOS results for the University Drive segment. Shading indicates LOS impacts, either beneficial (green) or adverse (red), and bold italic text indicates significant adverse LOS impacts of the Previous Design compared to the No Build case (presented in previous NEPA documentation).

Table 1-1: Overall Intersection LOS and Delay (seconds per vehicle) Comparison for University Drive

University Drive Intersection	AM Peak Hour		PM Peak Hour	
	Previous Design	Proposed Refinements	Previous Design	Proposed Refinements
Snow Crest Trail/Ivy Creek Boulevard	C (29.9)	A (8.9)	C (27.0)	D (49.7)
Larchmont Road	F (57.6)^a	C (24.0)	F (55.6)^a	E (64.2)
Martin Luther King Jr. Boulevard	E (61.0)	D (52.0)	E (60.1)	E (70.4)
Westgate Drive	D (37.9)	C (33.0)	E (57.5)	E (67.7)
BB&T Plaza Driveway	^b	A (8.6)	^b	E (55.1)

Notes: a. Larchmont intersection unsignalized in the Previous Design scenario; 1-way stop intersection LOS is reported for worst movement instead of average for all movements.
b. Intersection was not analyzed for this scenario.

The Proposed Refinements would not result in any new significant LOS impacts according to the application of City of Durham and NCDOT standards to overall intersection LOS. The delay at the Westgate Drive signal would worsen compared to the Previous Design. This effect apparently results from the consolidation of shopping center driveways in conjunction with moving the LRT tracks from the median of University Drive to the south side.

In addition to the investigation of University Drive, the Shannon Road/Auto Drive intersection was examined to identify whether a nearby change, the LRT underpass of the University Drive/Shannon Road intersection, would require traffic impact mitigation. The proposed underpass would introduce a new LRT at-grade crossing at the Shannon Road/Auto Drive intersection that was not present in the Previous Design. In order to accommodate LRT operations, minor changes in striping and signal operations were included in the Proposed Refinement. These would improve LOS in both 2040 peak hours, compared to Previous Design conditions, even after accounting for LRT operations.

1.2 Erwin Road

The Proposed Refinement for the Erwin Road segment would move the LRT trackway from a median at-grade configuration to the southeast side of Erwin Road (though still at-grade) where it crosses Cameron Boulevard and Towerview Road. East of the Towerview Road crossing, the Proposed Refinement transitions to an elevated trackway. Intersections along Erwin Road east of Towerview Road are not subject to analysis because the Proposed Refinement is similar to the No Build case (presented in previous NEPA documentation). **Table 1-2** presents overall 2040 peak hour intersection LOS results for the Erwin Road (West) segment. Shading indicates LOS impacts, either beneficial (green) or adverse (red).

Table 1-2: Overall Intersection LOS and Delay (seconds per vehicle) Comparison for Erwin Road (West)

Erwin Road Intersection	AM Peak Hour		PM Peak Hour	
	Previous Design	Proposed Refinements	Previous Design	Proposed Refinements
Cameron Boulevard	C (25.4)	C (22.1)	D (42.0)	C (33.4)
Towerview Road/ Morreene Road	D (46.4)	D (37.8)	E (70.1)	D (47.9)

The analysis of the Proposed Refinements in the eastern part of Erwin Road showed intersection LOS results that were better than the results for the Previous Design in almost every case.

1.3 Downtown Durham

In terms of traffic operations, the Proposed Refinements in Downtown Durham include the closure of the Blackwell Street crossing of the North Carolina Railroad Company (NCRR) tracks; the conversion of Dillard Street to 1-way operation at the NCRR crossing; the removal of the southbound Fayetteville Street left turn movement at Pettigrew Street; and the conversion of Ramseur Street, a part of the City's Downtown Loop, from a 1-way (Eastbound) to 2-way operation. The first three of these would optimize the geometry and operations at joint LRT/NCRR crossings. The Ramseur 2-way conversion change would facilitate bus access to the Durham Bus Center and replace some of the westbound traffic capacity on Pettigrew Street between West Chapel Hill Street and Dillard Street with the loss of a travel lane due to the project.

Overall traffic conditions as represented in both traffic simulation scenarios (Previous Design and Proposed Refinements) are acceptable during both peak hours, especially along Pettigrew Street. The simulation analysis results for Downtown Durham indicate that the design proposed for the 2-way conversion of Ramseur Street would result in peak hour traffic conditions that meet the City of Durham's LOS E standard during both peak hours at all intersections examined.

Of the four Ramseur Street intersections proposed for 1-way to 2-way street conversion that are under NCDOT jurisdiction, none would have new significant impacts due to the Proposed Refinements. While the Proposed Refinements would result in a minor impact at the Pettigrew/Fayetteville intersection, with LOS D conditions in both peak hours, that result is well within the City's standard of LOS E or better and the Fayetteville approaches would exhibit lower delays than the Pettigrew ones. The Proposed Refinements in Downtown Durham would not require mitigation for in part because the City of Durham is undertaking a comprehensive study of its downtown street system, including the potential conversion of its entire Downtown Loop from 1-way to 2-way operation. **Table 1-3** presents overall 2040 peak hour intersection LOS results for the Downtown Durham segment. Shading indicates LOS impacts, either beneficial (green) or adverse (red), and bold italic text indicates a significant adverse LOS impact of the Previous Design compared to the No Build case (presented in previous NEPA documentation).

**Table 1-3: Overall Intersection LOS and Delay (seconds per vehicle) Comparison for
Downtown Durham**

Downtown Durham Intersection	AM Peak Hour		PM Peak Hour	
	Previous Design	Proposed Refinements	Previous Design	Proposed Refinements
W. Chapel Hill Street and Duke Street	C (27.5)	C (25.0)	C (32.4)	C (28.2)
W. Chapel Hill Street and Pettigrew Street	B (13.4)	B (10.4)	C (25.8)	B (15.1)
W. Chapel Hill Street and Ramseur Street	^a	C (26.1)	^a	C (27.7)
Pettigrew Street and Blackwell Street	B (15.3)	D (28.4) ^b	B (14.3)	C (19.5) ^b
Ramseur Street and Blackwell/Corcoran Street	B (12.4)	B (18.7)	B (12.5)	B (18.3)
Main Street and Corcoran Street	B (15.4)	D (41.4)	C (22.9)	C (28.4)
Pettigrew Street and Mangum Street	A (4.6)	B (13.5)	A (2.7)	B (11.4)
Ramseur Street and Mangum Street	C (26.8)	C (22.7)	C (34.9)	C (23.4)
Main Street and Mangum Street	D (35.7)	D (40.1)	E (76.3)	D (53.3)
Pettigrew Street and Roxboro Street	B (16.3)	B (19.8)	B (18.7)	B (18.8)
Ramseur Street and Roxboro Street	^a	A (3.0) ^b	^a	A (3.4) ^b
Pettigrew Street and Dillard Street	B (18.3)	B (16.9)	C (22.3)	B (18.7)
Ramseur Street and Dillard Street	^a	C (15.3)	^a	D (26.5)
Pettigrew Street and Fayetteville Street	C (28.9)	D (37.6)	D (39.7)	D (50.9)
Pettigrew Street and Grant Street	B (15.2)	B (15.6)	B (18.7)	C (28.9)

Notes: a. Intersection was not analyzed for this scenario.

b. 1-way stop intersection LOS is reported for worst movement instead of average for all movements.

The Proposed Refinements would result in no new significant impacts to overall intersection LOS. The significant impact at the Main Street/Mangum Street intersection in the Previous Design would be removed with the Proposed Refinements. In addition, none of the signalized intersections added to the analysis for the Proposed Refinements condition would operate worse than LOS C in either peak hour. The all-way stop at the Ramseur Street/Dillard Street intersection would operate at LOS D in the PM peak with the Proposed Refinements, but it is worth noting that stop-controlled intersections have lower delay thresholds for LOS grades than signalized ones do.

2. Introduction

This Traffic Analysis Technical Report documents the detailed evaluation of the effects of the Proposed Refinements on intersections in the D-O LRT Project area. While there are many Proposed Refinements, this report describes only the refinements that would result in different intersection level of service impacts as compared with the impacts described in the NEPA documentation for the Previous Design. Proposed Refinements were evaluated for traffic operations in three areas of the project, as follows:

1. **University Drive:** Change in at-grade LRT alignment from the median to the side of University Drive (the north side west of Martin Luther King Jr. Parkway and the south side east of this intersection) and the introduction of two new traffic signals at existing “T” intersections at Larchmont Road and BB&T Plaza Driveway.
2. **Erwin Road (West):** Change in at-grade LRT alignment from the median to the east side of Erwin Road between Cameron Boulevard and south of LaSalle Street.
3. **Downtown Durham:** Addition of a station between Blackwell and Mangum Streets, addition of a traffic signal at the Durham bus center station for pre-emption of Pettigrew Street traffic by transit buses, and conversion of Ramseur Street from 1-way to 2-way operation between Blackwell/Corcoran and Dillard streets.

Traffic operations in each of these areas are described in detail in this report.

3. Methods and Assumptions

The traffic analysis documented in this report has followed the same methods and used the same general assumptions as the previous detailed analysis that supported the NEPA documentation for the Previous Design, with a few minor exceptions. The fundamentals of this methodology are described in detail in the Traffic Analysis Methodology report (November 2013), provided in Appendix K.3 of the DEIS.

Because the fundamental nature of the D-O LRT Project and the street networks in the surrounding areas have not changed since the Previous Design, no new traffic volume assignment information was generated from the regional travel demand model for the analysis of the Proposed Refinements. The only traffic adjustment was a minor increase at the two Erwin Road intersections to reflect the recent opening of a new parking structure in the area that is not believed to have been accounted for in the previous travel demand forecasts. Traffic estimates related to this change were taken directly from the parking structure’s 2015 traffic impact study as approved by NCDOT.

The VISSIM model originally used to evaluate the Previous Design for each analysis area of interest was updated to account for the Proposed Refinements. In addition to the analysis of the associated track, roadway, and traffic signal changes, care was used when taking into account the routing of traffic, speed decisions, and yielding behavior in the model. These changes were made with the goal of preserving as much of the original, calibrated, approved simulation model as possible while still accommodating the Proposed Refinements in full.

The software versions used to assess the Previous Design are no longer available. For this effort, Synchro version 9.1 was used for signal timing optimization where applicable, and VISSIM version 9 was used to generate the detailed traffic operations measures of effectiveness (MOEs) of delay-based intersection LOS, average queue, and maximum queue.

Where more basic intersection analysis was called for to investigate the incremental impacts of smaller changes, Synchro was used to estimate LOS and delay, and Synchro results for the Previous Design were used as the basis for comparison.

The work documented in this report includes analysis of both signalized and unsignalized intersections, and results are presented together. Because LOS thresholds differ depending on whether an intersection is signal-controlled, delay criteria are presented in **Table 3-1** for easy reference.

Table 3-1: Intersection Level of Service Criteria (Average Delay, Seconds per Vehicle)

Signalized	Level of Service	Unsignalized
10.0 or less	A	10.0 or less
10.1 to 20.0	B	10.1 to 15.0
20.1 to 35.0	C	15.1 to 25.0
35.1 to 55.0	D	25.1 to 35.0
55.1 to 80.0	E	35.1 to 50.0
80.1 or more	F	50.1 or more

Source: Transportation Research Board Special Report 209 (Highway Capacity Manual).

Delay estimates are only considered reliable when volume is less than capacity. This is due to the unpredictable relationship between demand and throughput when volume is very high and flow becomes unstable. For the D-O LRT Project, delays over 100 seconds are reported only as rough estimates.

When reading traffic operations summary results where microsimulation software is used, it is important to consider that vehicle queue length results for turning movements that share lanes can appear inconsistent with their respective delay estimates, and that “maximum queue” estimates are not a reliable basis for design.

There are two methods for defining an impact for intersection LOS in the areas studied. **Table 3-2** summarizes these methods.

These standards were only applied to the overall intersection LOS.

Table 3-2: Intersection Impact Definitions Used in Evaluating D-O LRT Project Refinements

	City of Durham	NCDOT
Jurisdiction definition:	Both cross-streets under City of Durham control	At least one cross-street under NCDOT control
Definition of unacceptable peak hour LOS (impact):	Varies by development tier in the city: <ul style="list-style-type: none"> • Downtown Tier: LOS F [meaning LOS E is acceptable] • Compact Neighborhood Tier: LOS F • Urban Tier: LOS E • Suburban Tier: LOS D • Rural Tier: LOS C 	Any one of the following conditions results from the proposed action: <ol style="list-style-type: none"> a. Overall delay increases by 25 percent or greater while maintaining the same LOS b. The LOS degrades by at least one level; c. LOS is F

Sources: Chapter 5, Section J of “Policy on Street and Driveway Access to North Carolina Highways”, NCDOT, (2003); Chapter 8 of “City of Durham Comprehensive Plan”, City of Durham (2012).

All of the intersections in the City of Durham that were studied for this report are located in either the Downtown Tier or a Compact Neighborhood area. Therefore, all such non-NCDOT intersections were considered to be affected by the Proposed Refinements if they would result in an LOS F condition overall

in either peak hour (AM or PM), using 2040 traffic volume projections. In order to apply the criteria somewhat consistently, for intersections under NCDOT control at LOS E or F in either peak hour with the Proposed Refinements, part b of the NCDOT standard was only applied where the project would result in a degradation in overall intersection to LOS E or F. For example, an intersection's overall LOS worsening from B to C as a result of the project was not considered to be an impact, but LOS D worsening to E was. This distinction is not officially part of NCDOT's written standards, but it was discussed with their staff prior to application here.

4. Effects Analysis

4.1 University Drive

The five University Drive intersections examined here as a result of a refinement in the project definition are Snow Crest Trail/Ivy Creek Boulevard, Larchmont Road, Martin Luther King Jr. Parkway, Westgate Drive, and the BB&T Plaza Driveway. All of the roadways under study in the University Drive corridor are maintained by the City of Durham, and therefore subject to the City LOS standard, with the exception of Martin Luther King Jr. Parkway.

4.1.1 Previous Design

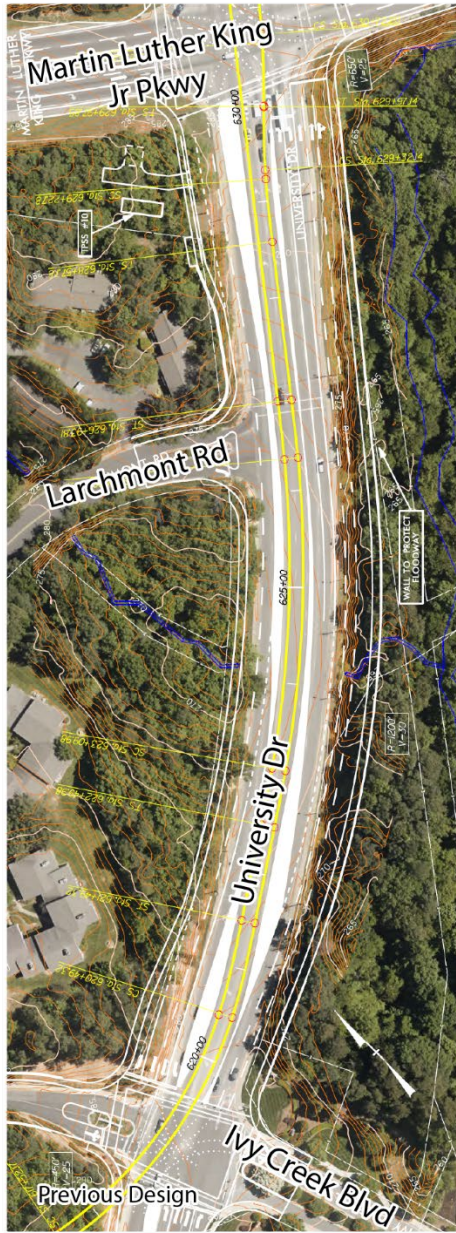
The Previous Design includes light rail tracks running in the median of University Drive between the Snow Crest Trail/Ivy Creek Boulevard intersection on the west and the Shannon Road intersection on the east. The Martin Luther King Jr. Parkway Station of the Previous Design is located in the median of University Drive just east of Martin Luther King Jr. Parkway, with pedestrian access from each end (Martin Luther King Jr. Parkway and Lyckan Parkway intersections). While this alignment balances the impacts between the north and south sides of University Drive, it is not compatible with the compact, walkable development desired and planned for the Martin Luther King Jr. Parkway station area.

4.1.2 Proposed Refinements

In response to comments on the DEIS and through the advancement of the project design, the Proposed Refinement to the University Drive segment would locate the trackway along the north side of University Drive west of Martin Luther King Jr. Parkway, and along the south side of University Drive east of Martin Luther King Jr. Parkway. The station would be positioned to the east, slightly farther away from the Martin Luther King Jr. Parkway intersection than in the Previous Design and would be located on the south side of University Drive rather than in the median. The refined configuration also includes two new traffic signals on University Drive to provide full-movement property access, which the LRT tracks in the Previous Design preclude. These new signals would be located at Larchmont Road about 300 feet west of Martin Luther King Jr. Parkway and at the BB&T Plaza Driveway about 450 feet west of Shannon Road.

The proposed new station location would remove the need for direct station access across University Drive at Lyckan Parkway. Riders accessing the station on foot and oriented north of University Drive would cross at either Martin Luther King Jr. Parkway or Westgate Drive, and those coming from the park-and-ride and nearby areas to the south would no longer need to cross street traffic to reach the platform.

The two configurations subject to comparison, Previous Design and Proposed Refinements, are shown side by side in **Figure 4-1** through **Figure 4-3**. The separation into three figures is due to the length and orientation of the corridor, and they are presented from west to east. Note also that there is some overlap on the ends and the “north” orientation varies between figures.



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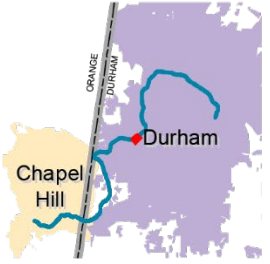


<p>University Drive DURHAM-ORANGE LIGHT RAIL TRANSIT PROJECT</p>		<p> D-O LRT Alignment</p>
<p>GO  Triangle</p> <p>0 100 200 Feet</p>		
<p>Sources: CGIA, NCDOT, NC OneMap 2017 Imagery</p>		

Figure 4-1: University Drive Alignment Comparison, Part 1 of 3

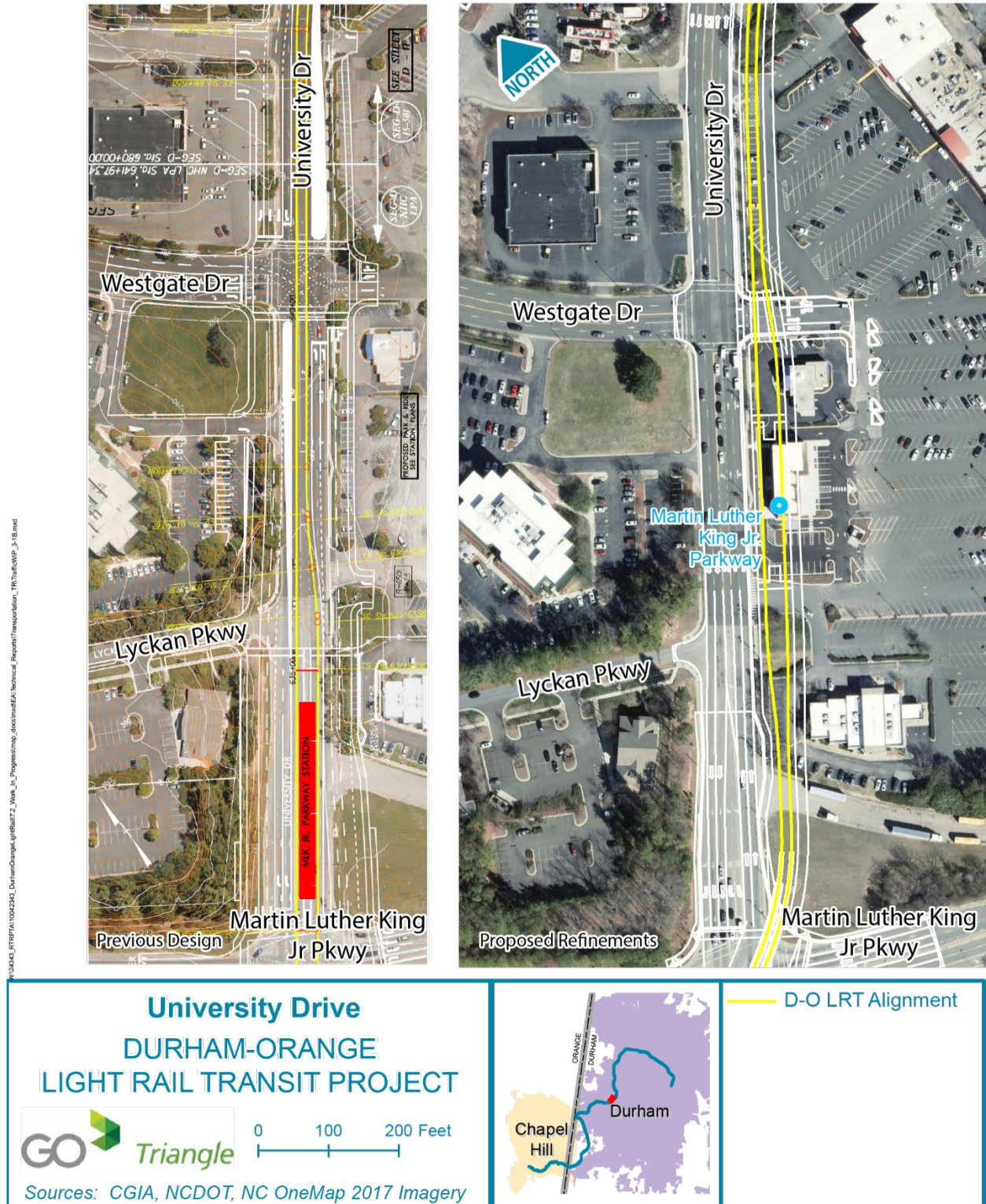
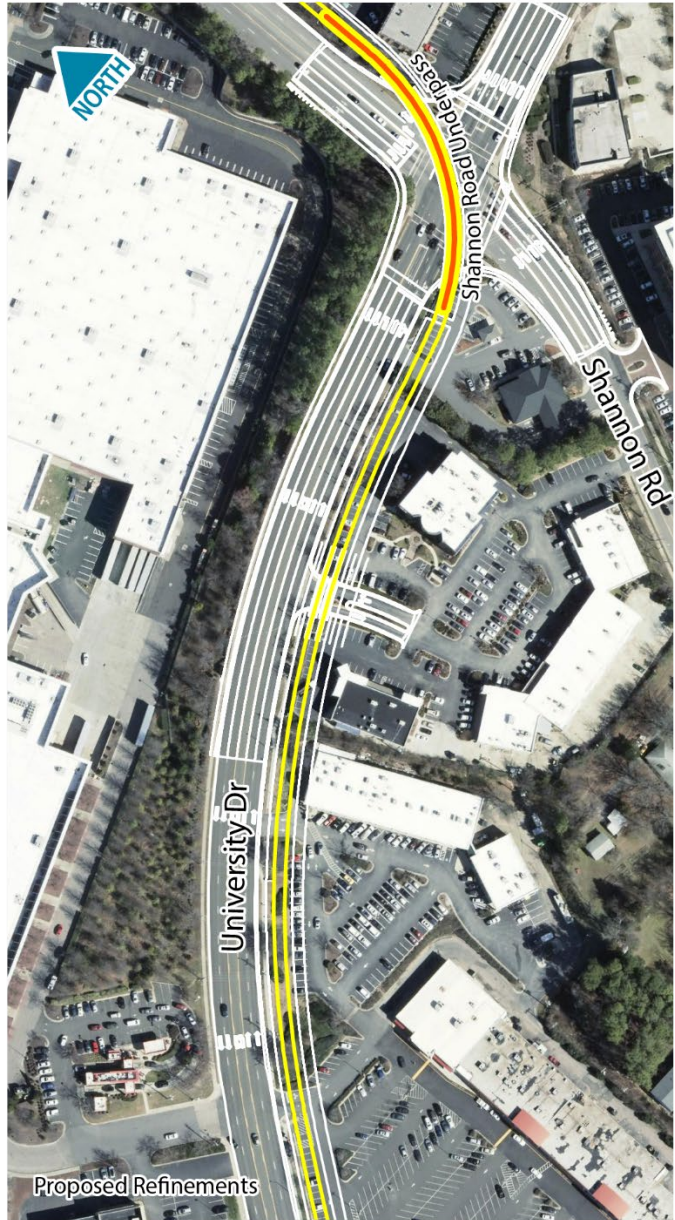


Figure 4-2: University Drive Alignment Comparison, Part 2 of 3



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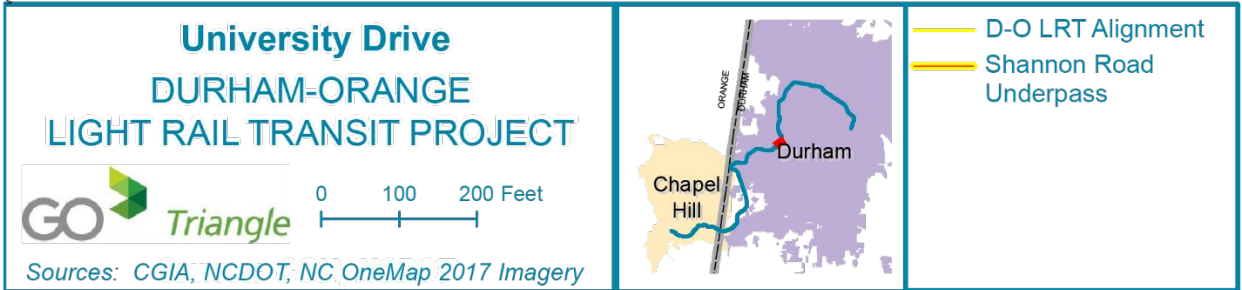


Figure 4-3: University Drive Alignment Comparison, Part 3 of 3

4.1.3 Traffic Analysis Results

The 2040 peak hour intersection delay and LOS comparison for the University Drive part of the D-O LRT project area is shown in **Table 4-1**. Note that University Drive is considered the east-west street at the intersections described in this section, and that the Shannon Road intersection on the eastern end of the corridor is not included because the proposed LRT tracks would pass under it, leaving intersection operations unaffected. Results for average queue and maximum queue are shown in **Table 4-2** and **Table 4-3**, respectively.

Traffic operations along University Drive during future peak hours are indicated by this analysis to be characterized by long delays and queues for several intersection movements. As a result of the Proposed Refinements, delays at some intersections would be worse than those projected with the Previous Design, while others are projected to be better.

Table 4-1: University Drive 2040 Intersection Comparison: LOS and Delay (seconds per vehicle)

Location Movement	AM Peak Hour		PM Peak Hour	
	Previous Design	Proposed Refinements	Previous Design	Proposed Refinements
University Drive and Snow Crest Trail/Ivy Creek Boulevard (signalized)				
NB Left	E (60.9)	D (50.4)	E (71.1)	E (56.1)
NB Through	A (0.0)	A (0.0)	D (50.1)	D (52.3)
NB Right	A (5.1)	A (7.2)	B (16.7)	A (0.0)
SB Left	E (67.2)	D (48.7)	F (84.4)	E (65.0)
SB Through	C (30.1)	D (45.7)	A (0.0)	A (0.0)
SB Right	E (59.8)	D (52.1)	E (77.0)	D (52.2)
EB Left	D (35.5)	A (8.4)	C (28.4)	E (61.0)
EB Through	C (30.5)	A (7.7)	C (21.8)	F (90.9)
EB Right	B (14.8)	A (3.8)	A (8.8)	C (26.8)
WB Left	D (35.2)	B (10.5)	C (24.6)	C (21.2)
WB Through	B (19.3)	A (4.6)	C (22.3)	B (16.8)
WB Right	B (12.9)	A (3.1)	B (14.5)	B (15.0)
Overall:	C (29.9)	A (8.9)	C (27.0)	D (49.7)
University Drive and Larchmont Road (signalized for Proposed Refinement only)				
SB Left	[prohibited]	F (81.2)	[prohibited]	F (200+) ^a
SB Right	A (7.7)	E (65.7)	A (8.5)	F (100+) ^a
EB Left	[prohibited]	F (100+) ^c	[prohibited]	D (48.0)
EB Through	F (57.6)	C (29.9)	F (55.6)	F (100+) ^a
WB Through	A (0.6)	A (3.2)	A (1.2)	A (4.0)
WB Right	A (0.2)	A (2.3)	A (0.9)	A (4.1)
Overall:	F (57.6)^b	C (24.0)	F (55.6)^b	E (64.2)

Table 4-1 (Cont'd): University Drive 2040 Intersection Comparison: LOS and Delay (seconds per vehicle)

Location	AM Peak Hour		PM Peak Hour	
Movement	Previous Design	Proposed Refinements	Previous Design	Proposed Refinements
University Drive and Martin Luther King Jr. Parkway (signalized)				
NB Left	D (39.8)	E (71.2)	E (64.2)	F (100+) ^a
NB Through	E (59.4)	E (58.1)	E (55.6)	E (72.9)
NB Right	A (8.4)	D (38.5)	A (7.8)	C (32.3)
SB Left	F (100+) ^a	F (90.4)	F (87.2)	F (200+) ^a
SB Through	D (50.4)	D (43.1)	E (57.4)	E (61.8)
SB Right	B (16.9)	B (11.9)	B (15.2)	B (19.2)
EB Left	E (79.8)	E (77.4)	E (78.2)	E (73.6)
EB Through	C (30.9)	D (42.7)	C (33.4)	F (100+) ^a
EB Right	C (21.8)	B (10.9)	C (27.3)	B (19.0)
WB Left	F (200+) ^a	F (80.4)	F (100+) ^a	E (56.2)
WB Through	D (52.7)	D (51.0)	E (59.5)	E (57.5)
WB Right	B (11.5)	A (8.7)	C (22.4)	A (8.7)
Overall:	E (61.0)	D (52.0)	E (60.1)	E (70.4)
University Drive and Westgate Drive (signalized)				
NB Left	D (53.2)	D (45.8)	F (81.6)	F (100+) ^a
NB Through	E (75.6)	E (65.2)	F (86.0)	F (94.0)
NB Right	D (44.3)	E (65.5)	E (55.0)	F (92.2)
SB Left	E (70.2)	D (48.2)	E (69.3)	E (61.7)
SB Through	F (83.4)	E (55.1)	F (92.5)	F (94.2)
SB Right	A (9.4)	A (6.0)	C (21.3)	C (24.8)
EB Left	E (75.2)	F (99.9)	E (78.5)	F (100+) ^a
EB Through	B (18.4)	B (11.5)	C (31.9)	D (37.1)
EB Right	A (0.0)	B (12.6)	C (24.6)	C (31.1)
WB Left	C (23.7)	F (100+) ^a	E (58.6)	F (100+) ^a
WB Through	B (19.2)	C (21.5)	F (91.8)	E (60.4)
WB Right	B (11.9)	B (15.5)	C (31.2)	D (47.2)
Overall:	D (37.9)	C (33.0)	E (57.5)	E (67.7)

Table 4-1 (Cont'd): University Drive 2040 Intersection Comparison: LOS and Delay (seconds per vehicle)

Location	AM Peak Hour		PM Peak Hour	
Movement	Previous Design	Proposed Refinements	Previous Design	Proposed Refinements
University Drive and BB&T Plaza (signalized for Proposed Refinement only)				
NB Left	c	D (45.7)	c	D (43.9)
NB Right		D (50.7)		D (42.8)
EB Through		A (3.8)		B (15.3)
EB Right		A (5.1)		B (14.7)
WB Left		B (12.4)		E (61.7)
WB Through		A (3.2)		F (100+) ^a
Overall:		A (8.6)		E (55.1)

Source: Previous Design results as indicated in DEIS Appendix K.9: Traffic Simulation Report for University Drive (July 2015); Proposed Refinements results from analysis conducted February 2018.

- Notes: a. The estimation of delay is not reliable when volume significantly exceeds capacity.
 b. 1-way stop intersection LOS is reported for worst movement instead of average for all movements.
 c. Intersection was not analyzed for this scenario.

Table 4-2: University Drive 2040 Intersection Comparison: Average Queue (feet)

Location	AM Peak Hour		PM Peak Hour	
Movement	Previous Design	Proposed Refinements	Previous Design	Proposed Refinements
University Drive and Snow Crest Trail/Ivy Creek Boulevard (signalized)				
NB Left	14	12	67	122
NB Through	14	12	67	132
NB Right	14	11	67	132
SB Left	113	24	84	24
SB Through	113	24	84	24
SB Right	113	24	84	24
EB Left	0	0	5	2
EB Through	137	25	78	711
EB Right	5	2	0	0
WB Left	32	4	1	0
WB Through	55	9	91	49
WB Right	0	8	1	49
University Drive and Larchmont Road (signalized for Proposed Refinement only)				
SB Left	-	127	-	170
SB Right	0	127	0	170
EB Left	-	87	-	99
EB Through	152	44	133	298
WB Through	0	9	0	11
WB Right	0	6	0	10

Table 4-2 (Cont'd): University Drive 2040 Intersection Comparison: Average Queue (feet)

Location	AM Peak Hour		PM Peak Hour	
Movement	Previous Design	Proposed Refinements	Previous Design	Proposed Refinements
University Drive and Martin Luther King Jr. Parkway (signalized)				
NB Left	8	27	42	107
NB Through	116	113	78	88
NB Right	1	41	0	122
SB Left	343	253	202	1,258
SB Through	229	99	225	1,249
SB Right	229	44	225	452
EB Left	282	181	276	108
EB Through	66	108	86	347
EB Right	21	4	86	24
WB Left	301	82	434	86
WB Through	109	71	321	135
WB Right	109	4	376	9
University Drive and Westgate Drive (signalized)				
NB Left	62	83	97	310
NB Through	62	83	97	310
NB Right	48	83	75	310
SB Left	125	74	308	297
SB Through	125	74	308	297
SB Right	1	9	54	156
EB Left	250	204	240	444
EB Through	66	30	90	205
EB Right	51	33	73	207
WB Left	10	40	141	116
WB Through	36	47	220	268
WB Right	36	69	220	302
University Drive and BB&T Plaza (signalized for Proposed Refinement only)				
NB Left	a	44	a	82
NB Right		44		82
EB Through		9		34
EB Right		9		35
WB Left		2		3
WB Through		3		315

Source: Previous Design results as indicated in DEIS Appendix K.9: Traffic Simulation Report for University Drive (July 2015); Proposed Refinements results from analysis conducted February 2018.

Note: a. Intersection was not analyzed for this scenario.

Table 4-3: University Drive 2040 Intersection Comparison: Maximum Queue (feet)

Location	AM Peak Hour		PM Peak Hour	
Movement	Previous Design	Proposed Refinements	Previous Design	Proposed Refinements
University Drive and Snow Crest Trail/Ivy Creek Boulevard (signalized)				
NB Left	103	91	209	254
NB Through	103	91	209	268
NB Right	103	96	209	268
SB Left	244	135	242	132
SB Through	244	135	242	132
SB Right	244	135	242	132
EB Left	26	23	121	66
EB Through	440	291	427	1,174
EB Right	188	90	73	132
WB Left	430	135	36	23
WB Through	524	244	673	550
WB Right	53	246	54	552
University Drive and Larchmont Road (unsignalized: 1-way stop in Previous, signalized in Refined)				
SB Left	-	384	-	379
SB Right	6	384	2	379
EB Left	-	606	-	642
EB Through	746	214	743	733
WB Through	10	169	87	348
WB Right	10	177	87	350
University Drive and Martin Luther King Jr. Parkway (signalized)				
NB Left	121	154	241	362
NB Through	499	412	303	357
NB Right	65	253	62	414
SB Left	982	757	746	1,481
SB Through	940	597	814	1,505
SB Right	940	403	814	1,125
EB Left	527	392	526	353
EB Through	412	402	458	490
EB Right	391	105	458	229
WB Left	539	362	563	446
WB Through	504	289	572	460
WB Right	504	95	632	157

Table 4-3 (Cont'd): University Drive 2040 Intersection Comparison: Maximum Queue (feet)

Location	AM Peak Hour		PM Peak Hour	
Movement	Previous Design	Proposed Refinements	Previous Design	Proposed Refinements
University Drive and Westgate Drive (signalized)				
NB Left	141	321	146	560
NB Through	141	321	146	560
NB Right	123	321	123	560
SB Left	562	339	743	698
SB Through	562	339	743	698
SB Right	84	119	547	552
EB Left	548	538	543	546
EB Through	522	315	542	496
EB Right	489	322	506	500
WB Left	171	246	333	335
WB Through	287	348	339	372
WB Right	287	402	339	411
University Drive and BB&T Plaza (signalized for Proposed Refinement only)				
NB Left	a	135	a	130
NB Right		135		130
EB Through		170		312
EB Right		172		312
WB Left		62		61
WB Through		139		583

Source: Previous Design results as indicated in DEIS Appendix K.9: Traffic Simulation Report for University Drive (July 2015); Proposed Refinements results from analysis conducted February 2018.

Note: a. Intersection was not analyzed for this scenario.

There is not a clear pattern of overall intersection delay effects in the corridor that can be tied directly to the change in the LRT alignment on University Drive. In most cases, changes in the performance results for individual intersection movements represent tradeoffs associated with changes made during the corridor-wide signal timing optimization completed in the normal course of simulation analysis. However, at the Martin Luther King Jr. Parkway intersection, the overall PM peak hour intersection delay could worsen by about 17 percent with the Proposed Refinement. The number of individual movements that experience LOS F conditions in the PM peak hour could increase from two to three with the Proposed Refinement. Despite this change, the overall intersection at Martin Luther King Jr. Parkway is expected to remain at LOS E. The vehicle delay increase over No Build conditions was indicated by the simulation analysis to be 23.9 percent (70.4 seconds vs. 56.8 seconds [indicated in DEIS Appendix K.9]), which is less than the applicable NCDOT limit to define an impact requiring mitigation (25 percent) and less than the definition of an impact for this project.

An important finding is that even after considering LRT operations, the proposed signalization of the Larchmont Road intersection appears to be feasible from a delay and queuing standpoint, as it is not projected to have peak hour queues that would affect the Martin Luther King Jr. Parkway intersection. Although the southbound movement on Larchmont Road would operate at LOS F in both peak hours, it is

important to note that this movement would have been prohibited at all times under the Previous Design, and the overall intersection LOS is within the acceptable range after signalization. There are also other ways out of the neighborhood served by this intersection, so actual future demand could be lower than projected volumes if individuals adjust their routing based on this condition.

There are no major operational issues expected to result from the proposed BB&T Driveway signal.

In addition to the investigation of University Drive, the Shannon Road/Auto Drive intersection (north of University Drive) was examined to identify whether a nearby change, the LRT undercrossing of the University Drive/Shannon Road intersection, would require traffic impact mitigation. This examination was conducted using a basic intersection analysis rather than an overall corridor simulation and queuing analysis because (a) the LRT would only cross the side street rather than the main street and (b) the next intersections to either side of the Shannon Road/Auto Drive intersection would not have any LRT interaction.

The 10-minute peak-period operating headway for LRT was used along with an assumption that each LRT crossing event would block the east leg of the intersection for about 40 seconds. The operating headway translates to a blockage in either direction every 5 minutes on average, or 12 times per hour. As such, the east leg would be blocked for about 480 seconds total. This time represents 4/30 of the peak hour, or 13.33 percent. To account for this blockage, the ideal saturation flow rate (the basis of capacity) was reduced by 15 percent for all movements that would cross the east leg, as well as those that must share space with such a blocking movement—the southbound left, northbound through/right, eastbound through/left, and all westbound movements.

As part of the Proposed Refinements at this location, the eastbound and westbound approaches would be reconfigured, the signal phasing modified, and the signal timing re-optimized in order to balance the needs of LRT with the other movements. A summary of the intersection LOS and delay for the Shannon Road/Auto Drive intersection is shown in **Table 3-4**. Results for the Previous Design conditions are shown as they were completed in 2015, with no changes to assumptions about signal timing or intersection geometry. The Previous Design and Proposed Refinements scenarios use the same traffic volume assumptions.

Table 4-4: Shannon Road/Auto Drive 2040 LOS and Delay Comparison

AM Peak Hour		PM Peak Hour	
Previous Design	Proposed Refinements	Previous Design	Proposed Refinements
C (25.3)	C (21.7)	D (49.3)	C (25.3)

Source: Previous Design results from analysis conducted July 2015; Proposed Refinements results from analysis conducted April 2018.

The minor changes in striping and signal operation included in the Proposed Refinements would improve LOS in both 2040 peak hours even after accounting for LRT operations. This improvement is due in part to a return to shorter cycle lengths, similar to those used today, and in part to better distribution of east-west traffic among the lanes available.

4.2 Erwin Road

The Erwin Road intersections subject to detailed traffic analysis as a result of the Proposed Refinements are at Cameron Boulevard and Towerview Road/Morreene Road. This section is referred to with a “West” designation for the purpose of this study because at the remaining Erwin Road intersections there is no substantial difference in effects between the Previous Design and the Proposed Refinement. The eastern part is very similar to the No Build condition (presented in previous NEPA documentation) from the standpoint of LRT/traffic interaction, and is discussed separately.

4.2.1 Previous Design

The LRT alignment designed previously and approved in the Amended ROD would result in tracks and stations located at-grade in the Erwin Road median. The median track alignment would have spatial impacts on each side of Erwin Road.

4.2.2 Project Refinements

The project team refined the configuration in this segment through two changes. West of LaSalle Street, the tracks were moved from the median to the east side adjacent to Erwin Road but kept at grade. From LaSalle Street to Anderson Street, the LRT tracks were elevated, entering the Erwin Road median just east of LaSalle Street. The first of these was subject to microscopic simulation (including detailed queuing analysis) due to the multi-intersection interaction between LRT and traffic, while the second set of changes was examined using a more basic intersection LOS and comparison. The changes in the eastern part of the segment would be minor, and related only to the conversion of the existing center turn lane to a solid median to accommodate the elevated LRT guideway. Left turns to and from Erwin Road would be retained at signalized intersections, with the exception of the eastbound left turn movement at Emergency Drive. The Erwin Road/LaSalle Street intersection was not analyzed for LOS impacts because there are no traffic-related changes included in the Proposed Refinements, but it was included in the traffic models for both segments.

For the western segment, the two configurations subject to simulation analysis, Previous Design and Proposed Refinements, are shown side by side in **Figure 4-1** and **Figure 4-2**. The separation into two figures is due to the length and orientation of the corridor, and they are presented from southwest to northeast. Note also that there is some overlap on the ends and the “north” orientation varies between figures.

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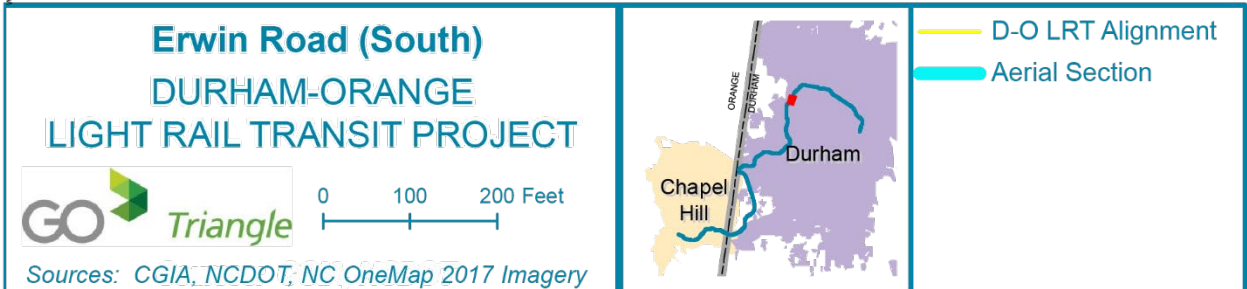


Figure 4-4: Erwin Road (West) Alignment Comparison, Part 1 of 2



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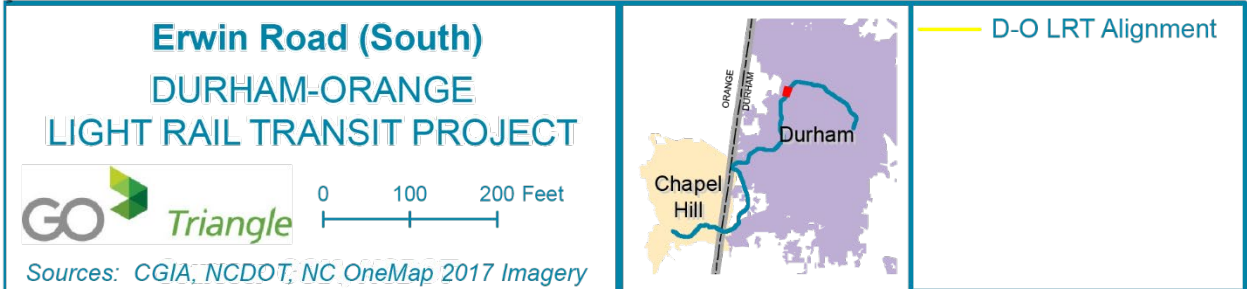


Figure 4-5: Erwin Road (West) Alignment Comparison, Part 2 of 2

4.2.3 Traffic Analysis Results

The 2040 peak hour intersection delay and queuing comparison for the western part of the Erwin Road segment is shown in **Table 4-1**. Note that Erwin Road is considered the east-west street at the intersections described in this section. Results for average queue and maximum queue are shown in **Table 4-2** and **Table 4-3**, respectively.

Table 4-5: Erwin Road (West) 2040 Intersection Comparison: LOS & Delay (seconds per vehicle)

Location	AM Peak Hour		PM Peak Hour	
	Previous Design	Proposed Refinements	Previous Design	Proposed Refinements
Erwin Road and Cameron Boulevard (signalized)				
NB Through	D (51.5)	D (48.4)	E (67.3)	D (43.4)
NB Right	B (12.6)	C (23.7)	B (18.2)	B (11.0)
SB Left	C (25.5)	C (30.6)	D (35.5)	D (39.8)
SB Through	C (25.9)	A (6.9)	D (39.4)	A (3.6)
WB Left	C (30.3)	D (38.7)	D (52.0)	E (58.9)
WB Right	A (4.7)	A (7.9)	B (15.0)	C (32.2)
Overall:	C (25.4)	C (22.1)	D (42.0)	C (33.4)
Erwin Road and Towerview Road/Morreene Road (signalized)				
NB Left	D (46.0)	D (42.6)	F (100+) ^a	D (53.2)
NB Through	D (38.4)	C (33.9)	F (100+) ^a	E (56.5)
NB Right	B (14.8)	A (7.7)	F (100+) ^a	C (30.2)
SB Left	E (55.8)	C (33.7)	F (84.7)	E (78.5)
SB Through	E (55.8)	D (35.9)	E (62.2)	C (21.7)
SB Right	C (33.4)	B (19.4)	B (19.4)	A (9.1)
EB Left	E (60.5)	D (45.8)	E (66.9)	F (94.0)
EB Through	D (43.9)	D (49.2)	C (26.6)	D (38.5)
EB Right	C (24.4)	D (41.7)	A (4.9)	B (13.6)
WB Left	F (81.1)	E (69.2)	D (50.3)	D (49.7)
WB Through	D (54.8)	D (37.8)	C (34.9)	D (49.7)
WB Right	B (18.3)	B (10.9)	C (28.7)	D (44.3)
Overall:	D (46.4)	D (37.8)	E (70.1)	D (47.9)

Source: Previous Design results as indicated in DEIS Appendix K.10: Traffic Simulation Report for Erwin Road (July 2015); Proposed Refinements results from analysis conducted February 2018.

Note: a. The estimation of delay is not reliable when volume significantly exceeds capacity.

Table 4-6: Erwin Road (West) 2040 Intersection Comparison: Average Queue (feet)

Location	AM Peak Hour		PM Peak Hour	
Movement	Previous Design	Proposed Refinements	Previous Design	Proposed Refinements
Erwin Road and Cameron Boulevard (signalized)				
NB Through	50	47	235	181
NB Right	0	51	1	11
SB Left	61	243	41	78
SB Through	75	82	67	9
WB Left	24	57	77	237
WB Right	0	5	23	146
Erwin Road and Towerview Road/Morreene Road (signalized)				
NB Left	26	2	198	42
NB Through	33	33	1,004	321
NB Right	1	0	205	3
SB Left	529	34	162	108
SB Through	529	239	162	23
SB Right	131	2	7	8
EB Left	80	58	58	86
EB Through	144	134	29	44
EB Right	8	35	0	2
WB Left	21	13	24	22
WB Through	44	32	114	205
WB Right	0	12	8	76

Source: Previous Design results as indicated in DEIS Appendix K.10: Traffic Simulation Report for Erwin Road (July 2015); Proposed Refinements results from analysis conducted February 2018.

Table 4-7: Erwin Road (West) 2040 Intersection Comparison: Maximum Queue (feet)

Location	AM Peak Hour		PM Peak Hour	
Movement	Previous Design	Proposed Refinements	Previous Design	Proposed Refinements
Erwin Road and Cameron Boulevard (signalized)				
NB Through	196	213	852	902
NB Right	0	418	37	208
SB Left	390	1,065	231	462
SB Through	530	1,002	342	259
WB Left	167	415	354	1,152
WB Right	2	95	598	1,090
Erwin Road and Towerview Road/Morreene Road (signalized)				
NB Left	199	45	1,130	241
NB Through	210	260	1,323	1,390
NB Right	44	34	873	100
SB Left	1,114	411	806	466
SB Through	1,114	1,107	805	268
SB Right	420	68	160	142
EB Left	496	296	267	332
EB Through	850	539	227	203
EB Right	368	270	0	68
WB Left	108	119	342	197
WB Through	222	199	831	1,045
WB Right	0	185	387	891

Source: Previous Design results as indicated in DEIS Appendix K.10: Traffic Simulation Report for Erwin Road (July 2015); Proposed Refinements results from analysis conducted February 2018.

The Proposed Refinement in the western part of the Erwin Road corridor was indicated by the simulation analysis to provide a substantial reduction in overall intersection delay at the Cameron Boulevard and Towerview Road/Morreene Road intersections. Queue extents would only be higher on some approaches, due to a change in lane arrangements, for the signal timing conditions tested in this study; actual timings would be set in the field to balance queues and delay at the discretion of the agency with traffic signal jurisdiction. It is also worth noting that the Proposed Refinement includes a substantial reduction in the amount of roadway widening expected to be required compared to the Previous Design.

For the eastern part of the corridor, the comparison of LOS and delay is shown in **Table 4-4**.

Table 4-8: Erwin Road (East) 2040 LOS and Delay Comparison

Erwin Road Cross-Street	AM Peak Hour		PM Peak Hour	
	Previous Design	Proposed Refinements	Previous Design	Proposed Refinements
Douglas Street/Research Drive	D (35.1)	B (19.2)	E (64.7)	C (30.2)
Duke Eye Care Center	B (12.9)	A (6.7)	B (18.7)	B (11.5)
Fulton Street	C (27.9)	C (25.3)	C (28.5)	C (26.6)
Emergency Drive	A (6.1)	A (2.5)	B (13.0)	A (9.3)
Trent Drive	D (37.5)	C (32.6)	C (32.3)	C (34.2)
Flowers Drive	a	B (10.5) ^b	a	B (14.4) ^b

Source: Previous Design results from Synchro analysis conducted July 2015; Proposed Refinements results from Synchro analysis conducted March 2018.

Notes: a. Intersection was not analyzed for this scenario.

b. 1-way stop intersection LOS is reported for worst movement instead of average for all movements.

The analysis of the Proposed Refinements in the eastern part of Erwin Road showed intersection LOS results that were better than the results for the Previous Design in nearly every case.

4.3 Downtown Durham

The portion of downtown Durham covered by the analysis documented in this report extends along Pettigrew Street from West Chapel Hill Street on the west to Grant Street on the east. It also includes selected intersections along Ramseur Street and Main Street that would be directly affected by the Proposed Refinement. The stations in this segment are Durham Station, Blackwell/Mangum Streets Station and Dillard Station.

4.3.1 Previous Design

The Previous Design featured the replacement of the westbound lane on Pettigrew Street with a LRT trackway between West Chapel Hill Street and Dillard Street. The location of the proposed D-O LRT tracks between the NCCR tracks and properties along the south side of Pettigrew Street only allows enough width for a single travel lane on Pettigrew Street. Early review of operations along Pettigrew Street has made it clear that eastbound is preferable to westbound for the orientation of this lane. East of Dillard Street, there is sufficient width to provide 2-way Pettigrew Street traffic in addition to the new LRT trackway.

4.3.2 Project Refinement

From a traffic standpoint, the LRT configuration would not change substantially as a result of the Proposed Refinements. The Proposed Refinement that drives the need for the updated traffic analysis is the conversion of a section of Ramseur Street, which is part of Durham's current downtown 1-way loop, from 1-way to 2-way operation. The need for this conversion stems from the following changes:

1. The restriction of Pettigrew Street to eastbound traffic only between W. Chapel Hill Street and Dillard Street.
2. The closure of the Blackwell Street crossing of the NCCR tracks.
3. The permanent restriction of Dillard Street to 1-way southbound traffic only across the NCCR tracks.

It is also important to note that the 2010 study by the City of Durham recommended the conversion of the entire existing downtown street loop from 1-way to 2-way operation. The City's conversion plan was part of the decision to study the Proposed Refinement in this location.

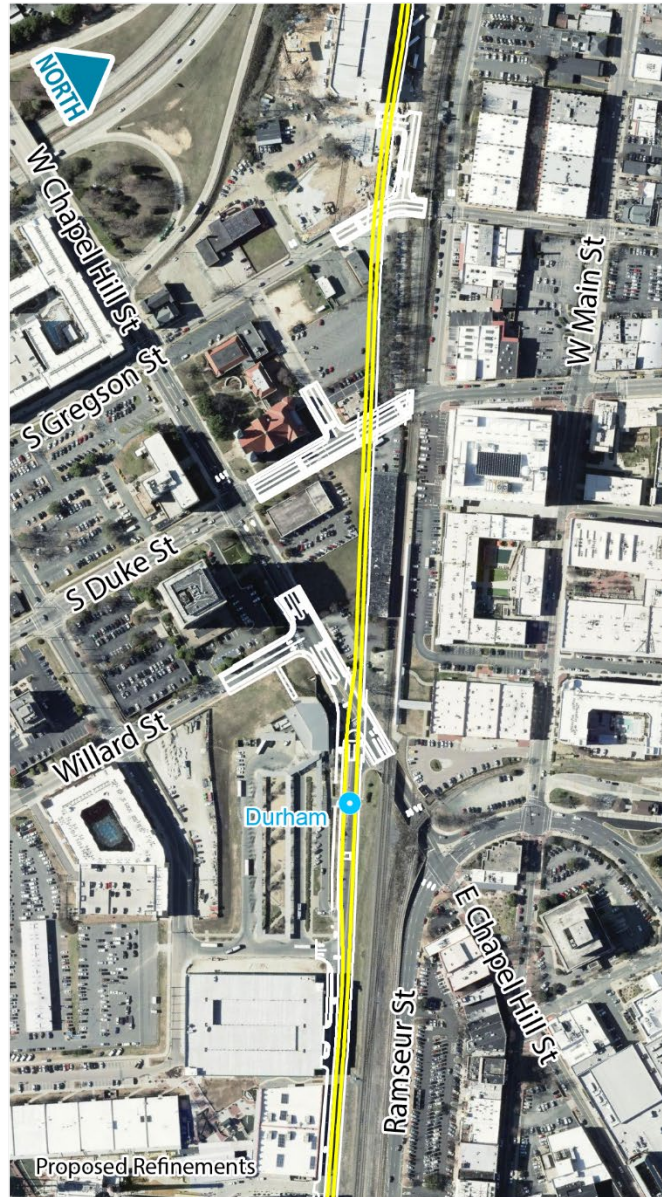
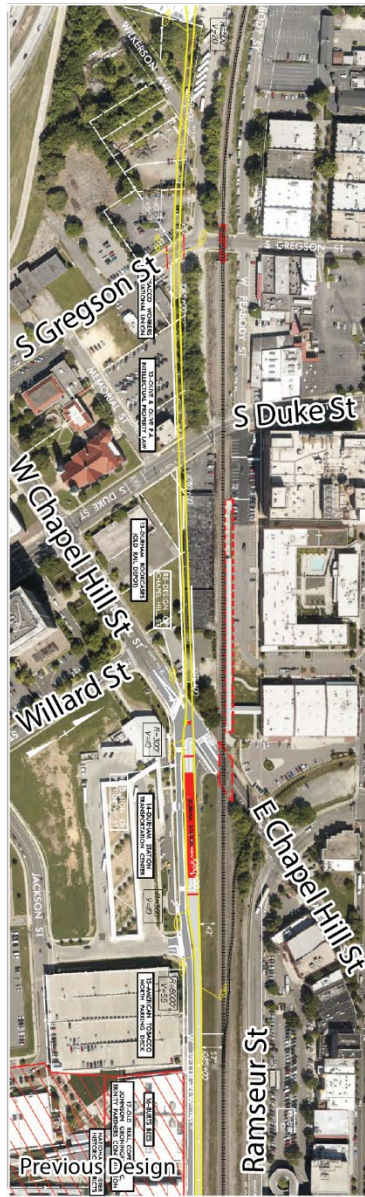
Under the Previous Design without the Ramseur 2-way conversion, GoDurham buses (and other authorized buses) bound for the Durham Bus Center would have to either (1) make wide-ranging path changes or (2) use the westbound LRT trackway for a considerable distance—as far away as Dillard Street. Out-of-direction bus movements would increase operating costs and also jeopardize bus reliability. Extensive joint use of the LRT trackway represents a potential penalty for both buses and LRT and could also have an adverse effect on driver expectation for general traffic at Pettigrew Street intersections. The design team demonstrated that the Ramseur 2-way conversion would eliminate the need to construct the westbound LRT trackway to handle bus traffic. With the conversion, buses would travel on Ramseur Street in the westbound direction along with general traffic and access the Durham Bus Center via West Chapel Hill Street.

The Ramseur 2-way conversion associated with the D-O LRT project would extend from West Chapel Hill Street to Dillard Street, and it would require a revised connection near Roxboro Street for eastbound traffic to access Main Street. The addition of this 2-way street connection would allow for certain traffic movements to be made more efficiently and directly than with today's street configuration. Minor

localized adjustments were made to volume forecasts in the traffic simulation model to account for this change. The change to Ramseur Street would be made with paving, striping, and traffic signal modifications. Full reconstruction would not be necessary.

The configurations of the Previous Design and Proposed Refinements are shown side by side in **Figure 5-1** through **Figure 5-3**. The separation into three figures is due to the length and orientation of the corridor, and they are presented from west to east. Note that there is some overlap on the ends and the “north” orientation varies between figures. It is also important to consider that the extension of the D-O LRT Project from the Alston Avenue station south to North Carolina Central University resulted in a revision to the proposed crossing at the Pettigrew Street/Grant Street intersection.

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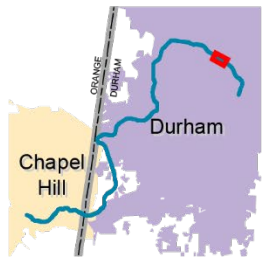
<p>Downtown Durham DURHAM-ORANGE LIGHT RAIL TRANSIT PROJECT</p>  <p>0 100 200 Feet</p> <p>Sources: CGIA, NCDOT, NC OneMap 2017 Imagery</p>		<p>— D-O LRT Alignment</p>
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Figure 4-6: Downtown Durham Alignment Comparison, Part 1 of 3

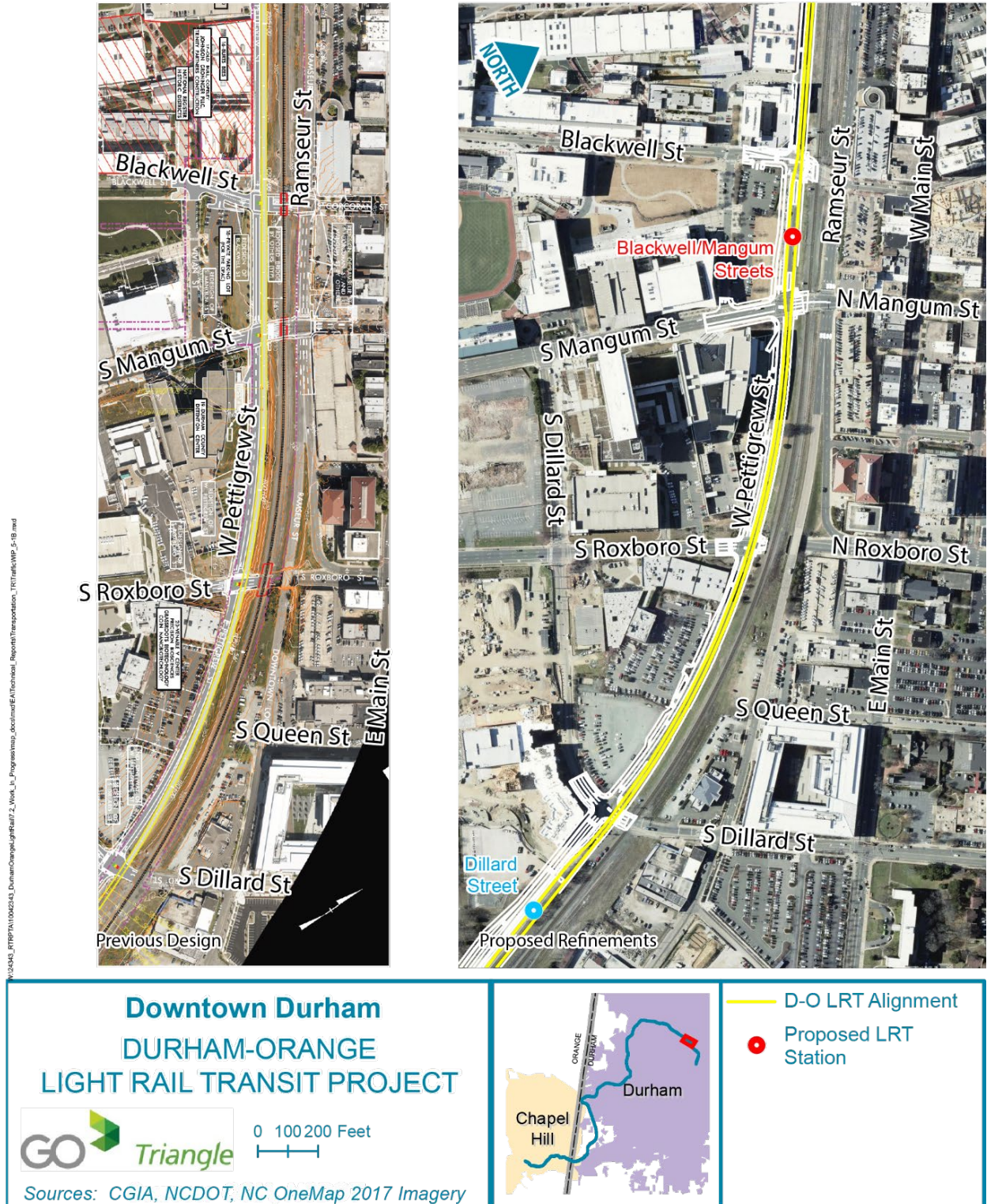
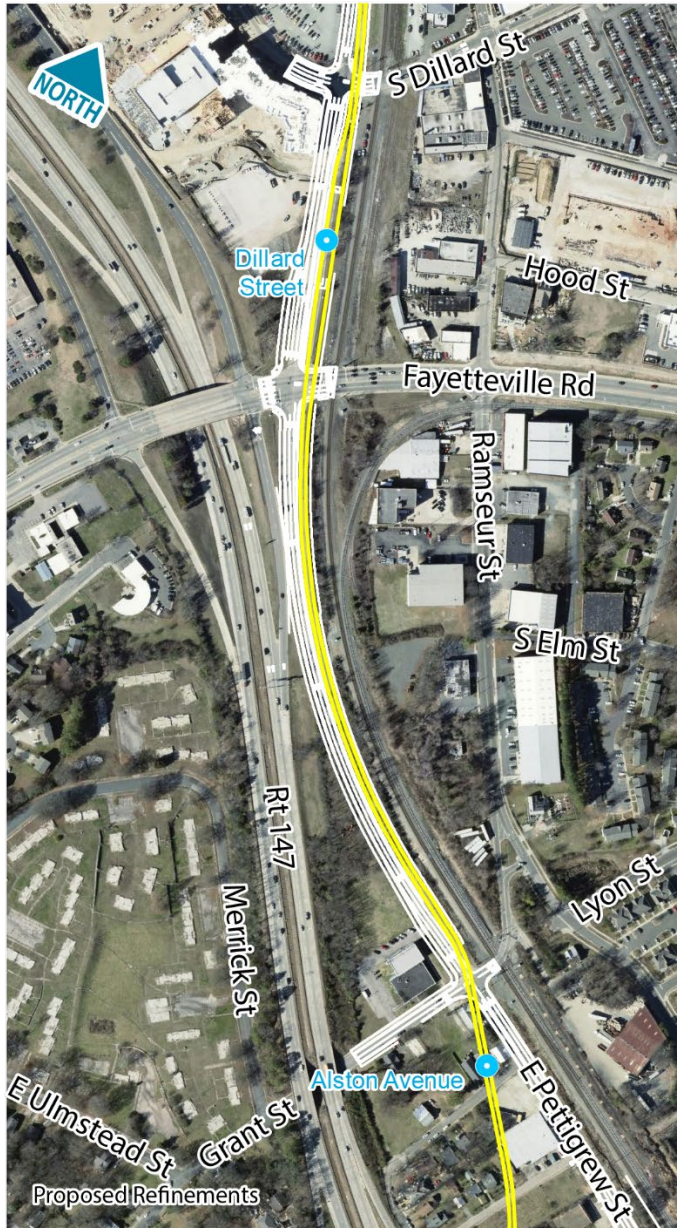
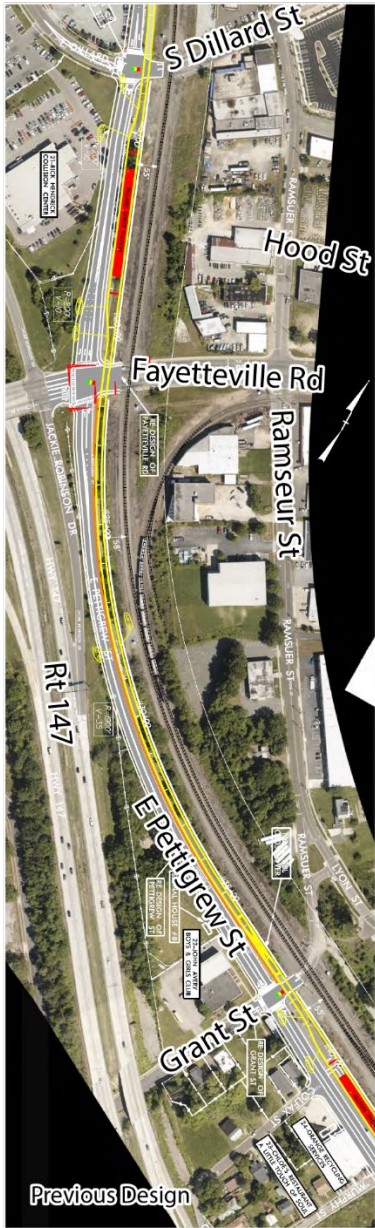


Figure 4-7: Downtown Durham Alignment Comparison, Part 2 of 3



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<p>Downtown Durham DURHAM-ORANGE LIGHT RAIL TRANSIT PROJECT</p> <p>GO Triangle</p> <p>Sources: CGIA, NCDOT, NC OneMap 2017 Imagery</p>	<p>Chapel Hill Durham</p>	<p>— D-O LRT Alignment</p>
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Figure 4-8: Downtown Durham Alignment Comparison, Part 3 of 3

Note that the Ramseur Street intersections with West Chapel Hill Street and Dillard Street were not analyzed for the Previous Design. Each is included in the Proposed Refinements with its current control condition—signal at West Chapel Hill Street and all-way stop at Dillard Street.

4.3.3 Traffic Analysis Results

The 2040 peak hour intersection delay and queuing comparison for the Downtown Durham part of the D-O LRT project area is shown in **Table 5-1**. Results are presented generally west-to-east. Results for average queue and maximum queue are shown in **Table 5-2** and **Table 5-3**, respectively.

Table 4-9: Downtown Durham 2040 Intersection Comparison: LOS & Delay (seconds per vehicle)

Location	AM Peak Hour		PM Peak Hour	
Movement	Previous Design	Proposed Refinements	Previous Design	Proposed Refinements
W. Chapel Hill Street and Duke Street (signalized)				
NB Left	C (27.1)	C (27.5)	D (38.5)	C (30.8)
NB Through	C (28.0)	C (30.2)	D (41.2)	D (36.4)
NB Right	C (32.8)	B (18.0)	A (9.0)	A (8.3)
EB Left	C (22.9)	D (38.0)	D (48.1)	D (41.3)
EB Through	C (27.0)	B (18.9)	B (16.7)	B (15.3)
WB Through	C (27.8)	B (19.8)	C (22.7)	C (20.2)
WB Right	C (25.6)	B (18.1)	C (20.4)	C (22.1)
Overall:	C (27.5)	C (25.0)	C (32.4)	C (28.2)
W. Chapel Hill Street and Pettigrew Street (signalized)				
EB Through	A (8.4)	A (7.1)	A (7.8)	A (4.2)
EB Right	A (7.0)	A (5.6)	A (6.3)	A (3.0)
WB Left	C (30.3)	B (18.8)	D (36.7)	B (17.1)
WB Through	C (20.5)	B (14.5)	D (38.7)	C (23.2)
Overall:	B (13.4)	B (10.4)	C (25.8)	B (15.1)
W. Chapel Hill Street and Ramseur Street (signalized)				
NWB Left	a	D (39.9)	a	E (75.7)
NWB Right		D (38.9)		A (0.0)
SB Left		A (0.0)		D (38.1)
SB Through		B (18.6)		D (36.8)
SB Right		A (3.1)		A (7.7)
EB Through		C (34.4)		C (23.7)
EB Right		C (30.8)		B (11.3)
WB Left		E (59.2)		C (33.7)
WB Through		D (50.6)		C (20.4)
Overall:				C (26.1)

Table 4-9 (continued)

Location	AM Peak Hour		PM Peak Hour	
Movement	Previous Design	Proposed Refinements	Previous Design	Proposed Refinements
Pettigrew Street and Blackwell Street (Previous: signalized; Proposed: unsignalized)				
NB Through	B (15.1)	-	B (16.7)	-
NB Right	A (4.3)	D (28.4)	A (8.1)	C (19.5)
SB Left	A (3.6)	-	B (13.3)	-
SB Through	A (2.2)	-	A (7.4)	-
EB Left	A (0.0)	-	C (27.3)	-
EB Through	D (36.0)	B (11.5)	C (26.6)	A (4.4)
EB Right	C (22.8)	A (3.6)	B (17.1)	A (1.1)
Overall:	B (15.3)	D (28.4)^c	B (14.3)	C (19.5)^c
Ramseur Street and Blackwell/Corcoran Street (signalized)				
NB Through	A (2.8)	-	A (4.2)	-
NB Right	A (0.2)	-	A (1.6)	-
SB Left	B (13.4)	B (15.0)	B (12.9)	B (12.8)
SB Through	B (11.9)	-	B (10.7)	-
SB Right	-	A (0.0)	-	C (20.4)
EB Left	B (12.6)	C (24.0)	B (16.2)	C (21.0)
EB Through	B (14.8)	B (16.6)	B (14.9)	B (17.9)
EB Right	A (4.8)	-	B (19.0)	-
WB Through	-	C (22.0)	-	C (20.5)
WB Right	-	C (22.8)	-	C (22.0)
Overall:	B (12.4)	B (18.7)	B (12.5)	B (18.3)

Table 4-9 (continued)

Location	AM Peak Hour		PM Peak Hour	
Movement	Previous Design	Proposed Refinements	Previous Design	Proposed Refinements
Main Street and Corcoran Street (signalized)				
NB Left	A (7.3)	C (24.1)	B (10.5)	D (40.3)
NB Through	A (9.4)	C (24.1)	A (7.4)	D (35.4)
NB Right	A (5.0)	D (46.8)	B (10.4)	C (32.1)
SB Left	B (16.9)	D (49.1)	B (16.3)	C (30.1)
SB Through	B (12.7)	C (25.5)	B (11.1)	C (25.1)
SB Right	A (7.9)	C (20.1)	A (7.7)	C (21.0)
EB Left	C (30.8)	E (69.4)	C (34.4)	E (62.3)
EB Through	C (27.2)	F (82.5)	C (32.9)	D (52.0)
EB Right	C (20.2)	E (57.1)	C (22.6)	D (43.9)
WB Left	B (11.1)	A (8.5)	C (33.8)	B (16.6)
WB Through	A (7.7)	C (23.0)	C (31.6)	B (15.9)
WB Right	A (6.3)	C (22.6)	C (25.6)	B (14.2)
Overall:	B (15.4)	D (41.4)	C (22.9)	C (28.4)
Pettigrew Street and Mangum Street (signalized)				
SB Left	A (1.6)	A (3.4)	A (2.0)	A (6.7)
SB Through	A (0.7)	A (3.3)	A (0.8)	A (6.4)
EB Through	D (37.6)	E (57.2)	B (19.9)	C (27.8)
EB Right	A (7.6)	C (28.0)	A (5.0)	B (14.5)
Overall:	A (4.6)	B (13.5)	A (2.7)	B (11.4)
Ramseur Street and Mangum Street (signalized)				
SB Left	C (29.5)	B (17.5)	D (41.5)	C (24.4)
SB Through	C (27.1)	B (15.7)	D (39.3)	B (19.9)
SB Right	-	A (8.5)	-	A (0.0)
EB Through	B (15.7)	D (38.5)	A (9.7)	C (25.2)
EB Right)	D (49.9)	B (15.7)	D (54.3)	D (35.5)
WB Left	-	D (40.5)	-	C (23.3)
WB Through	-	D (41.1)	-	C (23.7)
Overall:	C (26.8)	C (22.7)	C (34.9)	C (23.4)

Table 4-9 (continued)

Location	AM Peak Hour		PM Peak Hour	
Movement	Previous Design	Proposed Refinements	Previous Design	Proposed Refinements
Main Street and Mangum Street (signalized)				
SB Left	C (35.0)	C (22.1)	E (78.8)	E (66.7)
SB Through	C (34.1)	C (21.2)	E (71.9)	E (65.5)
SB Right	B (12.5)	A (6.5)	C (23.4)	C (31.8)
EB Through	E (55.4)	F (100+) ^b	D (36.0)	C (33.5)
EB Right	D (49.0)	F (100+) ^b	D (38.8)	D (35.2)
WB Left	D (47.1)	E (63.0)	F (100+) ^b	D (36.7)
WB Through	C (23.1)	D (50.8)	E (72.0)	D (43.4)
Overall:	D (35.7)	D (40.1)	E (76.3)	D (53.3)
Pettigrew Street and Roxboro Street (signalized)				
NB Through	B (14.0)	B (16.3)	B (18.3)	B (15.8)
NB Right	B (12.9)	A (4.3)	B (17.7)	A (6.8)
EB Left	D (48.4)	D (40.8)	C (29.9)	C (34.2)
EB Through	D (37.4)	C (29.0)	C (24.3)	C (26.2)
Overall:	B (16.3)	B (19.8)	B (18.7)	B (18.8)
Ramseur Street and Roxboro Street (unsignalized)				
EB Left	a	A (3.0)	a	A (3.4)
EB Through		A (2.2)		A (0.0)
WB Through		A (0.2)		A (0.2)
WB Right		A (1.9)		A (0.5)
Overall:		A (3.0)^c		A (3.4)^c

Table 4-9 (continued)

Location	AM Peak Hour		PM Peak Hour	
Movement	Previous Design	Proposed Refinements	Previous Design	Proposed Refinements
Pettigrew Street and Dillard Street (signalized)				
NB Through	C (28.2)	-	C (23.0)	-
NB Right	B (11.5)	C (26.0)	B (19.4)	A (8.7)
SB Left	C (28.2)	B (19.3)	D (35.5)	C (22.2)
SB Through	C (27.5)	C (21.5)	C (23.5)	C (24.1)
EB Left	B (12.5)		B (16.8)	-
EB Through	A (8.1)	A (8.2)	B (11.0)	B (19.2)
EB Right	A (5.5)	A (6.7)	A (6.9)	B (11.7)
WB Left	A (7.5)	B (10.3)	C (21.8)	C (21.4)
WB Right	A (7.0)	-	C (23.3)	-
Overall:	B (18.0)	B (16.9)	C (22.3)	B (18.7)
Ramseur Street and Dillard Street (unsignalized: all-way stop)				
NB Left	a	A (9.4)	a	A (9.9)
NB Through		A (8.3)		A (8.3)
NB Right		A (7.7)		A (7.6)
SB Left		A (0.0)		A (0.0)
SB Through		C (18.3)		E (40.3)
SB Right		C (17.0)		E (37.8)
EB Left		C (16.3)		B (10.1)
EB Through		B (14.6)		B (10.4)
EB Right		B (13.6)		B (10.1)
WB Left		B (14.6)		A (9.8)
WB Through		B (14.9)		A (9.0)
WB Right		B (12.8)		A (7.3)
Overall:				C (15.3)

Table 4-9 (continued)

Location	AM Peak Hour		PM Peak Hour	
Movement	Previous Design	Proposed Refinements	Previous Design	Proposed Refinements
Pettigrew Street and Fayetteville Street (signalized)				
NB Left	A (8.6)	C (32.4)	A (8.8)	C (24.1)
NB Through	A (2.7)	C (21.4)	A (2.4)	C (20.7)
NB Right	A (0.4)	B (20.0)	A (0.4)	B (19.2)
SB Left	D (40.9)	-	E (61.1)	-
SB Through	D (41.8)	D (40.5)	E (63.7)	D (47.4)
SB Right	B (16.1)	C (30.7)	D (47.4)	D (44.8)
EB Left	E (57.2)	E (56.1)	D (42.9)	F (90.5)
EB Through	D (37.7)	E (56.5)	D (42.0)	F (91.6)
EB Right	A (5.0)	A (9.4)	B (10.4)	C (32.4)
WB Left	D (48.7)	E (63.0)	E (72.4)	F (100+) ^b
WB Through	D (51.2)	D (50.6)	D (48.0)	F (95.4)
WB Right	C (32.6)	D (51.5)	C (23.4)	E (81.0)
Overall:	C (28.9)	D (37.6)	D (39.7)	D (50.9)
Pettigrew Street and Grant Street (signalized)				
NB Left	A (0.0)	A (0.0)	C (28.6)	C (31.5)
NB Through	C (26.5)	C (23.2)	C (27.8)	C (30.8)
NB Right	B (14.5)	C (22.7)	B (18.6)	C (30.9)
SB Left	C (33.2)	C (26.4)	D (35.4)	E (67.8)
SB Through	C (31.0)	C (24.5)	C (32.5)	E (60.8)
SB Right	A (0.0)	A (0.0)	A (0.0)	A (0.0)
EB Left	A (0.0)	A (0.0)	B (16.6)	B (16.3)
EB Through	A (7.6)	B (11.5)	B (11.0)	B (15.3)
EB Right	A (7.0)	A (7.6)	A (0.0)	A (0.0)
WB Left	A (8.9)	B (14.3)	B (17.0)	C (21.7)
WB Through	B (10.7)	B (12.8)	B (11.1)	B (18.5)
WB Right	B (11.1)	A (4.8)	B (10.7)	B (12.9)
Overall:	B (15.2)	B (15.6)	B (18.7)	C (28.9)

Source: Previous Design results as indicated in DEIS Appendix K.11: "Traffic Simulation Report for Downtown Durham" (July 2015); Proposed Refinements results from analysis conducted February 2018.

- Notes:
- a. Intersection was not analyzed for this scenario.
 - b. The estimation of delay is not reliable when volume significantly exceeds capacity.
 - c. 1-way stop intersection LOS is reported for worst movement instead of average for all movements.

Table 4-10: Downtown Durham 2040 Intersection Comparison: Average Queue (feet)

Location	AM Peak Hour		PM Peak Hour	
Movement	Previous Design	Proposed Refinements	Previous Design	Proposed Refinements
W. Chapel Hill Street and Duke Street (signalized)				
NB Left	79	83	158	185
NB Through	79	83	158	185
NB Right	64	105	142	208
EB Left	18	36	43	32
EB Through	109	82	33	34
WB Through	87	115	197	175
WB Right	71	132	177	181
W. Chapel Hill Street and Pettigrew Street (signalized)				
EB Through	94	57	57	13
EB Right	85	3	51	1
NWB Left ^a	-	-	-	-
NWB Right ^a	-	-	-	-
WB Left	56	54	119	121
WB Through	56	54	119	121
W. Chapel Hill Street and Ramseur Street (signalized)				
NWB Left	b	51	b	105
NWB Right		51		105
SB Left		0		3
SB Through		24		64
SB Right		24		64
EB Through		92		61
EB Right		14		0
WB Left		67		31
WB Through		67		22

Table 4-10 (Cont'd): Downtown Durham 2040 Intersection Comparison: Average Queue (feet)

Location	AM Peak Hour		PM Peak Hour	
Movement	Previous Design	Proposed Refinements	Previous Design	Proposed Refinements
Pettigrew Street and Blackwell Street (signalized)				
NB Through	7	-	16	-
NB Right	2	16	7	33
SB Left	1	-	30	-
SB Through	1	-	30	-
EB Left	36	-	28	-
EB Through	36	4	28	0
EB Right	23	4	17	0
Ramseur Street and Blackwell/Corcoran Street (signalized)				
NB Through	1	-	3	-
NB Right	0	-	0	-
SB Left	9	5	5	8
SB Through	9	-	5	-
SB Right	-	5	-	8
EB Left	22	25	28	26
EB Through	22	25	28	26
EB Right	30	-	28	-
WB Left	-	45	-	33
WB Right	-	45	-	33

Table 4-10 (Cont'd): Downtown Durham 2040 Intersection Comparison: Average Queue (feet)

Location	AM Peak Hour		PM Peak Hour	
Movement	Previous Design	Proposed Refinements	Previous Design	Proposed Refinements
Main Street and Corcoran Street (signalized)				
NB Left	5	17	7	28
NB Through	5	17	7	28
NB Right	2	25	4	40
SB Left	10	20	11	29
SB Through	10	20	11	29
SB Right	5	30	6	43
EB Left	50	148	66	98
EB Through	50	148	66	98
EB Right	40	176	55	98
WB Left	11	62	38	56
WB Through	11	62	38	56
WB Right	6	70	29	64
Pettigrew Street and Mangum Street (signalized)				
SB Left	1	18	2	40
SB Through	1	18	2	40
SB Right	-	-	-	-
EB Through	32	151	12	88
EB Right	20	172	5	104
WB Left	20	-	-	-
WB Through	-	-	-	-
Ramseur Street and Mangum Street (signalized)				
SB Left	134	65	245	85
SB Through	134	65	245	85
SB Right	-	65	-	85
EB Through	39	73	56	67
EB Right)	39	72	56	67
WB Left	-	74	-	32
WB Through	-	74	-	32
Main Street and Mangum Street (signalized)				
SB Left	188	110	380	358
SB Through	188	110	380	358
SB Right	174	97	362	380
EB Through	109	250	81	71
EB Right	94	250	68	71
WB Left	12	19	279	9
WB Through	46	139	63	152

Table 4-10 (Cont'd): Downtown Durham 2040 Intersection Comparison: Average Queue (feet)

Location	AM Peak Hour		PM Peak Hour	
Movement	Previous Design	Proposed Refinements	Previous Design	Proposed Refinements
Pettigrew Street and Roxboro Street (signalized)				
NB Left	-	-	-	-
NB Through	81	184	94	107
NB Right	69	197	83	117
EB Left	30	85	15	93
EB Through	30	85	15	93
WB Through	-	-	-	-
WB Right	-	-	-	-
Ramseur Street and Roxboro Street (unsignalized)				
EB Left	b	1	b	2
EB Through		1		1
WB Through		0		0
WB Right		0		0
Pettigrew Street and Dillard Street (signalized)				
NB Through	10	-	26	-
NB Right	5	12	19	4
SB Left	31	32	64	45
SB Through	31	32	64	45
EB Left	2	-	15	-
EB Through	2	4	5	18
EB Right	0	4	1	19
WB Left	2	2	9	2
WB Right	2	-	9	-

Table 4-10 (Cont'd): Downtown Durham 2040 Intersection Comparison: Average Queue (feet)

Location	AM Peak Hour		PM Peak Hour	
Movement	Previous Design	Proposed Refinements	Previous Design	Proposed Refinements
Ramseur Street and Dillard Street (unsignalized: all-way stop)				
NB Left	b	1	b	1
NB Through		0		0
NB Right		1		1
SB Left		40		114
SB Through		21		87
SB Right		42		116
EB Left		24		13
EB Through		25		15
EB Right		24		13
WB Left		28		4
WB Through		28		4
WB Right		27		4
Pettigrew Street and Fayetteville Street (signalized)				
NB Left	10	50	7	23
NB Through	10	50	7	23
NB Right	45	54	8	26
SB Left	16	-	36	-
SB Through	84	60	190	108
SB Right	84	60	190	108
EB Left	3	70	1	245
EB Through	11	70	30	245
EB Right	0	1	0	6
WB Left	22	48	49	128
WB Through	48	48	19	128
WB Right	48	38	19	70

Table 4-10 (Cont'd): Downtown Durham 2040 Intersection Comparison: Average Queue (feet)

Location	AM Peak Hour		PM Peak Hour	
Movement	Previous Design	Proposed Refinements	Previous Design	Proposed Refinements
Pettigrew Street and Grant Street (signalized)				
NB Left	20	16	31	69
NB Through	20	16	31	69
NB Right	14	16	23	69
SB Left	24	26	47	93
SB Through	24	26	47	93
SB Right	24	37	47	93
EB Left	0	0	3	2
EB Through	5	7	17	23
EB Right	5	10	17	23
WB Left	2	27	16	39
WB Through	21	27	13	39
WB Right	21	2	12	6

Source: Previous Design results as indicated in DEIS Appendix K.11: “Traffic Simulation Report for Downtown Durham” (July 2015); Proposed Refinements results from analysis conducted August 2018.

Notes: a. Movement is replaced by Durham Station in either proposed scenario.
b. Intersection was not analyzed for this scenario.

Table 4-11: Downtown Durham 2040 Intersection Comparison: Maximum Queue (feet)

Location	AM Peak Hour		PM Peak Hour	
Movement	Previous Design	Proposed Refinements	Previous Design	Proposed Refinements
W. Chapel Hill Street and Duke Street (signalized)				
NB Left	301	312	569	664
NB Through	301	312	569	664
NB Right	282	342	550	694
EB Left	326	352	343	310
EB Through	385	381	345	366
WB Through	406	424	428	430
WB Right	377	464	398	470
W. Chapel Hill Street and Pettigrew Street (signalized)				
EB Through	297	294	293	257
EB Right	281	238	277	138
WB Left	292	438	300	515
WB Through	292	438	300	515
W. Chapel Hill Street and Ramseur Street (signalized)				
NWB Left	a	320	a	464
NWB Right		320		464
SB Left		0		47
SB Through		183		301
SB Right		183		301
EB Through		395		412
EB Right		201		17
WB Left		403		225
WB Through		403		205
Pettigrew Street and Blackwell Street (signalized)				
NB Left	-	-	-	-
NB Through	96	-	159	-
NB Right	72	157	135	215
SB Left	57	-	159	-
SB Through	57	-	159	-
SB Right	-	-	-	-
EB Left	-	-	260	-
EB Through	253	235	260	25
EB Right	226	235	232	25
WB Left	-	-	-	-
WB Through	-	-	-	-
WB Right	-	-	-	-

Table 4-11 (Cont'd): Downtown Durham 2040 Intersection Comparison: Maximum Queue (feet)

Location	AM Peak Hour		PM Peak Hour	
Movement	Previous Design	Proposed Refinements	Previous Design	Proposed Refinements
Ramseur Street and Blackwell/Corcoran Street (signalized)				
NB Through	34	-	47	-
NB Right	10	-	18	-
SB Left	154	100	103	122
SB Through	154	-	103	-
SB Right	-	100	-	122
EB Left	147	185	168	265
EB Through	147	185	168	265
EB Right	192	-	170	-
WB Left	-	391	-	342
WB Right	-	391	-	342
Main Street and Corcoran Street (signalized)				
NB Left	88	157	114	204
NB Through	88	157	114	204
NB Right	79	182	105	229
SB Left	149	197	169	219
SB Through	149	197	169	219
SB Right	128	224	149	247
EB Left	325	472	348	432
EB Through	325	472	348	432
EB Right	309	509	332	432
WB Left	207	420	312	370
WB Through	207	420	312	370
WB Right	186	443	290	394
Pettigrew Street and Mangum Street (signalized)				
SB Left	104	172	118	175
SB Through	104	172	118	175
EB Through	214	475	178	444
EB Right	193	501	157	469
WB Left	193	-	157	-
WB Through	-	-	-	-

Table 4-11 (Cont'd): Downtown Durham 2040 Intersection Comparison: Maximum Queue (feet)

Location	AM Peak Hour		PM Peak Hour	
Movement	Previous Design	Proposed Refinements	Previous Design	Proposed Refinements
Ramseur Street and Mangum Street (signalized)				
SB Left	322	327	331	328
SB Through	322	327	331	328
SB Right	-	327	-	328
EB Through	170	305	240	338
EB Right)	170	305	240	338
WB Left	-	249	-	192
WB Through	-	249	-	192
Main Street and Mangum Street (signalized)				
SB Left	533	536	540	540
SB Through	533	536	540	540
SB Right	515	515	521	571
EB Through	394	444	408	386
EB Right	376	444	390	386
WB Left	92	211	374	174
WB Through	334	370	366	365
Pettigrew Street and Roxboro Street (signalized)				
NB Through	291	944	290	563
NB Right	269	968	273	586
EB Left	211	608	165	545
EB Through	211	608	165	545
Ramseur Street and Roxboro Street (unsignalized)				
EB Left	a	133	a	134
EB Through		116		117
WB Through		0		0
WB Right		14		0

Table 4-11 (Cont'd): Downtown Durham 2040 Intersection Comparison: Maximum Queue (feet)

Location	AM Peak Hour		PM Peak Hour	
Movement	Previous Design	Proposed Refinements	Previous Design	Proposed Refinements
Pettigrew Street and Dillard Street (signalized)				
NB Through	104	-	224	-
NB Right	90	120	212	12
SB Left	222	197	292	301
SB Through	222	197	292	301
EB Left	77	-	186	-
EB Through	82	152	105	237
EB Right	43	171	67	260
WB Left	96	96	133	69
WB Right	96	-	133	-
Ramseur Street and Dillard Street (unsignalized: all-way stop)				
NB Left	a	73	a	73
NB Through		0		0
NB Right		73		73
SB Left		2335		287
SB Through		203		255
SB Right		238		290
EB Left		265		142
EB Through		266		144
EB Right		266		143
WB Left		165		87
WB Through		166		88
WB Right		164		86

Table 4-11 (Cont'd): Downtown Durham 2040 Intersection Comparison: Maximum Queue (feet)

Location	AM Peak Hour		PM Peak Hour	
Movement	Previous Design	Proposed Refinements	Previous Design	Proposed Refinements
Pettigrew Street and Fayetteville Street (signalized)				
NB Left	143	342	138	336
NB Through	143	342	138	336
NB Right	141	361	133	355
SB Left	225	-	384	-
SB Through	343	275	414	404
SB Right	343	275	414	404
EB Left	43	415	25	737
EB Through	415	319	233	737
EB Right	0	56	12	111
WB Left	214	433	299	594
WB Through	350	433	210	594
WB Right	350	298	210	451
Pettigrew Street and Grant Street (signalized)				
NB Left	205	151	255	344
NB Through	205	151	255	344
NB Right	191	151	241	344
SB Left	218	198	315	381
SB Through	218	198	315	381
SB Right	218	236	315	381
EB Left	0	0	59	58
EB Through	120	143	210	227
EB Right	120	156	210	227
WB Left	70	364	184	388
WB Through	305	364	199	388
WB Right	303	62	197	133

Source: Previous Design results as indicated in DEIS Appendix K.11: “Traffic Simulation Report for Downtown Durham” (July 2015); Proposed Refinements results from analysis conducted August 2018.

Notes: a. Intersection was not analyzed for this scenario.

Overall traffic conditions as represented in both traffic simulation scenarios are acceptable during both peak hours, especially along Pettigrew Street.

The simulation analysis results for Downtown Durham indicate that the design proposed for the 2-way conversion of Ramseur Street would result in peak hour traffic conditions that meet the City of Durham’s LOS E standard during both peak hours at all intersections examined, as well as at the intersections that are subject to NCDOT impact criteria as defined previously in section 2 of this report. Because the Ramseur 2-way conversion represents a prominent change, the LOS results for the four NCDOT-controlled intersections there are compared in **Table 5-4** with respect to the LOS criteria.

Table 4-12: LOS Impact Determination at 2-way Ramseur Conversion Intersections under NCDOT Control

Ramseur at:	LOS (Delay, sec./vehicle)		NCDOT Impact Definition Met? ^a		
	No Build	Proposed Refinements	25 percent delay with same LOS	LOS worse by at least 1 grade ^a	LOS F
2040 AM Peak Hour					
W. Chapel Hill	^b	C (26.1)	N/A	N/A	No
Blackwell/Corcoran	B (14.0)	C (20.7)	N/A	No	No
Mangum	B (19.7)	D (35.9)	N/A	No	No
Roxboro	^b	A (1.8) ^c	N/A	N/A	No
2040 PM Peak Hour					
W. Chapel Hill	^b	C (27.9)	N/A	N/A	No
Blackwell/Corcoran	B (13.5)	C (25.6)	N/A	No	No
Mangum	C (26.5)	D (41.5)	N/A	No	No
Roxboro	^b	A (3.0) ^c	N/A	N/A	No

Source: No Build results as indicated in DEIS Appendix K.11: “Traffic Simulation Report for Downtown Durham” (July 2015); Refined configuration results from analysis conducted August 2018.

- Notes:
- a. As indicated in section 2 of this report: also resulting LOS of E or F.
 - b. Intersection was not analyzed for the No Build condition.
 - c. 1-way stop intersection LOS is reported for worst movement instead of average for all movements.

All four intersections examined would operate within the project LOS standard with no significant impact as defined in Section 2.

At the time of the updated analysis of the Proposed Refinements, the City of Durham was conducting an update of its 2010 study of the conversion of its entire Downtown Loop, which includes the conversion of Ramseur Street from 1-way to 2-way operation in the same segment as the Proposed Refinements. That study was expected to examine more information sources and alternatives and do so at a much greater level of detail and a broader area than would be appropriate for the current D-O LRT project. For this Reason, the proposed design of the 2-way Ramseur Street conversion is considered likely to be a partial element of the City’s future overall project.