

Date of Meeting: July 18, 2023

#I-2

**BOARD OF SUPERVISORS
BUSINESS MEETING
INFORMATION ITEM**

SUBJECT: **US Route 50 Long-Term Improvements and Sequencing
Corridor Study**

2011 ELECTION DISTRICT(S): Blue Ridge and Dulles

2022 ELECTION DISTRICT(S): Dulles and Little River

CRITICAL ACTION DATE: At the pleasure of the Board

STAFF CONTACT(S): Marie Pham, Transportation and Capital Infrastructure
Nancy Boyd, Transportation and Capital Infrastructure

PURPOSE: To present the results of the US Route 50 Long-Term Improvements and Sequencing Corridor Study (Attachment 1) for future planning and sequencing of projects located on or adjacent to the US Route 50 corridor.

BACKGROUND: US Route 50 (Route 50) is a critical east-west link for travel in Northern Virginia and Loudoun County (the County). The road serves rural land uses in the western portion of the County, developing suburban areas to the east, and fully developed suburban areas in Fairfax County. In its present condition, Route 50 is a four-lane divided roadway between the future Northstar Boulevard (VA Route 659 Relocated) and Stone Springs Boulevard (VA Route 2625), and a six-lane median divided roadway from Stone Springs Boulevard to the Fairfax County line. It is currently classified in the *Loudoun County 2019 Countywide Transportation Plan* (2019 CTP) as a principal arterial roadway, ultimately to be converted to a limited-access highway east of Northstar Boulevard, with a six-lane cross section between Northstar Boulevard and the Fairfax County line. As stated in the Virginia Department of Transportation (VDOT) 2019 daily traffic volume estimate publication the average daily traffic volume varies between 17,000 and 49,000 vehicles per day between US Route 15 and Old Ox Road (Route 606). East of Loudoun, in Fairfax through the Sully Road (Route 28) interchange, the average daily traffic volumes increase to more than 71,000 vehicles per day.^{1,2}

¹ 2019 VDOT Daily Traffic Volume Estimates Incl. Vehicle Classification Estimates Jurisdiction Report 53

² [2019 VDOT Daily Traffic Volume Estimates Incl. Vehicle Classification Estimates Jurisdiction Report 29](#)

At the January 21, 2016, Business Meeting, the Board of Supervisors (Board) directed staff (8-0-1: Letourneau absent) to initiate a new Loudoun-Fairfax Route 50 Task Force³. As a result of this direction, staff from the Department of Transportation and Capital Infrastructure (DTCI) presented an item to the Board at its December 5, 2017, Business Meeting⁴ which provided the results of the Route 50 Task Force and Corridor Study (the 2017 Corridor Study). At this meeting, the Board directed staff (8-0-1: Buffington absent) to incorporate the Tier 1 short-term improvements from the 2017 Corridor Study into the proposed FY 2019-2024 Capital Improvement Program (CIP) Budget for further discussion, evaluation, and prioritization. The Board also directed staff to continue coordination efforts with the Fairfax County Department of Transportation (FCDOT), the Virginia Department of Transportation (VDOT), and the Metropolitan Washington Airports Authority (MWAA) to obtain feedback, develop consensus, and refine the concept of an east-west roadway connection through the MWAA property, now referred to as the Route 50 North Collector Road, and once consensus or firm objection has been reached, report back to the Board with the process outcomes.

As a result of the 2017 Corridor Study, the Adopted FY 2019 - 2024 CIP included a project titled “Route 50 Corridor Improvements” and provided \$645,000 of Local Tax funding (roads) in FY 2019 and \$6,125,000 of Local Tax Funding and General Obligation Funds in FY 2020 to implement the approved Tier 1 short-term improvements from the US Route 50 Corridor study. This project is being managed by VDOT and is currently in the design phase.

Additionally, several planning and coordination efforts regarding the Route 50 North Collector Road are ongoing. Through discussions with MWAA, it was determined that the acceptable limits of the Route 50 North Collector Road are from the Tall Cedars Parkway extension eastward to the Air and Space Museum Parkway interchange at Route 28 in Fairfax County. Preliminary engineering is underway; funding for future project phases is not yet identified in the current 6-year CIP. Coordination with both MWAA and Fairfax County is ongoing to determine the specific alignment of the Route 50 North Collector Road.

Summary of 2023 Study: The US Route 50 Long-Term Improvements and Sequencing Corridor Study (the 2023 Study) was completed to address continued recurring congestion along the Route 50 corridor between Northstar Boulevard to the west and the Fairfax County line to the east. The purpose of the study is to forecast long-term (2040) transportation conditions for the Route 50 corridor, including adjacent facilities; define the future sequencing of roadway and interchange improvements; and provide an assessment of the Route 50 North Collector Road. A study area map is provided as Attachment 2.

The 2023 Study provides recommendations for sequencing infrastructure improvements should the North Collector Road be advanced and should the North Collector Road not be constructed. These two scenarios were developed with the understanding that the proposed North Collector Road is not completely within Loudoun County’s jurisdiction and is subject to the cooperation of

³ [January 21, 2016, Item 14 Board Member Initiative: Loudoun - Fairfax Route 50 Task Force](#)

⁴ [December 5, 2017, Item 12 Response to Board Member Initiative: Loudoun - Fairfax Route 50 Task Force](#)

external agencies. The two sequencing scenarios devised from the study are provided below. The implementation scenarios are provided in sequential order and were determined using several considerations including the following: traffic analysis results, available programmed funding, transportation plans of neighboring jurisdictions, and right-of-way and access implications to adjacent parcels.

Methodology: In order to develop a program for implementation, several roadway network build-out scenarios were developed, along with associated traffic forecasts to assess the sensitivity of the network to various improvements and prioritize improvements based on those traffic impacts. This process was conducted with the understanding that the 2019 CTP network includes several new roadway facilities or expanded roadways that have not been programmed in the current CIP adopted in April 2023 and are unlikely to be fully implemented within a 20-year timeframe.

Network scenarios were developed based on implementation of three major elements:

1. **Loudoun County 2019 CTP Network Build-Out:** Unless otherwise noted, each scenario was analyzed assuming either the full 2019 CTP buildout or a fiscally-constrained 2019 CTP network which includes improvements currently included in the County's CIP. In the second case, the constrained 2019 CTP represents facilities which are reasonably anticipated to be in place by 2040. Table 1 provides a list of these improvements.
2. **North Collector Road Build-Out:** The Study focused on how the North Collector Road would impact traffic along Route 50 and other study area roadways.
3. **Inclusion of the Bi-County Parkway:** The study considered the potential impact of the Bi-County Parkway if this were to be constructed by 2040 between Prince William County and Loudoun County.

The 2023 Study evaluated improvements that are projected to be completed as part of the constrained 2019 CTP and those projected to be completed as part of the full 2019 CTP network. The following 14 Roadway Network Scenarios were analyzed in the 2023 Study (Table 1).

Table 1: Roadway Network Scenarios

	Scenario ID	Scenario Name	Loudoun County Network Improvements		Regional Improvements
			North Collector Road	Route 606 Widening	
<i>Constrained 2019 CTP</i>	1	Constrained 2019 CTP			
	2	Constrained 2019 CTP + Route 606 Widening		✓	
	3	Constrained 2019 CTP + Bi-County Parkway			✓
	4	Constrained 2019 CTP + North Collector Road (Tall Cedars Parkway to Route 28)	✓		
	5	Constrained 2019 CTP + North Collector Road (Tall Cedars Parkway to Route 28) + Bi-County Parkway	✓		✓
	6	Constrained 2019 CTP + North Collector Road (Tall Cedars Parkway to Route 28) + Bi-County Parkway + Route 606 Widening	✓	✓	✓
	12	Constrained 2019 CTP + -North Collector Road (Tall Cedars Parkway to Route 28) + Route 606 Widening	✓	✓	
<i>Full 2019 CTP</i>	7	Full 2019 CTP			
	8	Full 2019 CTP + Route 606 Widening		✓	
	9	Full 2019 CTP + Bi-County Parkway			✓
	10	Full 2019 CTP + Route 606 Widening + Bi-County Parkway		✓	✓
	11	Full 2019 CTP + North Collector Road (Tall Cedars Parkway to Route 28)	✓		
	13	Full 2019 CTP + 606 Eight-Lane Widening		✓	
	14	Full 2019 CTP + 606 widening + North Collector Road (Tall Cedars Parkway to Route 28)	✓	✓	

Influences from other jurisdictions/agencies were also considered as the study area is adjacent to Fairfax County, Prince William County, and the Washington Dulles International Airport (IAD) which is operated by MWAA.

- Fairfax County: The effectiveness of improvements to Route 50 in Loudoun County, east of Route 606, is largely dependent on improvements to Route 50 in Fairfax County. Currently, Route 50 is comprised of a six-lane cross section from Stone Springs Boulevard to the Fairfax County line. Loudoun County and Fairfax County are coordinating funding applications to implement some short-term spot improvements between Route 606 and Route 28. However, without increasing the east-west capacity of Route 50 into Fairfax County, congestion will remain and increase over time.

- Prince William County: Over the past decades, two parkways have been proposed to provide an enhanced north-south connection between Loudoun County and Prince William County; these planned roadways are known as the Bi-County Parkway and Tri-County Parkway. The Bi-County Parkway was planned to be a limited-access corridor extending the Route 234 Bypass in Prince William County from its terminus at Interstate-66 (I-66) northward to Northstar Boulevard at Route 50 in Loudoun County. The Tri-County Parkway was planned to be a new roadway between Loudoun County Parkway (Loudoun County Parkway/Bull Run Post Office Road corridor) and Godwin Drive in Manassas, thus connecting Loudoun County, Fairfax County, and Prince William County. The Loudoun County 2019 CTP recognizes the Bi-County Parkway (Northstar Boulevard corridor); however, Prince William County shows neither of these proposed facilities in their transportation planning documents.
- MWAA: MWAA owns a large area between Dulles Airport proper and Route 606, some of which is not currently planned for future airport uses. In September 2019, the MWAA Board of Directors voted to approve the sale of approximately 424 acres of land, known as the Western Lands, to a global data center provider. Currently, 160 acres adjacent to Route 606, north of Route 50, is available for lease. To prevent disturbance to the developable areas, MWAA has expressed that it will only consider the North Collector Road alignment east of Tall Cedars Parkway at this time.
- Route 28 Corridor Improvements: Route 28 is planned to be a limited-access facility between Route 7 and I-66. In Loudoun County, Route 28 is planned to be an eight-lane limited-access highway from Route 7 to Old Ox Road (Route 606) and a 10-lane limited-access highway from Old Ox Road to the Fairfax County line.
- Dulles Loop Implementation Plan: In 2009, the Dulles Loop Implementation Group, the Dulles Area Transportation Association, and the Washington Airport Task Force conducted a study to improve the 18-mile loop that surrounds IAD. These roadways include Route 50, Route 606, and Route 28. The Dulles Loop plan recommended Route 50 be converted to a limited-access facility with continuous parallel connector roads, grade separated crossings at all intersecting roadways, and preservation of right-of way for a future transit alternative.

Traffic Forecasting and Analysis: Traffic forecasts were developed and analyzed for the scenarios denoted in Table 1 (above) using the following methodology:

1. Obtain baseline (existing) traffic volumes: Baseline daily volumes were obtained from VDOT 2019 daily traffic volume estimate publication. Baseline weekday AM and PM peak hour turning movement volumes were obtained from DTCI which include traffic counts along the Route 50 corridor from 2021. Traffic volumes collected in 2021 that were used as the baseline for the traffic forecasts for this study included a COVID adjustment in accordance with the VDOT guidance effective at the time they were collected.

2. Conduct travel demand model runs for the network scenarios: The Loudoun County travel demand model (TDM) was used to derive future 2040-year growth for the corridor.
3. Use travel demand model run results to produce daily screenline forecasts: Daily volume forecasts were first developed using a process that estimated total volume across several parallel links referred to as screenlines. These screenlines were used to estimate daily volume forecasts for individual links along Route 50 and adjacent study arterials.
4. Use daily screenline forecasts to produce peak-hour turning movement estimates: Once link level forecasts were produced, the forecast volumes were converted to peak-hour approach and then turning movement forecasts using an industry-standard process in *NCHRP 765: Analytical Travel Forecasting Approaches for Project-Level Planning and Design*.
5. Conduct intersection capacity analysis: This analysis utilized Synchro software to estimate future delay and level of service (LOS) along intersection approaches and overall delay/LOS for each signalized intersection planned for a future interchange in Loudoun County.

Given the projected delay in seconds and LOS at each intersection in each Roadway Network Scenario, preliminary recommendations were generated for the likelihood of needing grade separated interchanges by 2040. It is noted that pursuant to the 2019 CTP, a LOS of A through D is considered acceptable and LOS E and F are considered unacceptable. Tables 2 and 3 (below) provide the projected AM and PM peak hour LOS with the delay and Table 4 provides a qualitative assessment of interchange needs. Tables 2, 3 and 4 consider the impact that completing planned roadway improvements will have on the Route 50 corridor; the addition of each roadway connection is designated with a plus sign (+) in each scenario. While some roadway improvements are projected to improve the LOS at Route 50 intersections, the analysis of future traffic conditions indicates that the LOS will significantly decline at several intersections which indicates that interchanges will likely be needed at those locations.

Table 2: Projected 2040 AM Peak hour LOS and Delay (in seconds) for Roadway Network Scenarios

		Intersection						
Scenario		Northstar Boulevard	Stone Springs Boulevard	Gum Spring Road/Arcola Boulevard	Loudoun County Parkway	South Riding Boulevard	Tall Cedars Parkway	Pleasant Valley Road
0	Existing (2021)		F (181.5)	D (41.9)	F (160.8)	C (31.2)	E (67.5)	F (142.0)
1	Constrained 2019 CTP	F (104.6)	D (49.8)	F (91.1)	F (138.6)	B (17.8)	F (119.1)	F (108.2)
2	+ Route 606 Widening	F (121.0)	E (62.5)	F (94.1)	F (159.1)	B (18.4)	F (110.7)	F (101.5)
3	+ Bi-County Parkway	F (116.6)	D (54.9)	F (102.3)	F (131.0)	B (12.8)	F (117.7)	F (92.4)
4	+ North Collector Road	F (121.8)	D (51.2)	F (88.2)	F (144.9)	C (26.4)	F (228.4)	D (48.0)
5	+ North Collector Road + Bi-County Parkway	F (116.5)	D (50.1)	F (102.9)	F (152.2)	B (19.8)	F (188.3)	D (35.3)
6	+ North Collector Road + Bi-County Parkway + Route 606 Widening	F (114.0)	E (64.8)	F (94.4)	F (156.7)	B (12.4)	F (181.2)	C (34.0)
12	+ Route 606 Widening + North Collector Road	F (122.8)	E (63.6)	F (93.1)	F (159.0)	B (16.7)	F (180.9)	D (51.1)

LOS based on 2000 Highway Capacity Manual

Table 3: Projected 2040 PM Peak hour LOS and Delay (in seconds) for Roadway Network Scenarios

Scenario		Intersection						
		Northstar Blvd.	Stone Springs Blvd.	Gum Spring Rd./Arcola Blvd.	Loudoun County Pkwy.	South Riding Blvd.	Tall Cedars Pkwy.	Pleasant Valley Rd.
0	Existing (2021)		F (127.9)	D (43.8)	F (277.5)	C (28.7)	F (300.0)	F (195.8)
1	Constrained 2019 CTP	F (168.2)	F (135.7)	F (272.8)	F (133.0)	B (16.6)	C (34.6)	E (75.9)
2	+ Route 606 Widening	F (177.7)	F (280.3)	F (174.9)	F (285.1)	C (32.2)	F (84.0)	F (99.5)
3	+ Bi-County Parkway	F (170.6)	F (186.6)	F (290.6)	F (143.5)	B (15.3)	D (35.7)	F (105.1)
4	+ North Collector Road	F (161.5)	F (183.7)	F (286.0)	F (143.3)	B (16.2)	F (139.4)	E (62.1)
5	+ North Collector Road + Bi-County Parkway	F (184.0)	F (205.4)	F (302.3)	F (148.1)	B (16.4)	F (127.0)	D (46.9)
6	+ North Collector Road + Bi-County Parkway + Route 606 Widening	F (189.3)	F (205.1)	F (265.3)	F (203.4)	B (15.7)	F (135.7)	D (43.7)
12	+ Route 606 Widening + North Collector Road	F (164.1)	F (210.1)	F (263.8)	F (192.9)	B (16.9)	F (127.0)	D (41.5)

LOS based on 2000 Highway Capacity Manual

Table 4: Preliminary Interchange Evaluation Matrix

		Intersection Likelihood of Needing an Interchange by 2040						
Scenario		Northstar Blvd.	Stone Springs Blvd.	Gum Spring Rd./Arcola Blvd.*	Loudoun County Pkwy.*	South Riding Blvd.	Tall Cedars Pkwy.	Pleasant Valley Rd.
0	Existing (2021)		●	●	●	○	●	●
1	Constrained 2019 CTP	○	●	●	●	○	●	●
2	+ Route 606 Widening	○	●	●	●	○	●	●
3	+ Bi-County Parkway	●*	●	●	●	○	●	●
4	+ North Collector Road	○	●	●	●	○	●*	●
5	+ North Collector Road + Bi-County Parkway	●*	●	●	●	○	●*	○
6	+ North Collector Road + Bi-County Parkway + Route 606 Widening	●*	●	●	●	○	●*	○
12	+ Route 606 Widening + North Collector Road	○	●	●	●	○	●*	○

*Regional Connection

Likelihood of Needing an Interchange by 2040		
Unlikely	Somewhat Likely	Very Likely
<u>Unlikely</u>	Acceptable LOS; non-regional connection	
<u>Somewhat Likely</u>	Poor LOS in at least one peak hour, but a non-regional connection OR acceptable LOS; regional connection	
<u>Very Likely</u>	Poor LOS; regional connection	

The 2023 Study proposes the following sequencing of roadway and interchange improvements which are presented in two scenarios, Scenario 1 assumes construction of the North Collector Road; Scenario 2 recommends improvements if the North Collector Road is not constructed. A graphic illustrating Scenario 1 is provided as Attachment 3 and a graphic illustrating Scenario 2 is provided as Attachment 4.

Scenario 1: With the North Collector Road

1. Complete construction of the fully funded projects contained in the Loudoun County CIP projects. Currently, Arcola Boulevard and Northstar Boulevard are under construction and Dulles West Boulevard is in the utility relocation phase. These connections will complete localized access and key north-south corridors, thus reducing some of the trips along Route 50.
2. Construct the North Collector Road from Tall Cedars Parkway to Route 28.
3. Construct the Tall Cedars Parkway/North Collector Road/Route 50 interchange.
4. Construct the Route 606 (Loudoun County Parkway)/Route 50 interchange.
5. Construct the Arcola Boulevard/Gum Spring Road/Route 50 interchange.
6. Construct the Route 606 capacity improvements. In the 2019 CTP, the ultimate condition of Route 606 is an eight-lane freeway between Route 50 and Old Ox Road/Arcola Boulevard, then reduces to a six-lane roadway between Loudoun County Parkway/Arcola Boulevard and the County Line.
7. Construct the widening of Arcola Boulevard. In the 2019 CTP, the ultimate condition of Arcola Boulevard is a six-lane roadway from Route 50 to Route 606.
8. Construct the Northstar Boulevard/Route 50 interchange.

Scenario 2: Without the North Collector Road

1. Complete construction of the fully funded projects contained in the Loudoun County CIP projects. Currently, Arcola Boulevard and Northstar Boulevard are under construction and Dulles West Boulevard is in the utility relocation phase. These connections will complete localized access and key north-south corridors, thus reducing some of the trips along US Route 50.
2. Construct the Route 606 capacity improvements. In the 2019 CTP, the ultimate condition of Route 606 is an eight-lane freeway between Route 50 and Old Ox Road/Arcola Boulevard, then reduces to a six-lane roadway between Loudoun County Parkway/Arcola Boulevard and the County Line.
3. Construct the Route 606 (Loudoun County Parkway)/Route 50 interchange.
4. Construct the Arcola Boulevard/Gum Spring Road/Route 50 interchange.
5. Construct the widening of Arcola Boulevard. In the 2019 CTP, the ultimate condition of Arcola Boulevard is a six-lane roadway from Route 50 to Route 606.
6. Construct the Northstar Boulevard/Route 50 interchange.

ISSUES: Staff has identified four issues to elevate to the Board's attention.

1. *Route 50 in Fairfax County:* Intersection improvements and/or interchanges along Route 50 will provide some congestion relief; however, because Fairfax County does not have any immediate plans to add capacity to Route 50 in this location, the lengthy queues will remain as vehicles approach the Fairfax County line and are projected to worsen. The proposed interchanges will benefit localized traffic operations in Loudoun County.
2. *North Collector Road:* The North Collector Road continues to be the next logical roadway to plan and construct because it will alleviate the extreme congestion on Route 50 by providing an alternate east-west roadway north of Route 50. However, design and construction of the North Collector Road requires cooperation between Loudoun County, MWAA, and Fairfax County and their respective environmental and planning processes. Coordination with both MWAA and Fairfax County is ongoing to determine the specific alignment of the Route 50 North Collector Road. If the North Collector Road is not constructed, the focus of the roadway improvements should shift to adding capacity to Route 606, followed by construction of several interchanges.
3. *Sequencing of Improvements:* While the County's initial focus has been on the Route 50/Loudoun County Parkway interchange, the 2023 Study identifies the need to advance the Route 50/North Collector Road/Tall Cedars Parkway interchange, assuming the North Collector Road is constructed.
4. *Design Consistency for Interchanges:* In order to enhance the character and create a distinctive gateway along the Route 50 Corridor, consideration may be given to establishing consistent design features for all future interchanges as well as uniform landscaping and other visual elements. Both study scenarios contain a recommendation to construct several interchanges along the corridor. If the Board desires to consider specific interchange design elements and/or requirements for a cohesive corridor aesthetic, a separate item is recommended for discussion at a future Board meeting.

FISCAL IMPACT: There is no immediate fiscal impact to the County as a result of the 2023 Study. Future costs associated with funding planned improvements identified in the various scenarios will be identified at a later date as specific projects are considered for inclusion in the CIP.

ATTACHMENT(S):

1. US Route 50 Long-Term Improvements and Sequencing Corridor Study
2. Study Area Map
3. Scenario 1 - Proposed Sequencing of Improvements with the North Collector Road
4. Scenario 2 - Proposed Sequencing of Improvements without the North Collector Road



US ROUTE 50

Long-Term Improvement and Sequencing Corridor Study

February 2023



Prepared By:

Kimley»Horn

Attachment 1



US Route 50 – Loudoun County

Long-Term Improvements and Sequencing Corridor
Study



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EXECUTIVE SUMMARY

Project Purpose and Goals

The “US Route 50 Long-Term Improvements and Sequencing Corridor Study” was undertaken by the Loudoun County Department of Transportation and Capital Infrastructure (DTCI) to address continued recurring congestion along the US Route 50 corridor between Northstar Boulevard and the Fairfax County line. The purpose of this study is to forecast long-term (2040) transportation conditions for the US Route 50 corridor, including adjacent facilities, and to define the future sequencing of roadway and interchange improvements. Included in this study is an assessment of the North Collector Road as a potential relief route to US Route 50, including forecasted traffic impacts and actions needed to advance the project. Sensitivity tests have been conducted to assess the effects of various projects on US Route 50 traffic, allowing for prioritization of improvements.

This study provides recommendations for sequencing infrastructure implementation should the North Collector Road project be advanced. This study also provides an alternate sequence should the North Collector Road not be feasible. This information will allow the County to program unbuilt facilities along the corridor. Finally, this study also reviews the 2019 Countywide Transportation Plan (CTP) within the study area to make recommendations to update the CTP (if necessary).

Future Transportation Planning Efforts Related to the US Route 50 Corridor

In June 2019, the County adopted the 2019 CTP and Comprehensive Plan. Included in the 2019 CTP is the US Route 50 North Collector Road, from Route 606 east to Route 28 at the Air and Space Museum Parkway interchange. The CTP also identifies a planned interchange at the Tall Cedars Parkway extension and the North Collector Road (referred to as US 50 Alternative in the 2019 CTP.) Based on the direction received from MWAA, this study will only evaluate the North Collector Road east of the Tall Cedars Parkway Extension. Though a grade separated interchange at the proposed connection of US Route 50 North Collector Road/Tall Cedars Parkway and US Route 50 may be warranted, for purposes of this analysis a traditional at-grade intersection was assumed as the baseline. This assumption is consistent with the existing conditions along the corridor at adjacent intersecting north-south routes and provides a comparable baseline when considering which interchanges to construct first in the sequencing analysis.

The planned roadway network outlined in the CTP served as a starting point for developing analysis scenarios for this study. Within the study area, the CTP identifies planned overpasses at Pinebrook Road and Pleasant Valley Road. Grade-separated interchanges are identified at the following intersections with US Route 50:

- Northstar Boulevard
- Gum Spring Road/Arcola Boulevard
- Route 606/Loudoun County Parkway
- South Riding Boulevard
- Tall Cedars Parkway



Additionally, as part of the limited access ultimate condition, the CTP calls for termination of at-grade access to US Route 50 between Northstar Boulevard and the Fairfax County line. This planned condition affects several intersections with US Route 50, such as Elk Lick Road, Poland Road/Tanner Lane, Medical Drive, Pinebrook Road, etc. The remaining facilities would tie into the major arterials listed above for full access to US Route 50 or would have modified right in/right out (RIRO) only access onto and off of US Route 50.

The CTP plans for additional capacity on Route 606 consisting of widening the facility to an ultimate cross section of eight lanes between US Route 50 and Arcola Boulevard and six lanes between Loudoun County Parkway and the Dulles Greenway. This facility is planned as a limited access median divided urban arterial, but local access, interchange locations, and ultimate alignment are to be determined by later study with consideration of adjacent development. Tentative interchange locations have been proposed at the following locations:

- Route 606 at Dulles West Boulevard/ North Collector Road
- Route 606 at Arcola Mills Drive
- Route 606 at Arcola Boulevard

The effectiveness of improvements to US Route 50 in Loudoun County, east of Route 606, is largely dependent upon improvement to US Route 50 in Fairfax County. Without increasing east-west travel capacity in Fairfax County, major improvements to the west will only increase the rate at which traffic can reach the end of the queue. Fairfax County's Comprehensive Plan Transportation Map does show capacity improvements in the area. Braddock Road is planned to be widened to four lanes and realigned with Old Lee Road. However, in discussions with Fairfax County staff, it has been expressed that funding has not been allocated to this improvement, and there is not a schedule associated with the project. Two interchanges are proposed along US Route 50 in Fairfax County, at Centreville Road and Stringfellow Road, but both are located east of Route 28 and require further study. As such, Loudoun County cannot rely on this additional capacity south or east of US Route 50 and is exploring other opportunities to relieve the east-west commuter congestion, like the North Collector Road.

The existing and planned transportation connections to Prince William County will impact regional travel patterns and will influence the sequence of infrastructure improvements needed along the US Route 50 corridor in Loudoun County. Over decades of regional transportation planning, two parkways have been proposed to provide more north-south connections between Loudoun County and Prince William County: the Bi-County Parkway and the Tri-County Parkway. If constructed, the Bi-County Parkway would be a limited access corridor extending the Route 234 Bypass in Prince William County from its terminus at I-66 north to Northstar Boulevard at US Route 50 in Loudoun County. The Tri-County Parkway, if constructed, would be a new facility between Loudoun County Parkway and Godwin Drive in Manassas, connecting Loudoun County, Fairfax County, and Prince William County. Based on the recent update to the Prince William County Comprehensive Plan and draft Transportation Plan, dated December 5, 2022, Prince William County is planning to construct their portion of the Tri-county Parkway in what they're referring to as the Route 28 Bypass, however, it does not show the Bi-County Parkway.

The proposed North Collector Road alignment requires a public easement on MWAA property to allow for roadway construction and maintenance. The proposed alignment is intended to follow the southern border of the MWAA property line and is located south of the future planned fifth runway. As the North Collector Road travels east towards Route 28, it would cross through the



Udvar-Hazy Center property, a Smithsonian Institute facility leased from MWAA. The North Collector Road would tie into Air and Space Museum Parkway and connect with the existing interchange with Route 28. This further emphasizes that cooperation from MWAA will be paramount to move this project forward. MWAA is currently in the process of updating the Dulles International Airport Master Plan which should be released in the later part of 2023.

Many travelers use Route 28 to access the Dulles Toll Road to the north or I-66 to the south. It should be noted that the Dulles Toll Road has HOV-2+ (High Occupancy vehicle – 2+ passenger) lanes, and I-66 has recently been widened to include 2 Express Lanes (HOV-3+ [High Occupancy vehicle – 3+ passengers] and toll) and three to four general purpose lanes. In the Fairfax County Comprehensive Plan and the CTP, the Route 28 corridor is ultimately planned to accommodate four general purpose lanes and one High Occupancy Vehicle (HOV) lane in each direction, from Route 606 to I-66. These general-purpose lane capacity improvements have been implemented and no additional widening is planned at this time. HOV lanes are planned but have not been incorporated.

Future Traffic Forecasting and Analysis Results

The COVID-19 pandemic caused a notable change in the traffic patterns and volumes. The traffic volumes collected in 2021 that were used as the baseline for the traffic forecasts for this study included a COVID adjustment in accordance with the Virginia Department of Transportation (VDOT) guidance effective at the time they were collected.

The US Route 50 study area is unique given the many unbuilt and incomplete roadway facilities adjacent to it, uncertainty regarding future connections to Prince William County to the south, and quickly evolving land uses and travel patterns associated with the expansion of the Silver Line Metro into Loudoun County. In order to develop a program for implementation of unbuilt roadway facilities in Loudoun County, several roadway network build-out scenarios were developed as part of the travel demand modeling effort. Select model run scenarios were used to assess the sensitivity of the network to various improvements and prioritize improvements based on those traffic impacts.

A series of roadway network configurations was developed to examine various combinations of future network improvements. Network scenarios have been categorized based on network build-out (Full CTP vs Constrained CTP scenarios) and combination of network components that vary between the scenarios (North Collector Road, Route 606 Widening, and Bi-County Parkway). The Constrained CTP baseline scenario includes the existing roadway network plus improvements that are included within the CTP and that have funding or anticipated to have funding in the short term. The Full CTP scenario includes all improvements that are shown in the CTP and is not constrained by a fiscal budget allocation.

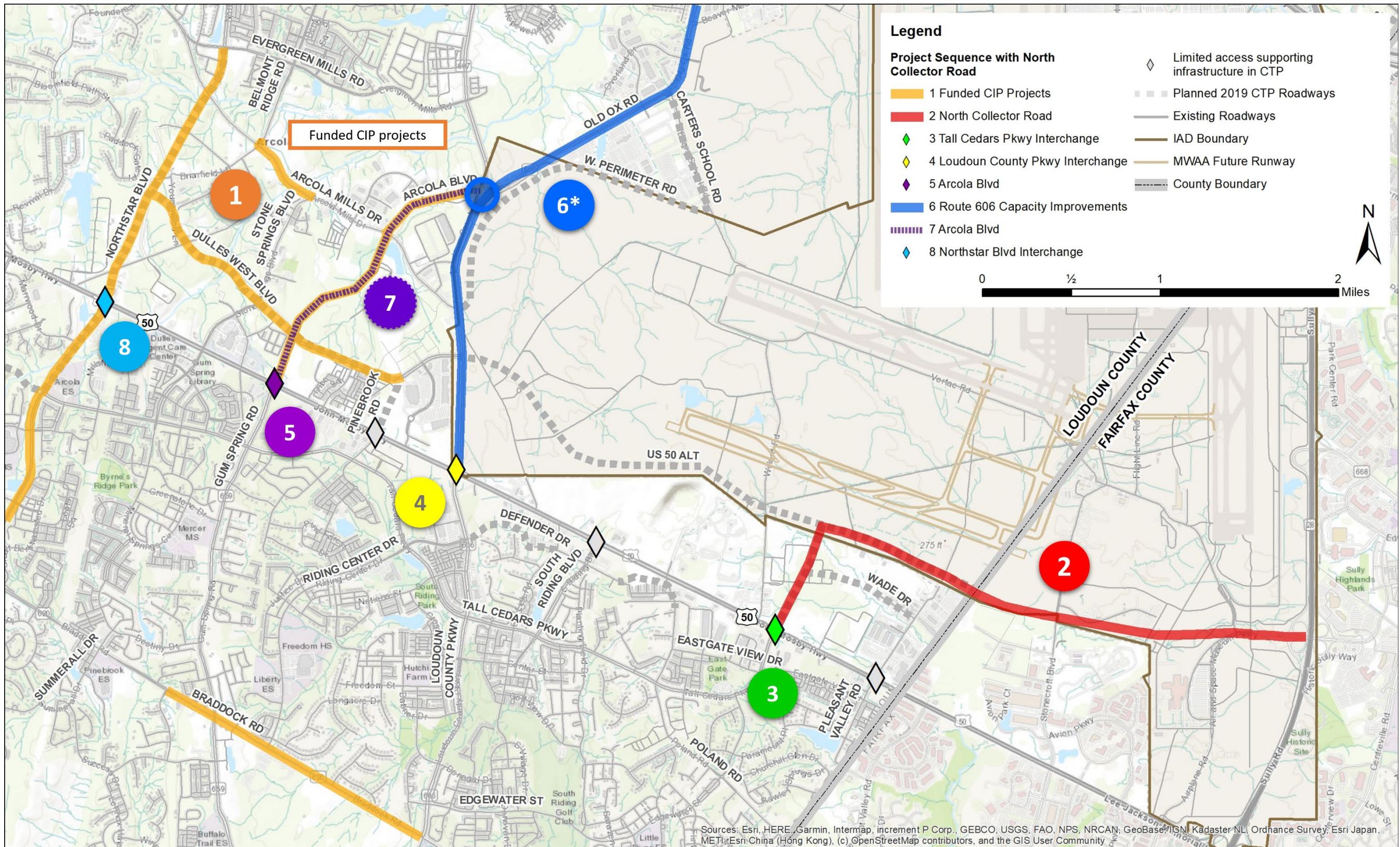
This sensitivity test of various network buildouts resulted in several traffic forecasts for the US Route 50 corridor, as well as major parallel and intersecting facilities. The Constrained CTP scenarios were carried forward for additional traffic analysis of peak-hour intersection capacity to provide a high-level assessment of the need for grade-separated interchanges. Analysis results showed that there is an anticipated need for grade separation at major intersection locations within the study corridor.

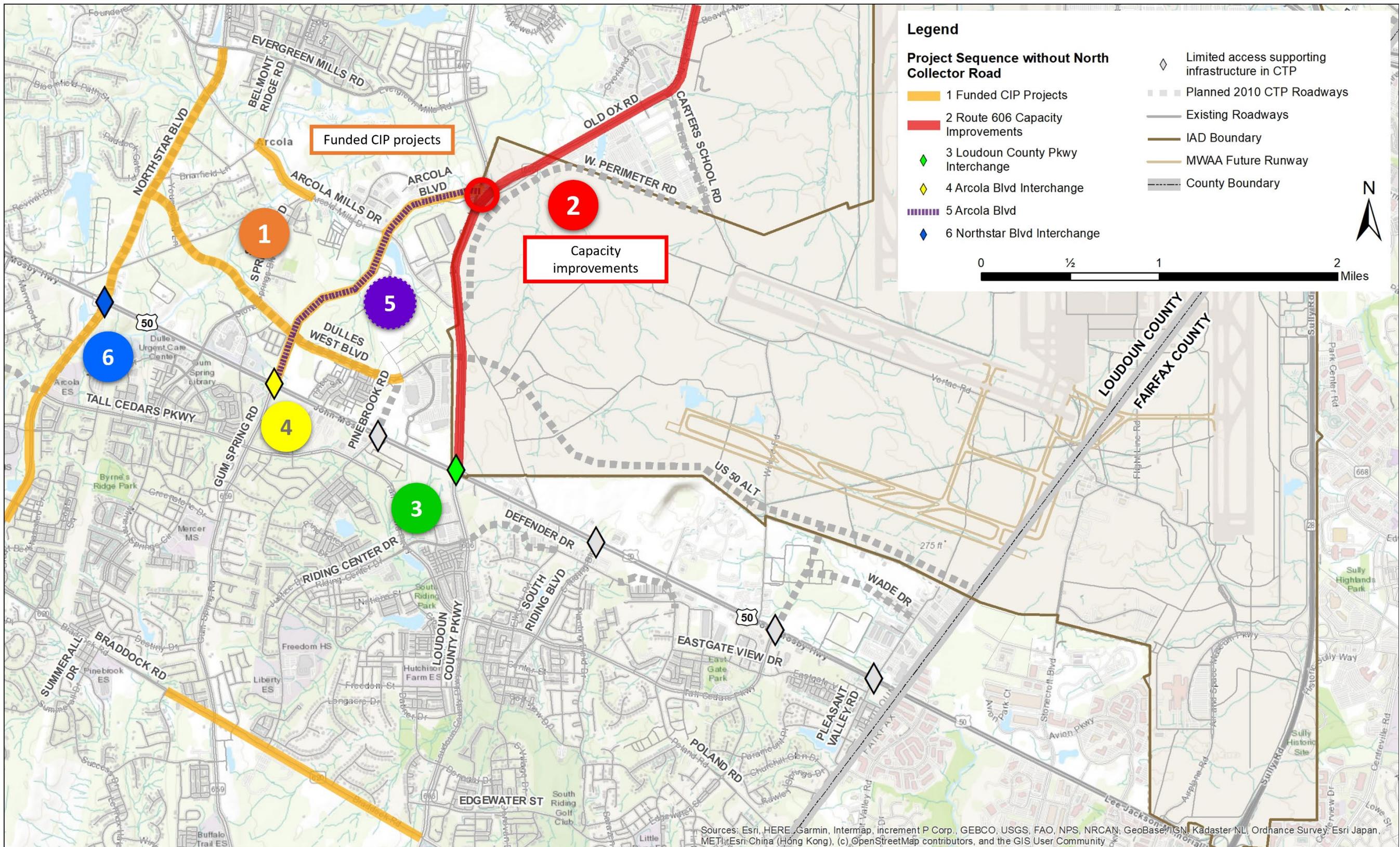
Recommended Sequencing of Improvements

Given the results of the traffic forecasting and sensitivity analysis, as well as consideration of available programmed funding, transportation plans of neighboring jurisdictions, and



right-of-way and access implications on adjacent parcels, two recommended sequences have been developed for implementation; one sequence includes the North Collector Road, and one sequence does not include the North Collector Road. These two separate sequences have been developed with the understanding that the proposed North Collector Road is not completely within Loudoun County's jurisdiction and is subject to the cooperation of external agencies and their respective environmental and planning processes. The two recommended sequences are shown in **Figures ES-1** and **ES-2**.







Recommended Sequence Summaries

- If the North Collector Road is determined to be feasible, sequence the key projects in the following order:
 1. Funded CIP Projects
 2. North Collector Road from Tall Cedars Parkway to Route 28
 3. Tall Cedars Parkway/North Collector Road Interchange
 4. Route 606 (Loudoun County Parkway) Interchange
 5. Arcola Boulevard/Gum Spring Road Interchange
 6. Route 606 Capacity Improvements
 7. Arcola Boulevard Widening
 8. Northstar Boulevard Interchange

- If the North Collector Road is determined to not be feasible, sequence the key projects in the following order:
 1. Funded CIP Projects
 2. Route 606 Capacity Improvements
 3. Route 606 (Loudoun County Parkway) Interchange
 4. Arcola Boulevard/Gum Spring Road Interchange
 5. Arcola Boulevard Widening
 6. Northstar Boulevard Interchange

Next Steps

Following completion of this study, the following steps are recommended to provide transportation improvements to the US Route 50 corridor.

- Complete the feasibility study and coordination with MWAA, Fairfax County, and VDOT to determine the viability of the North Collector Road. An amendment to Fairfax County's Comprehensive Plan may be required.
- Coordinate with Prince William County regarding the potential for a future Bi-County Parkway, as this facility would have an effect on future regional commuter patterns in Loudoun County.
- Conduct a corridor study along Route 606 from US Route 50 to Route 267, regardless of the feasibility of the North Collector Road, to evaluate the scope and sequence of Route 606 improvements that are warranted.
- Once the Route 606 corridor study is completed and after Arcola Boulevard travel patterns have "normalized", assess the operations along Arcola Boulevard and update traffic forecasts to anticipate when widening may be needed.
- With respect to the CTP:
 - Maintain the planned interchanges on US Route 50 within the study corridor.
 - Maintain the overpass recommendations at Pinebrook Road and Pleasant Valley Drive (Loudoun County).
 - Maintain the designation along US Route 50 to become limited access. However, the focus should be on the segment between Northstar Boulevard and Tall Cedars Parkway as this will connect to future limited access facilities along



Route 606 and North Collector Road. East of Tall Cedars Parkway should be a lower priority for conversion to limited access since Fairfax County has no plans to change US Route 50 to limited access.

- Maintain the planned six-lane typical section on US Route 50 within the study corridor
- Monitor improvement projects within and external to the County and revisit the recommended sequence of projects as travel patterns adjust along with these transportation infrastructure improvements. The County should revisit this sequence in approximately 3-5 years upon the completion of the CIP projects, regional projects, and ongoing land development in Loudoun County as those projects will likely change regional east-west travel patterns.
- Identify funding for the feasibility and environmental studies, design, right-of-way, and construction of the recommended roadways and interchanges.



1 INTRODUCTION

Prior to this Study, DTCI completed the "US Route 50 Corridor Study: Existing Conditions and Short-Term Improvements" study along US Route 50 between Northstar Boulevard and Centreville Road, dated November 2017. This study (referred to as "Short-Term Study") was a cooperative effort between Loudoun and Fairfax Counties sponsored and funded by Loudoun County. The Short-Term Study reviewed existing operations and safety issues to discover short-term operational and safety improvements that reduce congestion and improve safety. This study also looked at possible road network connectivity opportunities both north and south of US Route 50.

The study found that short-term improvements will help but not relieve the congestion, even in the near-term. Further, Fairfax County's Comprehensive Transportation Plan map does not show new transportation capacity (new roads, widening, or interchanges) along US Route 50 or along Braddock Road. This means that regardless of what transportation improvements are constructed in Loudoun County along US Route 50, there will still be a traffic bottleneck in Fairfax County, and congestion will remain and continue to grow. The Short-Term Study identified the potential for the North Collector Road, a new east-west roadway through the Dulles International Airport property between Route 606 and Route 28, approximately parallel to and north of US Route 50. This new roadway would help relieve congestion by providing additional east-west capacity in Fairfax County where none is currently planned. As an outcome of this study, the Board directed DTCI staff at the June 29, 2017, County Transportation Summit to transition the segment of US Route 50 between Northstar Boulevard and the Fairfax County line to a limited access highway.

Since the Transportation Summit, the County has adopted a new Comprehensive Land Use Plan and Countywide Transportation Plan (June 2019) which includes the US Route 50 North Collector Road, from Route 606 to Route 28 at the Air and Space Museum Parkway interchange. During this time the County also had discussions with the Metropolitan Washington Airports Authority (MWAA) regarding the proposed North Collector Road. MWAA expressed that the segment of the North Collector Road west of Tall Cedars Parkway would not be viable at this time and has requested that Loudoun County focus the efforts on the segment between Tall Cedars Parkway and Route 28.

The COVID-19 pandemic was also a notable change that occurred in the traffic patterns and volumes since completion of the prior study. Traffic volumes collected in 2021 that were used as the baseline for the traffic forecasts for this study included a COVID adjustment in accord with the VDOT guidance effective at the time they were collected.

1.1 Project Purpose and Goals

The purpose of this study is to forecast long-term (2040) transportation conditions for the US Route 50 corridor, including adjacent facilities, and to define the future sequencing of roadway and interchange improvements. Included in this study is an assessment of the North Collector Road as a potential relief route to US Route 50, including forecasted traffic impacts and actions needed to advance the project. Sensitivity tests have been conducted to assess the effects of various projects on US Route 50 traffic, allowing for prioritization of improvements.

This study provides recommendations for sequencing infrastructure implementation should the North Collector Road project be advanced. This study also provides an alternate sequence should that project prove to not be feasible. This information will allow the County to program



unbuilt facilities along the corridor. Finally, this study also reviews the 2019 Countywide Transportation Plan (CTP) to make recommendations to update the CTP (if necessary).

1.2 Document Organization

The following provides an overview of the rest of this document:

- **Chapter 2** provides further background on the corridor and study area. It details context on issues related to the corridor within Loudoun County as well as external to the County. It also provides an overview of the potential North Collector Road.
- **Chapter 3** documents a series of sensitivity tests conducted to project traffic forecast impacts in the corridor given the uncertain timeframes of several major projects both within and outside of Loudoun County. From these sensitivity tests, a high-level capacity assessment has been conducted on the need for grade separation at various intersections along the US Route 50 corridor.
- **Chapter 4** provides documentation of further considerations related to moving the North Collector Road project forward, including considerations regarding access as well as environmental and historical resources.
- **Chapter 5** provides recommendations for the 2040 roadway network in the corridor, including anticipated sequencing of improvements and planning-level cost estimates for improvements.
- **Chapter 6** documents a series of next steps for County, including coordination with external parties and the influence of this study on the CTP.



2 BACKGROUND

US Route 50 is a critical link for east-west travel in Northern Virginia and Loudoun County. The roadway serves a rapidly growing suburban area, as well as commercial land uses in eastern Loudoun County and provides access to Fairfax County. Due to geographic constraints, including Dulles Airport to the north and Manassas National Battlefield to the south, the corridor provides one of the few east-west links from southeastern Loudoun County to employment and other land uses in Fairfax County and points east. A significant portion of daily traffic along the corridor is comprised of commuters traveling east in the morning and returning west in the evening; this daily commuting pattern and the associated volume of traffic, contribute to recurring congestion along the corridor. The only "parallel" facilities to US Route 50 providing access to Fairfax County are Braddock Road, located just over two miles to the south, and Route 606, which intersects US Route 50 and runs west and north of Dulles Airport before turning east over five miles north of US Route 50.

To help relieve this recurring congestion along US Route 50, over a series of recent projects, the corridor has been widened from two to three lanes in each direction from east of the County line to Stone Springs Boulevard. However, even with this widening in place, the Short-Term Study found that, as of 2017, congestion still remained along the corridor. Loudoun County continues to experience rapid growth in housing and commercial land uses in the areas south and west of Dulles Airport along the US Route 50 corridor, adding to this congestion with no direct alternate routes available.

The Short-Term Study recommended several short-term and relatively low-cost improvements to enhance traffic operations and safety along the corridor. However, that study did not assess higher-cost improvements such as grade-separated interchanges along the corridor. The Loudoun County Board of Supervisors has directed DTCL staff to establish a strategy to transition the segment of US Route 50 between Northstar Boulevard and the Fairfax County line to a limited-access highway. As described in more detail below, Fairfax County has no plans to construct additional capacity, interchanges, or limited access conversions between the Loudoun County line and Route 28. This study aims to establish that strategy and assess the need for full limited-access conversion. In conjunction, this study also examines the potential for a parallel east-west roadway connection north of US Route 50 through the southern extent of Dulles Airport property to provide additional corridor capacity.

2.1 Study Corridor and TDM Study Area

This study focuses on the US Route 50 corridor between its future connection with Northstar Boulevard to the west and the Fairfax County line to the east. It also assesses a parallel east-west facility north of US Route 50, the North Collector Road. Finally, at a planning level, this study explores traffic projections for parallel facilities, such as Braddock Road and Tall Cedars Parkway, (which does not connect to Fairfax County), as well as intersecting north-south facilities. A study corridor map, showing the existing roadway network and planned CTP network, is shown in **Figure 2-1**.

For purposes of the travel demand modeling (TDM) effort, a TDM study area was also defined as shown in **Figure 2-2**. The TDM study area was used to constrain the extents of updates made to the 2016 Loudoun County TDM Transportation Analysis Zones (TAZ) to incorporate the 2019 Comprehensive Plan updated land uses and to reflect roadway improvements that have been completed since 2016. Additional information about this process is included in **Chapter 3**.



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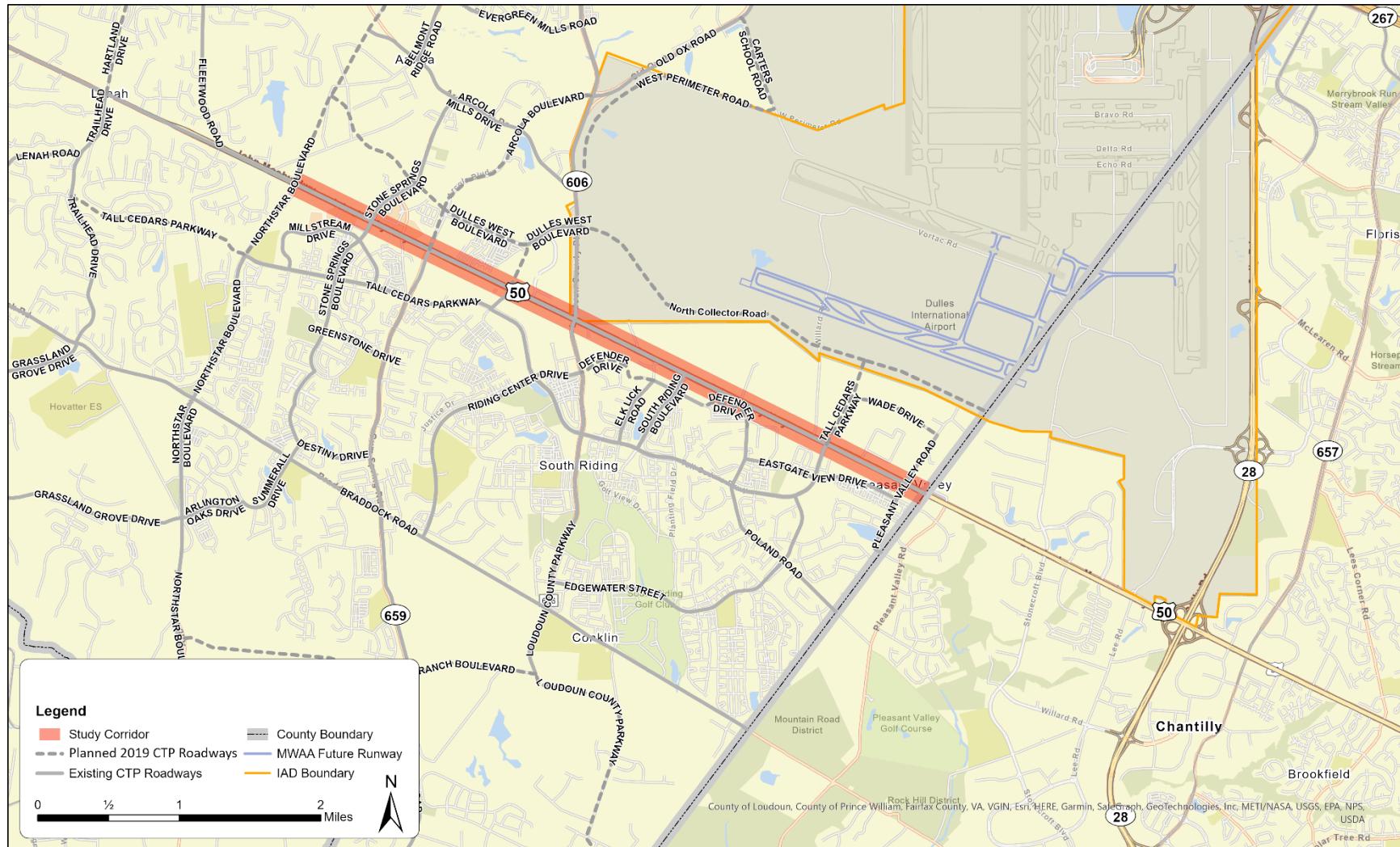


Figure 2-1: Study Corridor



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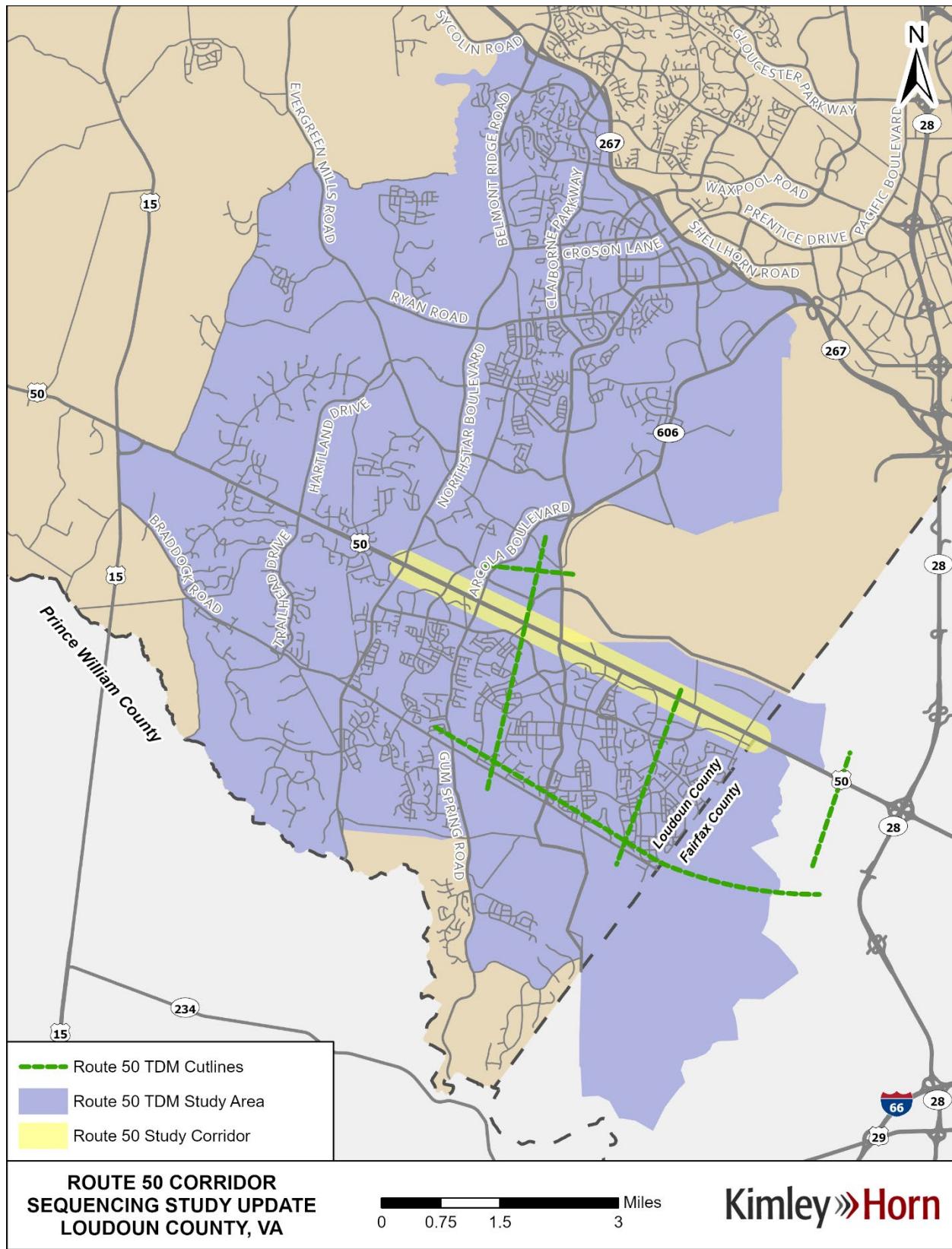


Figure 2-2: TDM Study Area



2.2 Considerations within Loudoun County

Many factors within Loudoun County were considered when determining the proposed sequencing of US Route 50 corridor improvements, including property access for parcels parallel to US Route 50, the CTP, and programmed funding for infrastructure improvements in proximity to the study corridor.

2.2.1 2019 Countywide Transportation Plan

Since the completion of the Short-term study, the County adopted the 2019 CTP and Comprehensive Plan. Included in the 2019 CTP is the US Route 50 North Collector Road, from Route 606 east to Route 28 at the Air and Space Museum Parkway interchange. The CTP also identifies a planned interchange at the Tall Cedars Parkway extension and the North Collector Road (referred to as US 50 Alternative in the 2019 CTP.) Based on the direction received from MWAA, this study will only evaluate the North Collector Road east of the Tall Cedars Parkway Extension. Though a grade separated interchange at the proposed connection of US Route 50 North Collector Road/Tall Cedars Parkway and US Route 50 may be warranted, for purposes of this analysis a traditional at-grade intersection was assumed as the baseline. This assumption is consistent with the existing conditions along the corridor at adjacent intersecting north-south routes and provide a comparable baseline when considering which interchanges to construct first in the sequencing analysis.

Planned Grade Separation

The planned roadway network outlined in the CTP served as a starting point for developing analysis scenarios for this study. Within the study area, the CTP identifies planned overpasses at Pinebrook Road and Pleasant Valley Road. Grade-separated interchanges are identified at the following intersections with US Route, as shown in **Figure 2-3**:

- Northstar Boulevard
- Gum Spring Road/Arcola Boulevard
- Route 606/Loudoun County Parkway
- South Riding Boulevard
- Tall Cedars Parkway

Additionally, as part of the limited access ultimate condition, the CTP calls for termination of at-grade access to US Route 50 between Northstar Boulevard and the Fairfax County line. This planned condition affects several intersections with US Route 50, such as Elk Lick Road, Poland Road/Tanner Lane, Medical Drive, Pinebrook Road, etc. The remaining facilities would tie into the major arterials listed above for full access to US Route 50 or would have modified right-in/right-out (RIRO) only access onto and off of US Route 50.



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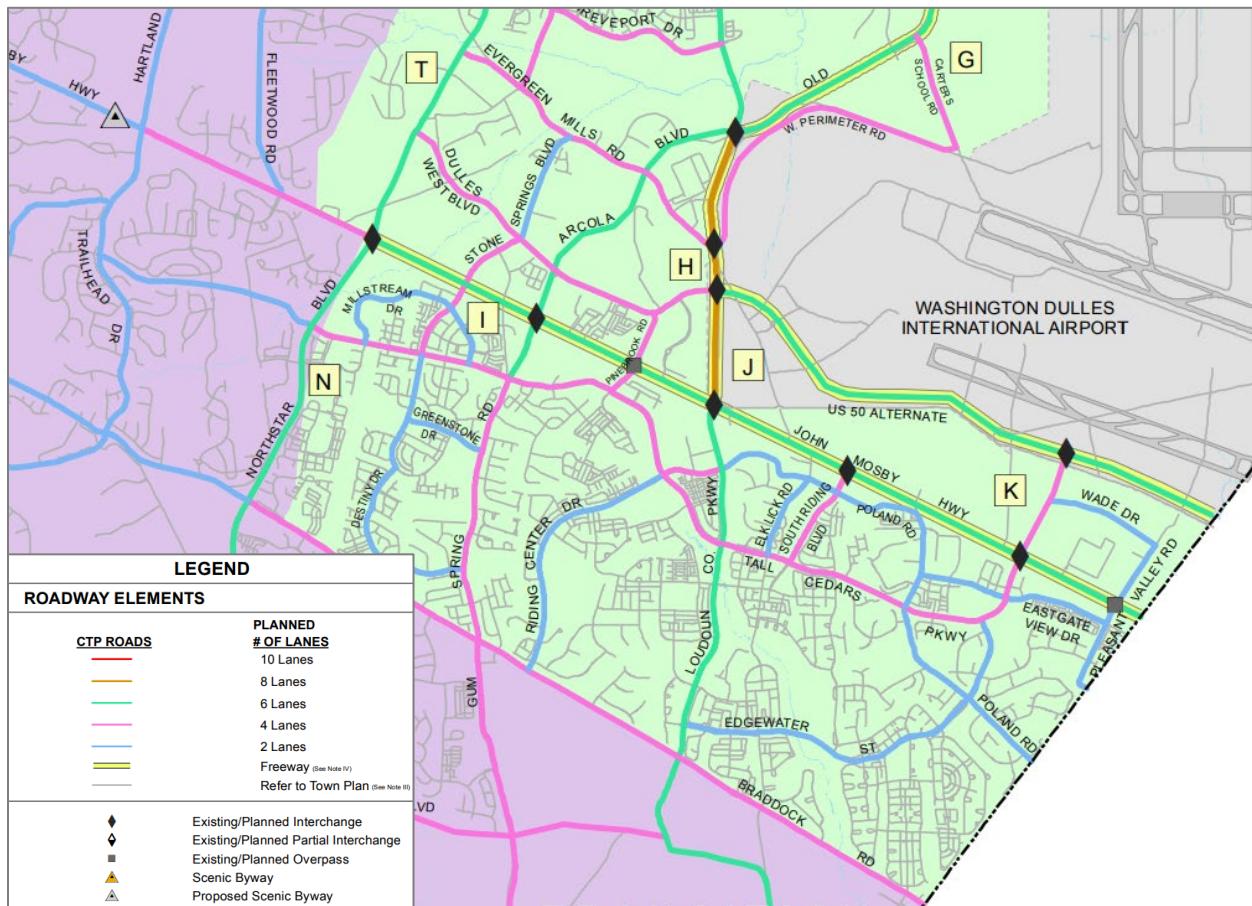


Figure 2-3 : 2019 Countywide Transportation Plan

Route 606 Improvements Sequencing

The CTP plans for additional capacity on Route 606 consisting of widening the facility to an ultimate cross section of eight lanes between US Route 50 and Arcola Boulevard and six lanes between Loudoun County Parkway and the Dulles Greenway. This facility is planned as a limited access median divided urban arterial, but local access, interchange locations and ultimate alignment are to be determined by later study with consideration of adjacent development. Tentative interchange locations have been proposed at the following locations:

- Route 606 at Dulles West Boulevard/ US Route 50 North Collector Road
- Route 606 at Arcola Mills Drive
- Route 606 at Arcola Boulevard

The proposed widening along Route 606 was factored into the parameters tested in this analysis to determine the sequencing of this improvement in relation to those proposed along and adjacent to the US Route 50 corridor. Proposed interchanges along Route 606 were not incorporated as any of the base conditions in these analysis scenarios.



2.2.2 Capital Improvement Program Funding

The Loudoun County Capital Improvement Program (CIP) outlines the available funding for infrastructure projects over the next six years. Projects included in this funding plan have been prioritized by the County and have the greatest likelihood of implementation in comparison to projects that are not programmed for funding. As such, CIP funding influenced the proposed sequencing of roadway projects. The following projects in **Table 2-1** have funding identified for study, preliminary engineering, or construction over the next six years, or were funded completely in a prior years CIP and are nearing construction completion.

Table 2-1. US Route 50 Corridor Projects in CIP FY23-28 or Recently Completed

No.	Roadway	Limits	Project Status ¹
1	Arcola Boulevard	US Route 50 to Route 606	Design complete, partial construction underway
2	Arcola Mills Drive, Segment 1	Belmont Ridge Road to Stone Springs Boulevard	Design procurement underway
3	Arcola Mills Drive, Segment 2	Stone Springs Boulevard to Loudoun County Parkway	Funding anticipated beyond 2028
4	Belmont Ridge Road	Arcola Mills Drive to Evergreen Mills Road	Funding anticipated beyond 2028
5	Braddock Road, Segment 1	Royal Hunter Drive to Gum Spring Road	Design and right-of-way acquisition underway
6	Braddock Road	Whitman Farm to Paul VI Eastern Entrance	Construction complete
7	Braddock Road, Segment 2	Paul VI Eastern Entrance to Loudoun County Parkway	Under design
8	Dulles West Boulevard	Northstar Boulevard to Arcola Boulevard	Design complete, right-of-way acquisition underway
9	Evergreen Mills Road	Reservoir Road and Watson Road	Design and right-of-way underway
10	Northstar Boulevard	Shreveport Drive to US Route 50	Right-of-way acquisition underway
11	Northstar Boulevard	US Route 50 to Tall Cedars Parkway	Construction underway
12	Northstar Boulevard (widening)	Tall Cedars Parkway to Braddock Road	Under design
13	US Route 50 North Collector Road	Tall Cedars Parkway to Route 28	Study underway

¹ Project status reported as of December 2022.

Note that given the construction of Northstar Boulevard and Arcola Boulevard, two new north-south connections will be added to US Route 50 that are not currently present. In addition, east-west capacity will be improved through the new facility parallel to US Route 50 between Northstar Boulevard and Route 606 (Dulles West Boulevard) and widening of Arcola Mills Drive. These projects will greatly enhance the network connectivity in the study area and help



distribute traffic more efficiently. Chapter 3 discusses the impact of this network connectivity on US Route 50 traffic.

2.2.3 “Constrained CTP” Overview

For conservative analysis purposes, in the event that the full CTP is not built out by 2040, seven scenarios assumed a constrained CTP network. This constrained CTP network only included existing CTP roadways, roadways with programmed funding through the County CIP, and improvements listed in the regional Constrained Long-Range Transportation Plan (CLRP). Major study area roadway improvements included are:

- Construct Arcola Boulevard to four lanes between US Route 50 and Route 606
- Construct Dulles West Boulevard to four lanes between Northstar Boulevard and Arcola Boulevard
- Widen Belmont Ridge Road to four lanes between Arcola Mills Drive and Evergreen Mills Road
- Widen Arcola Mills Road to four lanes between Belmont Ridge Road and Loudoun County Parkway
- Construct Northstar Boulevard to four lanes between Tall Cedars Parkway and Shreveport Drive
- Widen Northstar Boulevard to four lanes between Tall Cedars Parkway and Braddock Road
- Widen Braddock Road from two to four lanes, between Royal Hunter Drive and Gum Spring Road, and from Whiteman farm to the Fairfax County Line

2.2.4 US Route 50 and 606 Interchange

An interchange at US Route 50 and Route 606/ Loudoun County Parkway is identified in the CIP for design services but was not included in the constrained CTP projects listed previously. This is because it was explored in the sequencing analysis to determine which of the planned interchanges along US Route 50 may experience the most demand first, based on a variety of other changing parameters. This will be discussed further in later chapters.

2.2.5 North Collector Road Overview

The eastern segment of the US Route 50 North Collector Road is currently included in the Loudoun County CIP and is currently undergoing a feasibility study to identify a potential alignment, subject to change, as shown in **Figure 2-4**:

The project description consists of a four-lane, median-divided roadway within an 80-foot right-of-way. Where portions of the facility are located on MWAA property, the facility will be required to be placed in an easement. The preliminary alignment concept primarily follows the border of the MWAA property line, so as to minimize right-of-way impacts to the airport and to existing developments.

Chapter 3 provides an overview of traffic forecasts for the facility (and its impact on US Route 50 traffic) depending on its level of build-out as well as the presence of other external facilities.

Chapter 4 then discusses further considerations related to the North Collector Road, including access at its western terminus and along its route, as well as environmental and historic resources issues that may arise.



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The CTP currently includes the entire length of the North Collector Road between Route 606 and Route 28; however, this study will only explore the segment east of Tall Cedars Parkway based on direction from the County and MWAA. The future of the western segment is unknown as this time.



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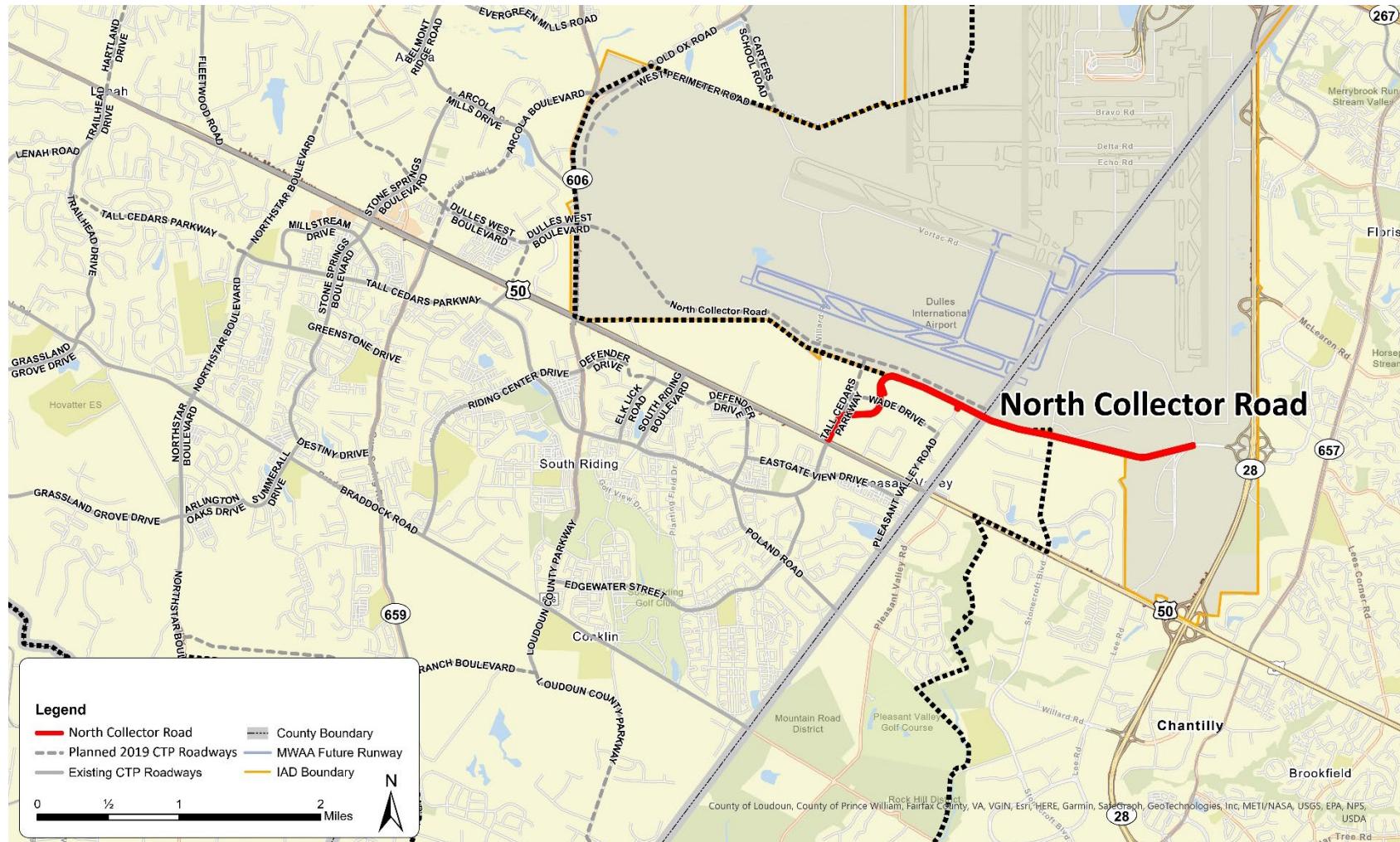


Figure 2-4: North Collector Road (NCR) Preliminary Alignment



2.2.6 Loudoun County Transit Service in the Study Area

The US Route 50 corridor is a key commuting corridor within Loudoun County and is served by multiple Loudoun County Transit (LCT) routes:

- Commuter bus service from the Dulles South park-and-ride lots in the Stone Ridge area (just west of Stone Springs Boulevard and just south of US Route 50) and from the East Gate park-and-ride lot (off Tall Cedars Parkway just south of US Route 50 near the County's eastern border).
- Silver Line bus service from this corridor is provided by two routes:
 - Route 381 (South Riding) provides service at East Gate Park & Ride Lot, Mercure Circle, and Dulles South Multipurpose Center to connect to the Loudoun Gateway Metro Station.
 - Route 382 (Stone Ridge) provides service along Pinebrook Road, Millstream Drive, Stone Springs Hospital, Gum Spring Road and Tall Cedars Parkway to connect to the Loudoun Gateway Metro Station.

Transit service along the corridor, both commuter bus service and the local Metro Connect service, utilizes US Route 50 to connect to Route 28 and ultimately to the Dulles Toll Road to access destinations in the Reston/Herndon area and beyond. This transit service is made less attractive as congestion continues to grow along US Route 50 at the eastern end of Loudoun County and into Fairfax County.

2.2.7 Programmed Intersection Improvements

Based on the US Route 50 Short-Term Study, and other County identified improvements, Loudoun County has programmed several intersection improvements as follows:

- US Route 50 and Pleasant Valley Road – converting a westbound left turn lane to an auxiliary through lane running to Tall Cedars Parkway
- US Route 50 and Arcola Boulevard/Gum Spring Road – Addition of a second eastbound US Route 50 left-turn lane to northbound Arcola Boulevard and extension of the existing turn lane

2.2.8 US Route 50 Corridor Property Access Review

While the timeline for the need to evolve the US Route 50 corridor to a fully limited access facility is uncertain, it is still advisable to reduce the number of direct access points along US Route 50, which will eliminate conflict points to improve safety and reduce friction along the corridor. A preliminary investigation of property access was performed to understand how access could be modified based on the implementation of limited access restrictions and the proposed North Collector Road. **Figure 2-5** and **Figure 2-6** show a preliminary alignment for the proposed North Collector Road, future interchange locations, and the resulting potential changes to property access. In areas where interchanges are proposed, multiple parcels may lose direct access to US Route 50. In some instances, additional access roads will be required to make these connections, which have been displayed via orange links in **Figure 2-5** and **Figure 2-6**. Any parcel that may lose access is marked with a red circle to display a potential future cul-de-sac.

The US Route 50 North Collector Road would provide an alternate route for properties that currently have access only on US Route 50, east of Tall Cedars Parkway. West of Route 606, the additional network provided by Arcola Boulevard, Northstar Boulevard, and Dulles West Boulevard presents many opportunities to redirect localized access along US Route 50 to these



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arterial and collector facilities. Multiuse trail and sidewalk facilities exist along Tall Cedars Parkway south of US Route 50 and on Air and Space Museum Parkway east of Route 28 that this project could connect to and improve bicycle and pedestrian access and mobility within the region.

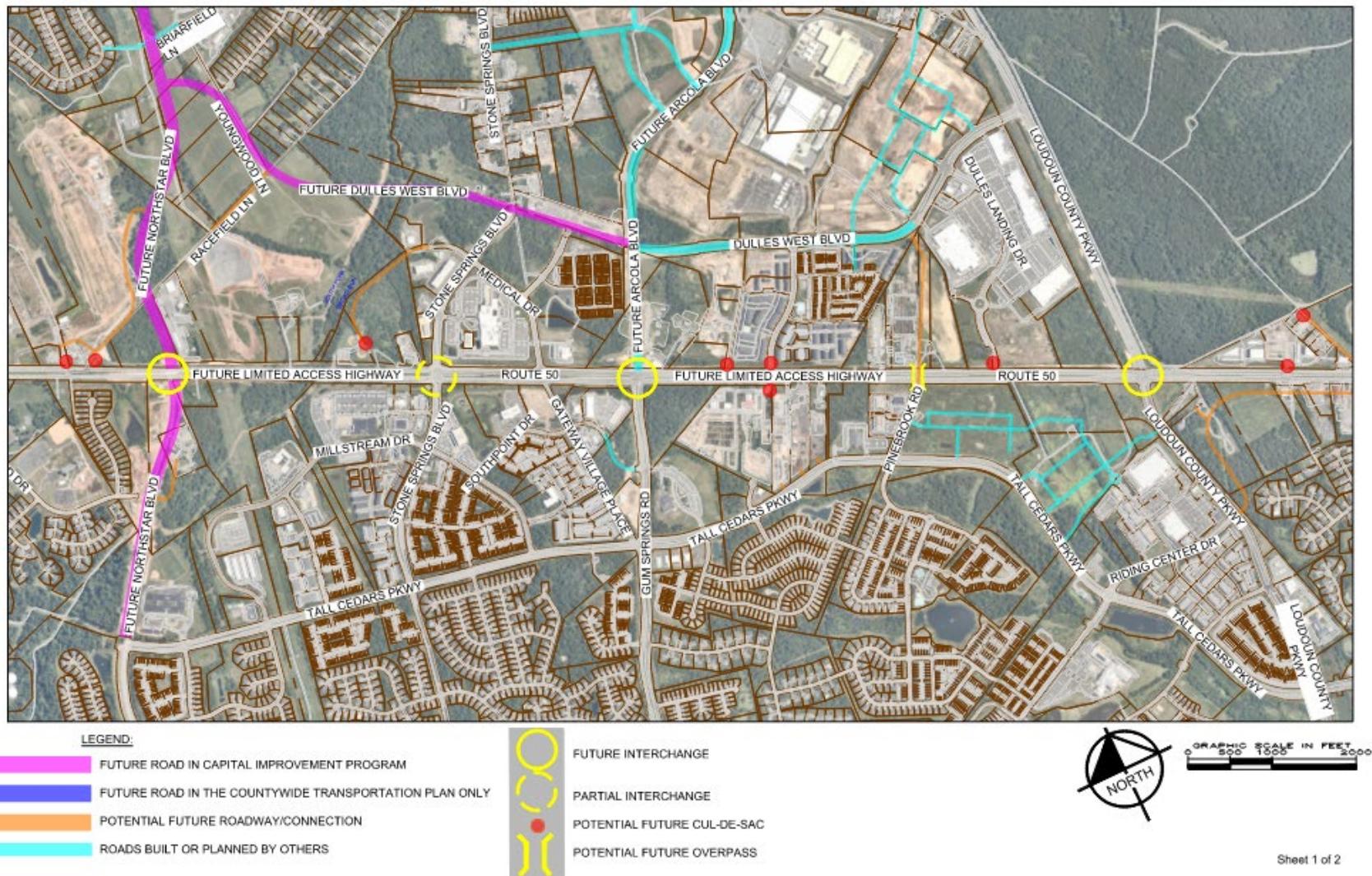


Figure 2-5: US Route 50 Property Access Review (West of Route 606)



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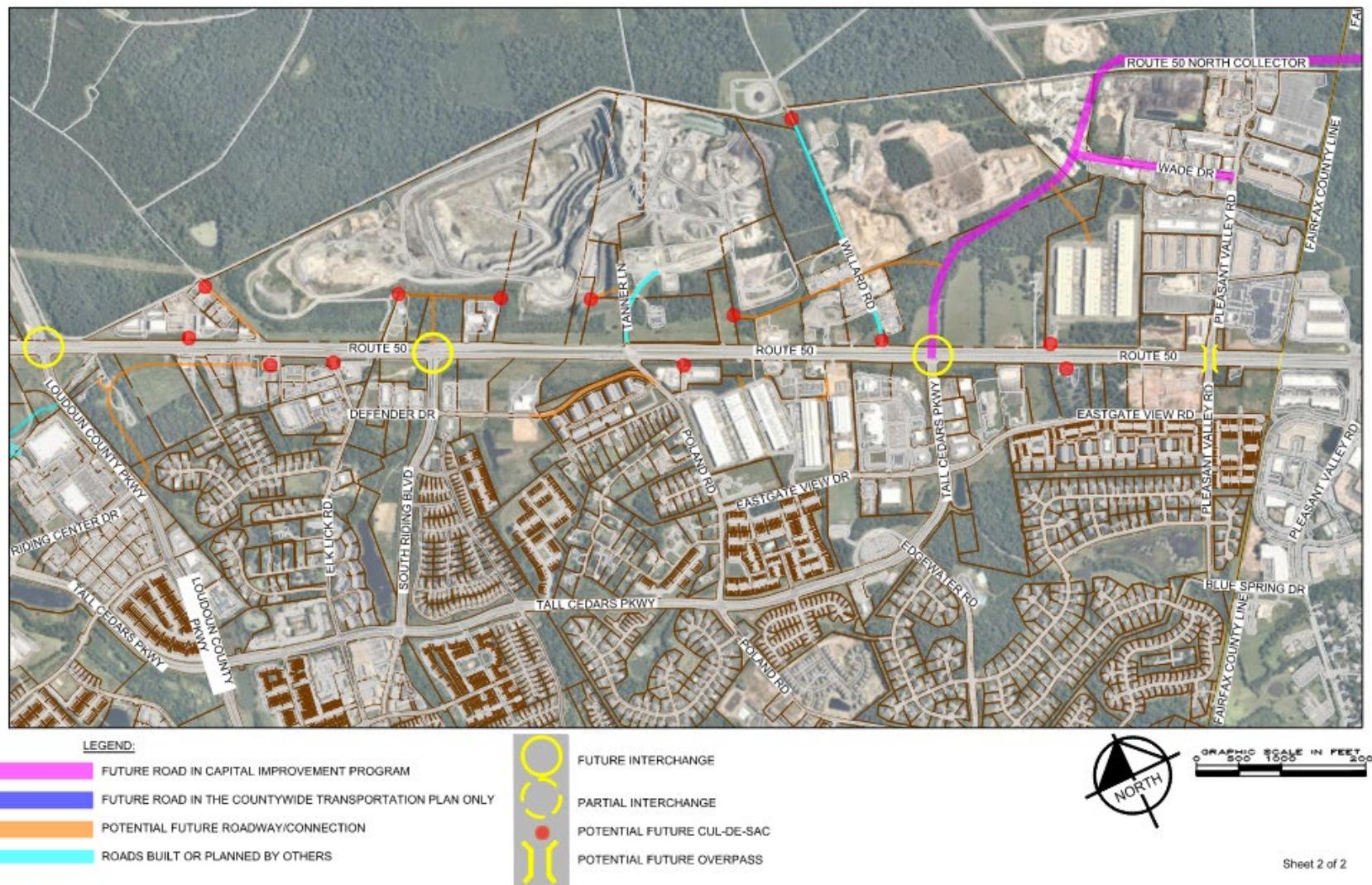


Figure 2-6: US Route 50 Property Access Review (East of Route 606)



2.3 Influences from Other Jurisdictions/Agencies/Projects

The US Route 50 corridor study area is located at the far southeast corner of Loudoun County, directly adjacent to Fairfax County but also just a few miles north of Prince William County.

Additionally, it is located immediately south of Dulles International Airport, where the MWAA owns over 20 square miles of federally regulated land. The plans and actions of these external parties have a significant influence on US Route 50 corridor travel.

2.3.1 Fairfax County

The effectiveness of improvements to US Route 50 in Loudoun County, east of Route 606, is largely dependent upon improvement to US Route 50 in Fairfax County. VDOT and developers recently widened US Route 50 to complete a six-lane cross section from Stone Springs Boulevard to the Fairfax County line. While this provided additional queuing capacity within the County, the morning commuter traffic continues to experience congestion in the eastbound direction due to queuing spillback from the delay experienced at signalized intersections along the segment approaching the US Route 50/Route 28 interchange in Fairfax County. Fairfax County has no plans to construct additional capacity, interchanges, or limited access conversions between the Loudoun County line and Route 28. However, without increasing east-west travel capacity in Fairfax County, major improvements to the west will only increase the rate at which traffic can reach the end of the queue.

Fairfax County's Comprehensive Plan Transportation Map does show capacity improvements in the area. As shown in **Figure 2-7**, Braddock Road is planned to be widened to four lanes and realigned with Old Lee Road. However, in discussions with Fairfax County staff, it has been expressed that funding has not been allocated to this improvement, and there is not a schedule associated with the project. Two interchanges are proposed along US Route 50 in Fairfax County, at Centreville Road and Fairfax County Parkway, but both are located east of Route 28 and require further study. As such, Loudoun County cannot rely on this additional capacity south or east of US Route 50 and is exploring other opportunities to relieve the east-west commuter congestion, like the US Route 50 Collector Road.

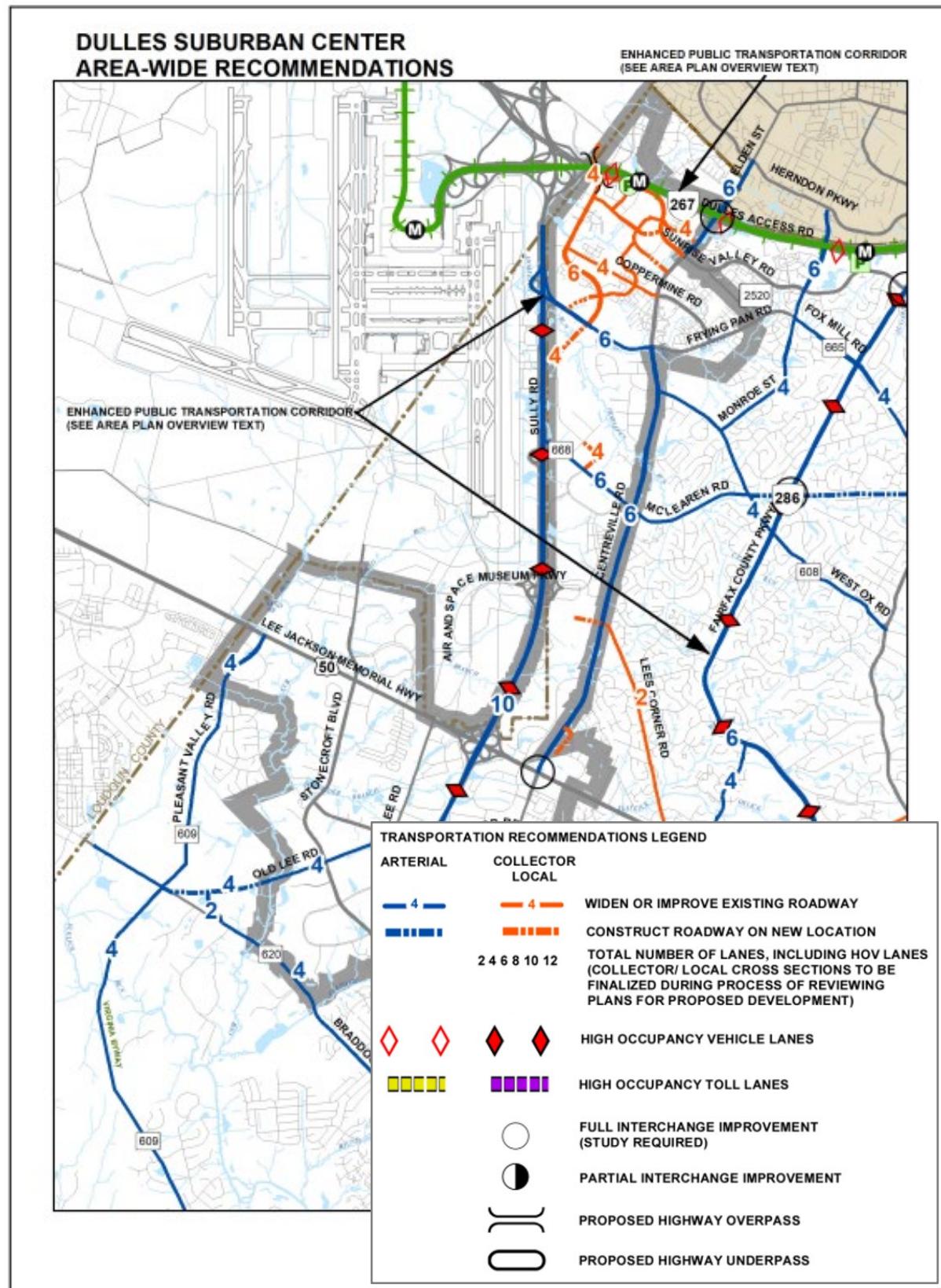


Figure 2-7: Fairfax County 2017 Comprehensive Plan- Dulles Suburban Center Transportation Recommendations



2.3.2 Prince William County

The existing and planned transportation connections to Prince William County will impact regional travel patterns and will influence the sequence of infrastructure improvements needed along the US Route 50 corridor in Loudoun County. Over decades of regional transportation planning, two parkways have been proposed to provide more north-south connections between Loudoun County and Prince William County; the Bi-County Parkway and the Tri-County Parkway. Loudoun, Prince William and Fairfax Counties, despite their large growing populations, are primarily connected by two-lane rural roads, putting strain on Route 28 and Route 15 to serve all north-south travel demand. If constructed, the Bi-County Parkway would be a limited access corridor extending the Route 234 Bypass in Prince William County from its terminus at I-66 north to Northstar Boulevard at US Route 50 in Loudoun County. The Tri-County Parkway, if constructed, would be a new facility between Loudoun County Parkway and Godwin Drive in Manassas, connecting Loudoun County, Fairfax County, and Prince William County. Based on the recent update to the Prince William County Comprehensive Plan and draft Transportation Plan, dated December 5, 2022, Prince William County is planning to construct their portion of the Tri-county Parkway in what is referenced as the Route 28 Bypass. Loudoun County and the MWCOG CLRP both recognize the Bi-County Parkway in their plans and associated transportation models however, Prince William County does not show the Bi-County Parkway, as can be seen in **Figure 2-8**. The presence of this corridor in the future greatly affects the travel patterns into and out of Loudoun County and will impact the decisions regarding infrastructure improvements along the US Route 50 corridor. As such, it was explored as a variable parameter in the various scenarios analyzed in this study.

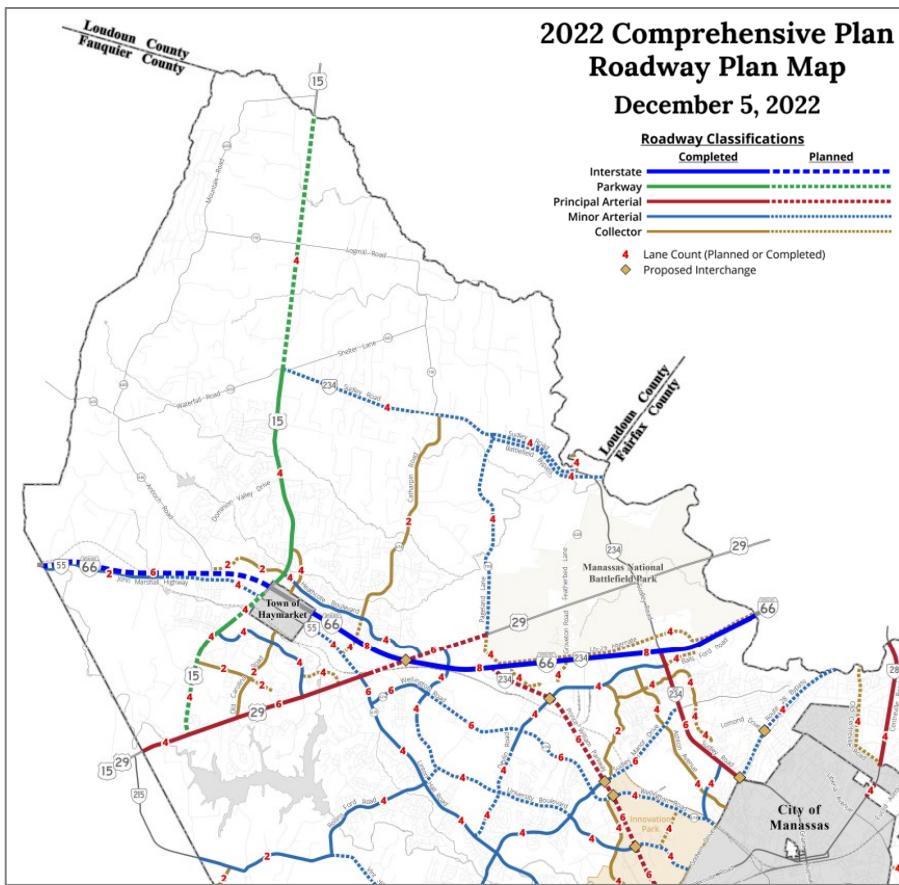


Figure 2-8: Prince William County Transportation Plan (Drafted December 5, 2022)

2.3.3 MWAA

The proposed North Collector Road alignment requires a public easement on MWAA property to allow for roadway construction and maintenance. The proposed alignment is intended to follow the southern border of the MWAA property line and is located south of the future planned fifth runway. As the North Collector Road travels east towards Route 28, it would cross through the Udvar-Hazy Center property, a Smithsonian Institute facility leased from MWAA. The North Collector Road would tie into Air and Space Museum Parkway and connect with the existing interchange with Route 28. This further emphasizes that cooperation from MWAA will be paramount to move this project forward.

Should the project receive support from MWAA, and granted a public easement, the facility would be constructed on federal property, and therefore subject to federal review processes, regardless of the funding sources.

Plans for MWAA Property

MWAA owns a large sector of land in Loudoun County, some of which is not planned for future airport use. There are two land areas currently available for lease along the Route 606 corridor, ideal for data center, warehouse, retail, and other non-residential commercial uses. These include: (1) 160 acres adjacent to Route 606, east of Route 606 and north of US Route 50 and (2) 68 acres adjacent to the future Loudoun Gateway Metro Station. Additionally, the MWAA Board of Directors voted in September 2019 to approve the sale of 424 acres adjacent to the airport and east of Route 606, known as Western Lands, to a global provider of data center, colocation,



and interconnection solutions. Development of these parcels could affect travel patterns in the area and will need to be considered when developing a proposed alignment for the US Route 50 Collector Road. Should MWAA choose to develop other parcels on their property, there could be additional impacts on the future roadway alignments and access in that area. MWAA is currently in the process of updating the Dulles International Airport Master Plan. The plan is in the Alternatives Development phase of the process, and the outcomes of this plan should be reviewed closely upon completion to determine any further impacts on the North Collector Road alignment. The plan will likely be released in the later part of 2023. Given these land use plans in the direct vicinity of the collector road alignment, this study has been focused solely on the segment of the North Collector Road from Tall Cedars Parkway east to Route 28.

2.3.4 Route 28 Corridor Improvements

Route 28 is a primary north-south corridor that provides access to the main east-west arteries into the employment centers east of Loudoun County. The Dulles International Airport creates a barrier for east-west roadways between Loudoun County and Fairfax County, and US Route 50 is the primary route in the Dulles South area for commuters to travel east. Since US Route 50 is congested in Fairfax County, many travelers use Route 28 to access the Dulles Toll Road to the north or I-66 to the south. It should be noted that the Dulles Toll Road has HOV-2+ (High Occupancy Vehicle – 2+ passengers) lanes, and I-66 has recently been widened to include 2 Express Lanes (HOV-3+ [High Occupancy Vehicle – 3+ passengers] and toll) and three to four general purpose lanes.

Many improvements have been implemented to the Route 28 corridor. Route 28 has been converted to a limited access facility from Route 7 to I-66. The previously remaining signalized intersections along this stretch of roadway, at Braddock Road/Walney Road and at EC Lawrence Park just north of the I-66 interchange, were removed as part of the I-66 Outside the Beltway project to complete the limited access facility. Interchange improvements are also being constructed at Route 28 and I-66 as part of the I-66 project to provide improved access to and from each facility, including the newly constructed I-66 express lanes. The cross section of the Route 28 corridor is ultimately planned in the Fairfax County Comprehensive Plan Transportation Map (**Figure 2-7**) and the CTP for four general purpose lanes and one High Occupancy Vehicle (HOV) lane in each direction, from Route 606 to I-66. These general-purpose lane capacity improvements have been implemented and no additional widening is planned at this time. HOV lanes are planned but have not been incorporated. A safety and operations study was completed in 2021 to evaluate improvements to the interchange at Route 28 and Dulles Toll Road. This resulted in recommendations to reconfigure access along Route 28 between Frying Pan Road and Route 606, including modifications to the adjacent arterial and collector roadway network. Multiple state and regional funding sources are being explored to advance this project into implementation.

2.3.5 Dulles Loop Implementation Plan

The Dulles Loop Implementation Plan was undertaken in 2009 by the Dulles Loop Implementation Group, the Dulles Area Transportation Association, and the Washington Airport Task Force to develop a plan for improving the 18-mile loop (shown in **Figure 2-9**) that encircles the Dulles International Airport (IAD). This loop includes US Route 50, Route 606, and Route 28. The operation and capacity of this loop was recognized as critical to the flow of regional traffic. The CTP also references this Dulles Loop as a Motor Vehicle Plan Policy, stating the commitment to support the implementation of this loop road. Along US Route 50, the implementation plan called for US Route 50 to become a free-flowing, limited access facility with continuous parallel



collector roads. Other US Route 50 recommendations from the Dulles Loop Implementation Plan included grade-separated crossings at all streets intersecting US Route 50 and the preservation of right of way for a future transit alternative. As this study has shown, turning US Route 50 into a limited access facility will not provide significant capacity improvements without improvements in Fairfax County. As such, the US Route 50 North Collector Road could provide the capacity via a parallel route to address the goals of this plan.



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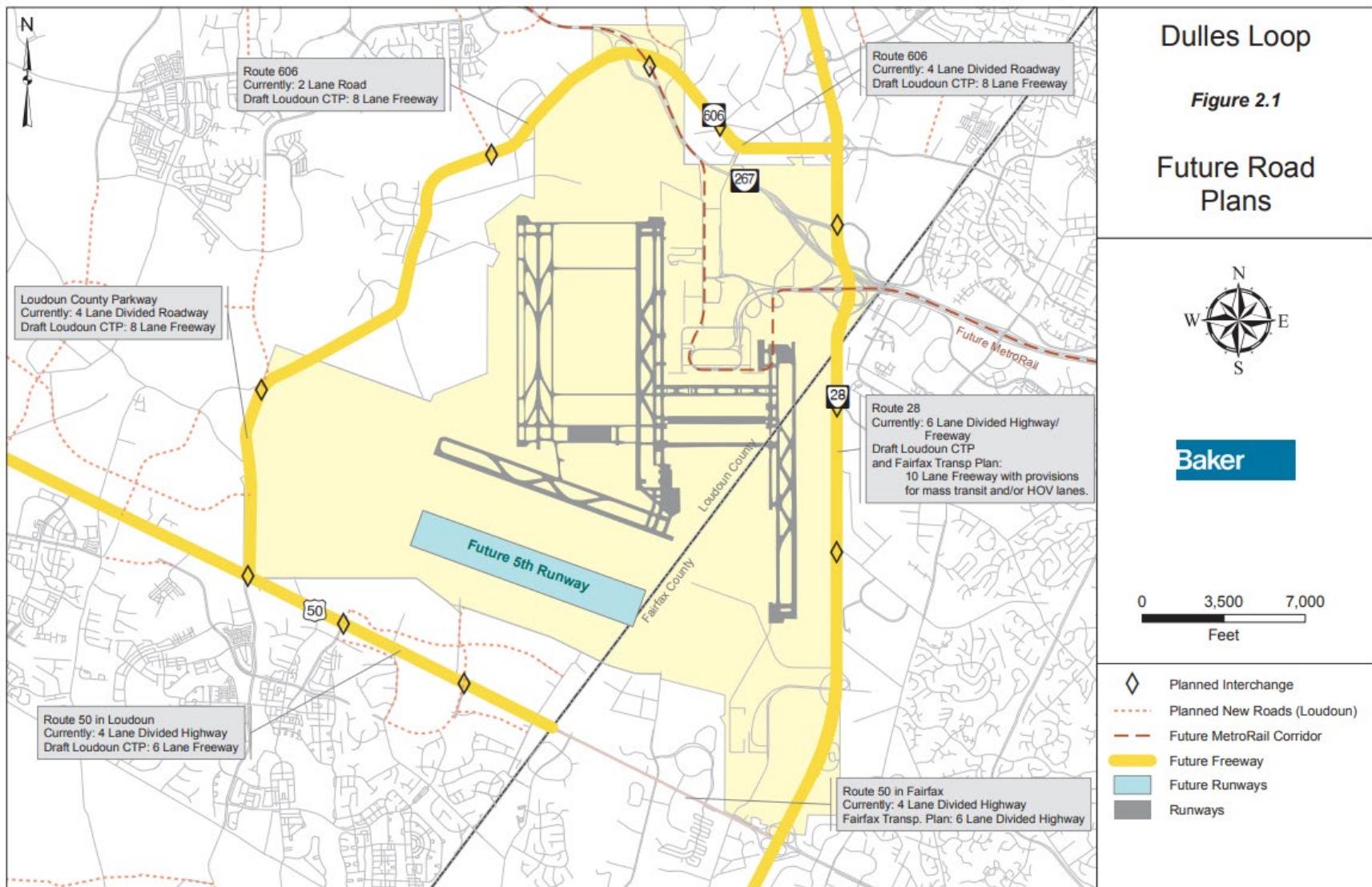


Figure 2-9: Dulles Loop (Source: Dulles Loop Implementation Plan Report, 2009)



3 ROADWAY NETWORK SCENARIOS AND TRAFFIC FORECASTING

The US Route 50 study area is unique given the many unbuilt and incomplete roadway facilities adjacent to it, uncertainty regarding future connections to Prince William County to the south, and quickly evolving land uses and travel patterns associated with the expansion of the Silver Line Metro into Loudoun County. In order to develop a program for implementation of unbuilt roadway facilities in Loudoun County, several roadway network build-out scenarios were developed as part of the TDM effort. Select model run scenarios were used to assess the sensitivity of the network to various improvements and prioritize improvements based on those traffic impacts. This process was conducted with the understanding that the CTP network includes several new roadway facilities or roadway expansions that do not have near-term funding and are unlikely to be fully implemented even within a 20-year timeframe. However, the County's current CIP and the regional CLRP can provide a view of improvements both within the County and adjacent to the County that are currently prioritized for implementation.

Additionally, the priorities of nearby jurisdictions to the US Route 50 corridor (Fairfax County, Prince William County, and MWAA) can shed further light on priorities outside of Loudoun County that affect the flow of traffic along US Route 50 within the County. This chapter describes the several network build-out scenarios that were examined and the subsequent impacts of the roadway network on future traffic in the study area, ultimately providing recommendations for the likelihood of needing grade-separated interchanges at targeted intersections.

3.1 Network Scenarios

A series of roadway network configurations was developed to examine various combinations of future network improvements. Due to the significant number of potential improvements, an exhaustive sensitivity analysis of all potential combinations was neither appropriate nor feasible; rather, the following scenarios were chosen based on discussions with County staff and an understanding of adjacent agencies' current plans for roadway network improvements. These scenarios allow for "with/without" comparisons for some of the most impactful facilities on study area traffic.

3.1.1 Baseline Scenario Network Components

Network scenarios have been categorized based on network build-out (Full CTP vs Constrained CTP scenarios) and combinations of network components that vary between the scenarios (North Collector Road, Route 606 Widening, and Bi-County Parkway). The Constrained CTP baseline scenario includes the existing roadway network plus improvements that are included within the CTP and that have funding allocated in the CIP, as listed in **Table 3-1**. The Full CTP scenario on the other hand, includes all improvements that are shown in the CTP and is not constrained by a fiscal budget allocation. This included construction of multiple grade separated interchanges or overpasses along US Route 50 and expansion of the surrounding roadway network. The exception to this was the exclusion of the North Collector Road, Bi-County Parkway, and Route 606 Widening projects which were not included so that they could be alternated in and out of the network within the scenarios to understand their individual or combined effects on travel patterns.

The use of these two different baselines provides a good comparison between what is most likely to be the future condition based on currently programmed projects and what could potentially be the future condition if all envisioned projects come to reality. **Figure 3-1** provides a summary



of the current CTP and CIP projects surrounding the study corridor. Based on this information, the resulting baseline scenarios modeled within the network for the Constrained CTP and Full CTP are shown in **Figure 3-2** and **Figure 3-3**.

Table 3-1: Constrained CTP Scenario Background Projects

Project	Limits	Laneage
Arcola Boulevard	US Route 50 to Route 606	4 lanes
Dulles West Boulevard	Northstar Boulevard to Arcola Boulevard	4 lanes
Belmont Ridge Road widening	Arcola Mills Drive to Evergreen Mills Road	4 lanes
Arcola Mills Road widening, Segment 1	Belmont Ridge Road to Stone Springs Boulevard	4 lanes
Arcola Mills Drive widening, Segment 2	Stone Springs Boulevard to Loudoun County Parkway	4 lanes
Northstar Boulevard	US Route 50 to Tall Cedars Parkway	4 lanes
Northstar Boulevard	Shreveport Drive (Evergreen Mills Road) to US Route 50	4 lanes
Northstar Boulevard widening	Tall Cedars Parkway to Braddock Road	4 lanes
Braddock Road widening, Segment 1	Royal Hunter Drive to Gum Spring Road	4 lanes
Braddock Road widening, Segment 1B	Whiteman Farm to Paul VI Eastern Entrance	4 lanes
Braddock Road widening, Segment 2	Paul VI Eastern Entrance to Loudoun County Parkway	4 lanes



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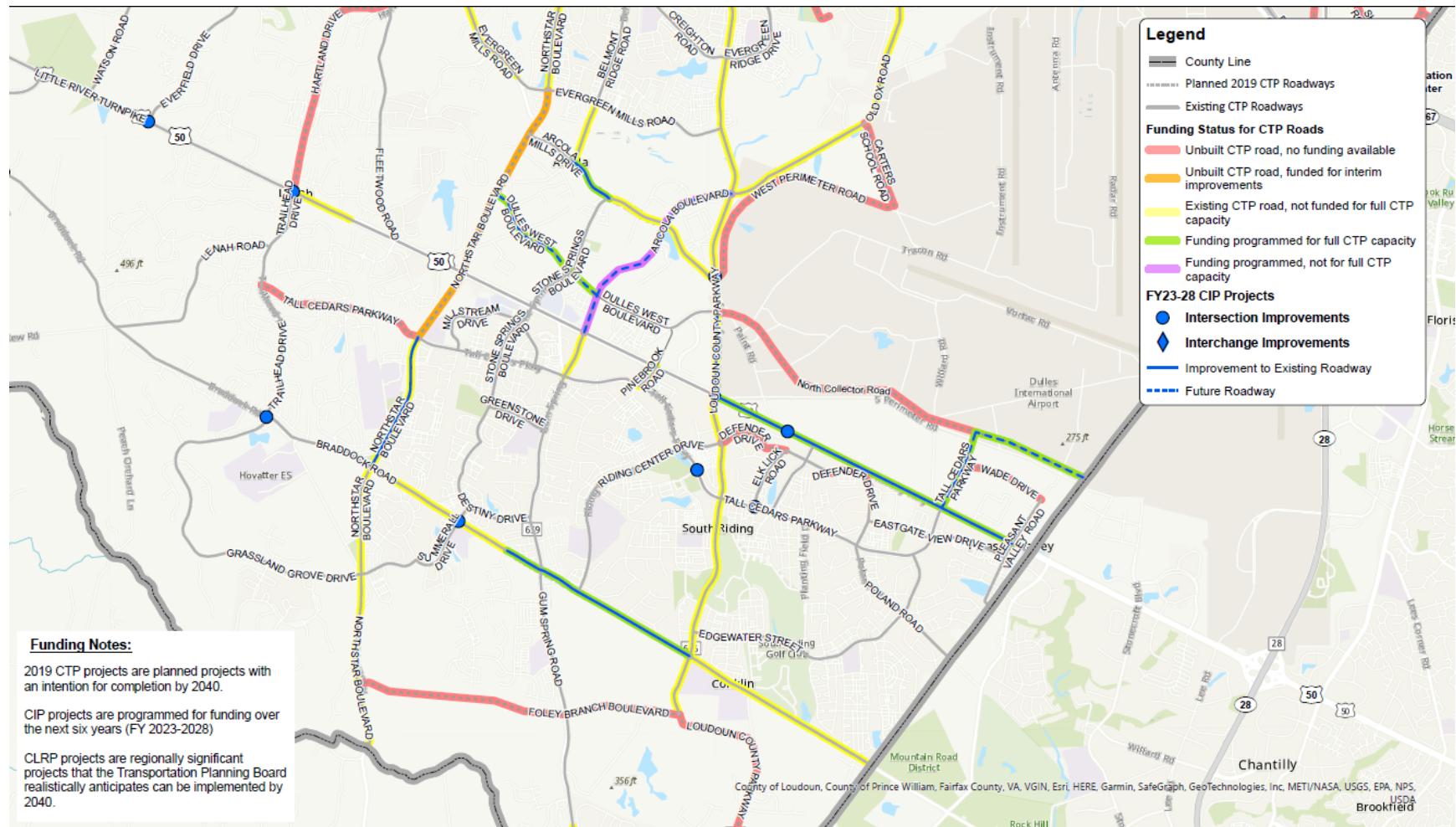


Figure 3-1: Planned Transportation Improvements and Funding Status



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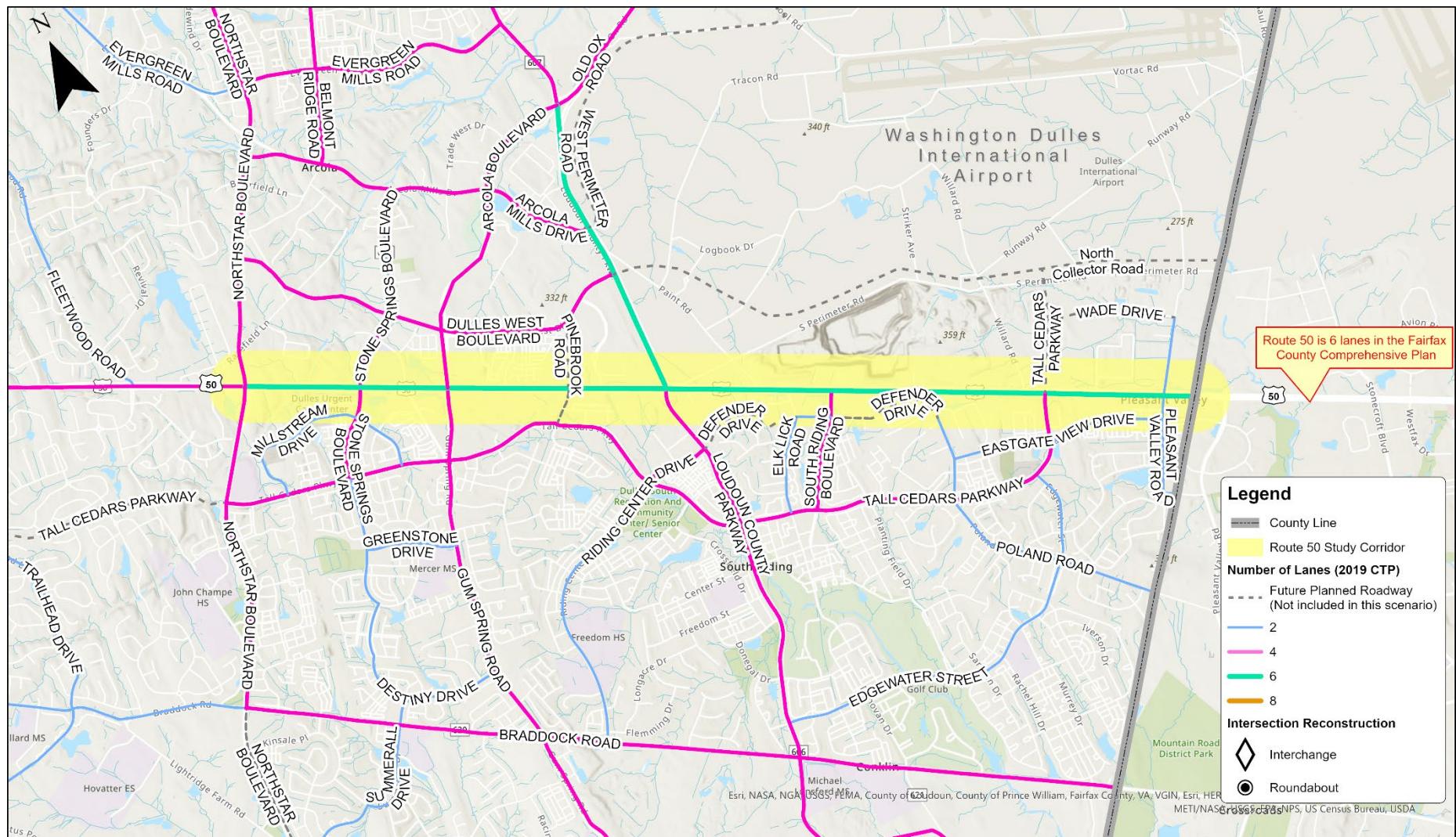


Figure 3-2: 2040 Constrained CTP Network



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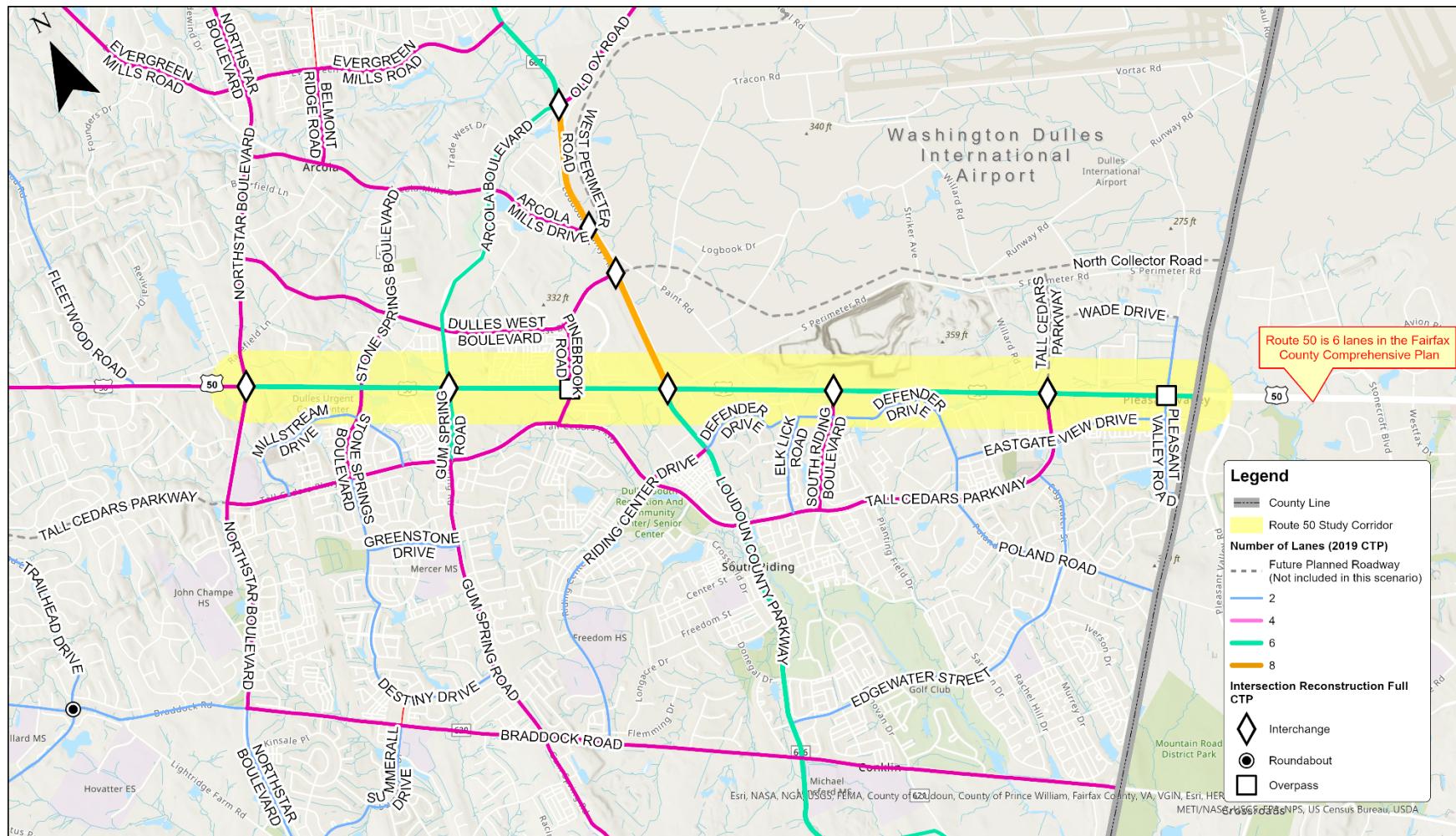


Figure 3-3: 2040 Full CTP Build Out Network



3.1.2 Build-Out Scenario Network Components

The two baseline scenarios, Constrained CTP and Full CTP, became the foundation off which all fourteen network scenarios evaluated as part of this study were built. The fourteen scenarios modeled as part of this study are summarized in Table 3-2. Scenarios 1-6 & 12 represent the scenarios based on the Constrained CTP and scenarios 7-11 & 13-14 represent those based on the Full CTP. A description of the three improvements that varied between each scenario is included below:

- North Collector Road: Proposed new alignment four-lane roadway between the current terminus of Tall Cedars Parkway at US Route 50 and the existing interchange of Air and Space Museum Parkway and Route 28.
- Route 606 Widening: Proposed widening of Route 606 (Old Ox Road) from Loudoun County Parkway to the Dulles Greenway (Route 267) to six lanes. In scenario 13 only, Route 606 assumed to be widened to eight lanes.
- Bi-County Parkway: Regional improvements to include a four-lane facility mostly along Route 705, beginning in Loudoun County along Northstar Boulevard and ending in Prince William County, at the existing interchange of I-66 and Prince William County Parkway.

Table 3-2. Roadway Network Scenarios and Scenario IDs

	Scenario ID	Scenario Name	Loudoun County Network Improvements		Regional Improvements
			North Collector Road Segment 1	Route 606 Widening	
Constrained CTP	1	Constrained CTP			
	2	Constrained CTP + Route 606 Widening		✓	
	3	Constrained CTP + Bi-County Parkway			✓
	4	Constrained CTP + North Collector Road (Tall Cedars Parkway to Route 28)	✓		
	5	Constrained CTP + North Collector Road (Tall Cedars Parkway to Route 28) + Bi-County Parkway	✓		✓
	6	Constrained CTP + North Collector Road (Tall Cedars Parkway to Route 28) + Route 606 Widening + Bi-County Parkway	✓	✓	✓
	12	Constrained CTP + North Collector Road (Tall Cedars Parkway to Route 28) + Route 606 Widening	✓	✓	
Full CTP	7	Full CTP			
	8	Full CTP + Route 606 Widening		✓	
	9	Full CTP + Bi-County Parkway			✓
	10	Full CTP + Route 606 Widening + Bi-County Parkway		✓	✓
	11	Full CTP + North Collector Road (Tall Cedars Parkway to Route 28)	✓		
	13	Full CTP + Route 606 eight-lane widening		✓ [8 lane]	
	14	Full CTP + North Collector Road (Tall Cedars Parkway to Route 28) + Route 606 widening	✓	✓	



3.2 Traffic Forecasting and Analysis

3.2.1 Methodology

Traffic forecasts were developed and analyzed for the scenarios denoted in **Section 3.1.2** according to the following steps, which are also shown in **Figure 3-4**:

1. **Obtain baseline (existing) traffic volumes.** Baseline daily volumes were obtained from VDOT's online count book for 2019¹. Average annual weekday traffic (AAWDT) values were used rather than average annual daily traffic (AADT) values wherever possible to account for higher weekday volumes during commuting periods. Baseline weekday AM and PM peak hour turning movement volumes were obtained from DTCI which include traffic counts along the US Route 50 corridor from 2021. Traffic volumes collected in 2021 that were used as the baseline for the traffic forecasts for this study included a COVID adjustment in accordance with the VDOT guidance effective at the time they were collected.
2. **Conduct TDM runs for network scenarios.** The Loudoun County TDM (version 2020_05_v6) was used to derive future 2040-year growth for the corridor, which could be applied to the currently established baseline (year 2021) weekday daily and AM/PM peak hour volumes. TDM runs were conducted modifying the 2016 base year model to reflect 2019 geometry and land-use changes within the TDM study area. The TAZ's land use data was updated to reflect the most recent comprehensive plan. The roadway network within the TDM study area was also updated to reflect roadway improvements completed since the last model update. Finally, a high-level screenline forecast of the existing model was compared to existing AADT values to identify major discrepancies and where modifications to the facility type or other modeling parameters may be needed to keep the model more in line with current travel patterns. These modifications are listed below. A full validation of the model was not completed. TDM runs were conducted for various network scenarios described in Section 3.1.
 - US Route 50 updated from facility type 3 (Principal Arterial) to 4 (Major Arterial) from just west of Loudoun County Parkway to Pleasant Valley Road
 - Braddock Road updated from facility type 6 (Major Collector) to 8 (Local) from Gum Spring Road to Donavon Drive
 - Braddock Road updated from facility type 8 (Local) to 6 (Major Collector) from US Route 15 to Goshen Road
 - Loudoun County Parkway updated from facility type 6 (Major Collector) to 5 (Minor Arterial) from Braddock Road to US Route 50
 - Loudoun County Parkway updated from facility type 7 (Minor Collector) to 6 (Major Collector) from US Route 50 to Creighton Road
 - Tall Cedars Parkway updated from facility type 5 (Minor Arterial) to 6 (Major Collector) from US Route 50 to Goshen Road
 - Eastgate View Drive updated from facility type 6 (Major Collector) to 8 (Local) from Tall Cedars Parkway to Pleasant Valley Road (Loudoun County)

¹ [VDOT Traffic Data](#)



The 2040 Loudoun County Network was updated to reflect the network geometry for the Constrained CTP and Full CTP configurations.

- The Constrained CTP scenarios (scenarios 1-6 and scenario 12) reflected a modified underlying 2040 network configuration that included CTP projects with programmed funding through the County CTP. Specifically, no programmed interchanges were included along US Route 50 and Loudoun County Parkway/Old Ox Road within the study area.
- The Full CTP scenarios (scenarios 7-11 and 13-14) reflected all improvements that are included in the CTP and not constrained by budget. This network included no modifications to the underlying geometry of the 'out-of-the-box' Loudoun County TDM.

3. **Use TDM run results to produce daily screenline forecasts.** Daily volume forecasts were first developed using a process that estimates total volume across several links in parallel (referred to as screenlines). Screenline volumes are broader estimates of total regional flows. These screenline forecasts were then post-processed into estimated daily volume forecasts for individual links along US Route 50 and adjacent study area arterials. Separate forecasts were developed for each of the scenarios described in **Section 3.1.2**. **Section 3.2.2** describes the daily screenline volume development process in more detail.

4. **Use daily screenline forecasts to produce peak-hour turning movement estimates.** Once link-level forecasts were produced, these forecast volumes were converted to peak-hour approach and then turning movement forecasts using industry-standard processes outlined in NCHRP 765: *Analytical Travel Forecasting Approaches for Project-Level Planning and Design*. Separate forecasts were developed for the majority of the scenarios described in **Section 3.2.1**. **Section 3.2.3** describes the process of developing intersection turning movement volumes in more detail.

5. **Conduct capacity analysis.** This analysis utilized Synchro software to estimate future delay and level of service (LOS) along intersection approaches and overall delay/LOS for each signalized intersection planned for a future interchange in Loudoun County. These future delay/LOS estimates could then be used as a proxy for the level of need for a grade-separated interchange at each intersection depending on the network scenario. **Section 3.2.4** describes the results of the capacity analysis, and **Section 3.3** evaluates the need for interchanges at study area intersections for various network scenarios.

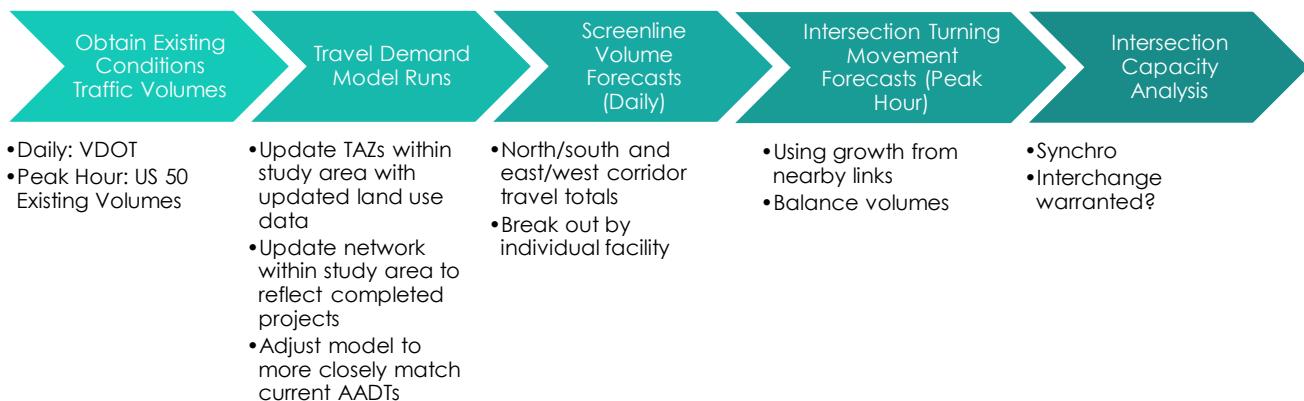


Figure 3-4. Traffic Forecasting and Analysis Process

3.2.2 Screenline Forecasting / Daily Link Volumes

The Loudoun County TDM was used in development of traffic forecasts. TDM runs were conducted using each model's 2019 base year and 2040 forecast year.

Given the adjacent parallel facilities to US Route 50 (Braddock Road, Tall Cedars Parkway, etc.), as well as the fact that some of the parallel and perpendicular facilities to US Route 50 have not yet been constructed (most notably the North Collector facility), traffic forecasts were first developed at a screenline level. Each screenline, representing the sum of traffic flows across several parallel links, is shown in **Figure 3-5**. Traffic forecasts were developed for three east-west screenlines (aggregate travel along east-west facilities) and two north-south screenlines (aggregate travel along north-south facilities). The roadways comprising each screenline are listed in **Table 3-3**, including facilities that are incomplete or not yet built as of 2022. The total daily forecast volumes, represented as annual average weekday traffic (AAWDT) for each screenline in each scenario, are provided in **Table 3-4**. Since the North Collector Road was not included in the screenlines listed in **Table 3-3**, a separate row in **Table 3-4** was added to show the volumes on North Collector Road. Full forecast volumes for individual facilities in each scenario are provided in **Appendix A**. A discussion of differences between forecast volumes for various scenarios is contained in the following section and shown graphically in **Appendix A**.



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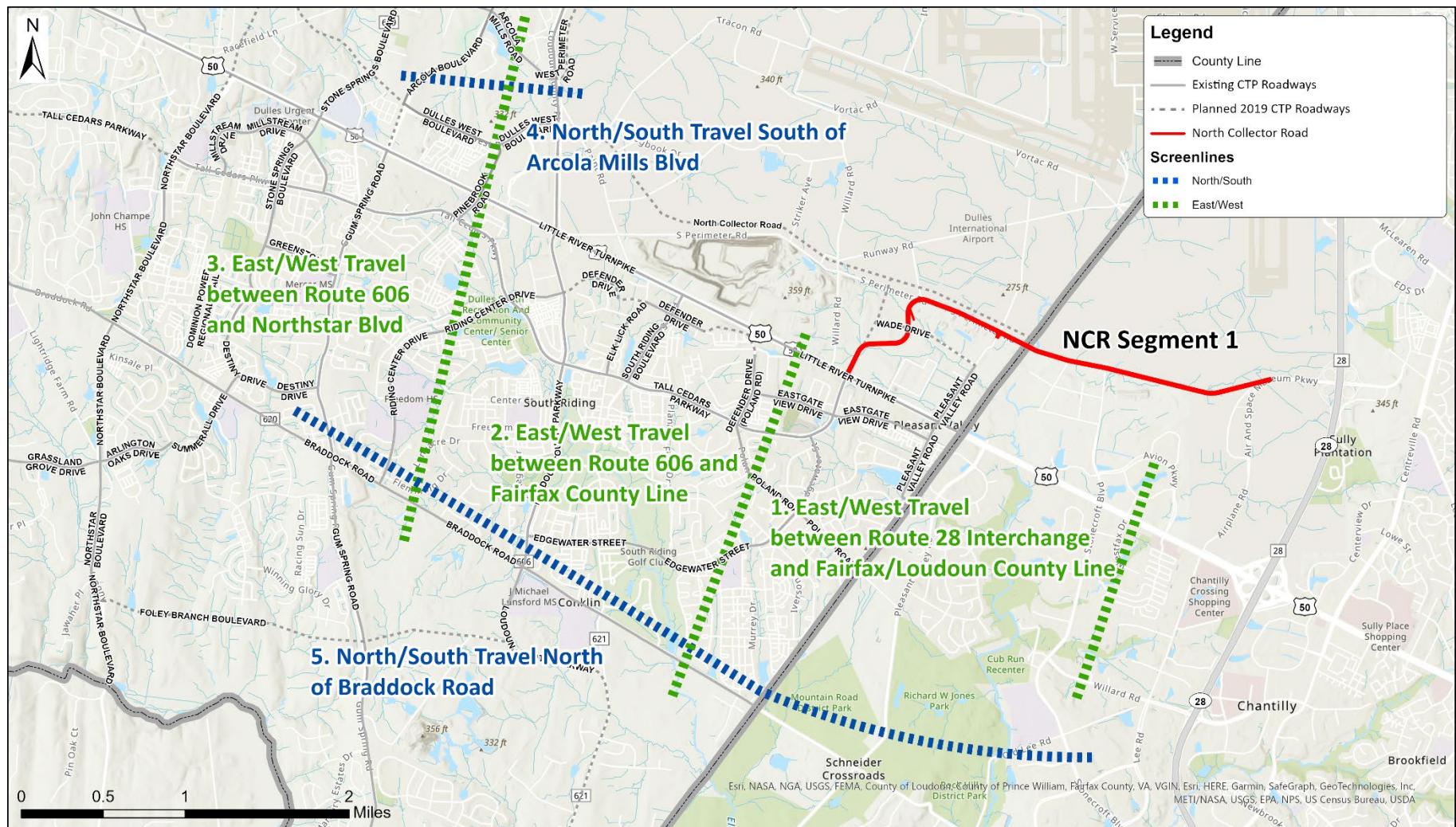


Figure 3-5. US Route 50 Study Area Screenlines for Traffic Forecasts



Table 3-3. Roadways Comprising US Route 50 Study Area Screenlines for Traffic Forecasts

No.	Screenline	Roadways
1	East/West Travel between Route 28 Interchange and Fairfax/Loudoun County Line	US Route 50 (eastern side)
2	East/West Travel between South Riding Boulevard and Route 606	US-50 (Center)
		Poland Road
		Braddock Road
3	East/West travel between Route 606 and Northstar Boulevard	Arcola Mills Drive
		US-50 (western side)
		Tall Cedars Parkway
		Braddock Road
4	North/South travel south of Arcola Mills Boulevard	Loudoun County Parkway
		Stone Springs Boulevard
5	North/South travel north of Braddock Road	Gum Spring Road
		Loudoun County Parkway
		Donavon Drive
		Pleasant Valley Road



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Table 3-4. 2040 Screenline Forecasts: Annual Average Weekday Traffic (AAWDT)

Screenline Total Volume Summary		2019 VDOT AAW DT	2040 AAWDT Forecasts													
			Constrained CTP							Full CTP						
			1	2	3	4	5	6	12	Constrained CTP + North Collector Road + Bi-County Parkway	Constrained CTP + Route 606 Widening + North Collector Road	Full CTP	Full CTP + Route 606 Widening	Full CTP + Bi-County Parkway	Full CTP + Bi-County Parkway + Route 606 Widening	Full CTP + North Collector Road
East/West	1: East	54,000	59,000	58,000	58,000	50,000	48,000	48,000	50,000	55,000	54,000	57,000	56,000	51,000	57,000	51,000
	North Collector Road	-	-	-	-	35,000	35,000	32,000	34,000	-	-	-	-	34,000	-	34,000
	2: Center	60,400	79,000	78,000	75,000	83,000	79,000	79,000	83,000	82,000	82,000	78,000	78,000	95,000	81,000	95,000
	3: West	71,500	83,000	83,000	80,000	86,000	83,000	85,000	86,000	65,000	65,000	63,000	62,000	71,000	64,000	69,000
North/South	4: South of Arcola Mills	51,700	51,000	54,000	49,000	50,000	47,000	49,000	51,000	73,000	76,000	70,000	73,000	71,000	78,000	74,000
	5: North of Braddock Road	50,600	81,000	83,000	75,000	84,000	77,000	78,000	85,000	87,000	88,000	82,000	83,000	87,000	87,000	88,000

Table 3-5: 2040 Screenline Forecasts on US Route 50 Only: Annual Average Weekday Traffic (AAWDT)

Screenline Total Volume Summary		2019 VDOT AAW DT	2040 AAWDT Forecasts													
			Constrained CTP							Full CTP						
			1	2	3	4	5	6	12	Constrained CTP + North Collector Road + Bi-County Parkway	Constrained CTP + Route 606 Widening + North Collector Road	Full CTP	Full CTP + Route 606 Widening	Full CTP + Bi-County Parkway	Full CTP + Bi-County Parkway + Route 606 Widening	Full CTP + North Collector Road
East/West	1: East	54,000	59,000	58,000	58,000	50,000	48,000	48,000	50,000	55,000	54,000	57,000	56,000	51,000	57,000	51,000
	2: Center	43,000	52,000	52,000	51,000	59,000	58,000	57,000	59,000	56,000	56,000	55,000	54,000	72,000	55,000	72,000
	3: West	43,000	24,000	23,000	23,000	26,000	26,000	25,000	26,000	27,000	27,000	27,000	26,000	32,000	26,000	31,000



Impact of North Collector Road (Scenarios 4, 5, 6, and 12)

Across all four of the Constrained CTP scenarios which included the North Collector Road, an approximately 15 to 18 percent decrease in screenline volumes was observed, as shown in **Table 3-6**, mostly on the US Route 50 corridor. This was the intended purpose of the North Collector Road project. This decrease in AAWDT volumes actually resulted in a 2040 forecasted volume along the US Route 50 corridor which is less than the current AAWDT volumes based on 2019 VDOT count books. The North Collector Road is forecasted to draw approximately 40,000 vehicles per day across all four scenarios. At the western and center screenline locations, the change in volumes was less notable but also resulted in an increase rather than a decrease in AAWDT volumes.

Table 3-6. East-West Screenline Forecast Comparisons for North Collector Road Scenarios

Scenario	Total Western Screenline AAWDT	Difference from Scenario 1	Total Center Screenline AAWDT	Difference from Scenario 1	Total Eastern Screenline AAWDT	Difference from Scenario 1	North Collector Road
1	83,000	-	79,000	-	59,000	-	
4	86,000	4%	83,000	6%	50,000	-16%	35,000
5	83,000	0%	79,000	1%	48,000	-18%	35,000
6	85,000	2%	79,000	0%	48,000	-18%	32,000
12	86,000	4%	83,000	6%	50,000	-15%	34,000

In all four scenarios the east-west change from an increase in volumes to a decrease in volumes, as compared to the Constrained CTP baseline scenario, occurred at the proposed Tall Cedars Parkway/US Route 50 North Collector Road intersection along US Route 50. As shown in the figures in **Appendix A**, the addition of the North Collector Road while it does decrease volumes along US Route 50 between Tall Cedars Parkway and Route 28, did generally draw more traffic from points south and west of this intersection, mostly concentrated in the South Riding area as bound by Braddock Road to the south and Gum Spring Road to the west. The extents and concentration of this increase in volume changes slightly between these four scenarios. One notable difference is that the westward limit of the increase in traffic along US Route 50 shifts to the east, to Loudoun County Parkway (Route 606), when the widening of Route 606 is included in the scenario.

Along the north-south screenlines, a notable and consistent effect due to the addition of the North Collector was not noted. As shown in **Table 3-4**, the volumes on screenline #4, south of Arcola Mills Boulevard, either slightly decreased or remained about the same. At screenline #5, north of Braddock Road, the change in volumes varied between a small increase and a small decrease. As shown in the figures in **Appendix A**, these results are due to the relatively small changes occurring on individual north-south roadways in the network and the fact that they individually varied between an increase and decrease in volumes.

Elsewhere in the network some notable concentrations of volume decreases were observed across all four scenarios along the Route 267 (Dulles Greenway) corridor and adjacent roadways between Route 28 and Claiborne Parkway. In scenarios with the Bi-County Parkway, this area of volume decreases increased in size towards the west along Route 267 and Claiborne Parkway up to Belmont Ridge Road, due to additional traffic being pulled further west to the Bi-County Parkway (Northstar Boulevard/Belmont Ridge Road). When the Route 606 widening was included in the scenario, the decrease in traffic along individual roadways was also observed further south between Route 606 and Northstar Boulevard in the Brambleton area. An increase in



volumes along Route 28 between Air and Space Museum Parkway and Route 267 (Dulles Toll Road/Dulles Greenway) was observed in scenarios 4 and 5 which do not include Route 606 widening improvements.

Impact of Route 606 Widening (Scenarios 2, 6, and 12)

The widening of Route 606 to six lanes was included in three of the Constrained CTP scenarios but unlike the North Collector Road, did not have a consistent effect on the surrounding roadway network volumes across those scenarios. As expected, since Route 606 is a north-south roadway, a notable effect on the east-west screenlines was not noted. The north-south screenline comparisons are shown in **Table 3-7** and indicate a relatively minor change in the north-south volumes at the screenline level based on the Route 606 widening. This would indicate that generation of additional trips through the study area is less likely, and the overall effect of the Route 606 widening improvements will be more in line with a traffic shift within the study area.

Table 3-7: North-South Screenline Forecast Comparison for Route 606 Widening Scenarios

Scenario	Total North Screenline AAWDT	Difference from Scenario 1	Total South Screenline AAWDT	Difference from Scenario 1
1	51,000	-	81,000	-
2	54,000	5%	83,000	2%
6	49,000	-3%	78,000	-4%
12	51,000	1%	85,000	5%

This shift in traffic can be seen more accurately on the figures in **Appendix A**. Scenario 2, which only includes the Route 606 widening, resulted in an increase in traffic along the entire Route 606 corridor from south of Braddock Road to north of Route 267. Though the highest percent increase of traffic was within the limits of the proposed widening, smaller increases are also noted north and south of the proposed construction. Increases in volumes on adjacent roadways were relatively minor and mostly concentrated at the termini of the corridor in South Riding and north of Route 267 and west of Route 28. The increases in traffic on these roads are generated from decreases in traffic on parallel facilities within the study area, namely Northstar Boulevard and Belmont Ridge Road, and other corridors outside the study area such as Route 28 and Route 650.

When the Route 606 widening is combined with the North Collector Road and Bi-County Parkway in scenario 6, the percent increase in traffic along Route 606 is smaller, indicating less of a draw to Route 606 considering the other two viable options to travel north-south and east-west. The effect of the project to decrease traffic volumes along Route 28 and Northstar Boulevard also diminished in this scenario. In scenario 12, when the Route 606 widening is combined with only the North Collector Road, a similar pattern to scenario 6 is observed with the exception that the general decrease in traffic along north-south roadways west of Route 606, most notably Northstar Boulevard, are again observed as they were in scenario 2.

Impact of Bi-County Parkway

The three scenarios which included the Bi-County Parkway all show a consistent but relatively low decrease (between 3 and 8 percent) in traffic volumes along the north-south screenlines as shown in **Table 3-8**.



Since the Bi-County Parkway would follow the existing and currently under development Northstar Boulevard alignment, which is just west of all of the screenlines, the draw of the new roadway is forecasted to pull some of the north-south traffic from within the screenlines to the improved Bi-County Parkway corridor. It should be noted though that as shown in the figures in **Appendix A**, there are few north-south roadways that are showing an individual decrease in AADT of greater than 5%. Across all three scenarios with the Bi-County Parkway an increase of traffic volumes is forecasted along Northstar Boulevard. The greatest increase is observed south of US Route 50 and is less north of US Route 50 especially in scenarios 5 and 6 due to the alternative routes provided by either the Route 606 widening or the North Collector Road.

Table 3-8: North-South Screenline Forecast Comparison for Bi-County Parkway Scenarios

Scenario	Total North Screenline AAWDT	Difference from Scenario 1	Total South Screenline AAWDT	Difference from Scenario 1
1	51,000	-	81,000	-
3	49,000	-4%	75,000	-7%
5	47,000	-8%	77,000	-5%
6	49,000	-3%	78,000	-4%

In the east-west direction, the inclusion of the Bi-County Parkway is forecasted to slightly decrease volumes as a stand-alone project. This is most likely due to traffic coming from outside the study area from the south and west using the Northstar Boulevard corridor instead of navigating any of the connecting roadways within the screenlines to access US Route 50, Route 606, Route 28, or another arterial. This decrease in traffic however does not apply to scenarios 5 and 6 which include the other network improvements on Route 606 and North Collector Road, indicating that those two projects have more of an effect on the traffic within the screenlines than the Bi-County Parkway.

Table 3-9: East-West Screenline Forecast Comparison for Bi-County Parkway Scenarios

Scenario	Total Western Screenline AAWDT	Difference from Scenario 1	Total Center Screenline AAWDT	Difference from Scenario 1	Total Eastern Screenline AAWDT	Difference from Scenario 1
1	83,000	-	79,000	-	59,000	-
3	79,971	-4%	75,000	-4%	58,000	-2%
5	83,285	0%	79,000	1%	48,000	-18%
6	84,908	2%	79,000	0%	48,000	-18%

Elsewhere in the study area, outside of the screenlines, some of the adjacent collector roads along Northstar Boulevard are forecasted to have some increases in volume with the Bi-County Parkway project. Further away from the Bi-County Parkway though, as shown in **Appendix A**, roadway segments along Route 267 and in South Riding generally experience decreases in traffic volume.

As of 2022, the Bi-County Parkway is not shown in Prince William County's comprehensive plan. It is thus recommended that planning efforts for US Route 50 conservatively assume that the Bi-County Parkway is not in place for the foreseeable future.



Impact of Full CTP Build-Out

Since the Full CTP scenarios are not fiscally constrained and less likely to occur in the forecasted time period, a more abbreviated analysis of the trends in scenarios 7-11, 13, and 14 was undertaken and are summarized in **Table 3-4** and **Appendix A**. In the Full CTP scenarios, it was generally observed that the same trends for increases and decreases in traffic in comparable scenarios occurred as compared to the Constrained CTP scenarios. For the North Collector Road, scenarios 11 and 14 also decreased traffic along US Route 50 east of Tall Cedars Parkway and increased traffic on the east-west screenlines and specifically on US Route 50 between Tall Cedars Parkway and Northstar Boulevard and along Route 28 if there are no Route 606 widening improvements. In scenarios 8, 10, and 14 which included the Route 606 widening, it was still observed that a small increase in volumes occurred along the north-south screenlines when Route 606 was widened as a standalone improvement or with the North Collector Road but remained the same or slightly decreased when combined with the Bi-County Parkway. The Route 606 widening's impact on the secondary roadway network is still focused on the Brambleton area but with less intensity as compared to the Constrained CTP scenarios as evidenced by fewer roads showing a decrease in volumes. The Bi-County Parkway was only included in scenarios 9 and 10 and still showed a small decrease in screenline volumes in the north-south direction. In the Full CTP, since more of the network is built out within the region a great increase of traffic is observed along Northstar Boulevard/Bi-County Parkway in scenario 9 and 10, especially south of US Route 50. Based on these overall results, it can be inferred that the full CTP network has a relatively minor impact on traffic volumes in the US Route 50 study corridor as compared to the constrained CTP network.

Segment Level Capacity of US Route 50

Prior to beginning the intersection capacity analysis portion of the study, a brief check of the anticipated segment volumes along US Route 50 was conducted to determine whether the existing six-lane typical section that is mainly present within the study corridor today would be sufficient in 2040 to provide the necessary throughput capacity. As shown in **Table 3-5**, all of the scenarios project AAWDT volumes on the central and eastern portions of US Route 50, generally between the Fairfax County Line and Route 606, to be in the 50,000 to 60,000 vehicles per day range. The segment of US Route 50 between Route 606 and South Riding Boulevard is the lone exception to this range, specifically in scenarios 11 (Full CTP and North Collector Road) and 14 (Full CTP, Route 606 widening, and North Collector Road) in which 72,000 vehicles per day were projected along US Route 50. With the existing six-lane configuration and dedicated turn lanes at the signalized intersections, US Route 50 would be anticipated to have sufficient throughput capacity to accommodate volumes in the 50,000 to 60,000 vehicles per day range, though it would be on the upper limit of its capacity. In the instance of a higher volume, an increase in lanes to increase the capacity or conversion of the corridor to a full controlled access corridor with interchanges and overpasses would be necessary. The AADT volume to capacity graphics for in **Appendix B**, reflect this conclusion as the entire study corridor is shown to be under capacity with only a few minor segments showing near or at capacity across all scenarios. When we consider the PM peak hour volume to capacity ratios also shown in the graphics in **Appendix B**, we can see that although there are more segments anticipated to be near or at capacity within the study corridor, only a few segments across all scenarios are anticipated to be over capacity in 2040. Understanding that the County plans to make US Route 50 a limited access facility, no widening of US Route 50 to eight lanes is recommended at this time, though continued growth on the corridor should be monitored.



3.2.3 Turning Movement Count Forecasting / Peak Hour Volumes

The capacity of US Route 50 in eastern Loudoun County in the study corridor is directly affected by the performance of its several at-grade signal-controlled intersections; in the segments between these signals, however, the number of lanes and design speed of the roadway appear to be currently sufficient to carry the projected traffic volumes. Thus, an assessment of the need to replace certain traffic signals with grade-separated interchanges should focus on the projected future volumes at these signals, specifically during peak commuting periods.

Given that various network buildouts influence daily traffic volumes along US Route 50, it can also be anticipated that these various network buildouts would also affect AM and PM peak hour traffic volumes in the corridor. Building from the existing peak-hour traffic volumes collected by the County as part of the ongoing Loudoun County Parkway and US Route 50 interchange project, and the TDM volume outputs from the scenarios described above, 2040-year AM and PM peak hour traffic volumes were developed for the Constrained CTP network scenarios (1-6 and 12) in the following manner:

1. For each approach/departure roadway at an intersection, identify:
 - The existing peak hour volumes collected in 2021
 - The AM Peak period volumes from the 2019 and 2040 TDM
 - The PM Peak period volumes from the 2019 and 2040 TDM
2. Calculate the:
 - AM and PM peak linear growth rates from the TDM outputs for the period between 2019 and 2040
 - Raw increase in volume between the modeled 2019 and 2040 modeled peak hour volumes using the Loudoun County model AM and PM period to hour factor values (37.4% and 34.4% respectively)
3. Calculate the:
 - Linear Growth Rate based peak hour volume (in vehicles) by multiplying the existing link peak hour volumes by the calculated respective peak period linear growth rate as calculated using the TDM outputs
 - Delta based peak hour volume (in vehicles) by adding the raw increase in volume between the modeled 2019 and 2040 modeled peak hour volumes to the existing peak hour volumes
4. Calculate the Average of the linear growth rate based peak hour volume and delta based peak hour volume as calculated in step 3 above for the AM and PM peak hours.
5. Proportionally adjust the peak hour volumes such that the inflows are equal to the outflows
6. Convert link volume forecasts to turning movement forecasts using the iterative-directional procedure outlined in NCHRP 765: Analytical Travel Forecasting Approaches for Project-Level Planning and Design. This provides forecast peak-hour turning



movement volumes at each intersection using existing turning movement counts as seed values. Note that for new locations intersections, such as Northstar Boulevard and North Collector Road, seed values based on existing turning movement counts are not available so seed values based on engineering judgement of most likely distributions of traffic were used.

7. Balance volumes between intersections within 10% of intersection outflows where feasible or to match existing percent imbalances in the network. There are multiple existing driveways and side streets not considered in the model and turning movement count analysis that can add or remove traffic from US Route 50. Since the Constrained CTP scenarios were used, no full limited access assumptions were made.

This process results in a set of balanced AM and PM peak-hour turning movement counts along US Route 50 within the study corridor between Northstar Boulevard (planned) and Pleasant Valley Road (Loudoun County) for each of the Constrained CTP future network scenarios. Turning movement forecasts for each scenario are provided in **Appendix B**.

Note that future turning movement counts were not developed for the Full CTP scenarios since the likelihood of the full buildup of the network within the analysis timeframe was less likely and as noted above did not appear to have a substantial effect or difference on the growth within the corridor as compared to the Constrained CTP scenarios.

3.2.4 Intersection Capacity Analysis

The resulting turning movement volumes for each scenario were brought into Synchro software for an assessment of intersection delay and level of service for the 2040 AM and PM peak hours. The existing Synchro network was obtained from VDOT and updated to match the existing laneage and signal timing/phasing that will be used for the study as shown in **Figure 3-7**. Based on the projects included in the Constrained CTP scenario (scenario 1) outlined in **Section 3.1.1**, the laneage at the intersections were updated as shown in **Figure 3-8**. Note that the US Route 50 short-term improvements currently in development by Loudoun County and VDOT, as noted in **Section 2.2.7**, have evolved since establishment of the traffic analysis parameters (February 2022). The prior proposed condition, included in the intersection capacity analysis, included an extension of the eastbound left-turn lane on US Route 50 at Loudoun County Parkway, and at the Gum Spring Road/Arcola Boulevard intersection included replacement of the northbound Gum Spring Road right turn lanes with a single free-flow right turn lane, a new eastbound US Route 50 merge lane from Gum Spring Road to Hutchinson Farm Drive, and extension of the westbound left turn lane. For the other scenarios, the inclusion of the Bi-County Parkway and Route 606 widening had no effect on the laneage included at intersections within the corridor, therefore the lane configurations used in scenarios 2 and 3 match those used in scenario 1. However, the addition of North Collector Road in scenarios 4, 5, 6, and 12 resulted in the addition or revision of the lanes at the existing US Route 50 and Tall Cedars Parkway intersection to facilitate the connection with the proposed roadway on new location and resulted in the configuration shown in **Figure 3-6**.

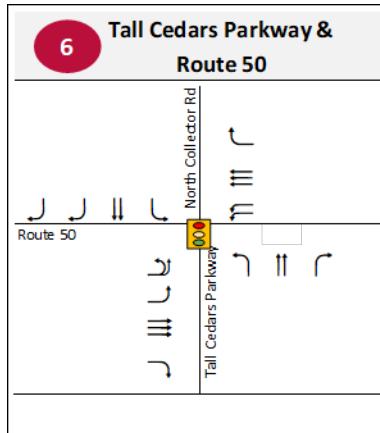


Figure 3-6: Tall Cedars Parkway Intersection Lane Configuration in Scenarios 4, 5, 6, and 12

Given the assumptions described above, the forecasted 2040 AM and PM peak-hour volumes for each network scenario were coded into the Synchro network, and signal timings were optimized at each intersection. The existing cycle lengths were assumed to remain constant from the existing condition. The resultant delay and level of service for each scenario for the AM peak hour is shown in **Table 3-10** and for the PM peak hour is shown in **Table 3-11**.

These metrics can be considered a proxy for the future need for grade separation at a given intersection, especially if specific conflicting movements result in capacity constraints that cannot be mitigated through conventional improvements at traffic signals (e.g., lengthening a turn bay, adding more lanes to a turn bay, etc.).

Table 3-12 provides a high-level summary of the combined AM and PM peak hour level of service results by indicating whether the intersection was projected to have an acceptable level of service (A, B, C, or D) in both the AM and PM peak hours, at least one peak hour (AM or PM) with an unacceptable level of service (E or F), or an unacceptable level of service in both the AM and PM peak hour.



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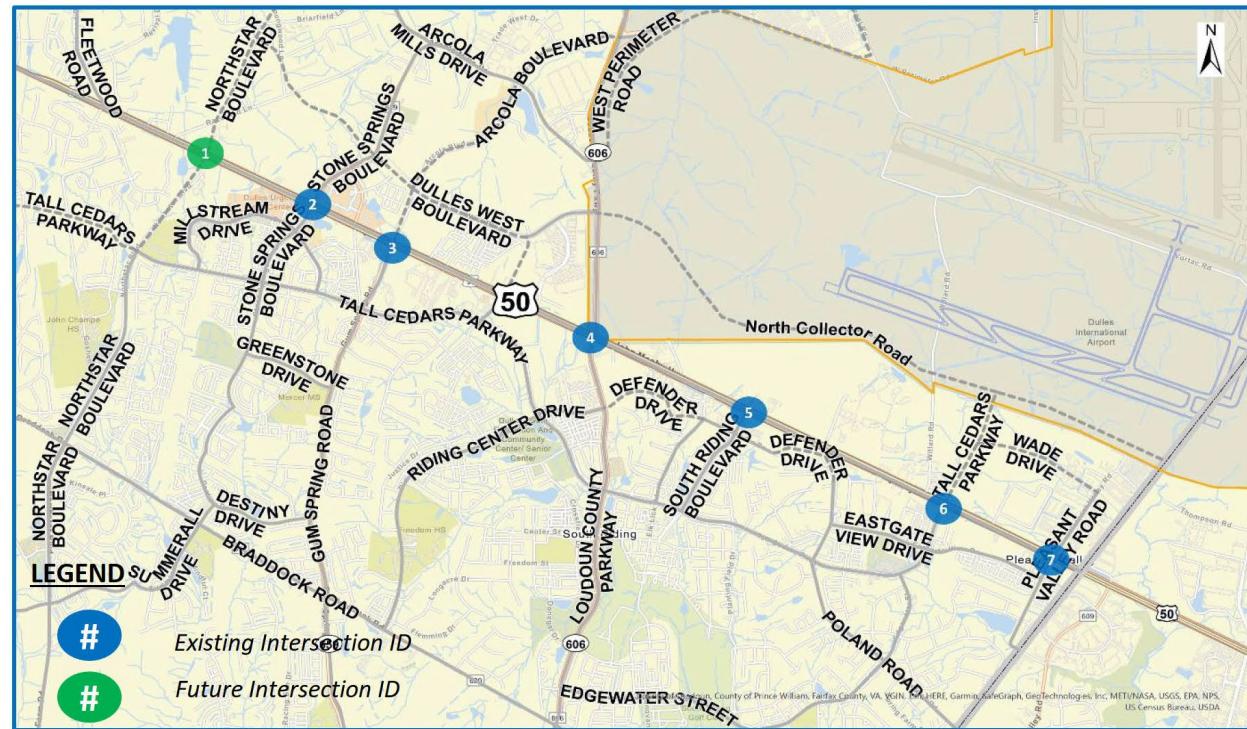
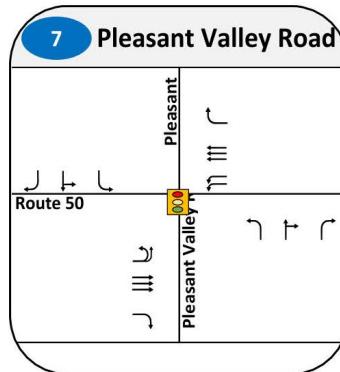
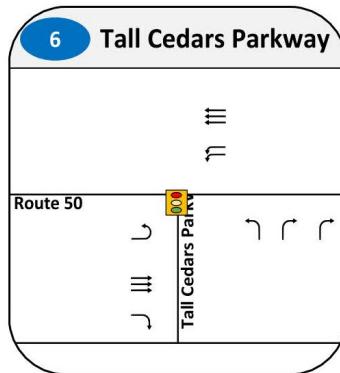
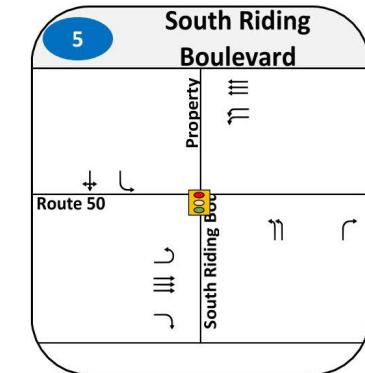
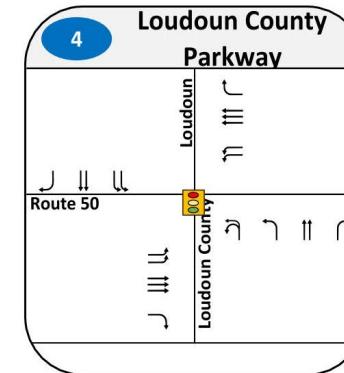
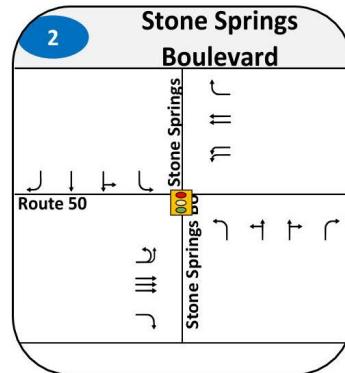
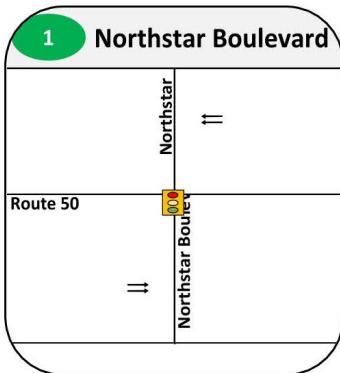


Figure 3-7: Existing Conditions Laneage Diagram for Synchro Analyses at Intersections Along US Route 50 (Minor Street Names Listed)



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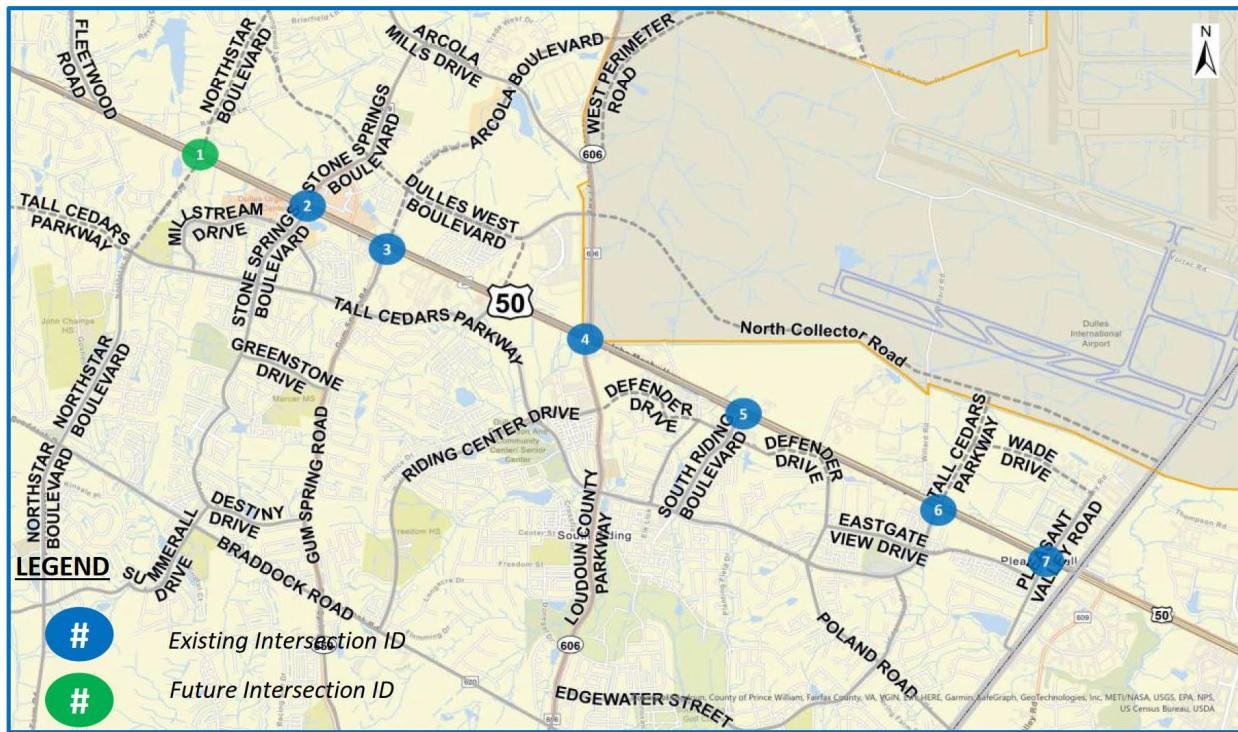
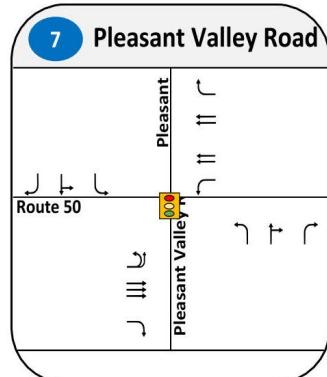
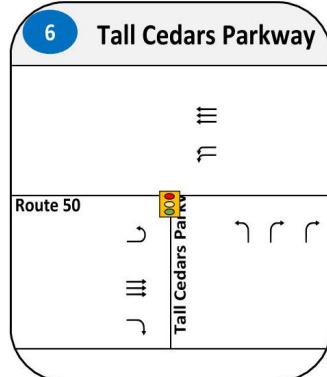
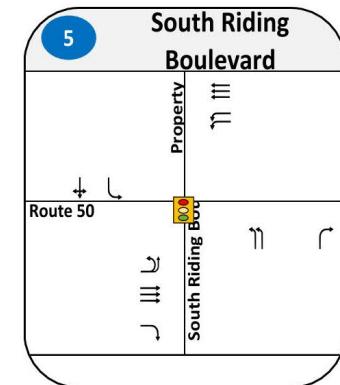
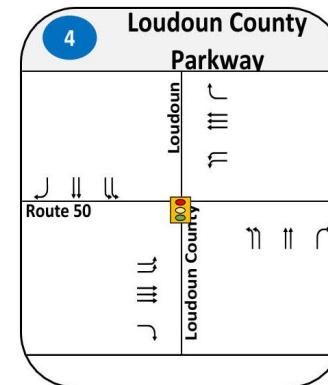
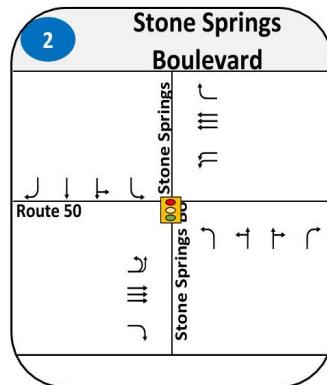
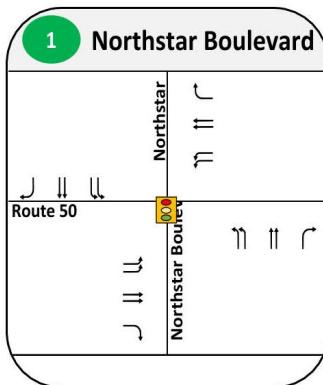


Figure 3-8: Constrained CTP (Scenario 1) Laneage Diagram for Synchro Analyses at Intersections Along US Route 50 (Minor Street Names Listed)



Table 3-10. Projected 2040 AM Peak Hour LOS and Delay for Roadway Network Scenarios

Scenario		Intersection						
		Northstar Boulevard	Stone Springs Boulevard	Gum Spring Road/Arcola Boulevard	Loudoun County Parkway	South Riding Boulevard	Tall Cedars Parkway	Pleasant Valley Road
0	Existing (2021)		F (181.5)	D (41.9)	F (160.8)	C (31.2)	E (67.5)	F (142.0)
1	Constrained CTP	F (104.6)	D (49.8)	F (91.1)	F (138.6)	B (17.8)	F (119.1)	F (108.2)
2	+ Route 606 Widening	F (121.0)	E (62.5)	F (94.1)	F (159.1)	B (18.4)	F (110.7)	F (101.5)
3	+ Bi-County Parkway	F (116.6)	D (54.9)	F (102.3)	F (131.0)	B (12.8)	F (117.7)	F (92.4)
4	+ North Collector Road	F (121.8)	D (51.2)	F (88.2)	F (144.9)	C (26.4)	F (228.4)	D (48.0)
5	+ North Collector Road + Bi-County Parkway	F (116.5)	D (50.1)	F (102.9)	F (152.2)	B (19.8)	F (188.3)	D (35.3)
6	+ North Collector Road + Bi-County Parkway + Route 606 Widening	F (114.0)	E (64.8)	F (94.4)	F (156.7)	B (12.4)	F (181.2)	C (34.0)
12	+ Route 606 Widening + North Collector Road	F (122.8)	E (63.6)	F (93.1)	F (159.0)	B (16.7)	F (180.9)	D (51.1)

Table Key (LOS based on 2000 HCM)	LOS A	LOS B	LOS C	LOS D	LOS E	LOS F
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Table 3-11. Projected 2040 PM Peak Hour LOS and Delay for Roadway Network Scenarios

Scenario		Intersection						
		Northstar Boulevard	Stone Springs Boulevard	Gum Spring Road/Arcola Boulevard	Loudoun County Parkway	South Riding Boulevard	Tall Cedars Parkway	Pleasant Valley Road
0	Existing (2021)		F (127.9)	D (43.8)	F (277.5)	C (28.7)	F (300.0)	F (195.8)
1	Constrained CTP	F (168.2)	F (135.7)	F (272.8)	F (133.0)	B (16.6)	C (34.6)	E (75.9)
2	+ Route 606 Widening	F (177.7)	F (280.3)	F (174.9)	F (285.1)	C (32.2)	F (84.0)	F (99.5)
3	+ Bi-County Parkway	F (170.6)	F (186.6)	F (290.6)	F (143.5)	B (15.3)	D (35.7)	F (105.1)
4	+ North Collector Road	F (161.5)	F (183.7)	F (286.0)	F (143.3)	B (16.2)	F (139.4)	E (62.1)
5	+ North Collector Road + Bi-County Parkway	F (184.0)	F (205.4)	F (302.3)	F (148.1)	B (16.4)	F (127.0)	D (46.9)
6	+ North Collector Road + Bi-County Parkway + Route 606 Widening	F (189.3)	F (205.1)	F (265.3)	F (203.4)	B (15.7)	F (135.7)	D (43.7)
12	+ Route 606 Widening + North Collector Road	F (164.1)	F (210.1)	F (263.8)	F (192.9)	B (16.9)	F (127.0)	D (41.5)

Table Key (LOS based on 2000 HCM)	LOS A	LOS B	LOS C	LOS D	LOS E	LOS F
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Table 3-12: Summary of Acceptable and Unacceptable Operations Based on Level of Service

Scenario		Intersection						
		Northstar Boulevard	Stone Springs Boulevard	Gum Spring Road/Arcola Boulevard	Loudoun County Parkway	South Riding Boulevard	Tall Cedars Parkway	Pleasant Valley Road
0	Existing (2021)							
1	Constrained CTP							
2	+ Route 606 Widening							
3	+ Bi-County Parkway							
4	+ North Collector Road							
5	+ North Collector Road + Bi-County Parkway							
6	+ North Collector Road + Bi-County Parkway + Route 606 Widening							
12	+ Route 606 Widening + North Collector Road							

Table Key (LOS based on 2000 HCM)	Acceptable LOS LOS A, B, C, or D in both the AM and PM Peak Hour	Mixed LOS LOS E or F in at least one of the AM or PM Peak Hours	Poor LOS LOS E or F in both the AM and PM Peak Hour
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3.3 Interchange Review

Given the projected delay and level of service at each intersection in the eight scenarios evaluated, preliminary recommendations are provided for the likelihood of needing a grade-separated interchange by 2040 and are shown in **Table 3-13**. The need for an interchange is a qualitative assessment according to the following:

- Unlikely – the intersection is forecasted to have an acceptable delay/LOS and is a non-regional connection.
- Somewhat likely – the intersection has a poor delay/LOS in at least one peak hour but is a non-regional connection, or, while it may have an acceptable delay/LOS, represents a regional connection.
- Likely – the intersection has an unacceptable delay/LOS in at least one peak hour and is a regional connection.

For purposes of these recommendations, Gum Spring Road/Arcola Boulevard and Loudoun County Parkway were considered regional connections in all scenarios. In the scenarios that included the Bi-County Parkway (3, 5, and 6), Northstar Boulevard was considered a regional connection. In the scenarios that included the North Collector Road (scenarios 4, 5, 6, and 12), Tall Cedars Parkway/North Collector Road was considered a regional connection.

It should be noted that the final decision for building an interchange is based on an Interchange Access Report process with more detailed technical analyses and consideration for right-of-way availability, environmental impacts, costs, and constructability.



Table 3-13. Preliminary Interchange Evaluation Matrix

Scenario		Intersection Likelihood of Needing an Interchange by 2040						
		Northstar Boulevard	Stone Springs Boulevard	Gum Spring Road/Arcola Boulevard*	Loudoun County Parkway*	South Riding Boulevard	Tall Cedars Parkway	Pleasant Valley Road
0	Existing (2021)		●	●	●	○	●	●
1	Constrained CTP	●	●	●	●	○	●	●
2	+ Route 606 Widening	●	●	●	●	○	●	●
3	+ Bi-County Parkway	●*	●	●	●	○	●	●
4	+ North Collector Road	●	●	●	●	○	●*	●
5	+ North Collector Road + Bi-County Parkway	●*	●	●	●	○	●*	○
6	+ North Collector Road + Bi-County Parkway + Route 606 Widening	●*	●	●	●	○	●*	○
12	+ Route 606 Widening + North Collector Road	●	●	●	●	○	●*	○

*Regional Connection

Likelihood of Needing an Interchange by 2040		
○	●	●
Unlikely	Somewhat Likely	Very Likely
<u>Unlikely</u>	Acceptable LOS; non-regional connection	
<u>Somewhat Likely</u>	Poor LOS in at least one peak hour, but a non-regional connection OR acceptable LOS; regional connection	
<u>Very Likely</u>	Poor LOS; regional connection	



3.3.1 Discussion of Interchange Recommendations

Northstar Boulevard – Delay and level of service are forecasted to reach failing conditions in both the AM and PM peak hours assuming the lane configurations shown in

Figure 3-8. If the Bi-County Parkway is constructed and ties into Northstar Boulevard, this intersection is proposed to be considered a significant connection for regional travel. Since the intersection is only considered a regional connection when the Bi-County Parkway project is included, an interchange is recommended to be likely needed in 2040 in Scenarios 3, 5, and 6. As noted previously, the Bi-County Parkway is currently not included in the Prince William County Comprehensive Plan so the likelihood of those scenarios becoming a reality by 2040 is low and therefore prioritizing construction of an interchange at this location should be relatively low. Further, west of Northstar Boulevard US Route 50 transitions to a two-lane roadway.

- **Stone Springs Boulevard** – Each scenario projects that this intersection will operate at a LOS F in the PM peak hour in 2040 in all scenarios and at a LOS F in scenarios 2, 6, and 12 in the AM. The remaining scenarios are projected to operate at a LOS D in the AM peak hour. Despite the poor LOS in most of the peak hour scenarios, since Stone Springs Boulevard is not considered a regional connection, an interchange is recommended to be considered a somewhat likely need in 2040 and should be prioritized below other intersections that are considered regional connections like adjacent parallel facilities (Gum Spring Road/Arcola Boulevard and Northstar Boulevard).
- **Gum Spring Road/Arcola Boulevard** – This intersection is projected to operate at a LOS F for all future scenarios in both the AM and PM peak hours, even though the existing intersection is estimated to be operating at LOS D. This substantial shift is due to the completion of the Arcola Boulevard connection to Route 606 in the future scenarios. The TDM forecasts project that much of the travel heading north-south along Route 606 is then heading to the south and west along US Route 50 so will most likely choose Arcola Boulevard over Loudoun County Parkway south of the future intersection of Route 606 and Arcola Boulevard. Once Arcola Boulevard is completed between US Route 50 and Route 606, and assuming the Bi-County Parkway is not in place by that point, this facility will be the major north-south connection between Loudoun and Prince William Counties in the study area. Since this intersection is projected to operate at a poor LOS and is considered a regional connection, construction of an interchange is recommended as very likely to be needed by 2040.
- **Route 606/Loudoun County Parkway** – This intersection currently operates at LOS F in the PM peak hour is also projected to operate at LOS F during the AM and PM peak hours in all future scenarios. It is currently a major regional connection for traffic coming from or heading to areas north and east of Dulles International Airport, and this intersection is already programmed for grade separation in the six-year CIP. Grade separation remains recommended at this intersection as being very likely to be needed for all scenarios by 2040.
- **South Riding Boulevard** – The forecasted delay and LOS at this intersection are projected to be acceptable for all scenarios in both the AM and PM peak hour. It is recommended that this intersection should remain an at-grade signalized intersection at least until the entire US Route 50 corridor is converted to a limited access facility. In that case, it should be considered a low priority for conversion to a grade separated interchange.



- **Tall Cedars Parkway** – This intersection is projected to operate at an LOS E or F in all AM and PM peak hour scenarios, with the exception of scenario 1 and 3 in the PM peak hour, both of which do not include the North Collector Road. Once the North Collector Road is constructed, it is anticipated that this will act as a significant regional connection. Therefore, a grade separated interchange at this intersection is recommended for instances where the North Collector Road is included (scenarios 4, 5, 6, and 12).
- **Pleasant Valley Road** – With this intersection also being affected by the presence of North Collector Road, the forecasted delays for the scenarios with North Collector Road (scenarios 4, 5, 6, and 12) all operate at an acceptable LOS. This intersection is the most significantly relieved within the study corridor by the construction of the North Collector Road. Scenarios 1, 2 and 3, without the North Collector Road in place are forecasted to operate at LOS E and F in the AM and PM peak hours as no improvements to the existing condition are planned at the intersection. Given the adjacency of this intersection to the Fairfax County border, including an at-grade intersection with Pleasant Valley Road (Fairfax County) less than 2,000 feet to the east, any efforts at grade separation (such as an overpass as shown in the 2019 Adopted CTP) would need to involve significant coordination with Fairfax County, and it is likely that any improved operations for eastbound traffic would be constrained by the series of traffic signals in Fairfax County between the County line and Route 28. It is recommended that a grade separated interchange at this location be considered somewhat likely in the absence of the North Collector Road and unlikely with the North Collector Road.



4 NORTH COLLECTOR ROAD CONSIDERATIONS

As described in **Section 2.2.5**, the North Collector Road corridor between Route 28 and Tall Cedars Parkway was included in this sequencing study, is included in the current CIP, and is currently undergoing a feasibility study to identify existing conditions and a potential alignment. Since that study is ongoing, a complete analysis of the corridor's preferred alignment and potential for impacts is not available so a brief overview of some of the considerations being evaluated.

4.1 Access Considerations

The alignment of the North Collector Road is anticipated to run either within, or immediately adjacent to, the MWAA property utilized for the Dulles International Airport. Any segments not within MWAA property would be located on private properties in Loudoun County and Fairfax County. This new roadway could provide alternate access to some existing land uses along US Route 50, introducing the opportunity to close access points along US Route 50. As shown in **Figure 2-6**, the segment of North Collector Road within Loudoun County could provide alternate access to Wade Drive and Pleasant Valley Road (Loudoun County). Additionally, this roadway could open existing parcels to future development that are currently land locked or without access to US Route 50. While many parcels could benefit from future access to the North Collector Road, the number of access points allowed should be strategically considered to maintain traffic flow along the corridor with minimal interruptions. Future access points are currently being developed as part of the feasibility study.

4.2 Environmental and Historic Resources Considerations

The North Collector Road project may require FAA approval for the release of any federally owned land, if the alignment is located on MWAA property and right-of-way is acquired, or if the roadway is constructed within an easement. This transfer of land or granting of an easement may result in the overall project being subject to the National Environmental Policy Act (NEPA) and the FAA implementing regulations. However, a Section 163 analysis in cooperation with MWAA and FAA would first need to be conducted to determine whether FAA has jurisdiction over the proposed land use modification. It is anticipated that if NEPA compliance is required that this project may qualify as a Categorical Exclusion (CE) project under FAA implementing regulations.

Additionally, if the project receives federal funding from the Federal Highway Administration (FHWA), the project will also need to meet the NEPA requirements of FHWA and VDOT. An Environmental Assessment (EA) is anticipated to be warranted under FHWA implementing regulations and VDOT NEPA procedures for Locally Administered Projects based on the scope and scale of the project. If VDOT funding is used and no FHWA funding is involved, the project would be subject to the VDOT State Environmental Review Process (SERP) in addition to the possibility of requiring compliance with the FAA NEPA process. Depending on the factors discussed above, coordination with FAA, FHWA, and VDOT should occur prior to initiating the NEPA process to gain concurrence on the agencies with jurisdiction, anticipated level of NEPA documentation, and participating agencies.

Supporting documentation for the EA or CE may include technical reports for cultural resources studies, natural resources studies, air quality and noise analyses, hazardous materials investigations, and agency coordination letters. If FHWA/VDOT or FAA determine that impacts to



environmental resources could be significant and/or require deeper analysis, they may require preparation of an Environmental Impact Statement (EIS).

As noted above, an analysis of the corridor and study area (a 1,000-foot-wide area centered on the preliminary alignment) is currently underway to identify existing conditions, including delineation of streams and wetlands, identification of potential hazardous material concerns, and evaluation of historic and archaeological resources. The planned width of the corridor is 80 feet, so a larger 1,000-foot wide study area is a conservative estimate of potential alignment alternatives that may be evaluated. The project team is currently waiting on confirmation of the delineations from the US Army Corps of Engineers and concurrence from the Virginia Division of Historic Resources on the recommended historic and archaeological resource evaluations. Once this initial data collection and alternatives analysis phase is complete, the County will begin the preliminary design and NEPA process which will build off of these studies and conduct further environmental review to include the remaining resource categories such as:

- Floodplains
- Resource Protection Areas (RPA)
- Threatened and Endangered Species
- Parks and Recreation
- Public Facilities
- Noise
- Air
- Socioeconomics
- Cumulative and Indirect Effects

4.3 Multimodal Considerations

The County has made a concerted effort to strengthen their transportation network with multimodal facilities through policy changes to the CTP, investment in the extension of the Silver Line Metrorail, expanded bus services, dedicated funding in the annual budget for bicycle and pedestrian improvements, amongst many others. As such, all major roadway network investments should also consider the enhancement of the County's multimodal facilities.

4.3.1 Bicycle and Pedestrian Facilities

As required by the CTP, all future roadway improvements must incorporate the construction of the appropriate parallel bicycle and pedestrian facilities, which are designated by facility and functional classification. Additionally, any future conversion of intersections to grade-separated interchanges will need to evaluate the impact on the existing bicycle and pedestrian facilities and identify opportunities for new connections. Due to airport security restrictions, bicycle and pedestrian facilities are not anticipated to be allowed north of Wade Drive.

4.3.2 Transit Considerations

Transit service and travel patterns in the County will evolve with the opening of the Silver Line Metrorail stations at Ashburn, Loudoun Gateway, and Dulles International Airport in November 2022. Once the Silver Line Phase II extension opened, bus service within Loudoun County evolved to provide metro feeder bus service to the newly opened stations. Service could also continue to evolve to include point-to-point service from park & ride lots to major job destinations to the east and changes to local fixed route services based on changes in development and travel patterns. These services should be considered in the development of the roadway network. For the North Collector Road corridor, the new east-west connection



could provide an alternative route for existing transit routes or new transit routes to access points to the north and east of Loudoun County within Fairfax County via a less congested and more reliable network. Elsewhere along the study corridor, improvements to Northstar Boulevard, Arcola Boulevard, or Route 606 would all greatly benefit north-south travel routes and provide better traffic flow for not only single-occupancy vehicles, but also local and commuter transit service.

Bicycle, pedestrian, and transit networks need to be supported and encouraged, especially in a growing congestion corridor, such as US Route 50. While transit is an important tool for moving more people with fewer vehicles, it was not included as a trip reduction factor for the purposes of a conservative analysis assumption.



5 NETWORK RECOMMENDATIONS

5.1 Network Elements Considered

The analysis performed and outlined in **Chapter 3** informed the recommendations for future roadway improvements to the US Route 50 study corridor. The following projects include new roadways, widening of existing roadways, and grade-separated intersections, that were considered as part of this study.

- Currently funded CIP projects included in the Constrained CTP Scenario as outlined in **Section 3.1.1**.
- Construction of North Collector Road as a four-lane facility from the Tall Cedars Parkway/ US Route 50 intersection to the Route 28/Air and Space Museum Parkway interchange.
- Route 606 Capacity Improvements from US Route 50 to Route 267
- Arcola Boulevard Widening from US Route 50 to Route 606
- Interchanges/overpasses along US Route 50 at:
 - Pleasant Valley Road (Loudoun County)
 - Tall Cedars Parkway
 - South Riding Boulevard
 - Loudoun County Parkway/ Route 606
 - Pinebrook Road
 - Arcola Boulevard/ Gum Spring Road
 - Northstar Boulevard

The sequencing of the improvement projects was determined with the following considerations:

- Traffic analysis results (see **Chapter 3**)
- Available programmed funding
- Transportation plans of neighboring jurisdictions
- Right of way and access implications on adjacent parcels.

The County understands that the proposed North Collector Road is not completely within their jurisdiction, as it passes through potentially both MWAA property and Fairfax County.

Construction of this facility will require the cooperation of both of these agencies and their respective environmental and planning processes. If the North Collector Road is determined to be infeasible, the County would like to understand how their investments in infrastructure would shift. Therefore, the sequencing of improvements was evaluated within two scenarios, one with the North Collector Road, described in **Section 5.2**, and one without the North Collector Road, described in **Section 5.3**.

5.2 Recommended Sequence of Implementation with the North Collector Road

The proposed sequencing of the recommended network improvements including the North Collector Road are as follows, and as shown in **Figure 5-1**.

1. **Funded CIP Projects** – The County has programmed funding in the CIP for Arcola Boulevard, Northstar Boulevard, Dulles West Boulevard, Belmont Ridge Road, Arcola Mills Road, and Braddock Road improvements for design, right-of-way acquisition, and



construction over the next six years. These roadway connections will complete much needed localized access, key north-south corridors, and alleviate some localized bottlenecks for residents and commuters surrounding the US Route 50 study corridor. Construction of these facilities is anticipated to reduce some trips along US Route 50 that currently travel east-west to find paths to travel north-south and provide parallel paths for trips currently using Loudoun County Parkway or Route 606 to travel north. Because these projects have allocated funding, and some are already under design, these projects are closer to implementation and have the most resources for completion.

2. **North Collector Road**– This roadway has funding programmed for design and right-of-way acquisition for the segment from Tall Cedars Parkway to Route 28 within the next six years. While the remaining funding may not be allocated until FY 2029 or later, it is the next logical step from a congestion relief and connectivity perspective. Intersection or interchange improvements along US Route 50 could provide some congestion relief to process more vehicles through the existing intersections, but without adding new capacity to US Route 50 in Fairfax County, Loudoun County traffic will continue to wait in lengthy queues during commuting peaks. The North Collector Road provides alternate access to Route 28 and additional capacity to the US Route 50 corridor. As outlined in **Chapter 3**, the traffic analysis showed that the North Collector Road decreases traffic along US Route 50 east of Tall Cedars Parkway. However, the daily volume along the North Collector Road is forecasted to be greater than the decrease in traffic along US Route 50, resulting in a net increase in east-west traffic that is able to be processed through the network. The North Collector Road would provide an alternate to some of the already congested north-south corridors to the west of Dulles International Airport and bring travelers to the more suitable north-south regional freeway facility on Route 28. As mentioned in **Chapter 4**, the North Collector Road facility should be designed with controlled access and limited interruptions to traffic flow. This facility is recommended to be prioritized over the interchanges included in the CTP and CIP documents along the US Route 50 corridor to provide increased network capacity and options prior to constructing interchange improvements.

3. **Interchange at Tall Cedars Parkway/North Collector Road** – The construction of the currently funded CIP projects and the North Collector Road as recommended in steps 1 and 2 above would be consistent with scenario 4 that was evaluated as part of this study. As shown in **Chapter 3**, in this case all of the intersection locations, with the exception of South Riding Boulevard, would be anticipated to operate at a poor LOS in the PM peak hour, with only Stone Springs Boulevard operating at an acceptable LOS in the AM peak hour. Construction of this interchange would facilitate easier use of the newly constructed North Collector Road and maximize the benefit from that investment. This interchange is recommended to be constructed first, as it is the eastern most intersection in the study corridor prior to accessing the North Collector Road and would provide a good starting point to construct interchange improvements along the corridor moving in an east to west fashion. Also taken into consideration for the sequencing is the fact that the projected growth in north-south traffic along Route 606, Northstar Boulevard, and other roadways west of the Dulles International Airport are based on future planned land uses that are subject to change, whereas the demand for a facility such as the North Collector Road, to serve trips from south and west of the study corridor to the Dulles International Airport and Dulles Toll



Road Corridor including Herndon and Reston is an existing demand that is anticipated to continue to grow.

4. **Interchange at Loudoun County Parkway (Route 606)** – The construction of Northstar Boulevard and Arcola Boulevard will provide some relief to the travel demand on Loudoun County Parkway, for both north-south and east-west travel patterns. They provide much needed network connectivity and allow more traffic circulation. This new network will allow trips from the west to avoid the intersection of US Route 50 and Loudoun County Parkway completely. However, the intersection is still anticipated to operate at a poor LOS in both the AM and PM peak hour and warrants an interchange be constructed. This interchange has already gone through substantial engineering studies and constructing this interchange after the North Collector Road/Tall Cedars Parkway interchange would be consistent with a progression of interchanges being constructed from east to west along the study corridor and is therefore recommended to be constructed prior to Arcola Boulevard/Gum Spring Road.

5. **Interchange at Arcola Boulevard/Gum Spring Road** – The construction of Arcola Boulevard, Northstar Boulevard, and Dulles West Boulevard between Northstar Boulevard and Route 606 significantly alters the network to the west of Route 606 and the resulting travel patterns. With these connections in place, many trips are projected to use alternate routes to traveling east along US Route 50 to access Route 606 and intersections east. As a result, the Arcola Boulevard/Gum Spring Road intersection is anticipated to experience the greatest intersection delay in the PM peak on the US Route 50 study corridor.

6. **Route 606 Capacity Improvements** – Following the US Route 50 corridor improvements, commuters from this region of the County would also benefit from capacity improvements to Route 606. Based on the planned land uses, the TDM results are projecting increased trip volumes between the US Route 50 corridor and points south or west to the Route 267 corridor area west of Dulles International Airport. As shown in the PM peak hour volume to capacity ratio figures included in **Appendix A**, the Route 606 corridor is anticipated to have multiple segments near, at, or over capacity following construction of the North Collector Road (scenario 4). Adding additional capacity to Route 606 between US Route 50 and Dulles Greenway would further increase capacity for commuter travel patterns within Loudoun County and improve access to the new Metrorail station. The 2019 Countywide Transportation Plan includes an ultimate eight-lane typical section along Route 606 between US Route 50 and Arcola Boulevard and a six-lane typical section between Arcola Boulevard and Route 267. As mentioned earlier, further analysis of specific north-south travel trends along this corridor is recommended to better understand the scope and timing of improvements. This notable increase in north-south travel patterns within this area of the County is also highly dependent on the planned land uses along the Route 267 corridor. Considering these factors, capacity improvements to Route 606 were placed behind the North Collector Road and interchange improvements described above.

7. **Arcola Boulevard Widening** – This facility is currently being constructed with a four-lane typical section but is planned, as indicated in the 2019 CTP, to be an ultimate six-lane typical section corridor. As noted above, the TDM is projecting increased trips heading north-south



in this area as future development continues north of the study corridor. As shown in the PM peak hour volume to capacity ratio figures included in **Appendix A**, the Arcola Boulevard corridor is anticipated to be near, at, or over capacity following construction of the North Collector Road and widening of Route 606 north of Arcola Boulevard to six-lanes (scenario 12). Adding additional capacity to Arcola Boulevard would help serve the north-south traffic that is anticipated. Prioritizing this improvement lower in the sequence will allow further analysis of this project in coordination with studies along the Route 606 corridor and development of the forecasted future land uses to the north.

8. **Interchange at Northstar Boulevard** – Following construction of Northstar Boulevard and all of the projects included in sequencing steps 1-7 above, the intersection of Northstar Boulevard and US Route is still anticipated to operate at a poor LOS, as shown in **Chapter 3**. Though it would be a poor LOS at the intersection, the segments of Northstar Boulevard are projected to draw substantially less volume, about half, than Arcola Boulevard, and less than a third of the volume projected on Route 606 and therefore should be a lower priority in the sequencing as compared to the interchange and capacity improvements to the east. Northstar Boulevard is also planned as the Loudoun County portion of the Bi-County Parkway, connecting Loudoun and Prince William Counties with an upgraded facility. Loudoun and the regional CLRP have plans to improve this facility to accommodate such connections; however, it is still unclear if the Bi-County Parkway will be completed in Prince William County. This decision will greatly influence travel demand and patterns into Loudoun County, and the order of interchanges along US Route 50 is contingent upon the construction of these corridors. Without the confidence of improvements to Northstar Boulevard as the Bi-County Parkway, Arcola Boulevard will be the major north-south connection between Loudoun and Prince William Counties in the study area and would likely warrant an interchange prior to Northstar Boulevard.

Not Included: Interchanges at South Riding Boulevard, Pinebrook Road, and Pleasant Valley Road – South Riding Boulevard operates at an acceptable LOS in all scenarios for both AM and PM peak hours and does not present the need for an interchange. The intersection of Pinebrook Road was not analyzed as part of the effort described in **Chapter 3**. Pleasant Valley Road experiences significant relief with the North Collector Road and Route 606 widening in place and is not recommended for an interchange or overpass under these scenarios. However, all interchange/overpass locations currently in the CTP should remain and be reevaluated following the completion of the surrounding roadway network infrastructure improvements. This recommendation does not take into account the potential future limited access condition on the US Route 50 corridor. In that case, interchanges or overpasses would be necessary at these locations to reach a consistent limited access facility status within Loudoun County.

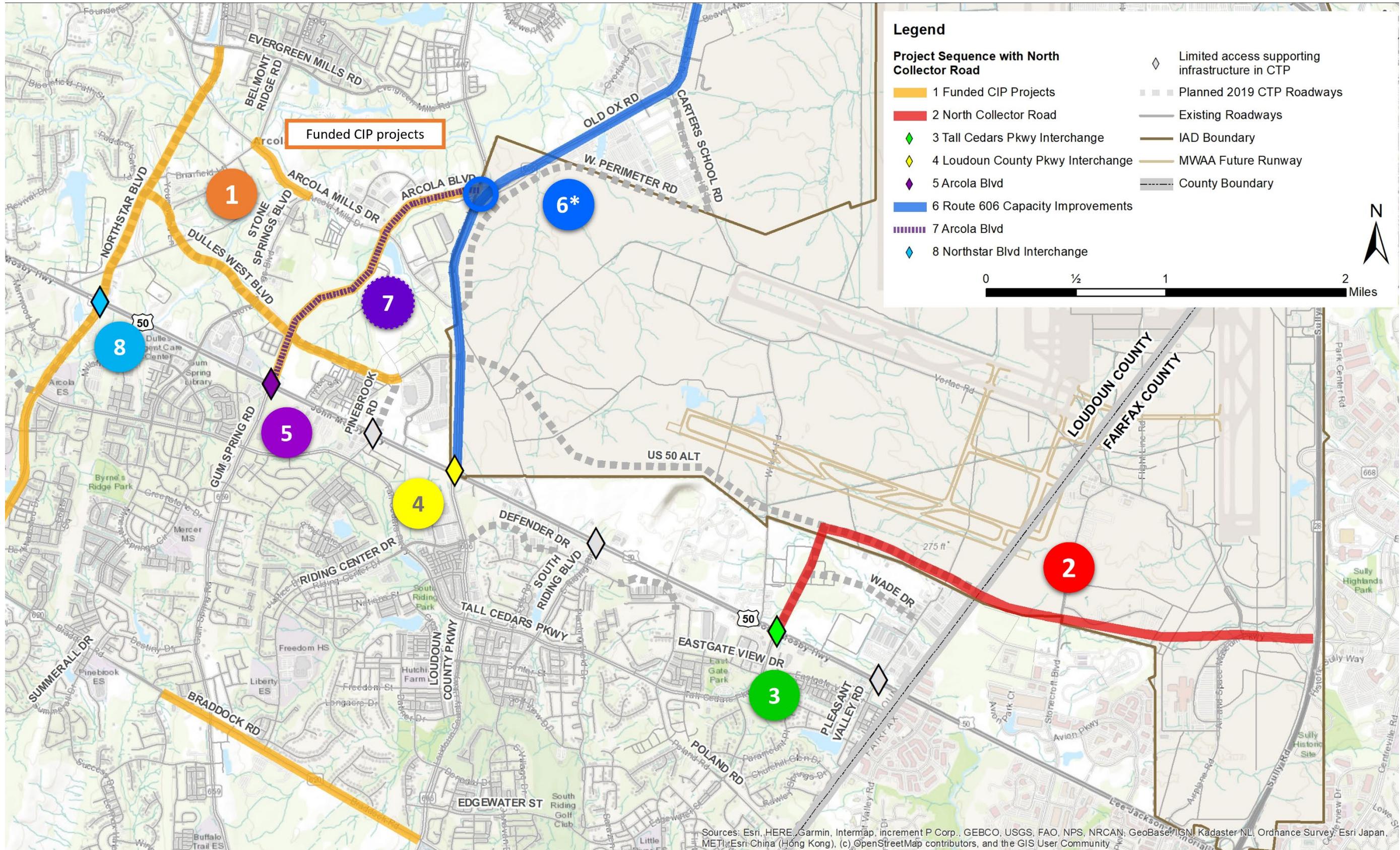


Figure 5-1: Proposed Sequence of Transportation Improvements with the North Collector Road



5.3 Recommended Sequence of Implementation without the North Collector Road

The proposed sequencing of the recommended network improvements in the absence of the North Collector Road are as follows, and as shown in **Figure 5-2**.

- 1. Funded CIP Projects** – The County has programmed funding in the CIP for Arcola Boulevard, Northstar Boulevard, Dulles West Boulevard, Belmont Ridge Road, Arcola Mills Road, and Braddock Road improvements for design, right-of-way acquisition, and construction over the next six years. These roadway connections will complete much needed localized access, key north-south corridors, and alleviate some localized bottlenecks for residents and commuters surrounding the US Route 50 study corridor. Construction of these facilities is anticipated to reduce some trips along US Route 50 that currently travel east-west to find paths to travel north-south and provide parallel paths for trips currently using Loudoun County Parkway or Route 606 to travel north. Because these projects have allocated funding, and some are already under design, these projects are closer to implementation and have the most resources for completion.
- 2. Capacity Improvements to Route 606** – In the absence of the North Collector Road, other infrastructure improvements will be necessary to relieve the travel demands along US Route 50. If US Route 50 congestion remains in Fairfax County without additional capacity improvements, and commuters cannot easily travel east on US Route 50, they will seek to travel north or south to other major east/west facilities. Route 606 is the most direct path for those traveling north or south to go east, and it would greatly benefit commuter traffic to invest in capacity improvements (additional travel lanes and interchanges) to this corridor between US Route 50 and Route 267. The Route 606 corridor also provides access to the Silverline Metrorail station at Loudoun Gateway and future developments along this corridor. As shown in the PM peak hour volume to capacity ratio figures included in **Appendix A**, the Route 606 corridor is anticipated to have multiple segments near, at, or over capacity following construction of the funded CIP projects (scenario 1). Adding additional capacity to Route 606 between US Route 50 and Dulles Greenway would further increase capacity for commuter travel patterns within Loudoun County. The 2019 Countywide Transportation Plan includes an ultimate eight-lane typical section along Route 606 between US Route 50 and Arcola Boulevard and a six-lane typical section between Arcola Boulevard and Route 267. As mentioned earlier, further analysis of specific north-south travel trends along this corridor is recommended to better understand the scope and timing of improvements. This notable increase in north-south travel patterns within this area of the County is also highly dependent on the planned land uses along the Route 267 corridor.
- 3. Interchange at Loudoun County Parkway (Route 606)** – As mentioned previously, the construction of Northstar Boulevard and Arcola Boulevard provides some relief to the travel demand on Loudoun County Parkway. However, without the North Collector Road, there will be little relief provided to US Route 50 and many trips will use Arcola Boulevard or Loudoun County Parkway to travel north to access major east-west routes such as the Dulles Greenway and Route 7. Additionally, the introduction of the Bi-County could alter the order in which interchanges along US Route 50 will be warranted. As shown in **Chapter 3**, the



Loudoun County Parkway intersection is projected to operate at a LOS F in 2040 once Route 606 is widened (scenario 2) and with notably higher delay than the adjacent Gum Spring Road/Arcola Boulevard interchange.

4. Interchange at Arcola Boulevard/Gum Spring Road – Following construction of the Route 606 widening and Arcola Boulevard between Route 606 and US Route 50, traffic is still anticipated to be pulled onto the new connection made by Arcola Boulevard and result in a LOS F at the intersection with US Route 50. However, without the Bi-County Parkway, the delay at the Loudoun County Parkway intersection is anticipated to be notably higher and should therefore be prioritized as an interchange.

5. Arcola Boulevard Widening – This facility is currently being constructed with a four-lane typical section but is planned, as indicated in the 2019 CTP, to be an ultimate six-lane typical section corridor. As noted above, the TDM is projecting increased trips heading north-south in this area as future development continues north of the study corridor. As shown in the PM peak hour volume to capacity ratio figures included in **Appendix A**, the Arcola Boulevard corridor is anticipated to be near, at, or over capacity following construction of the widening of Route 606 north of Arcola Boulevard to six-lanes (scenario 2). Adding additional capacity to Arcola Boulevard would help serve the north-south traffic that is anticipated. Prioritizing this improvement lower in the sequence will allow further analysis of this project in coordination with studies along the Route 606 corridor and development of the forecasted future land uses to the north.

6. Interchange at Northstar Boulevard – Without the North Collector Road and Bi-County Parkway (scenario 2), some of the intersections along US Route 50, east of Northstar Boulevard, are forecast to experience greater congestion by 2040 in the PM peak hour than the intersection at Northstar Boulevard as shown in **Chapter 3**. The construction of Northstar Boulevard and Arcola Boulevard will shift travel patterns within the County, but the travel demand and projected congestion at this intersection are less than that of Loudoun County Parkway and Stone Springs Boulevard and equal to that of Arcola Boulevard. The intersection is still anticipated to operate at a LOS F regardless of the status of the Bi-County Parkway therefore may warrant an interchange by 2040.

Not Included: Interchanges at South Riding Boulevard, Pinebrook Road, Tall Cedars Parkway, and Pleasant Valley Road – South Riding Boulevard operates at an acceptable LOS in all scenarios for both AM and PM peak hours and does not present the need for an interchange. The intersection of Pinebrook Road was not analyzed as part of the effort described in **Chapter 3**. Tall Cedars Parkway, though it would operate at a poor LOS, is not a regional connection without construction of the North Collector Road so an interchange was not included in the prioritization. Pleasant Valley Road also would experience a poor LOS without construction of the North Collector Road but is not included in the prioritization for an interchange or overpass under these scenarios due to its close proximity to Fairfax County which has no plans to make US Route 50 within Fairfax County a limited access facility. However, all interchange/overpass locations currently in the CTP should remain and be reevaluated following the completion of the surrounding roadway network infrastructure improvements. These interchange/overpasses could enhance mobility for Loudoun County



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residents and businesses by providing easier access to Route 606 and other north-south roadways.

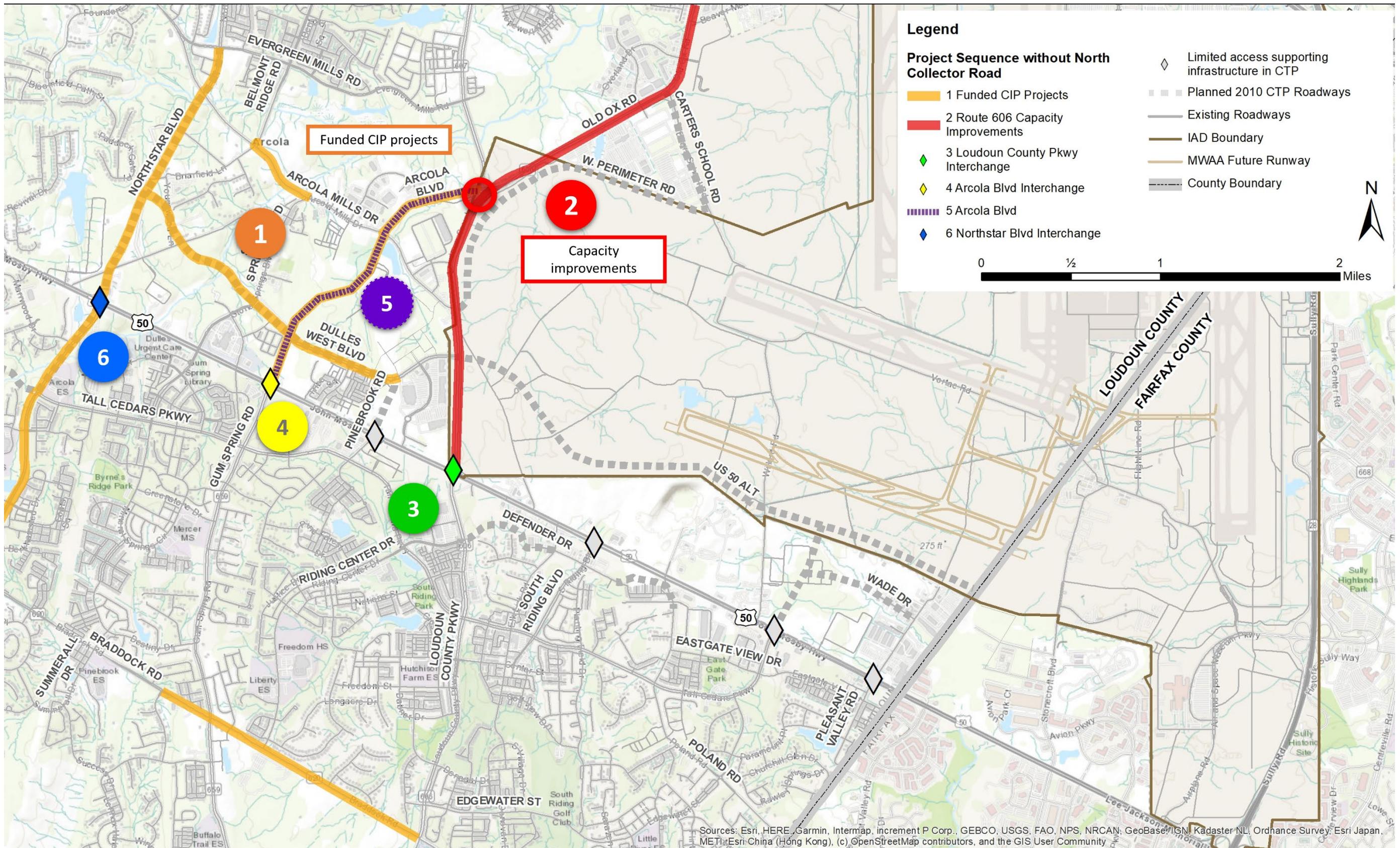


Figure 5-2: Recommended Sequence of Transportation Improvements without the North Collector Road



5.4 Improvement Project Cost Estimates

A preliminary high-level cost estimate was created for the interchange improvement projects discussed in **Sections 5.2** and **5.3** above. The cost estimates for construction of the four recommended priority interchanges along US Route 50 utilized historical costs from completed interchanges around the County and recent VDOT interchange projects to establish a low and high range for the potential project costs. This estimate does not take into account which type of interchange will ultimately be selected based on the traffic needs and constraints of the existing location as further analysis will be required to make those determinations. The project cost estimates were completed in 2022 dollars. No inflation was assumed or added onto the estimates. **Table 5-1** summarizes these preliminary cost estimates.

A high-level planning cost estimate for the North Collector Road from Tall Cedars Parkway to Route 28 was prepared in 2019 and estimated that the total project cost could be approximately \$78 million in 2019 dollars. As noted previously, a feasibility study is underway which will include an updated opinion of probable cost for that project, therefore a separate estimate was not completed as part of this study. Cost estimates for the proposed Arcola Boulevard widening and Route 606 capacity improvements were not included in this study as further analysis into the existing constraints, congestion, safety concerns, and access along the corridor should be conducted first to better understand the type and limits of improvements that are warranted. This study focused on the US Route 50 corridor and major intersections within the study limits and therefore did not include further analysis into the existing conditions of these north-south corridors. A recommendation from this study would be to conduct additional analyses along the Route 606 and Arcola Boulevard corridors to identify more acutely the needs along the corridors, ways in which they could be addressed, and the sequence in which they should be pursued.

Table 5-1: Opinion of Probable Cost

# OF INTERCHANGES	Total Cost (low)	Total Cost (High)
4	\$320 M	\$640 M

*Cost estimate based on historical costs for projects in County and by VDOT

** In 2022 dollars; no inflation was assumed or added onto the estimates



6 NEXT STEPS

Following completion of this study, the following sequence of improvements along US Route 50 and general next steps are recommended to provide transportation improvements to the US Route 50 corridor.

Recommended Sequence Summaries

- If the North Collector Road is determined to be feasible, sequence the key projects in the following order:
 1. Funded CIP Projects
 2. North Collector Road from Tall Cedars Parkway to Route 28
 3. Tall Cedars Parkway/North Collector Road Interchange
 4. Route 606 (Loudoun County Parkway) Interchange
 5. Arcola Boulevard/Gum Spring Road Interchange
 6. Route 606 Capacity Improvements
 7. Arcola Boulevard Widening
 8. Northstar Boulevard Interchange

- If the North Collector Road is determined to not be feasible, sequence the key projects in the following order:
 1. Funded CIP Projects
 2. Route 606 Capacity Improvements
 3. Route 606 (Loudoun County Parkway) Interchange
 4. Arcola Boulevard/Gum Spring Road Interchange
 5. Arcola Boulevard Widening
 6. Northstar Boulevard Interchange

Next Steps

- Complete the feasibility study and coordination with MWAA, Fairfax County, and VDOT to determine the viability of the North Collector Road. An amendment to Fairfax County's Comprehensive Plan may be required.
- Coordinate with Prince William County regarding the Bi-County Parkway, as this facility would have an effect on future regional commuter patterns in Loudoun County.
- Conduct a corridor study along Route 606 from US Route 50 to Route 267, regardless of the feasibility of the North Collector Road, to evaluate the scope and sequence of improvements that are warranted.
- Once the Route 606 corridor study is completed and after Arcola Boulevard travel patterns have "normalized", assess the operations along Arcola Boulevard and update traffic forecasts to anticipate when widening may be needed.
- With respect to the CTP:
 - Maintain the planned interchanges on US Route 50 within the study corridor.
 - Maintain the overpass recommendations at Pinebrook Road and Pleasant Valley Drive (Loudoun County).
 - Maintain the designation along US Route 50 to become limited access. However, the focus should be on the segment between Northstar Boulevard and



Tall Cedars Parkway as this will connect to future limited access facilities along Route 606 and North Collector Road. East of Tall Cedars Parkway should be a lower priority for conversion to limited access since Fairfax County has no plans to change US Route 50 to limited access.

- Maintain the planned six-lane typical section on US Route 50 within the study corridor
- Monitor improvement projects within and external to the County and revisit the recommended sequence of projects as travel patterns adjust along with these transportation infrastructure improvements. The County should revisit this sequence in approximately 3-5 years upon the completion of the CIP projects, regional projects, and ongoing land development in Loudoun County as those projects will likely change regional east-west travel patterns.
- Identify funding for the feasibility and environmental studies, design, right-of-way, and construction of the recommended roadways and interchanges.



APPENDIX A

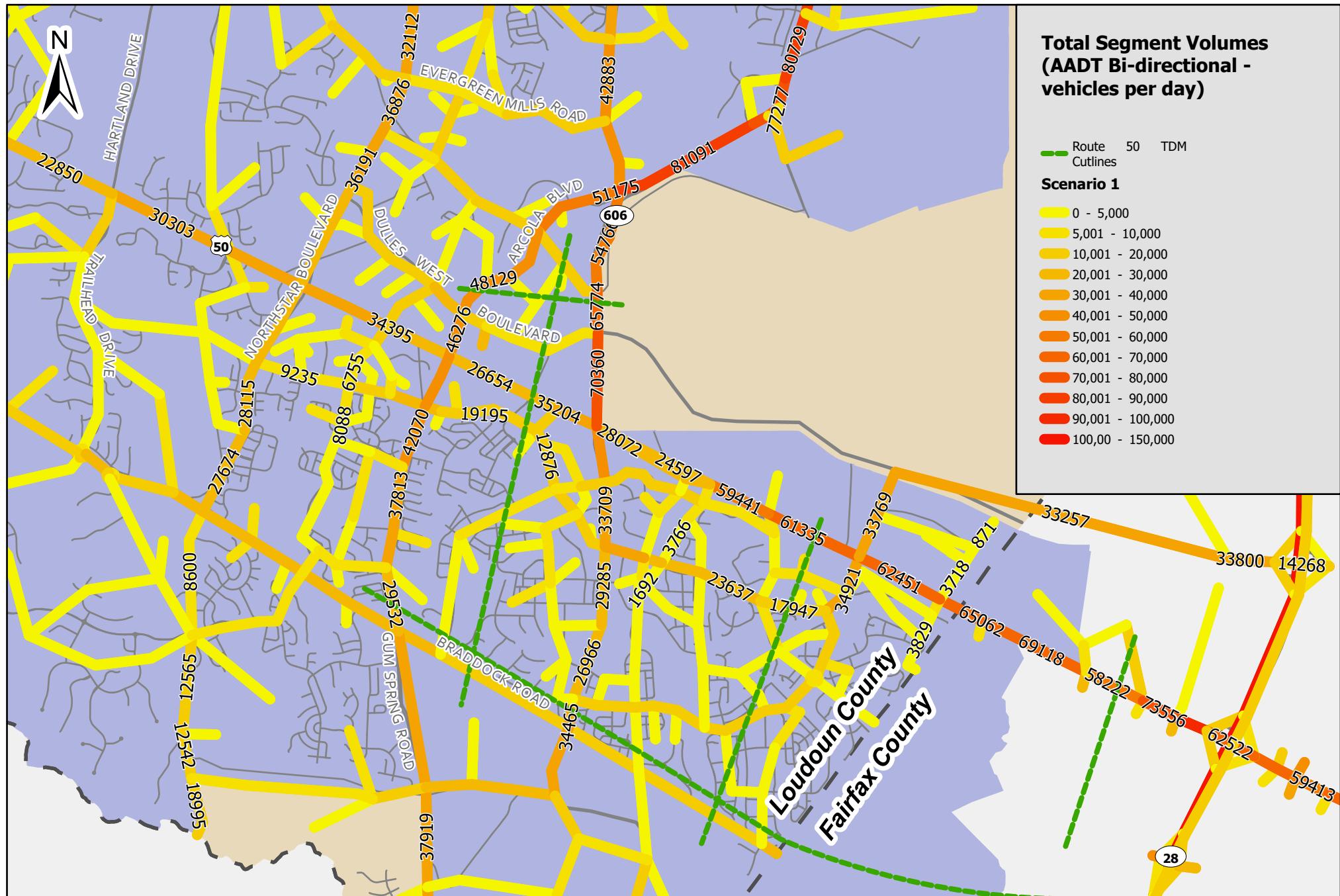
Travel Demand Model Scenario Summary and Comparison Graphics

This Appendix includes graphics depicting the resulting TDM outputs for each scenario based on the Constrained CTP or Full CTP in respect to the AADT, change in AADT, and volume to capacity ratios at the daily level and the PM Peak level. The change in AADT and volume to capacity ratio figures encompass the entire study area to give a good visual representation of how the changes in facilities within the network changes the overall travel patterns. The AADT figure focuses only on the study corridor and intersecting roadways. Each figure includes a grey highlighting along the roadway segments which have been added or revised in that specific scenario model (North Collector Road, Bi-County Parkway, or Route 606).



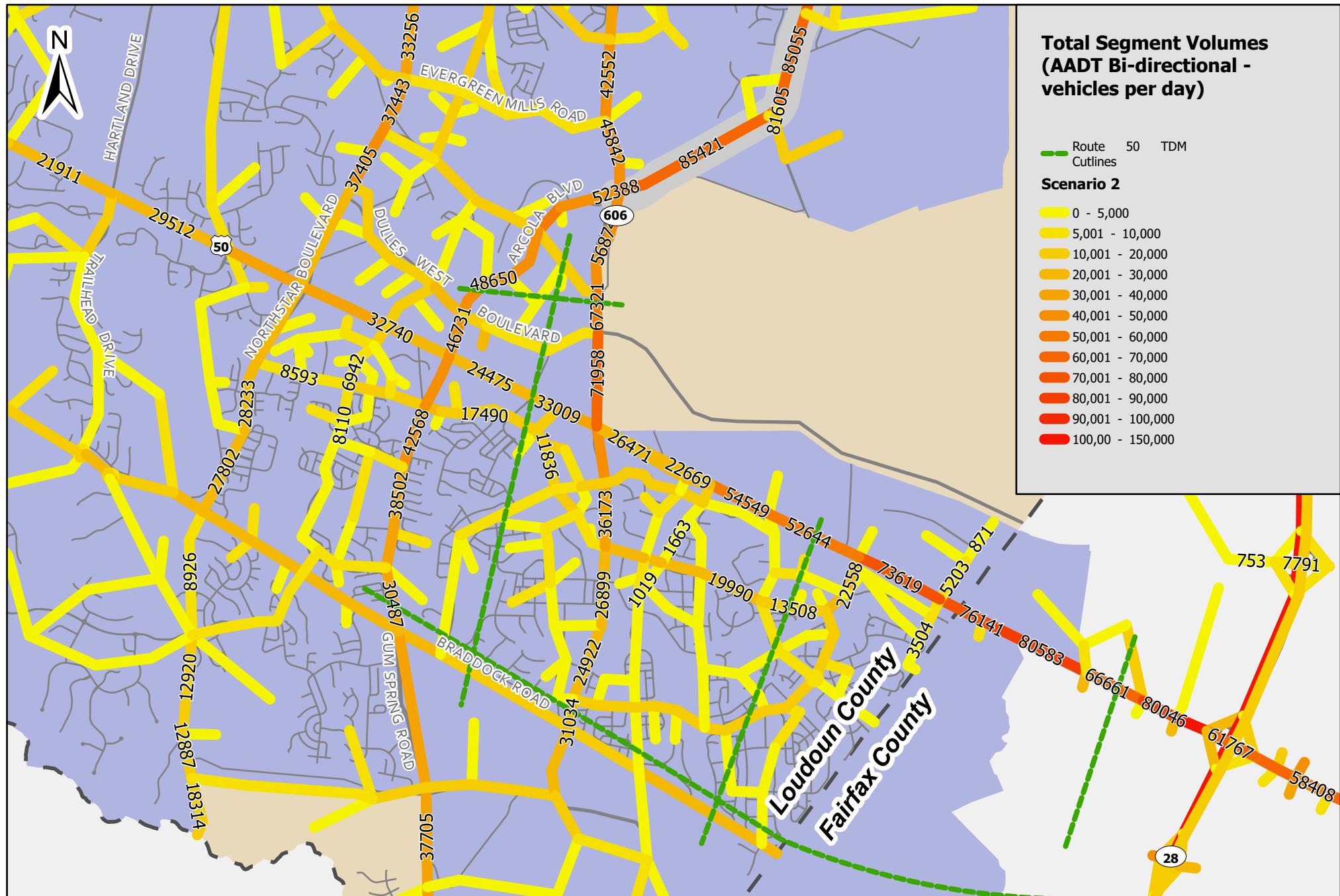
APPENDIX A-1

**AADT Bi-directional Vehicles per Day Adjacent
to Study Corridor**



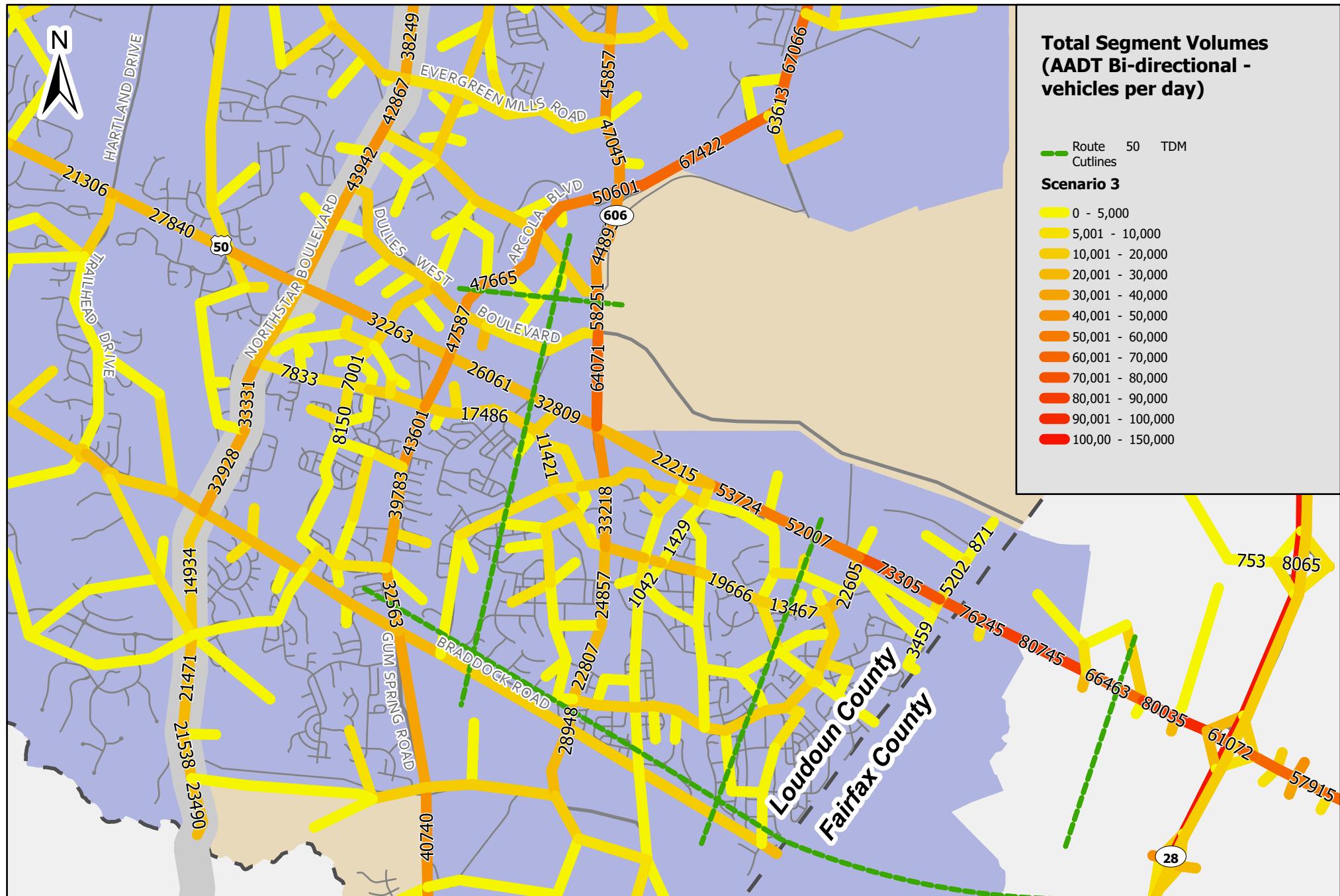
ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA

Kimley » Horn



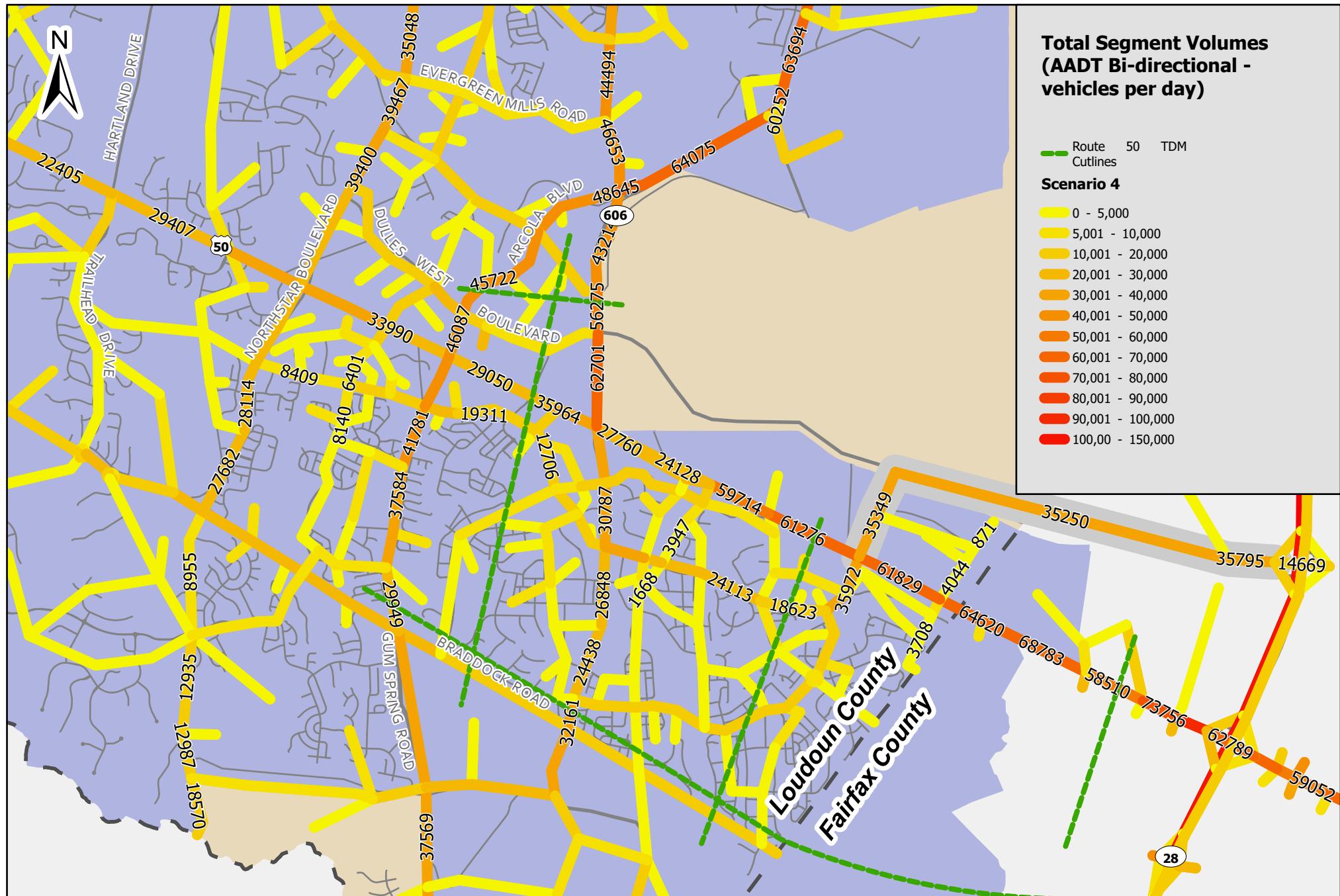
ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA

Kimley » Horn



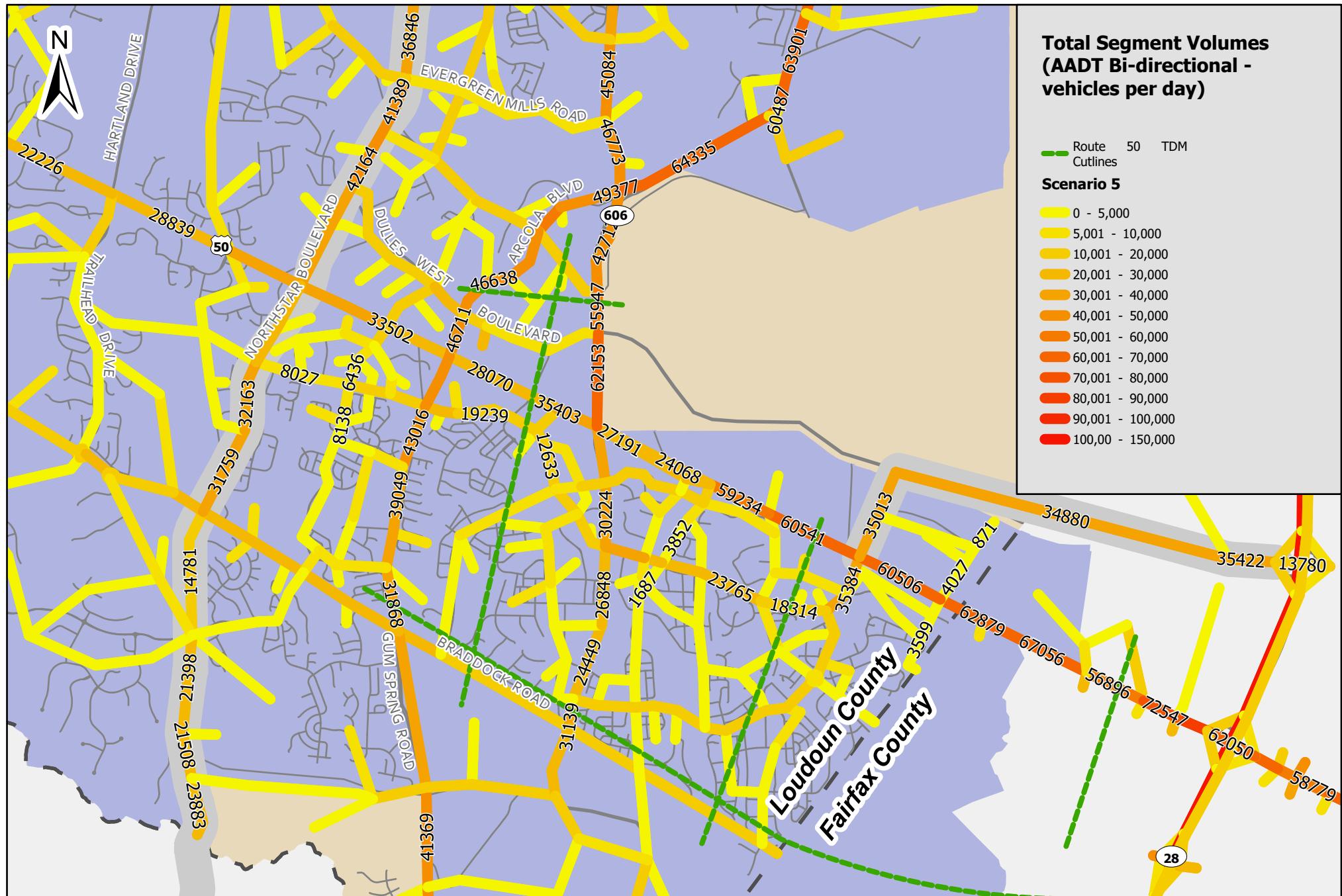
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SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA

Kimley » Horn



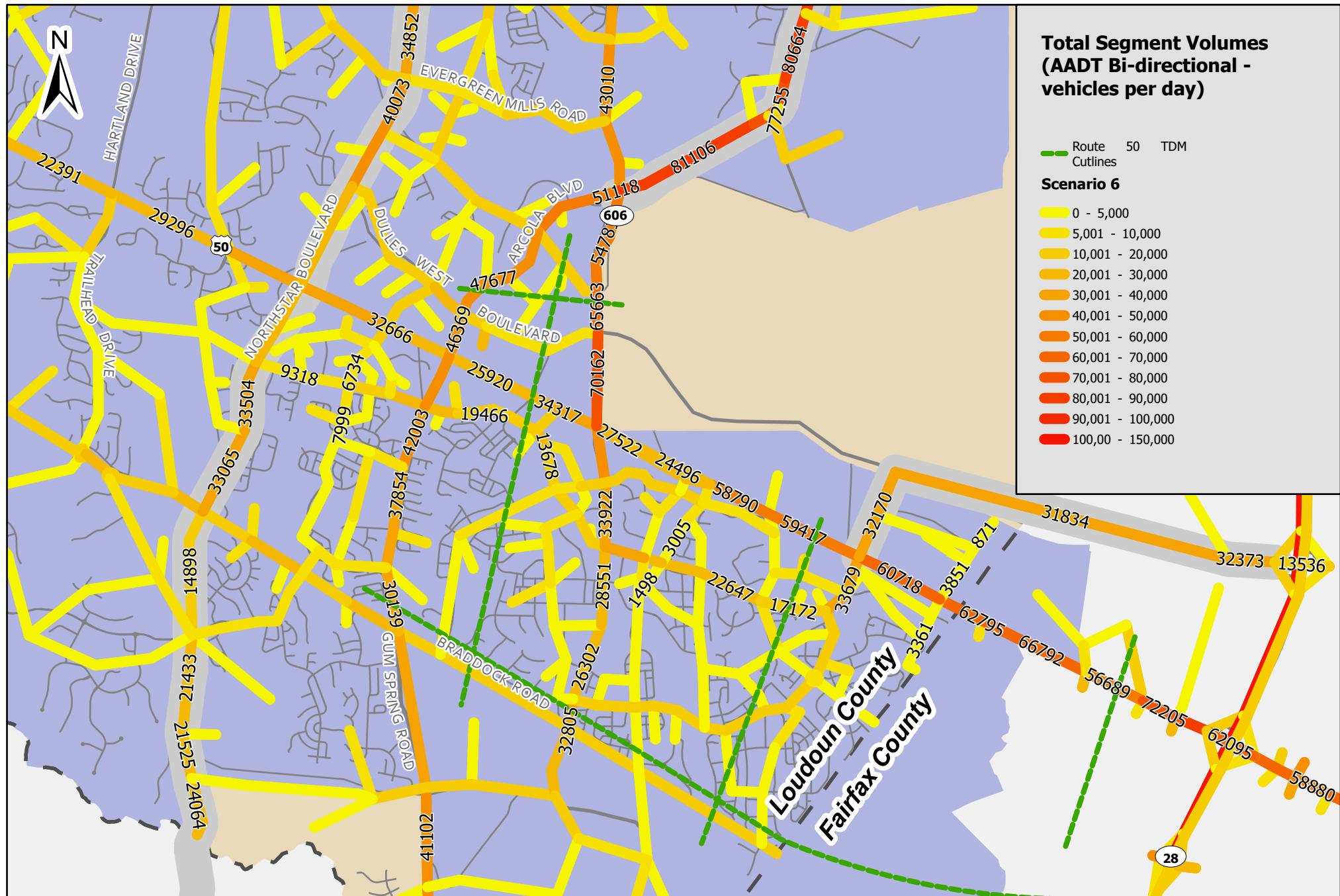
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SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA

Kimley » Horn



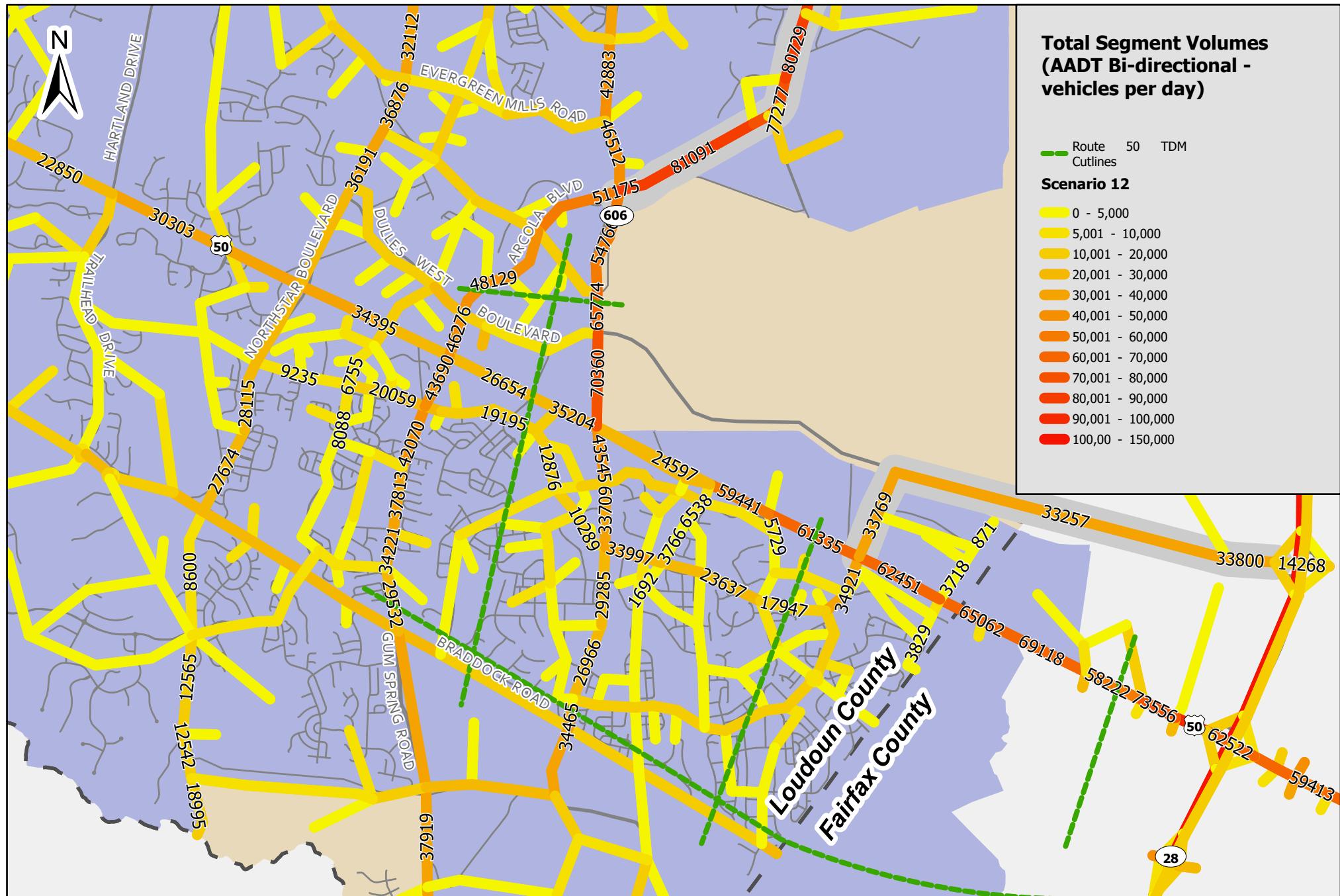
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LOUDOUN COUNTY, VA

Kimley » Horn



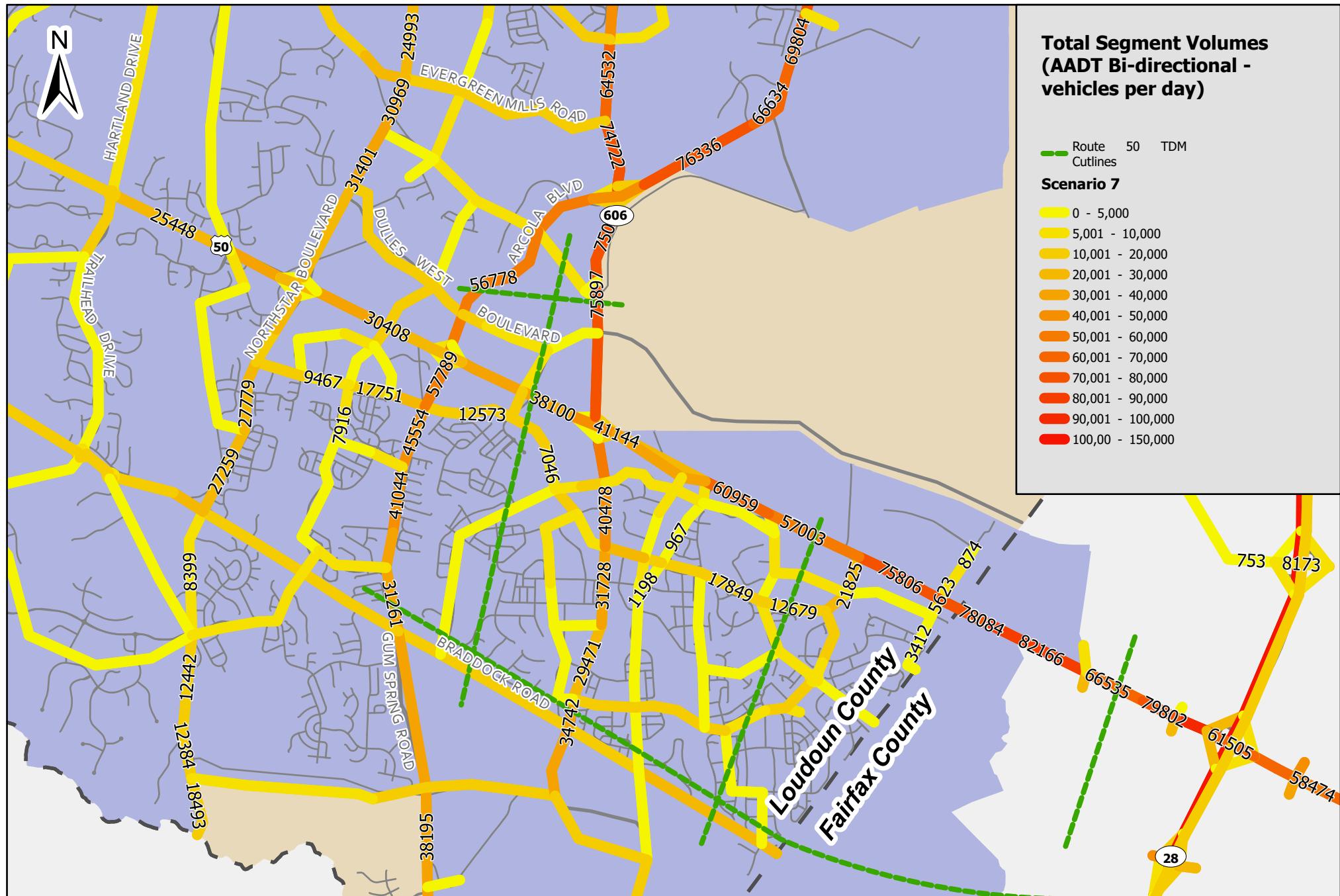
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SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA

Kimley » Horn



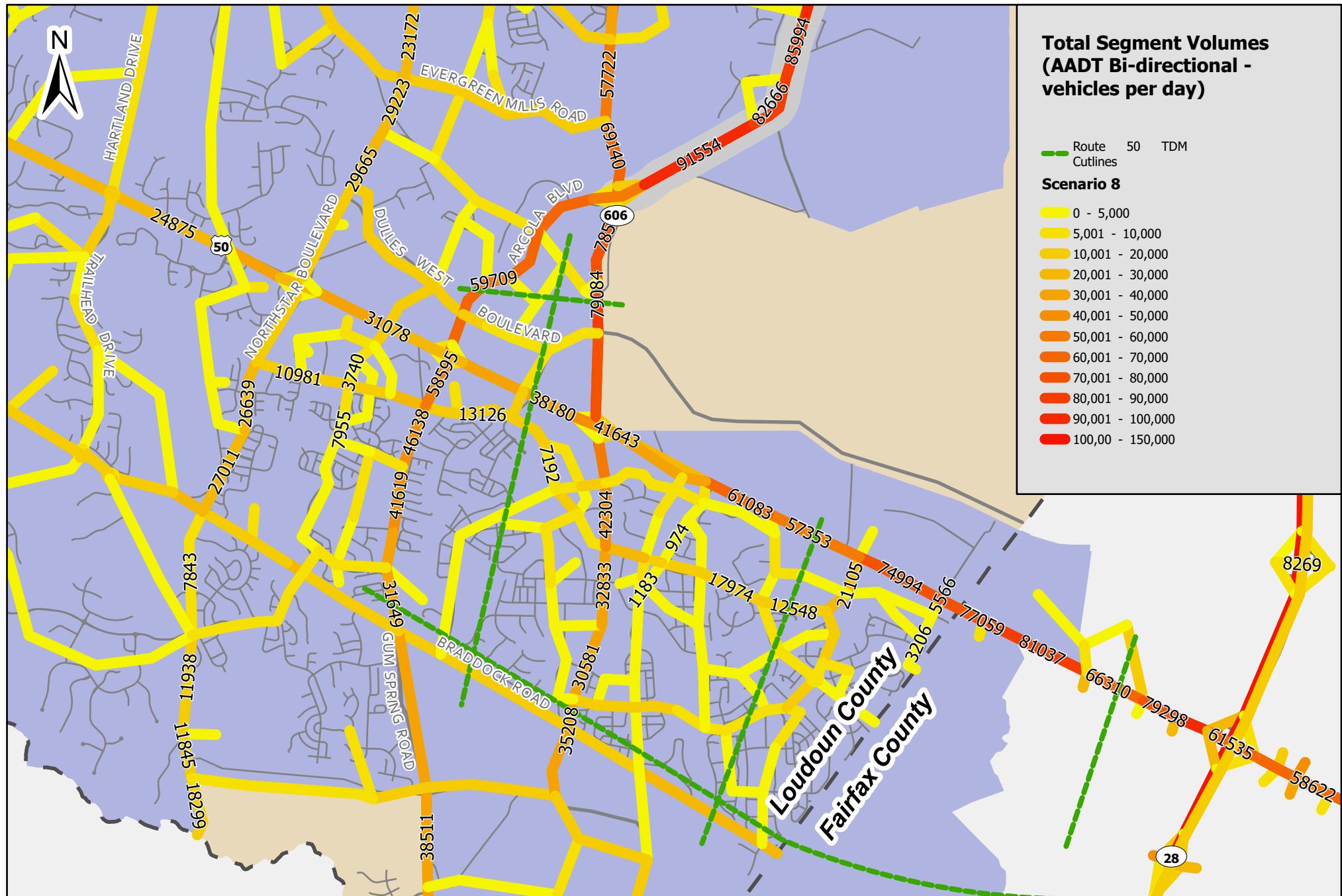
ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA

Kimley » Horn



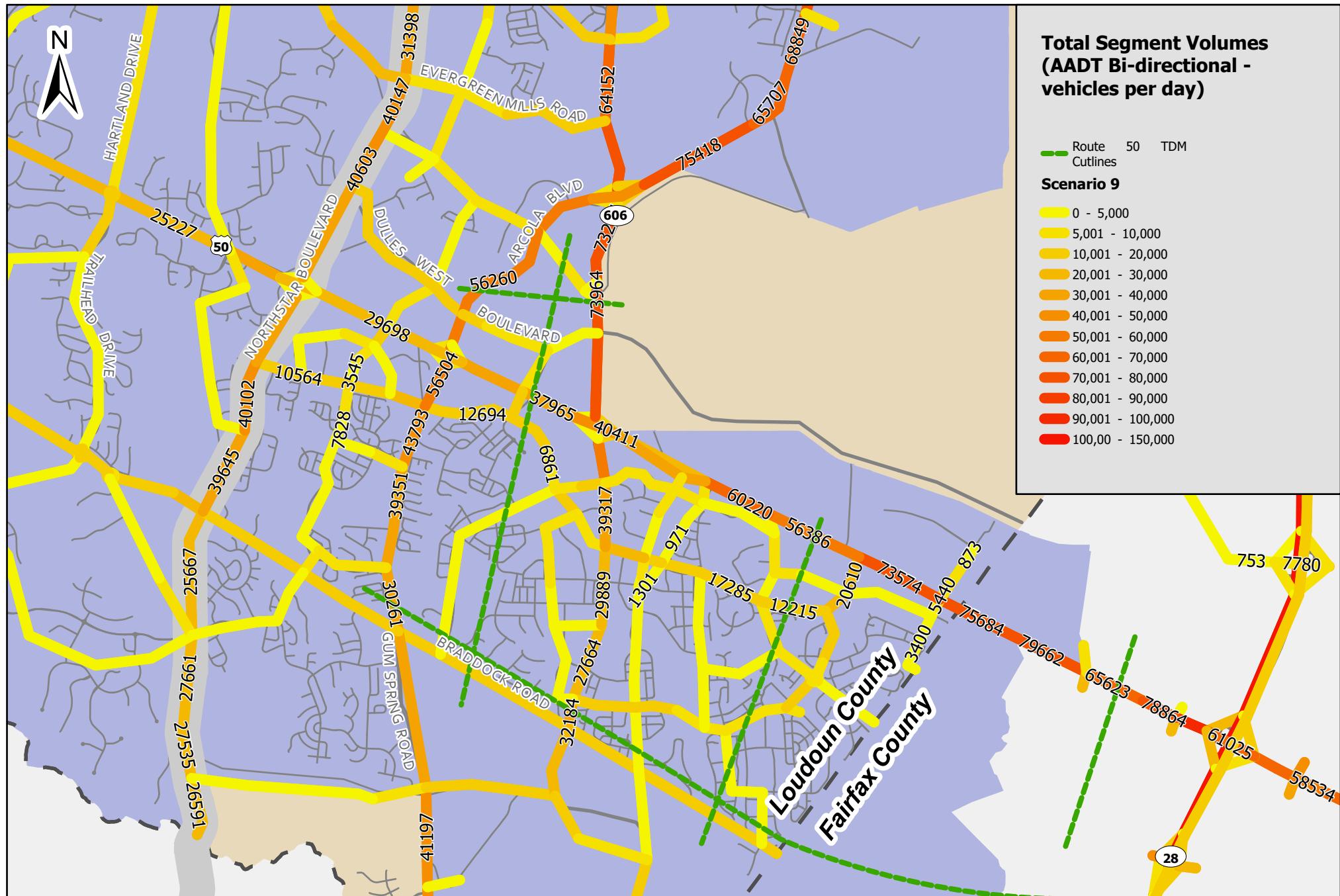
ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA

Kimley » Horn



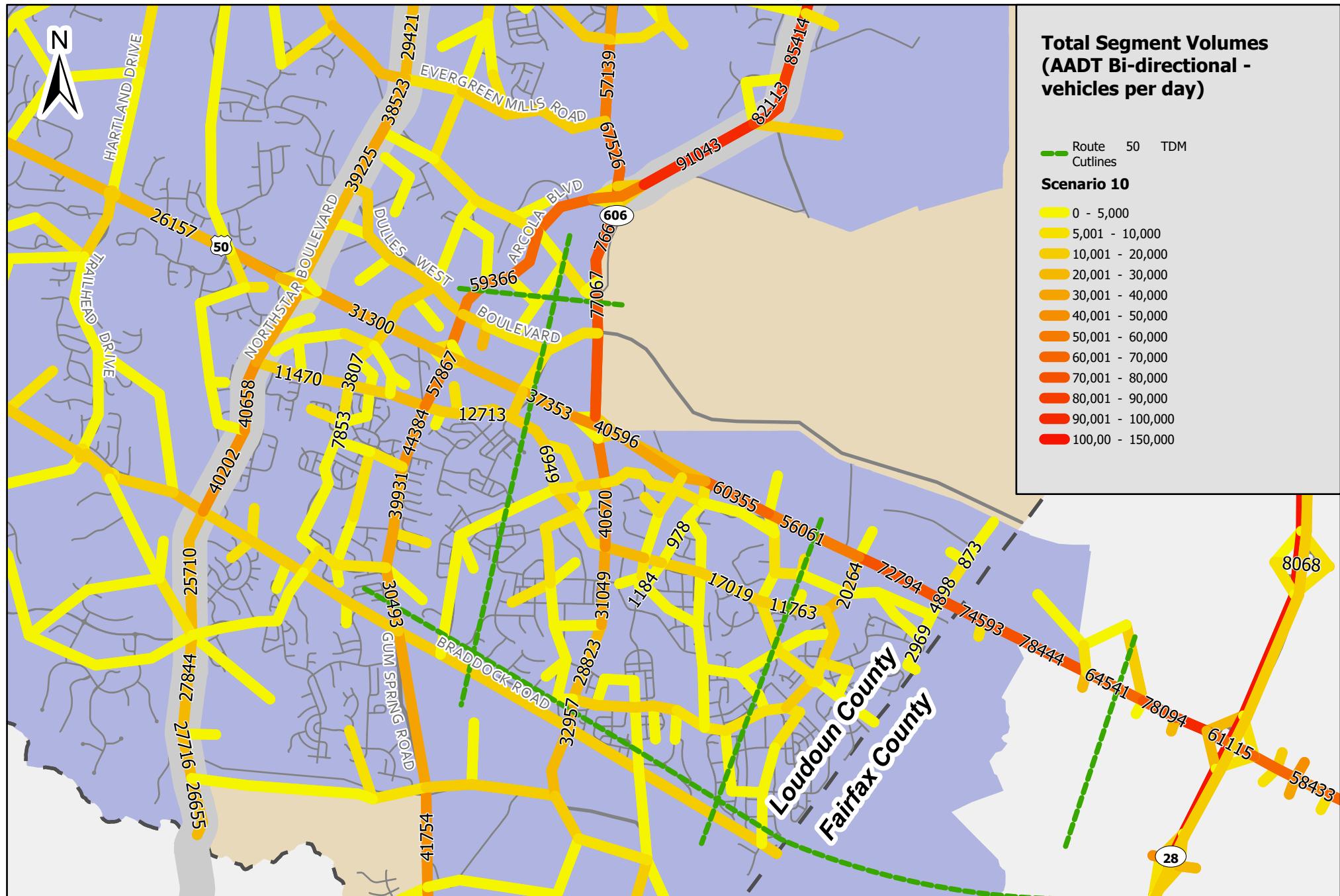
0 0.5 1 Miles

Kimley»Horn



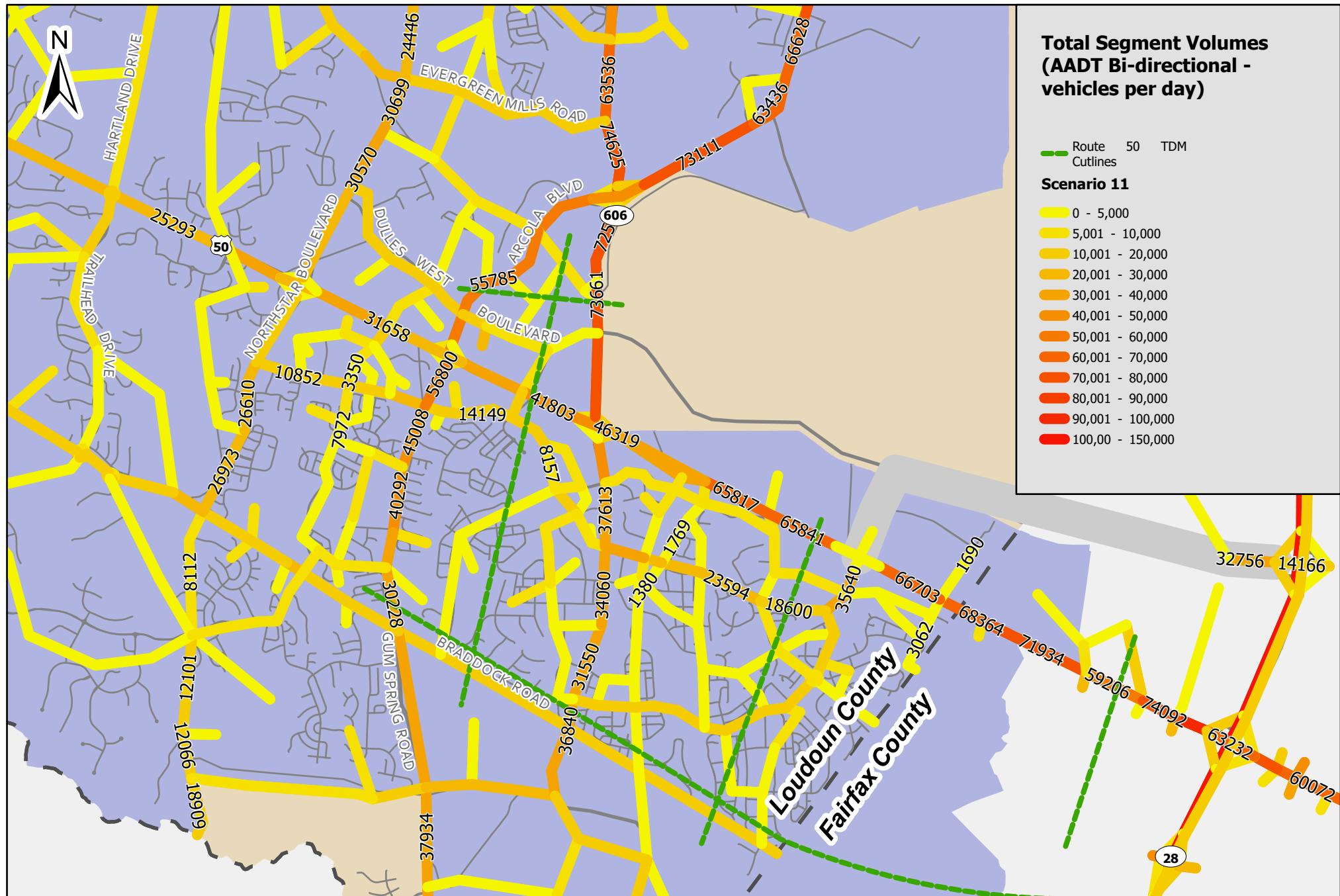
ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA

Kimley » Horn



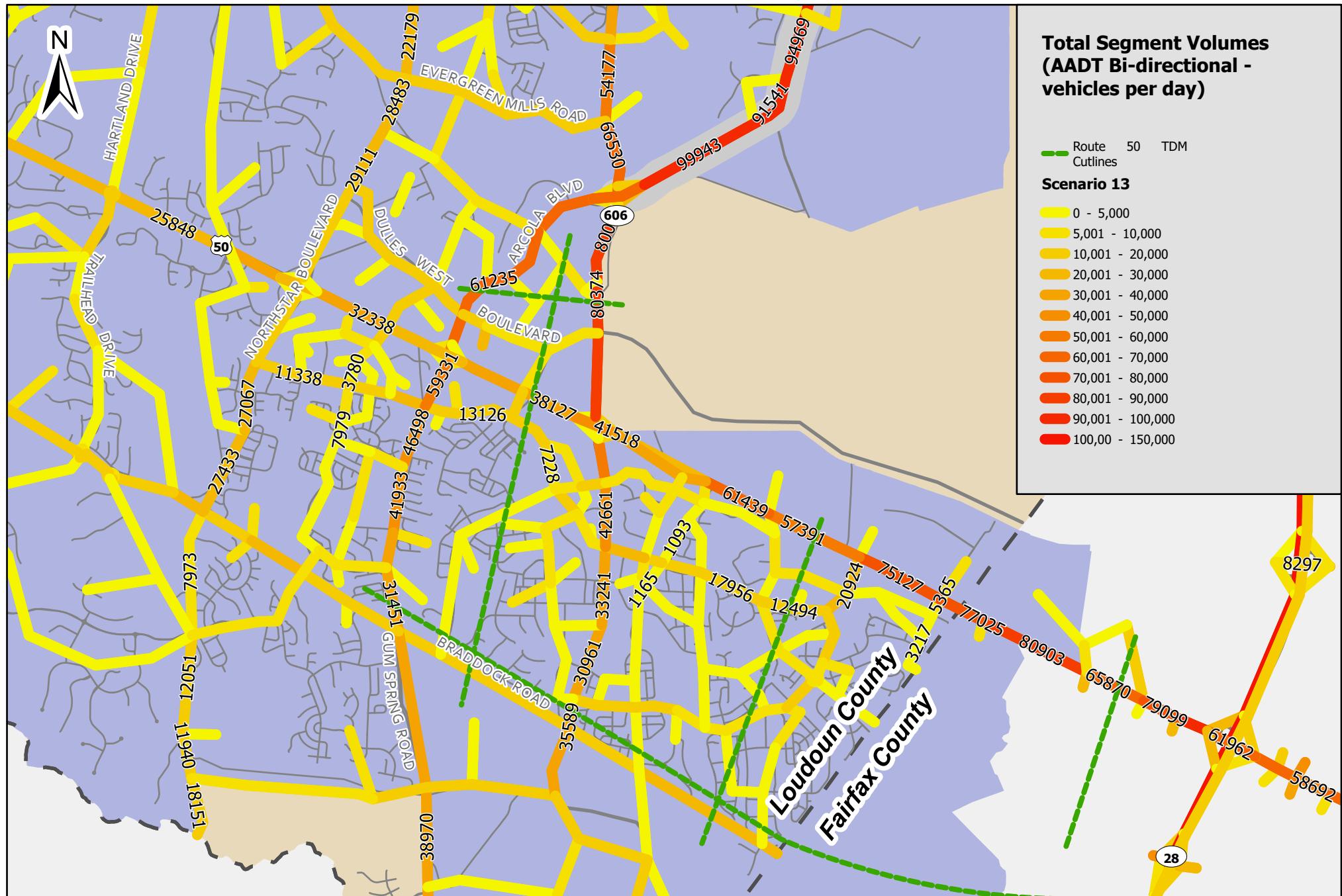
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LOUDOUN COUNTY, VA

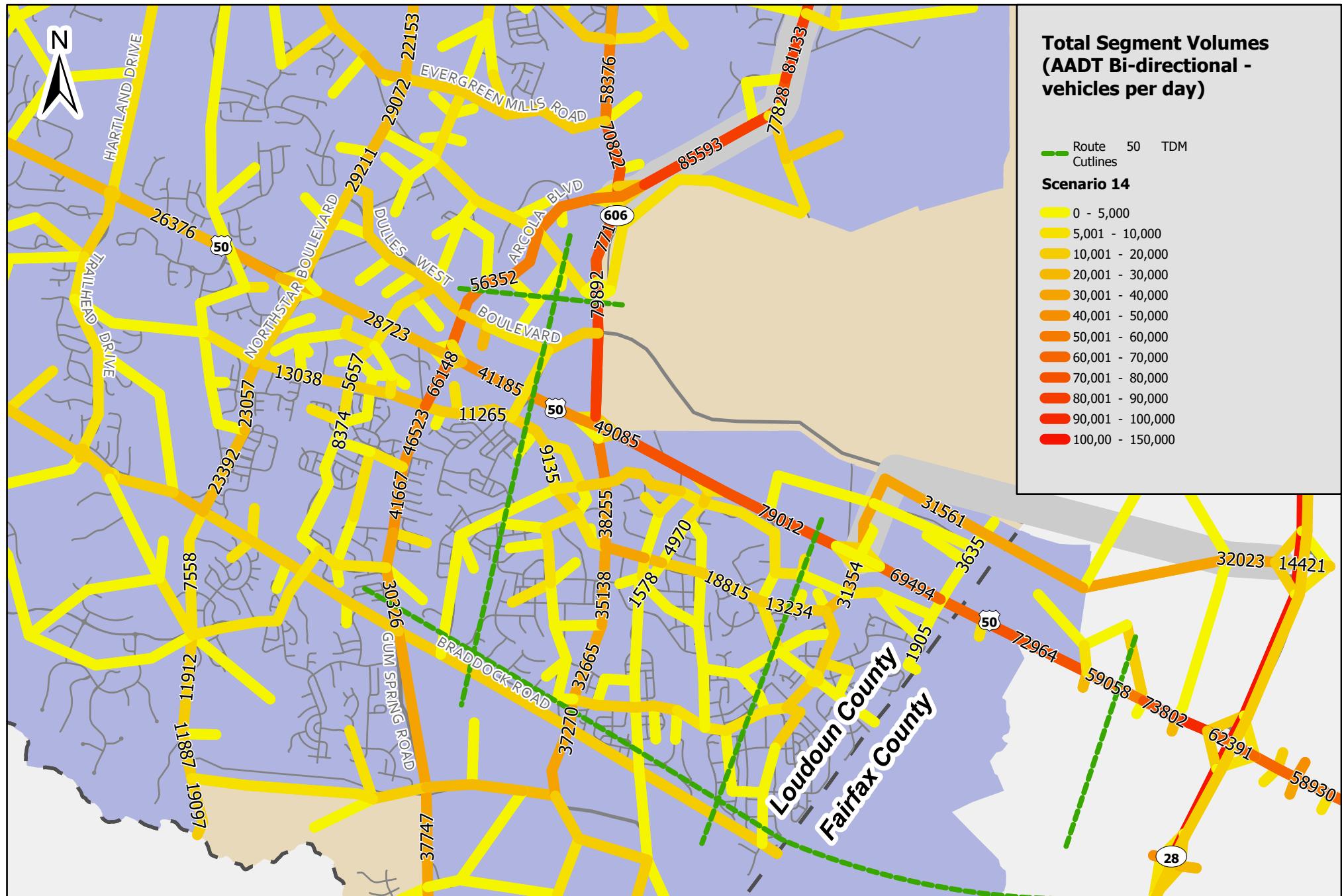
Kimley » Horn



ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA

Kimley » Horn





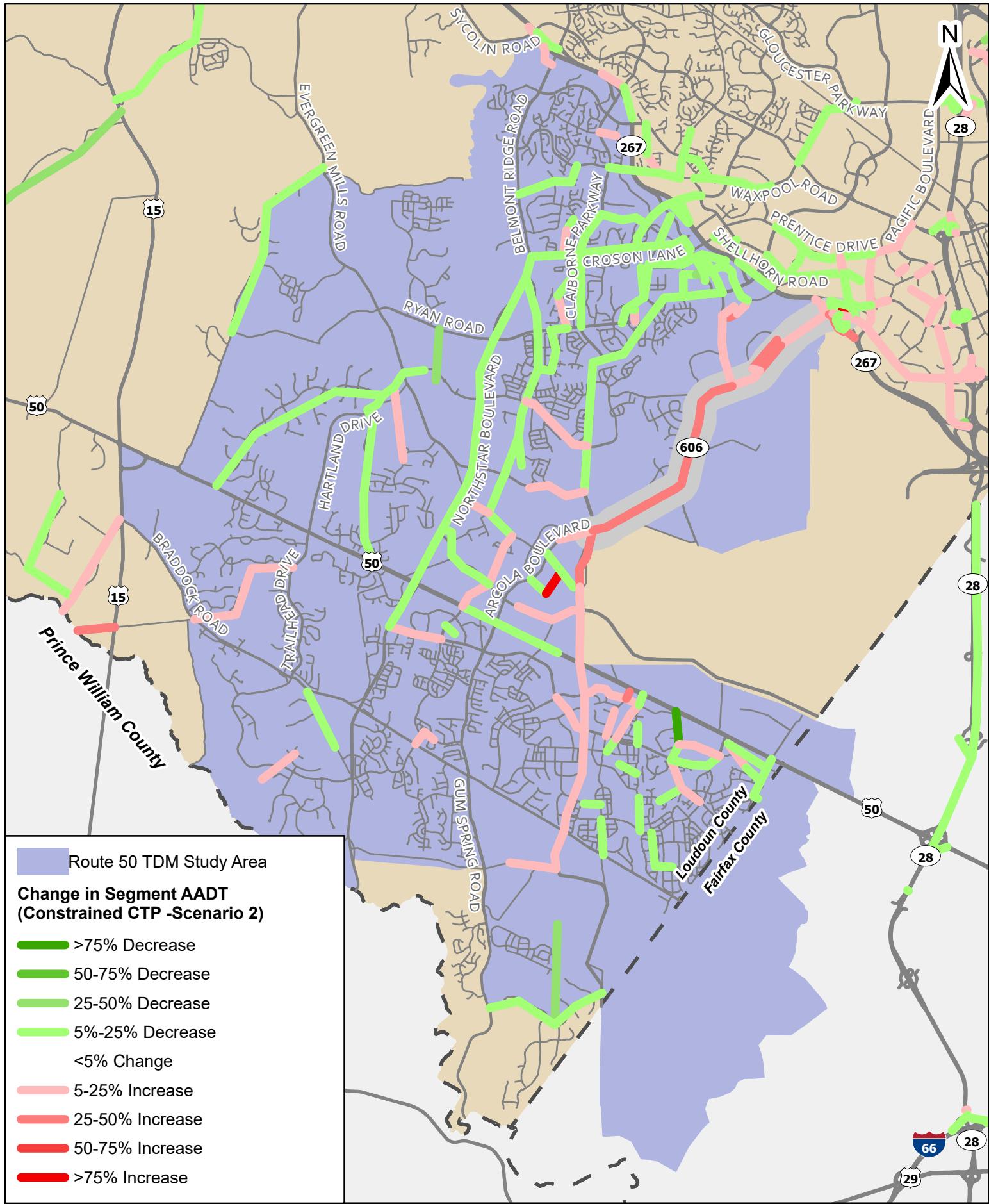
ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA

Kimley » Horn



APPENDIX A-2

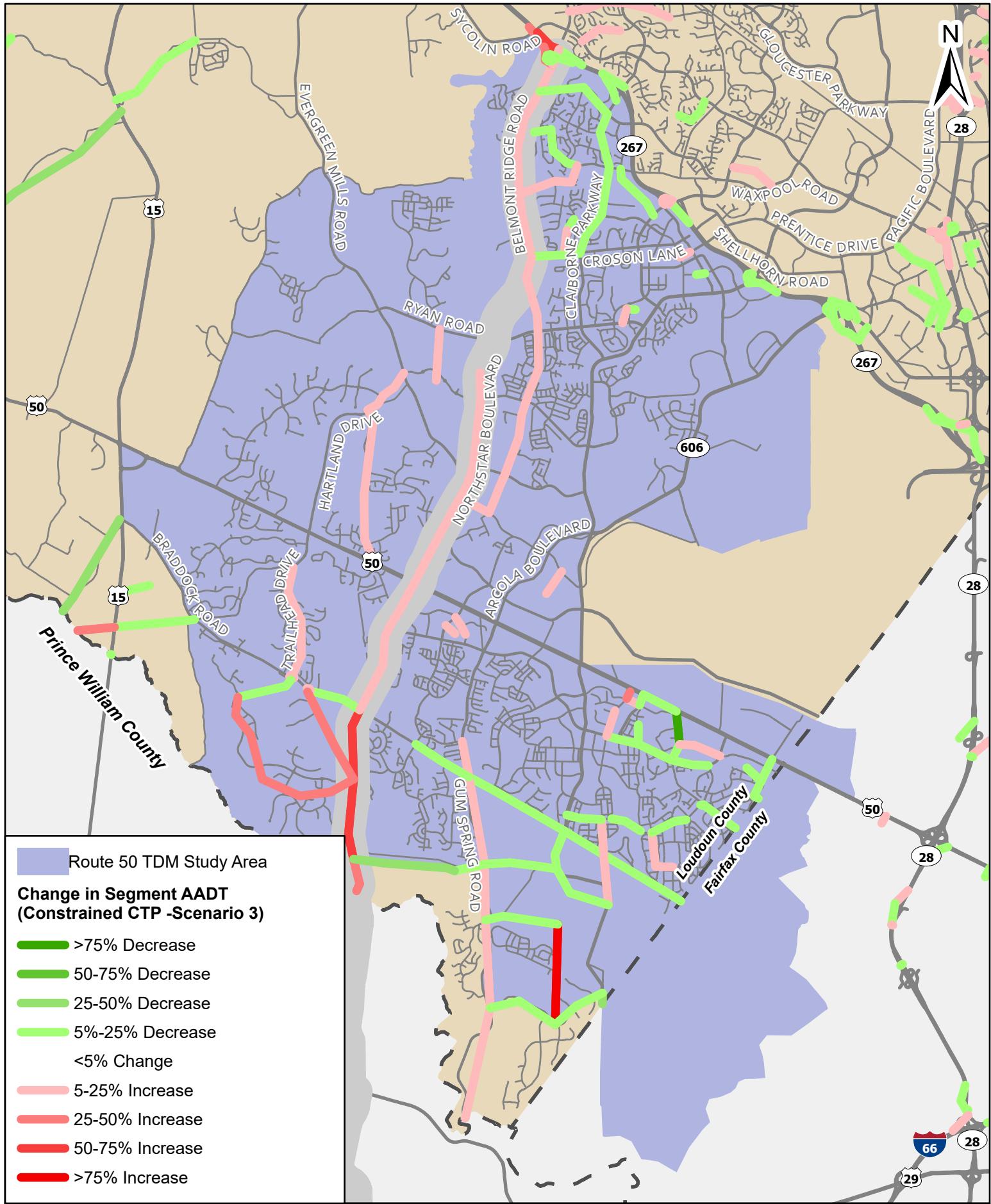
AADT Study Area Comparisons to Baseline Constrained CTP or Full CTP Scenarios



**ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA**

0 0.75 1.5 3 Miles

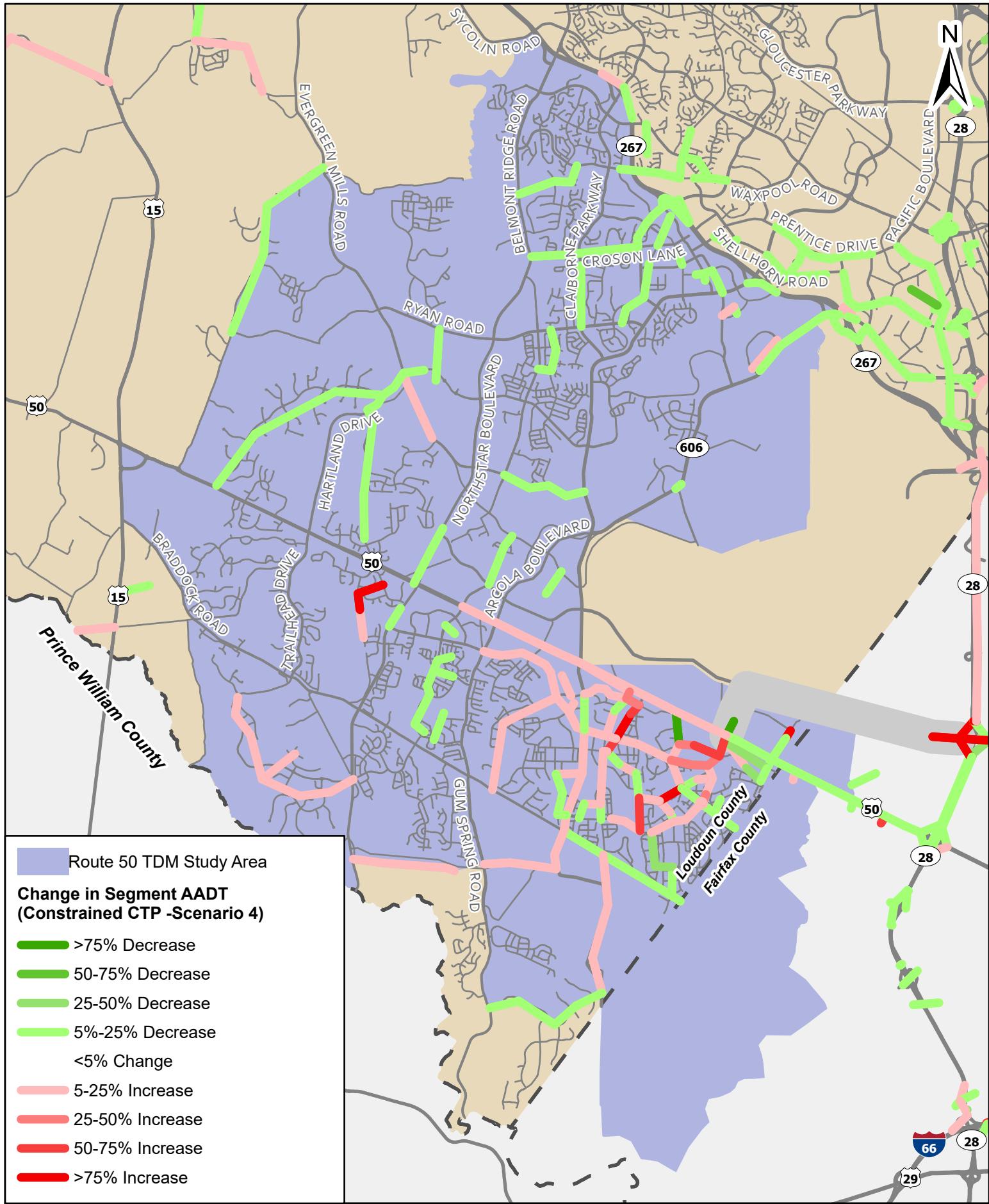
Kimley » Horn



**ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA**

0 0.75 1.5 3 Miles

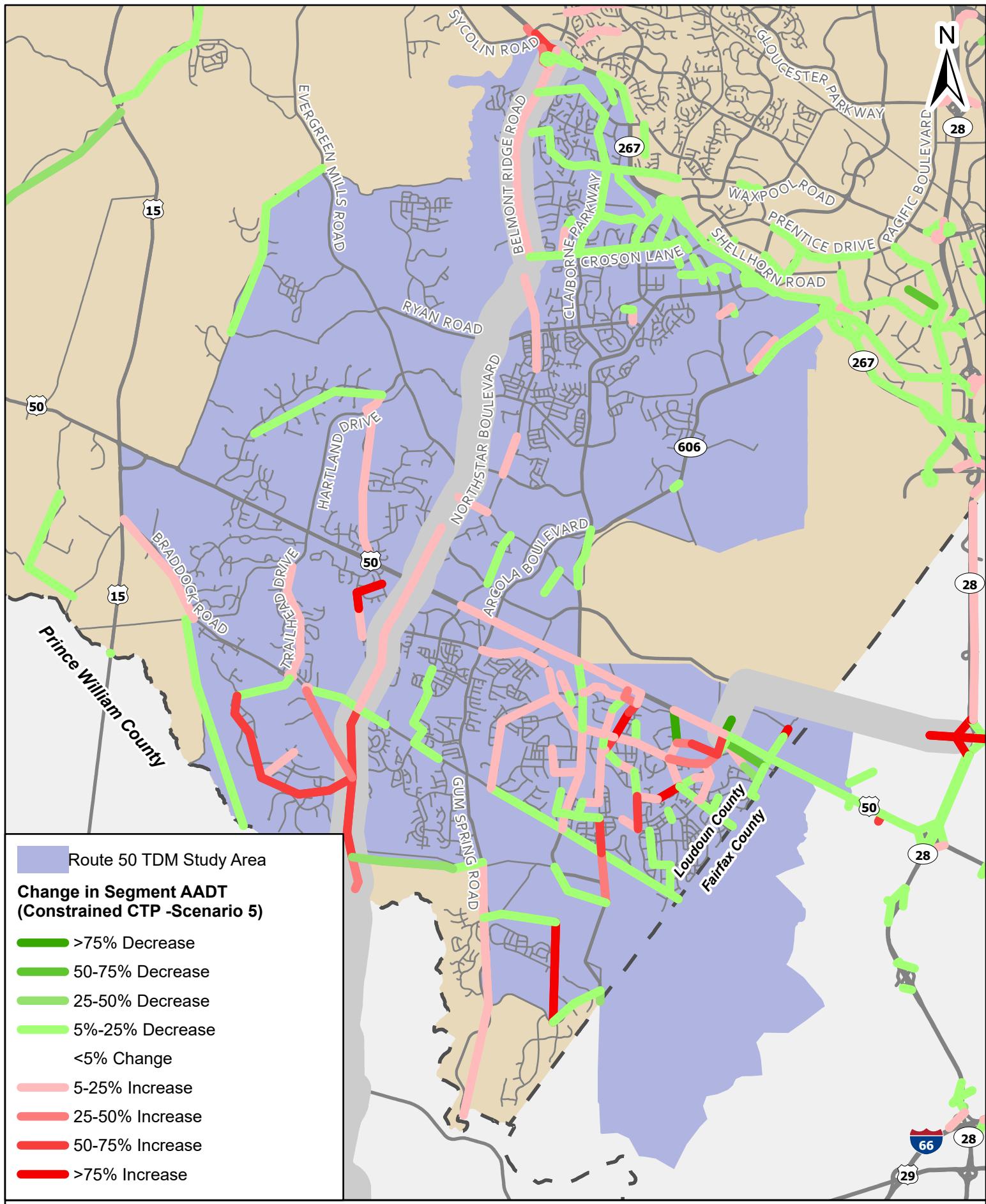
Kimley » Horn



**ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA**

0 0.75 1.5 3 Miles

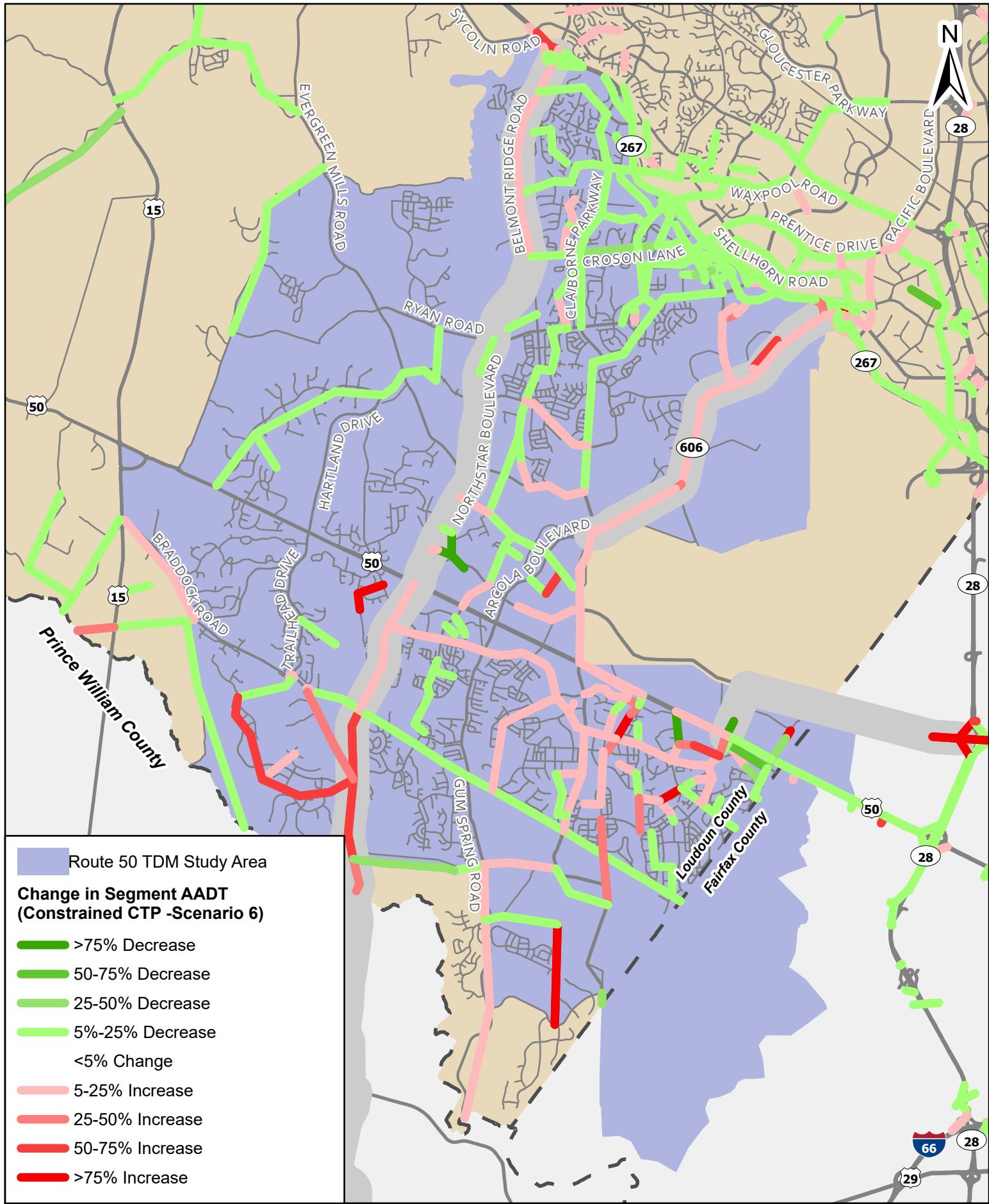
Kimley » Horn



**ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA**

0 0.75 1.5 3 Miles

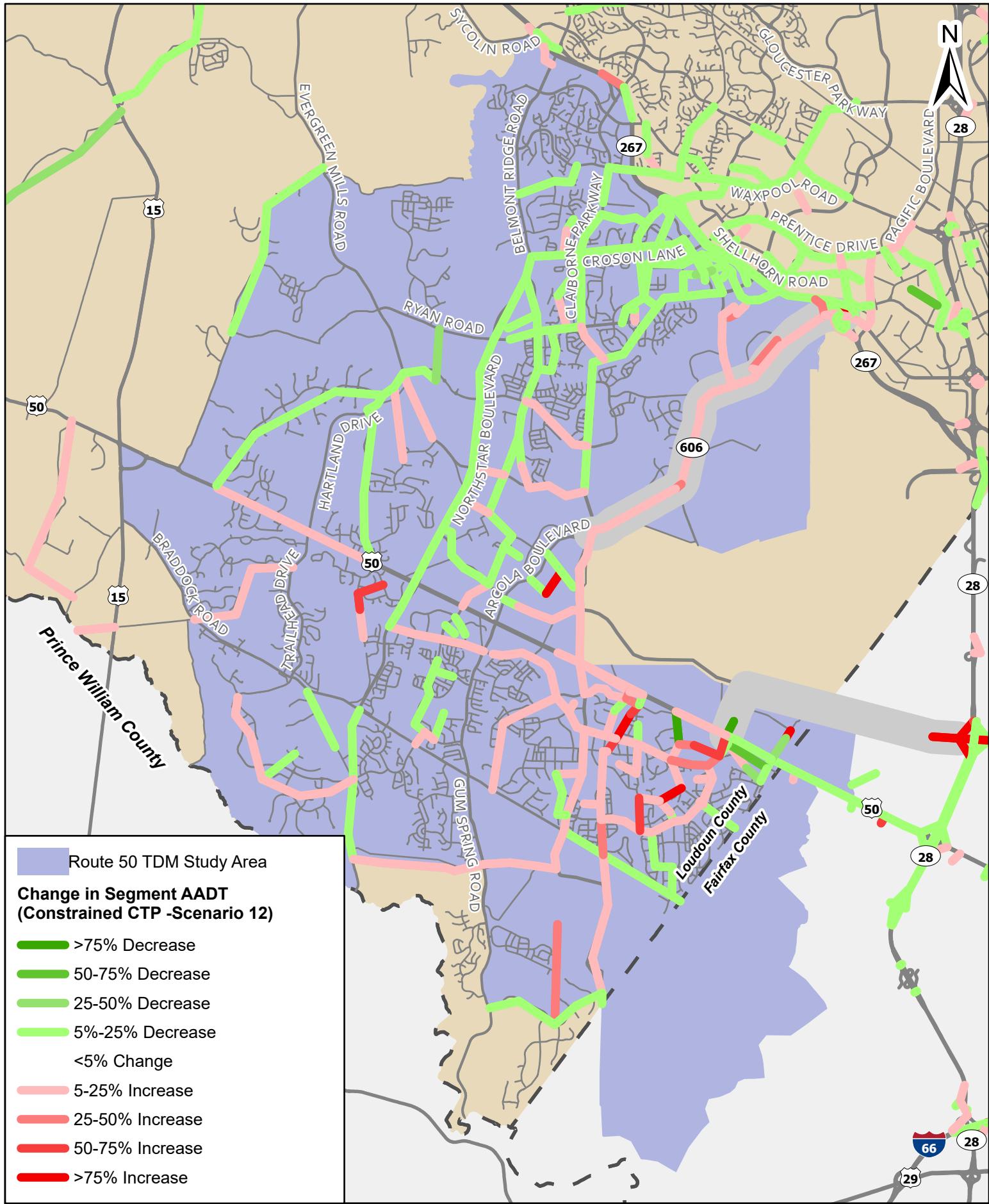
Kimley » Horn



ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA

0 0.75 1.5 3 Miles

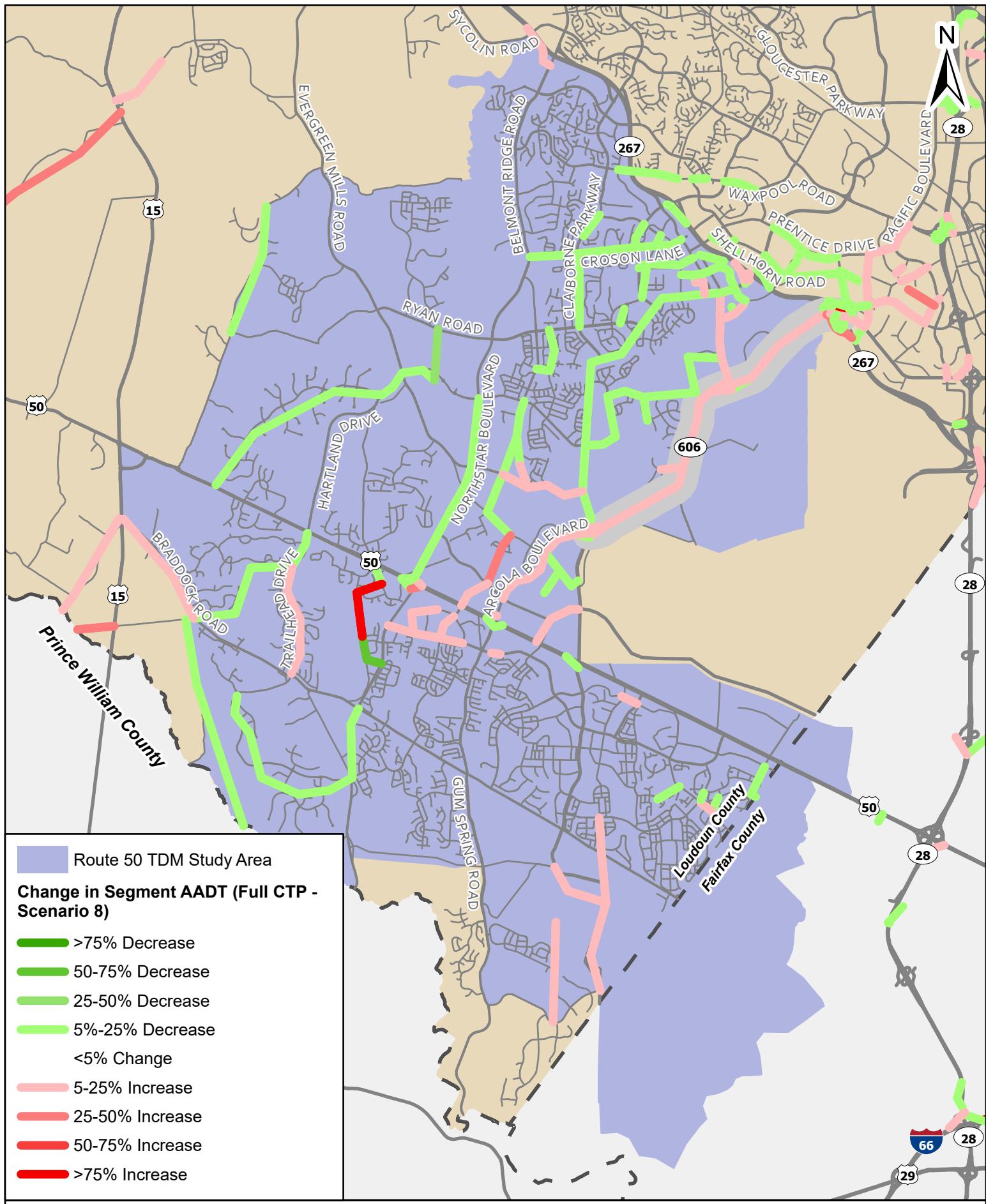
Kimley » Horn



**ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA**

0 0.75 1.5 3 Miles

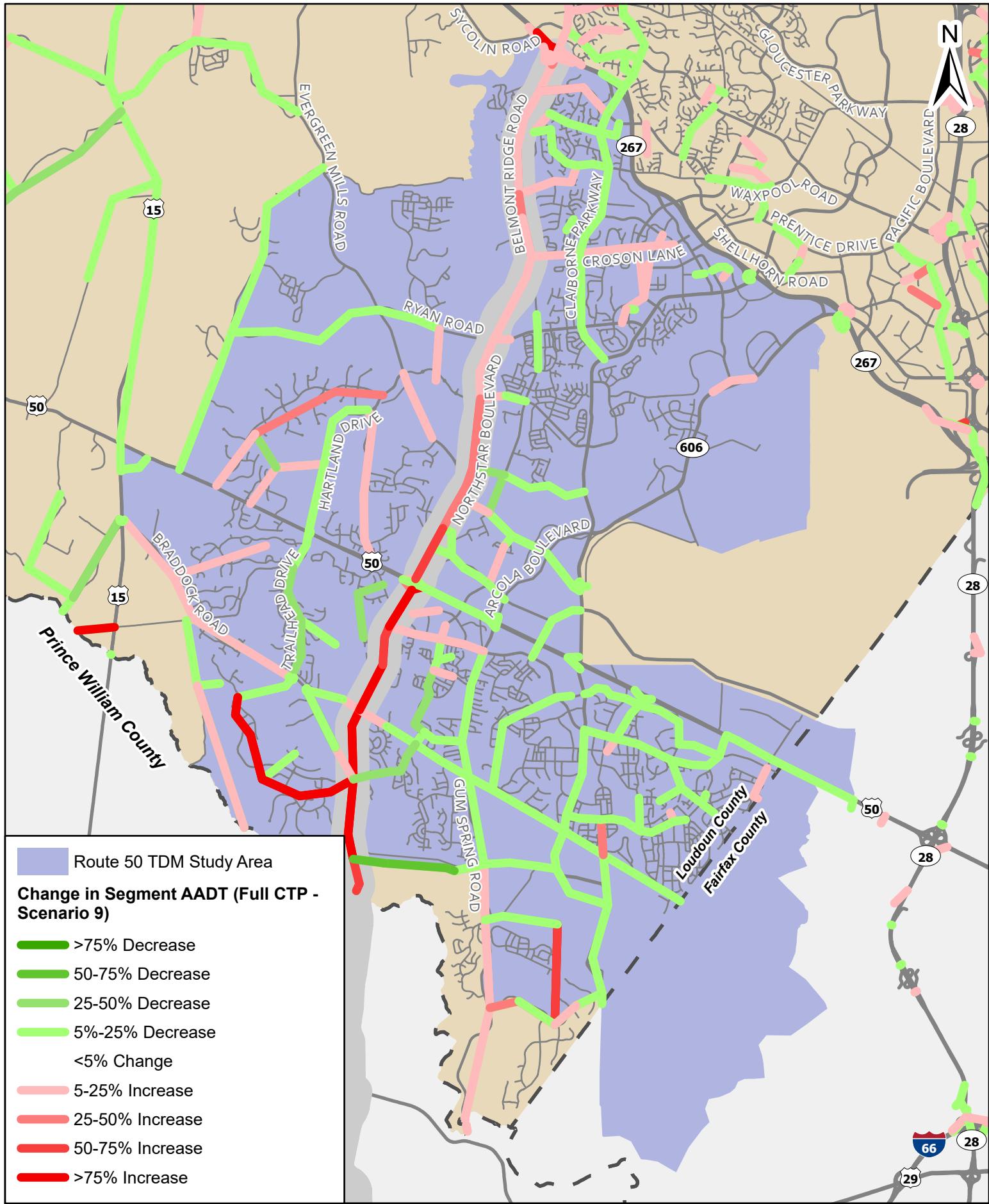
Kimley » Horn



**ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA**

0 0.75 1.5 3 Miles

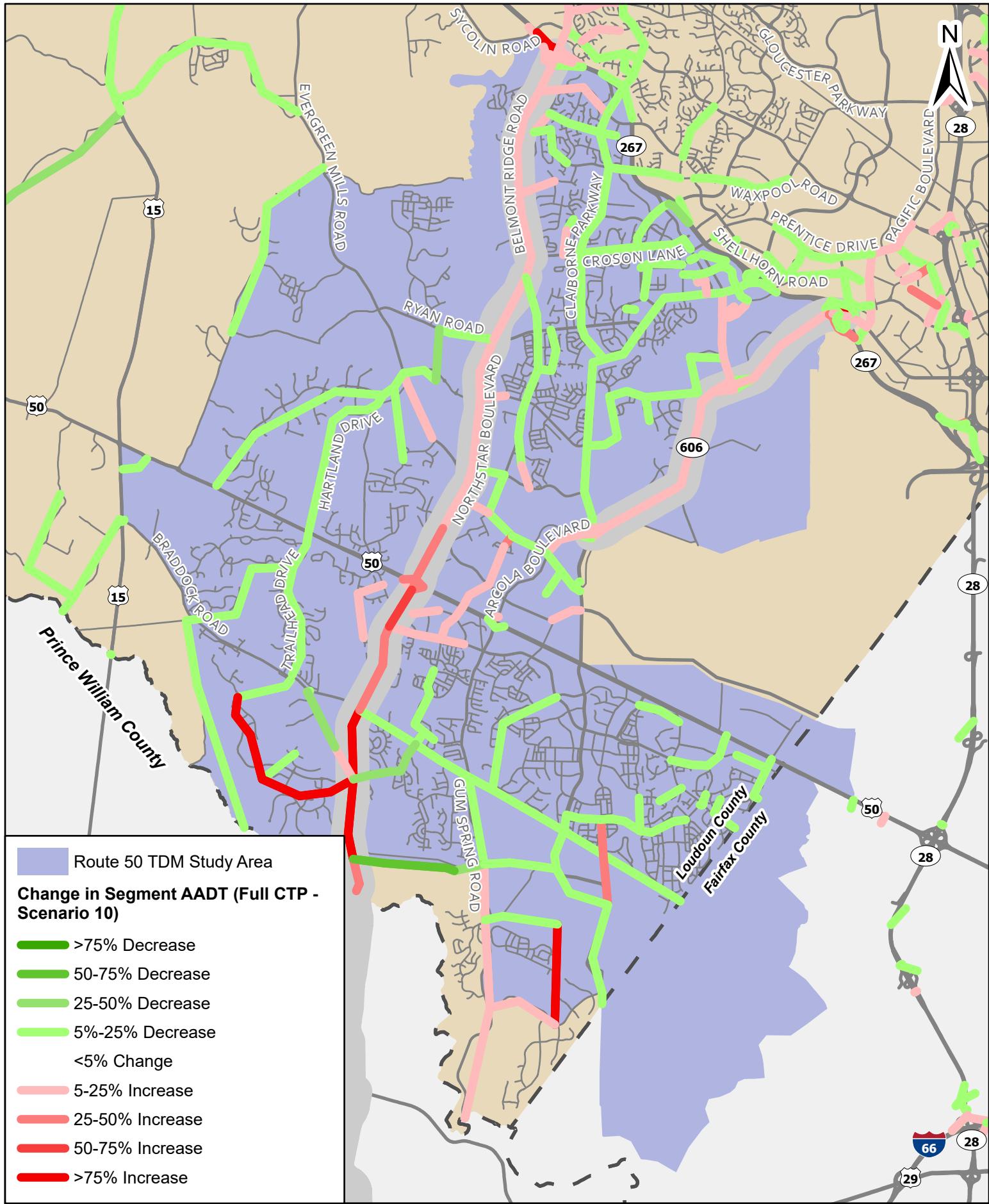
Kimley » Horn



**ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA**

0 0.75 1.5 3 Miles

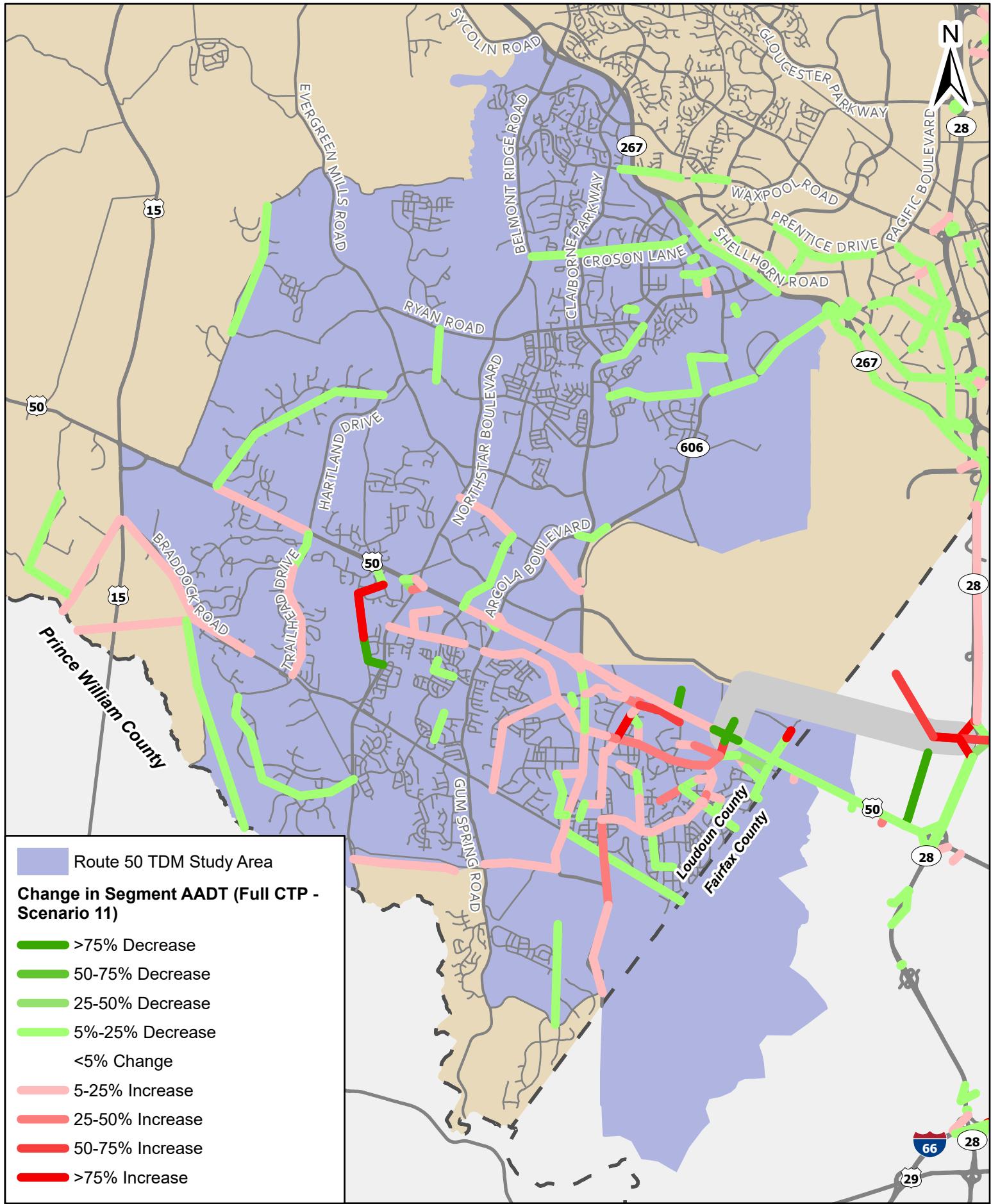
Kimley » Horn



**ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA**

0 0.75 1.5 3 Miles

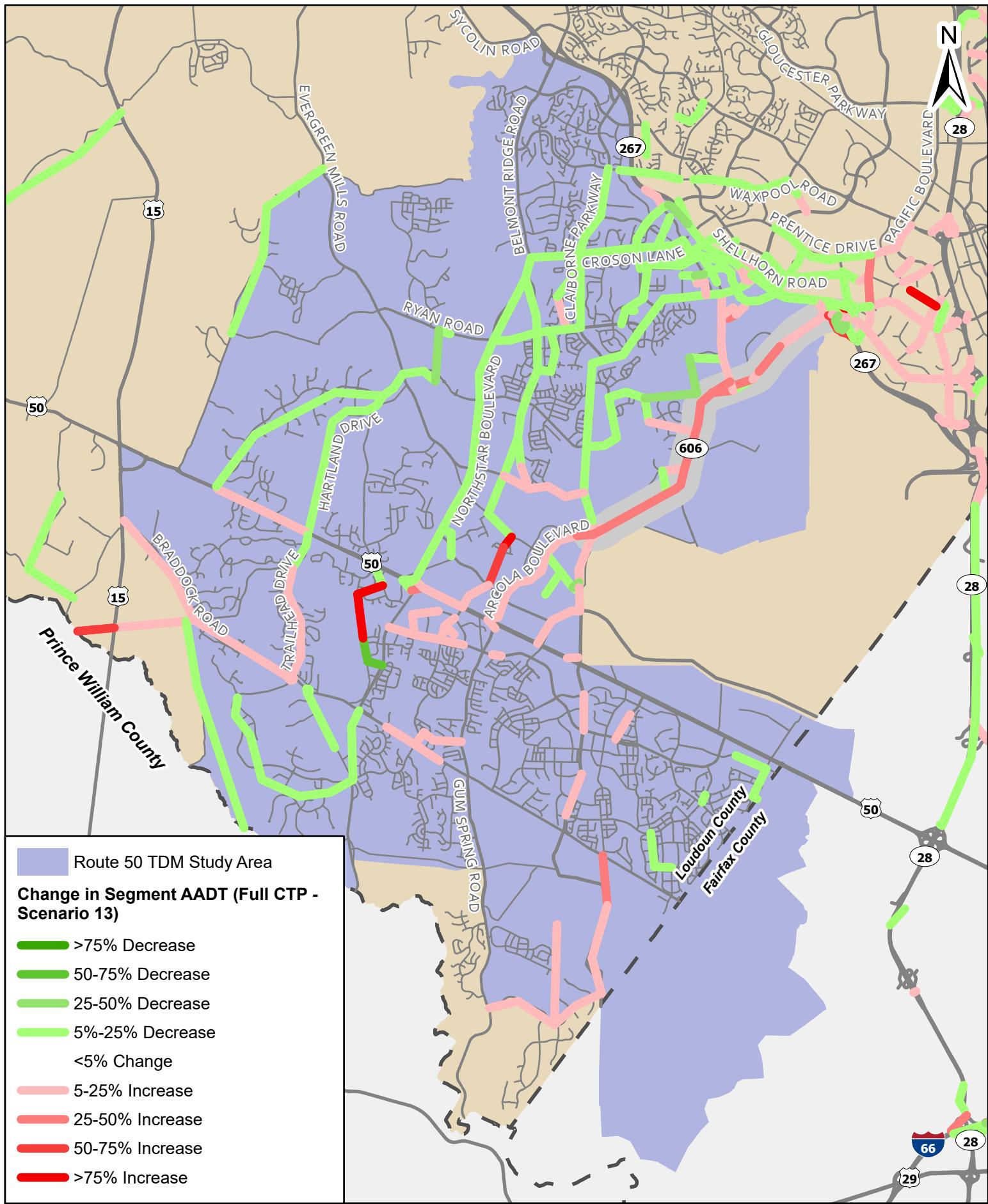
Kimley » Horn



**ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA**

0 0.75 1.5 3 Miles

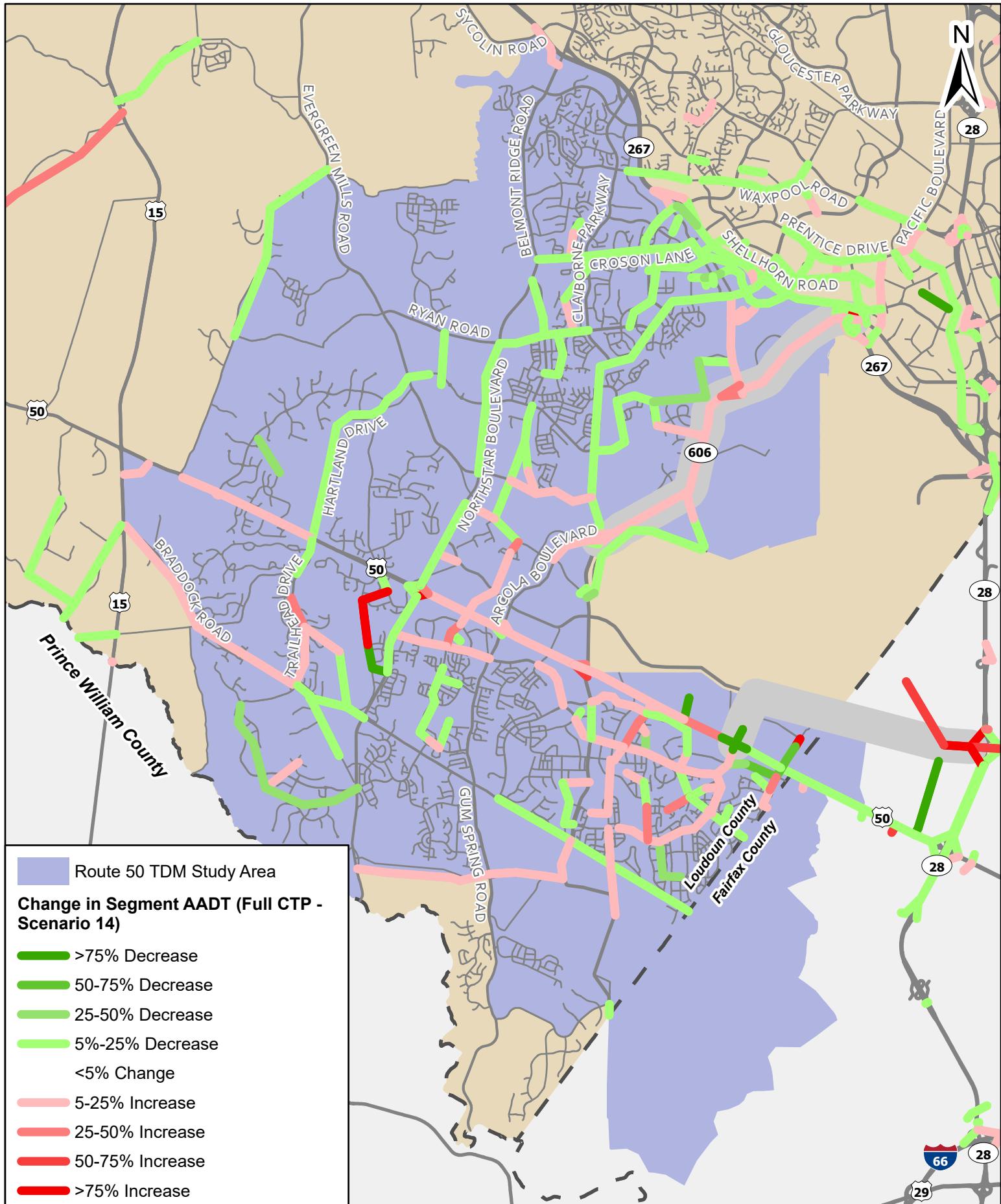
Kimley » Horn



**ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA**

0 0.75 1.5 3 Miles

Kimley » Horn



**ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA**

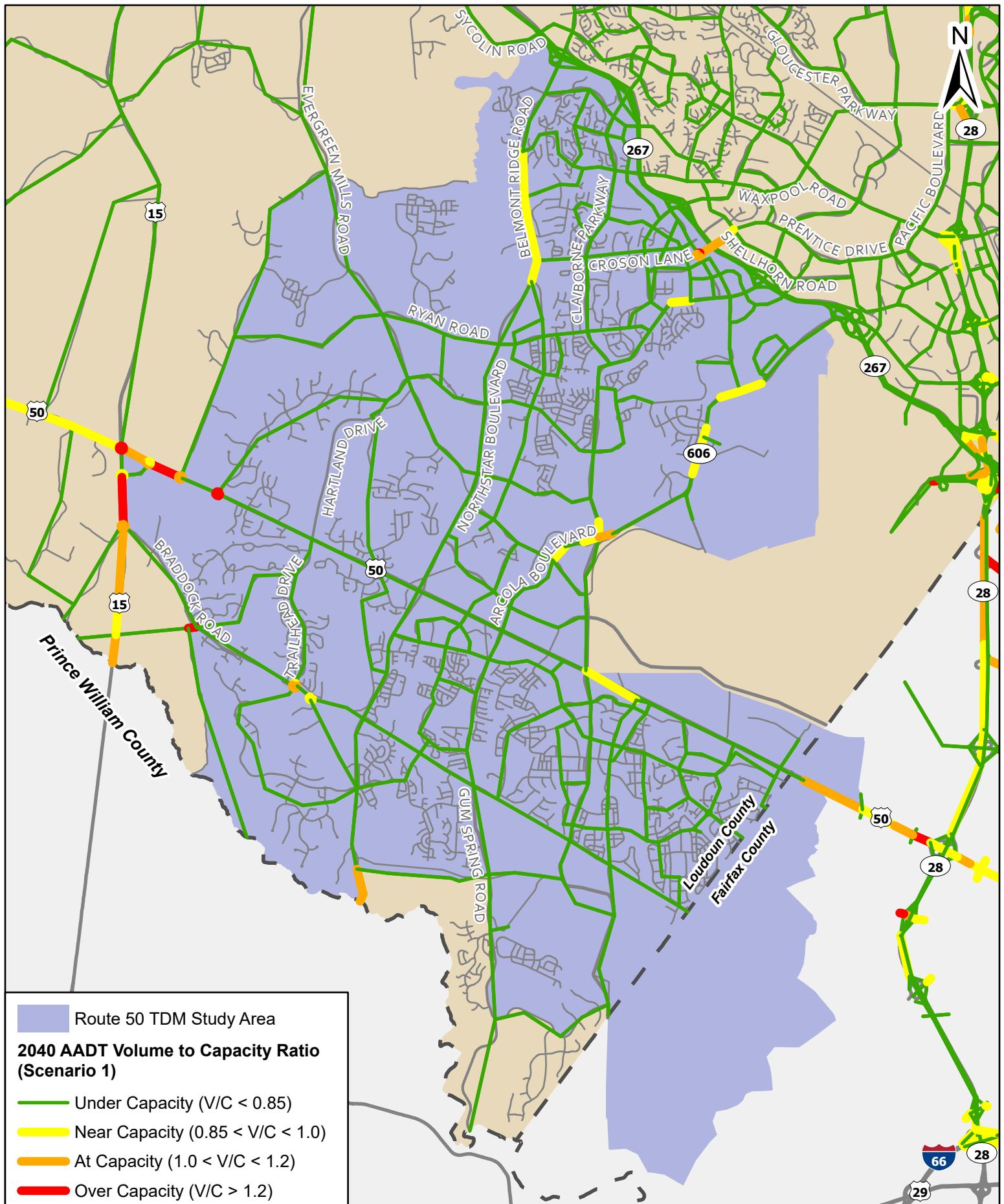
0 0.75 1.5 3 Miles

Kimley » Horn



APPENDIX A-3

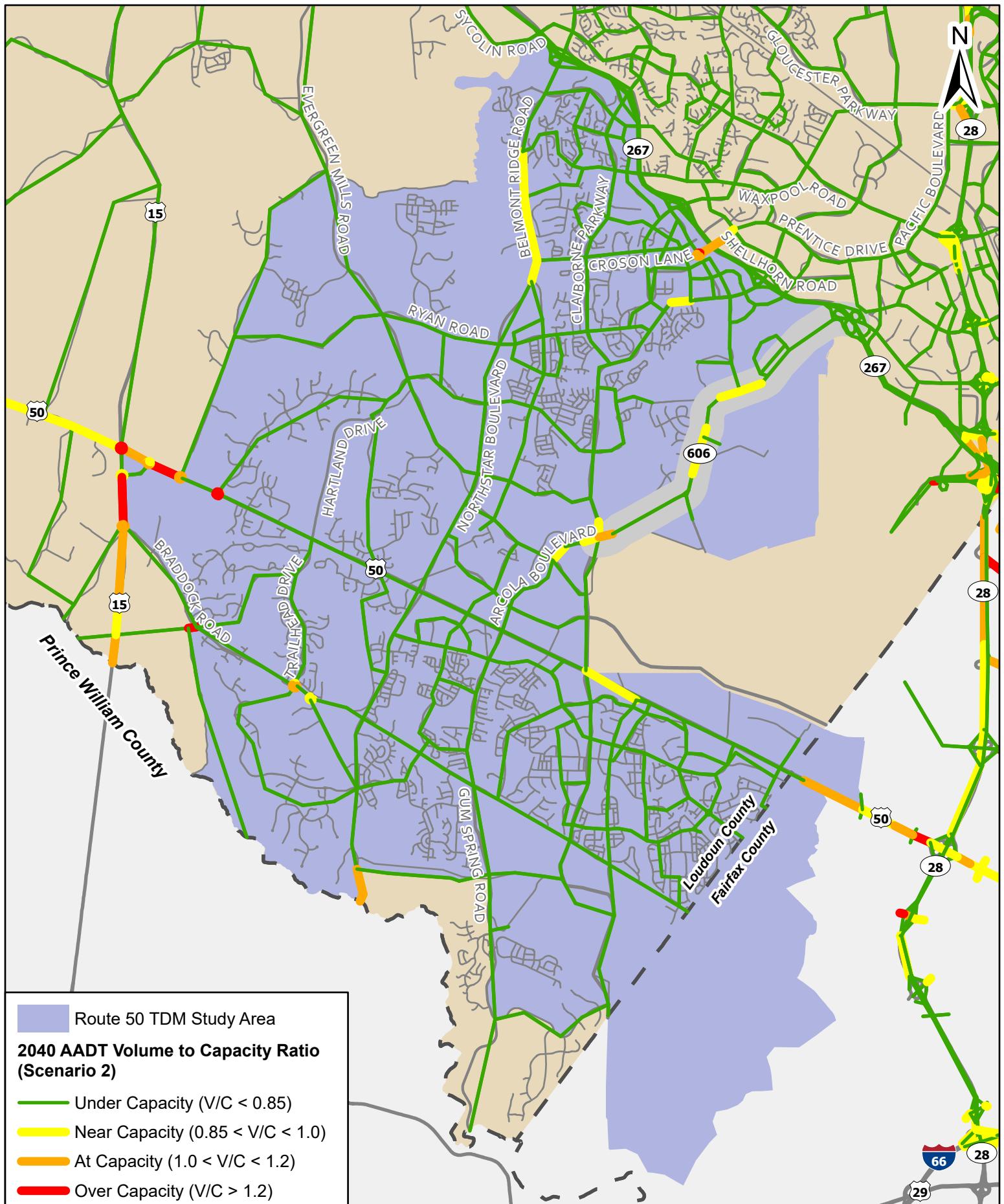
2040 AADT Volume to Capacity Ratios within the Study Area



ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA

0 0.75 1.5 3 Miles

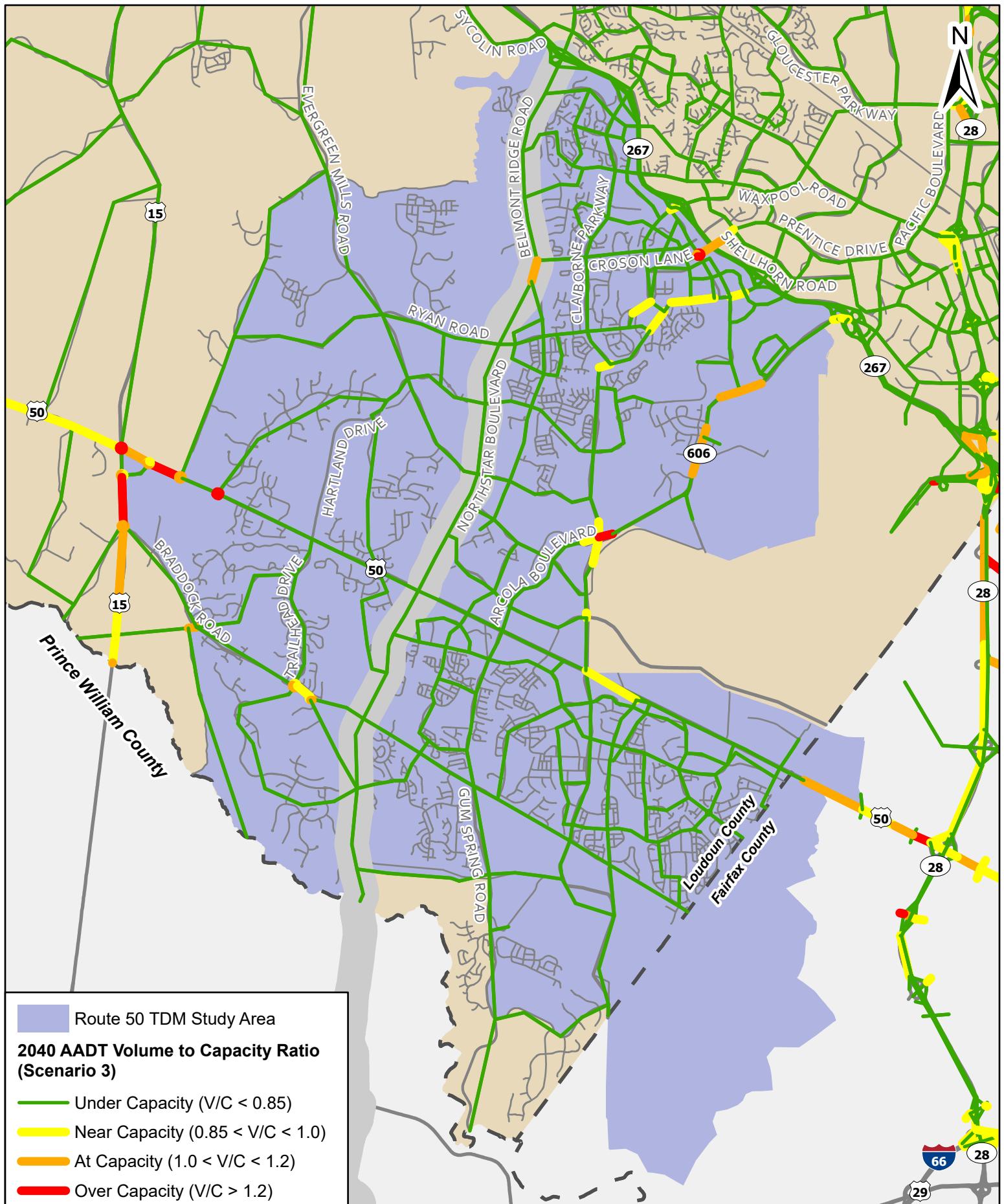
Kimley » Horn



ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA

0 0.75 1.5 3 Miles

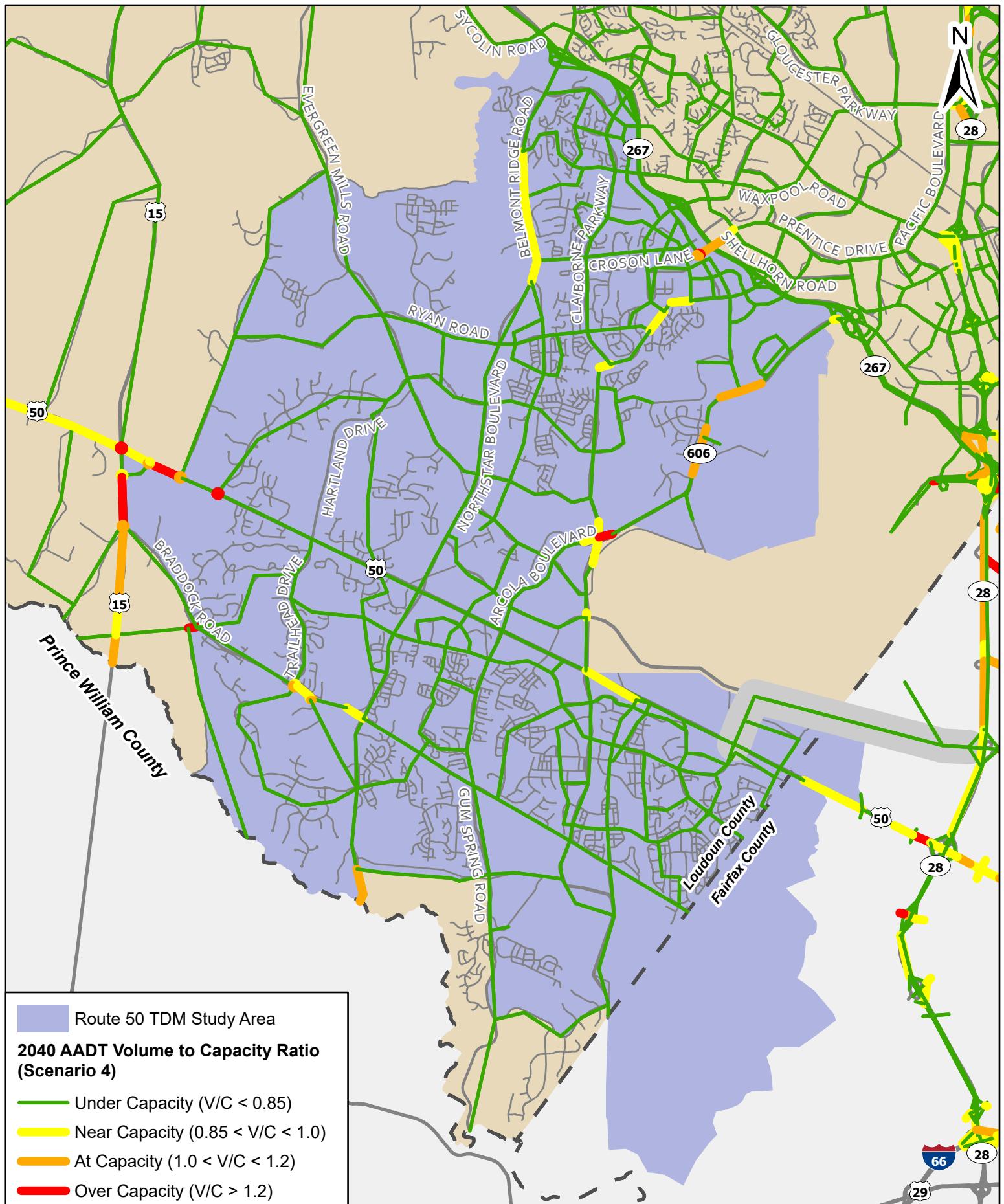
Kimley » Horn



ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA

0 0.75 1.5 3 Miles

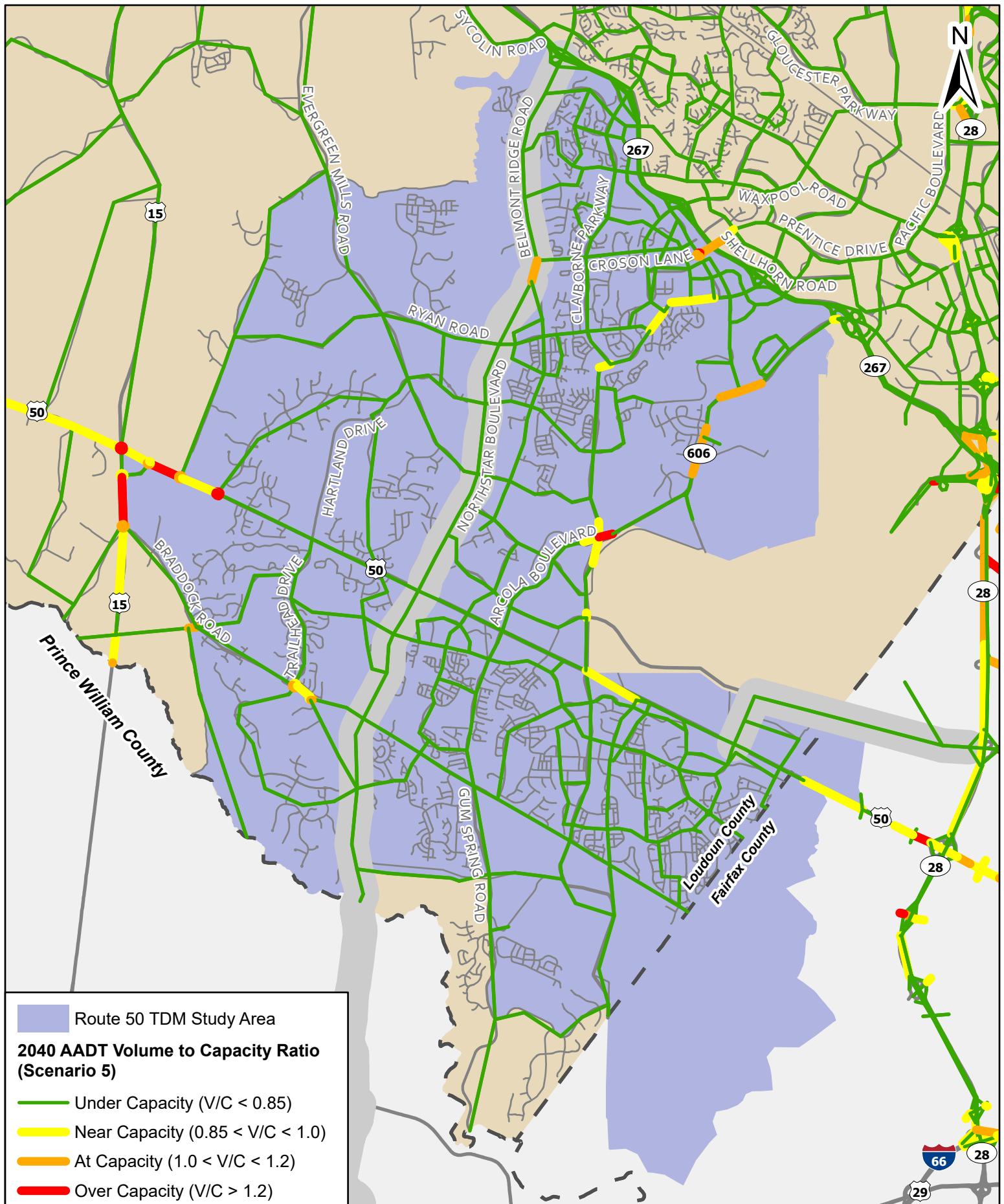
Kimley » Horn



ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA

0 0.75 1.5 3 Miles

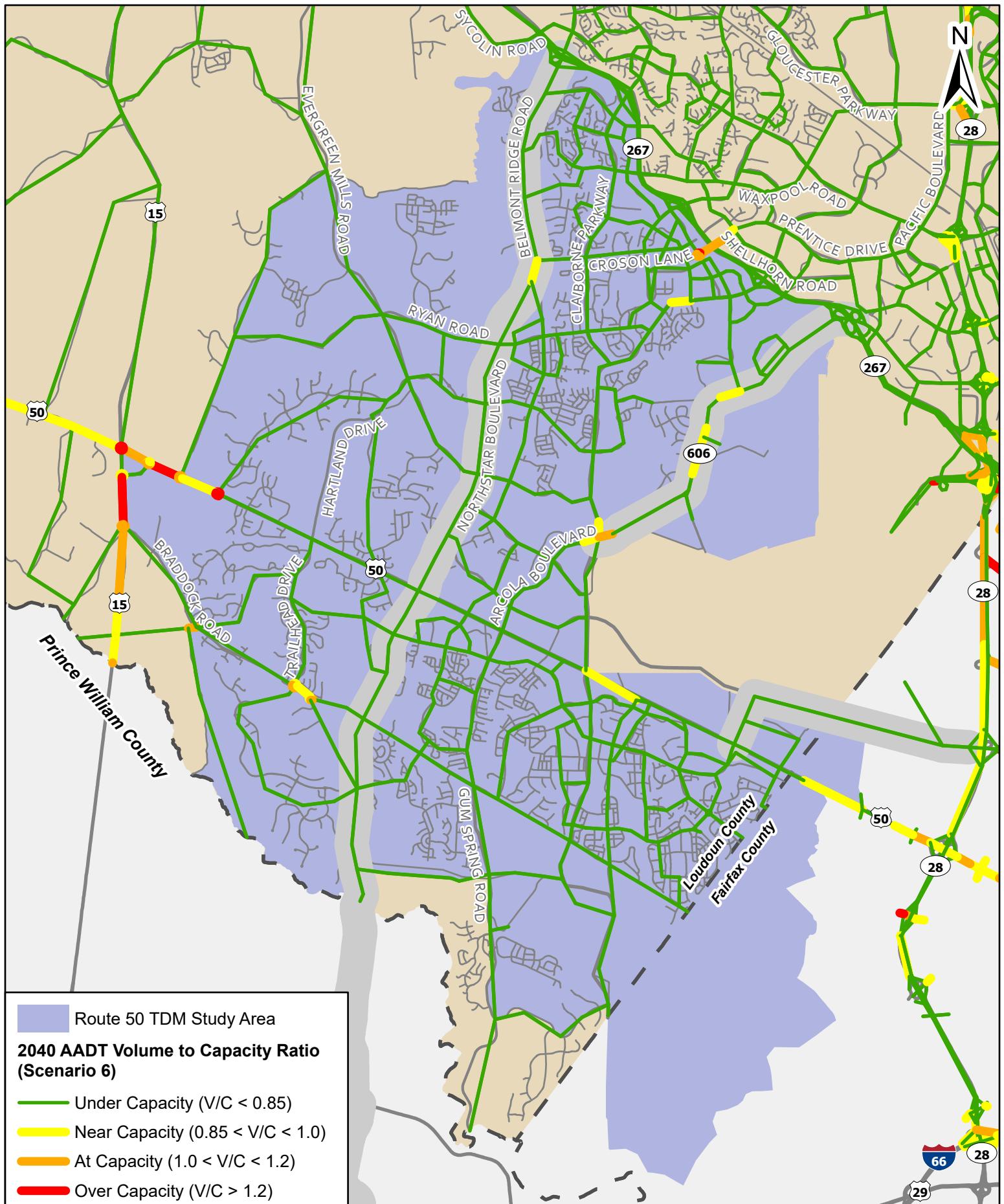
Kimley » Horn



**ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA**

0 0.75 1.5 3 Miles

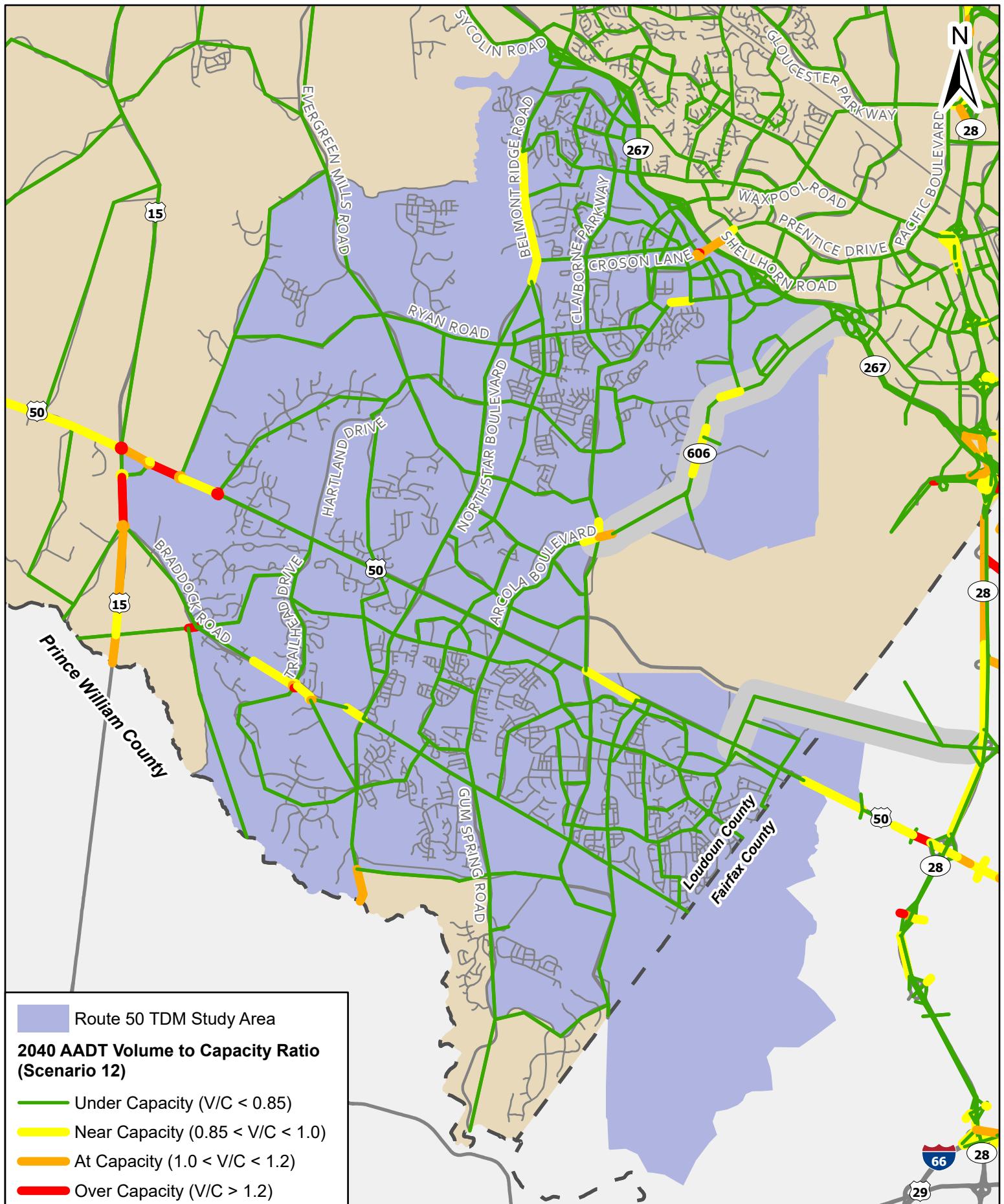
Kimley » Horn



ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA

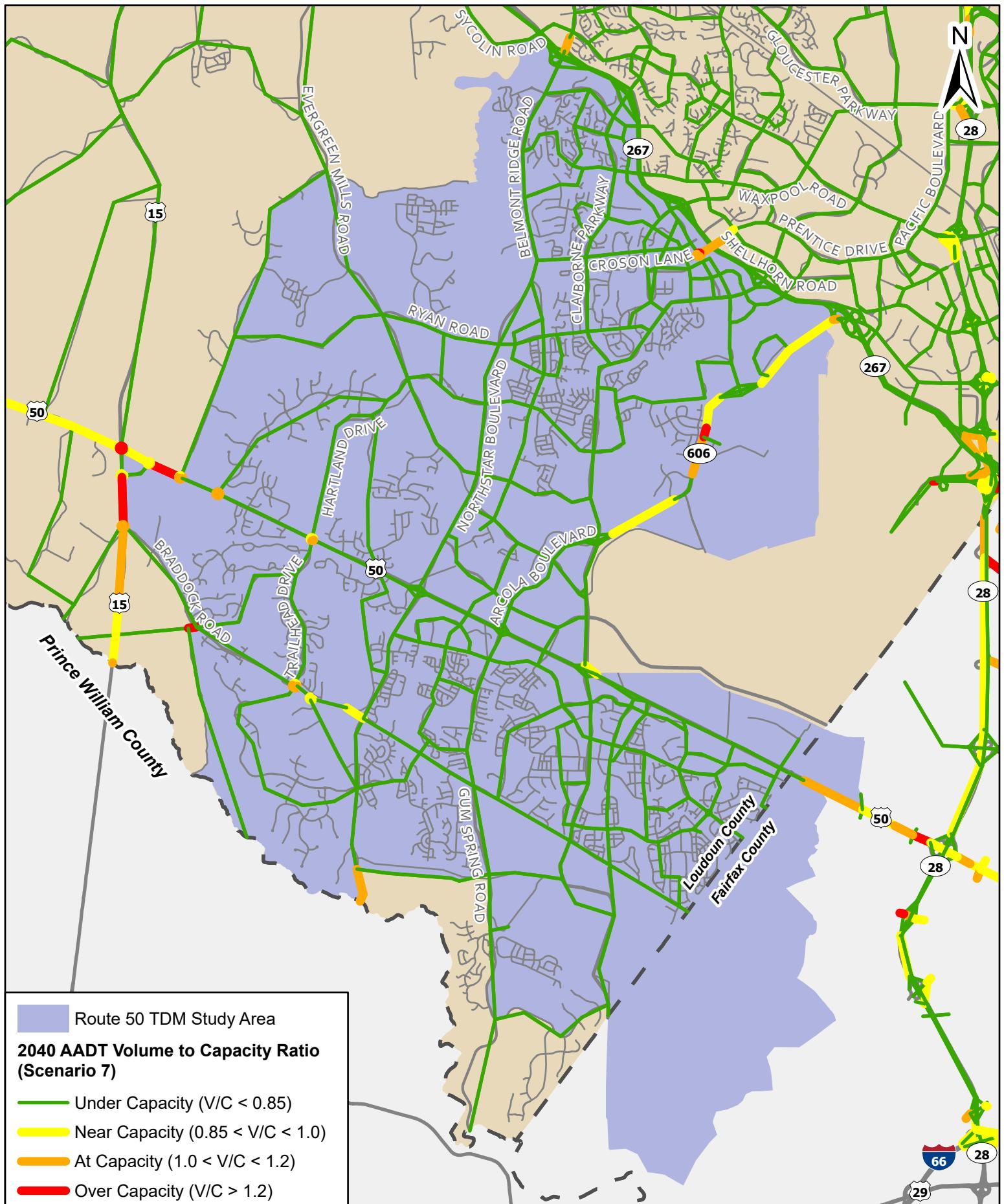
0 0.75 1.5 3 Miles

Kimley » Horn



**ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA**

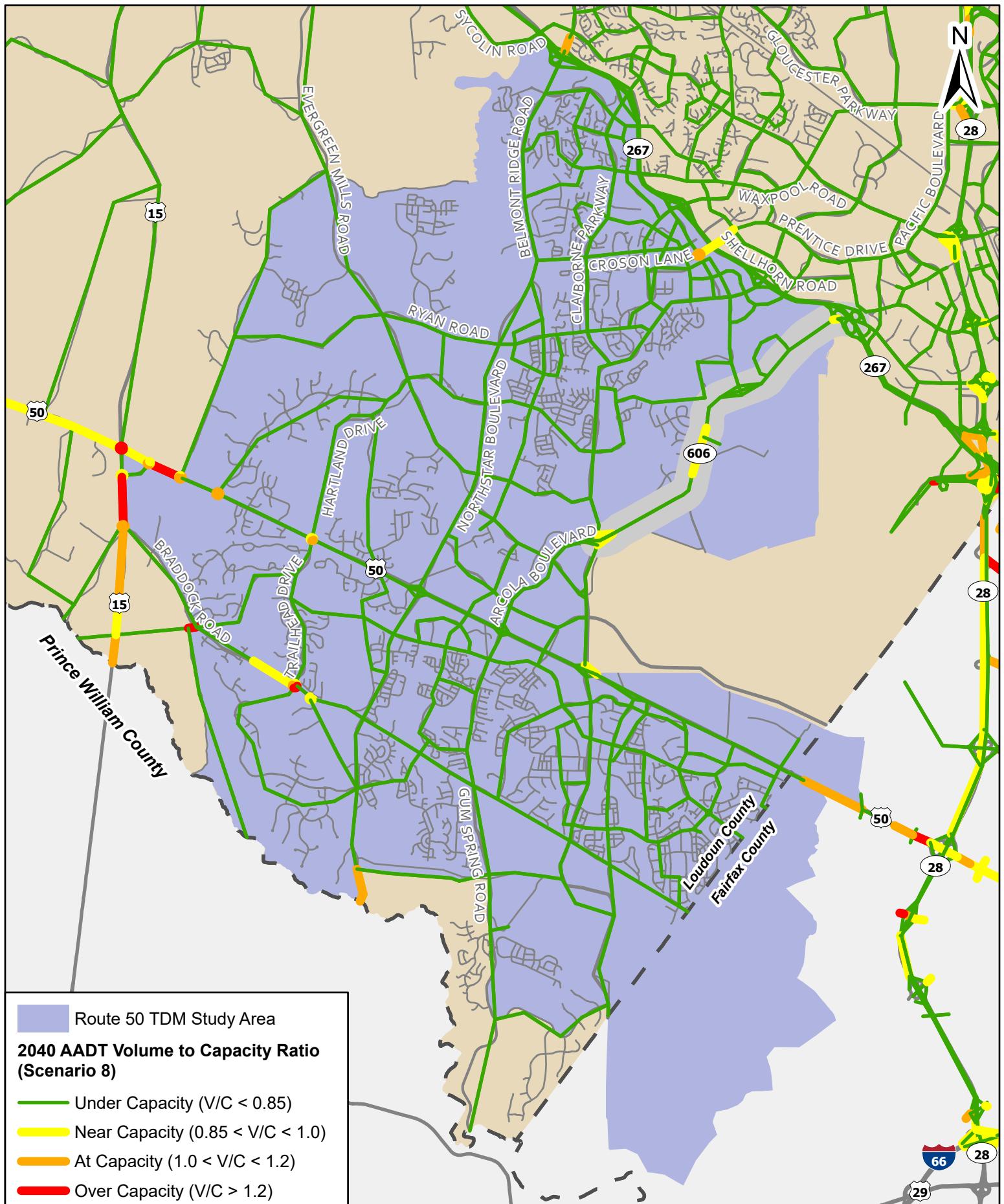
Kimley » Horn



**ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA**

0 0.75 1.5 3 Miles

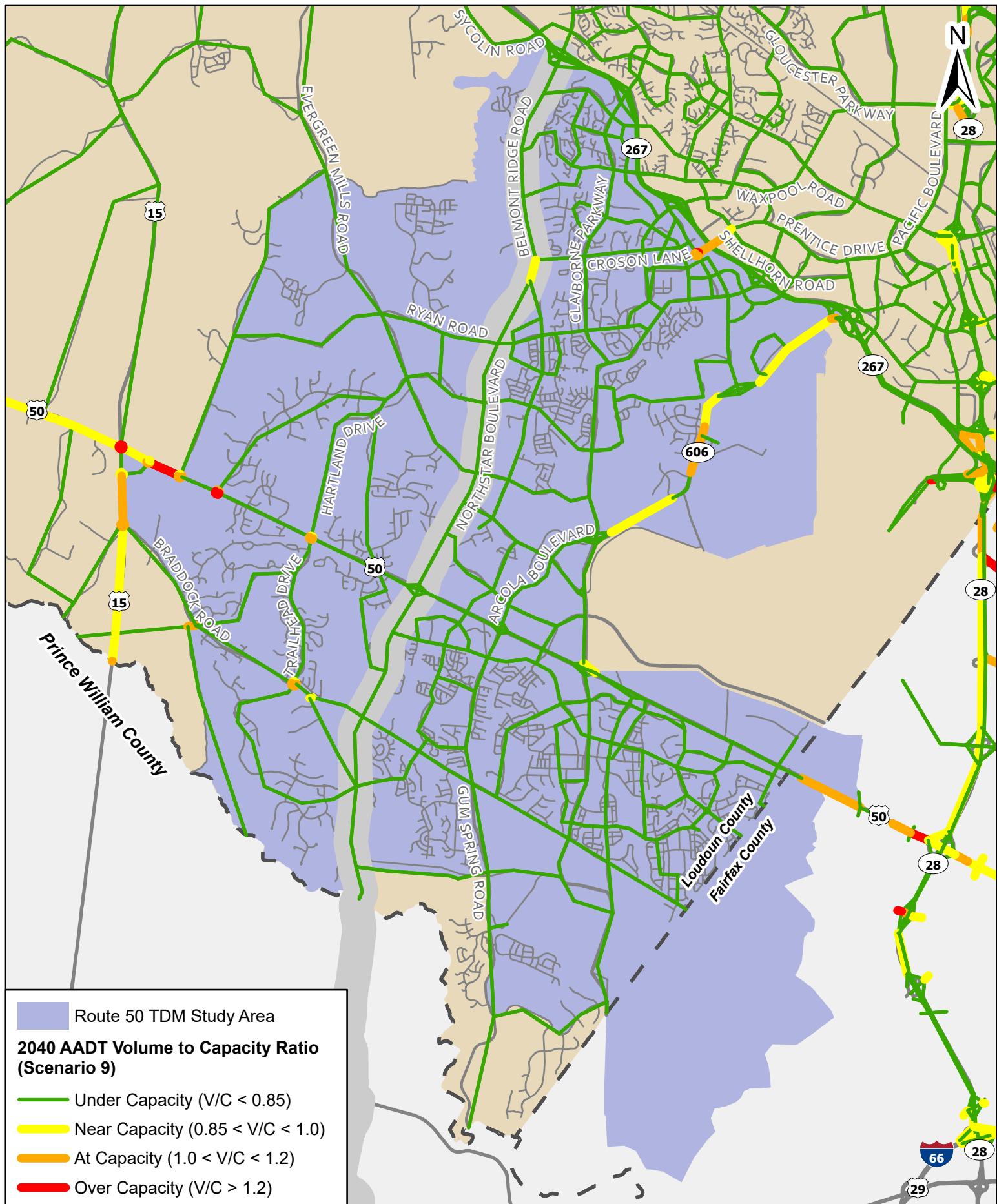
Kimley » Horn



ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA

0 0.75 1.5 3 Miles

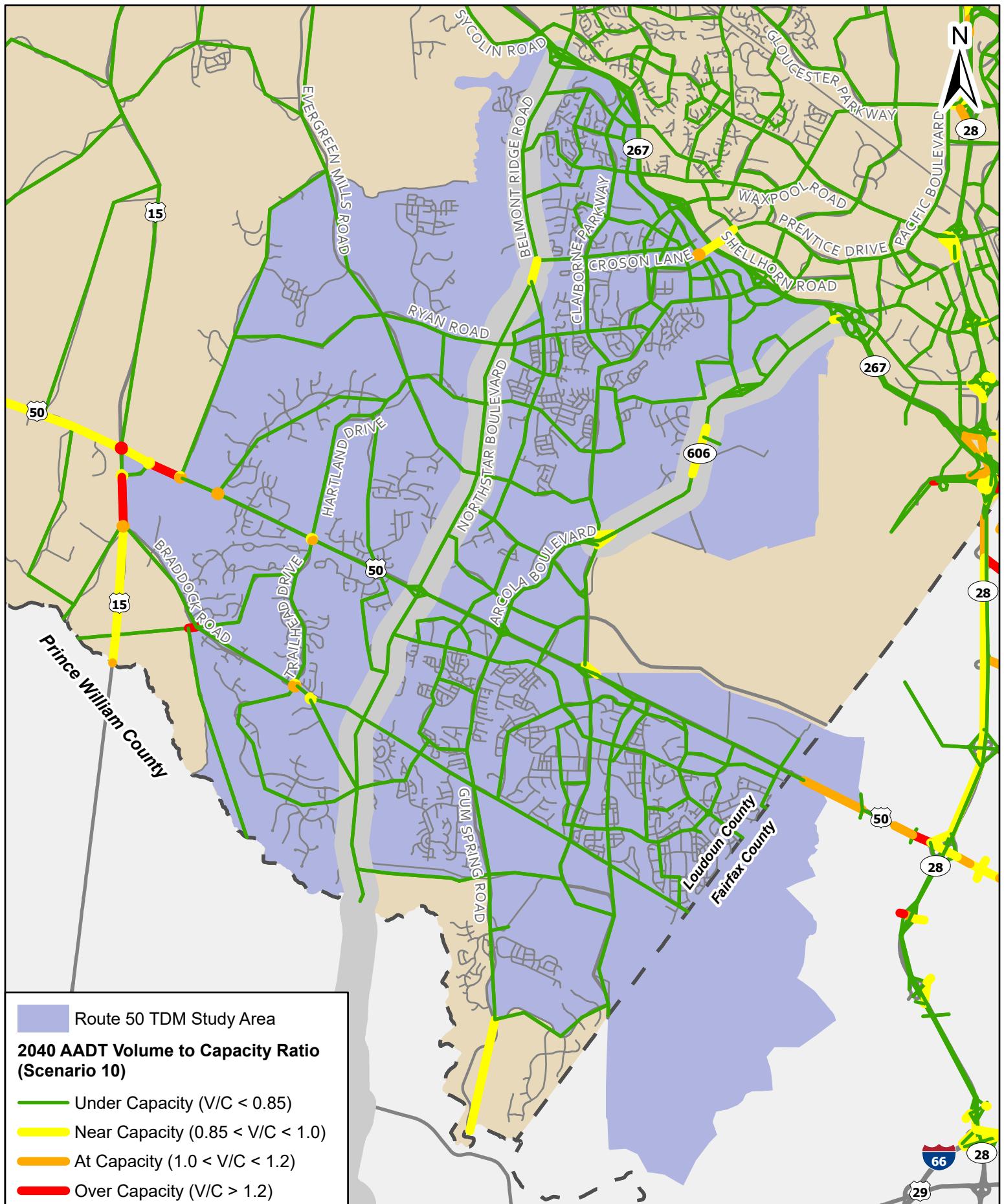
Kimley » Horn



ROUTE 50 CORRIDOR SEQUENCING STUDY UPDATE LOUDOUN COUNTY, VA

A scale bar representing distance in miles. It consists of a horizontal line with tick marks at 0, 0.75, 1.5, and 3. The segment from 0 to 1.5 is filled with a light gray color, while the segments from 1.5 to 3 and the rest of the bar are black. The word "Miles" is written in black text to the right of the bar.

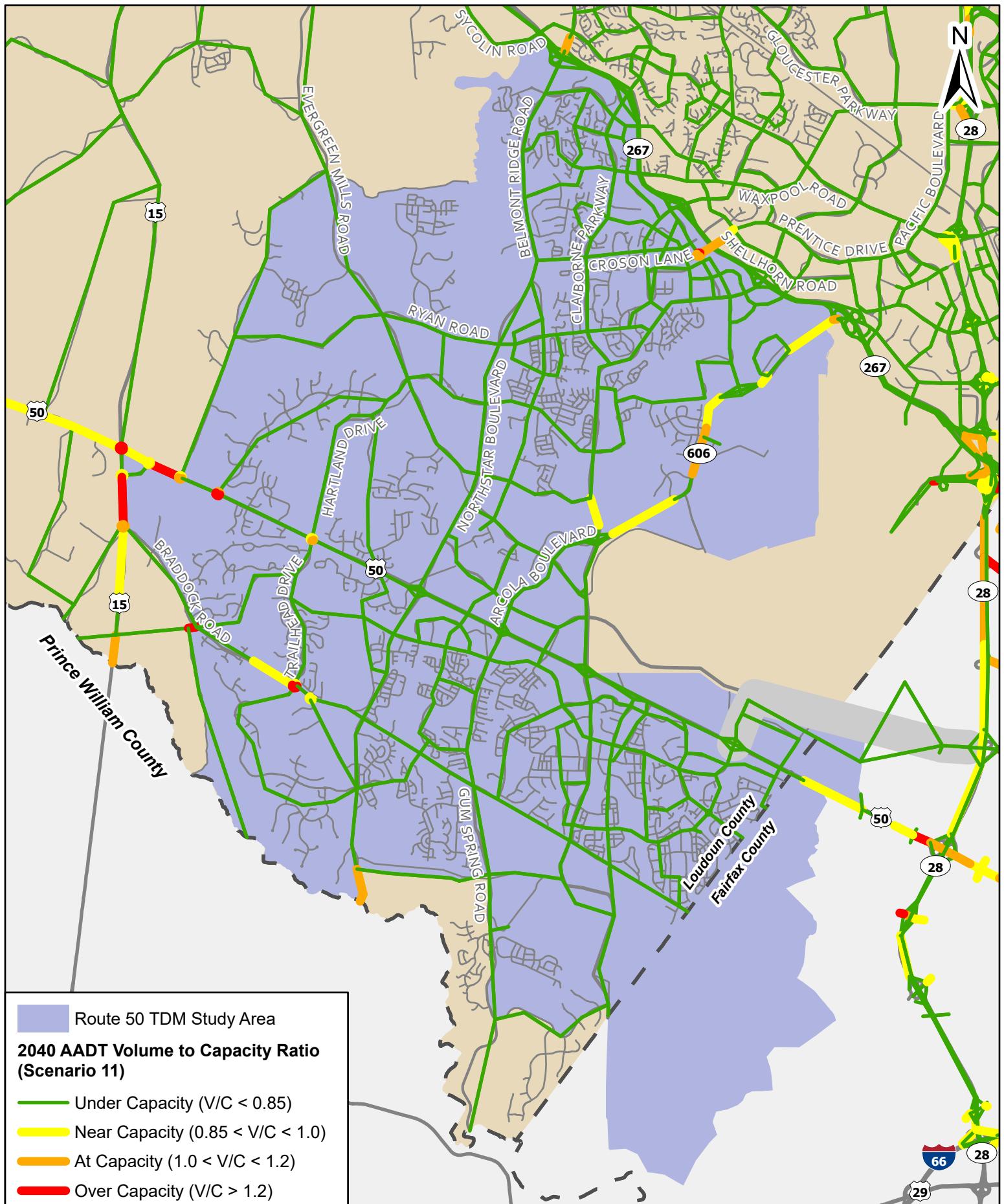
Kimley » Horn



**ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA**

0 0.75 1.5 3 Miles

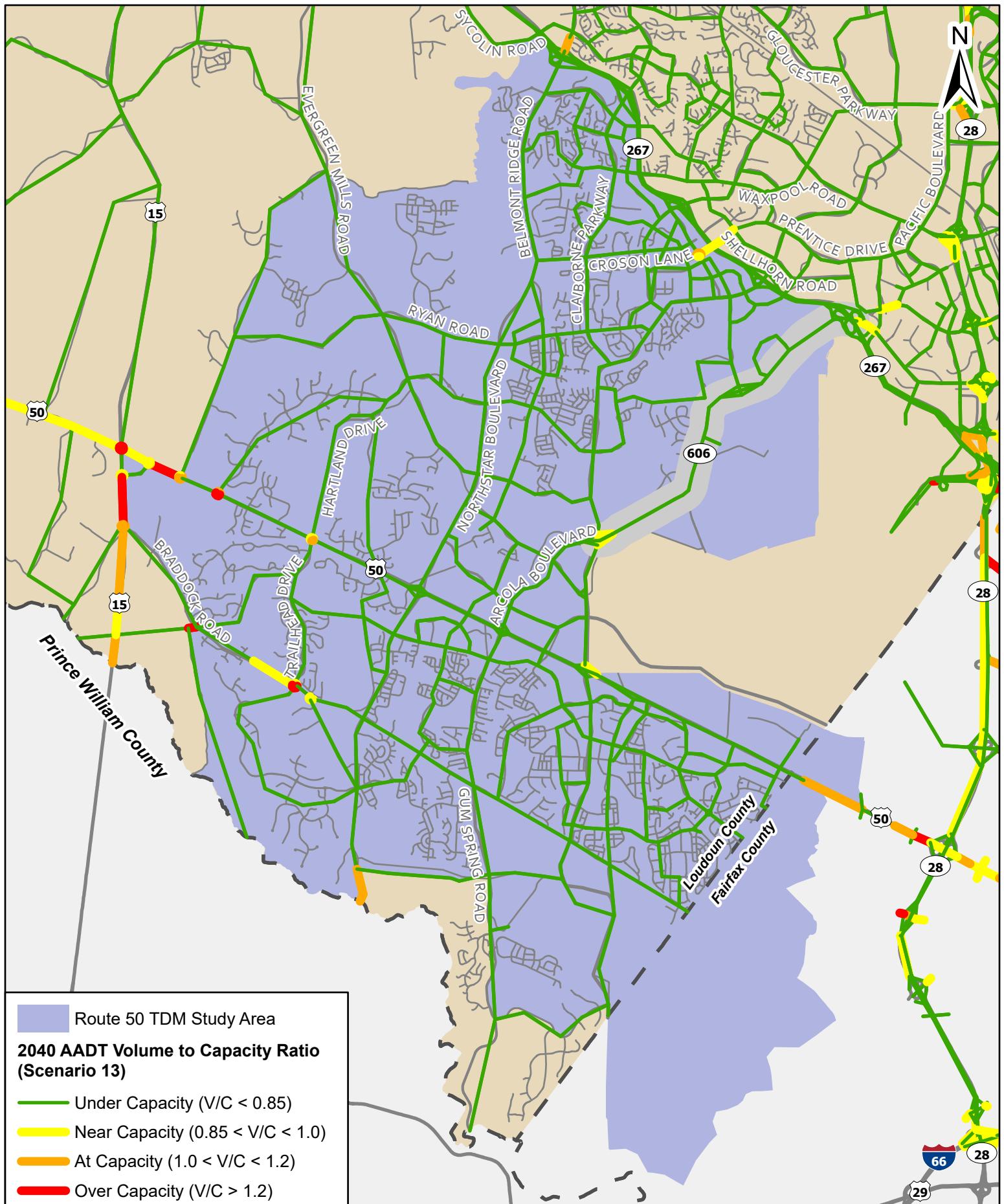
Kimley » Horn



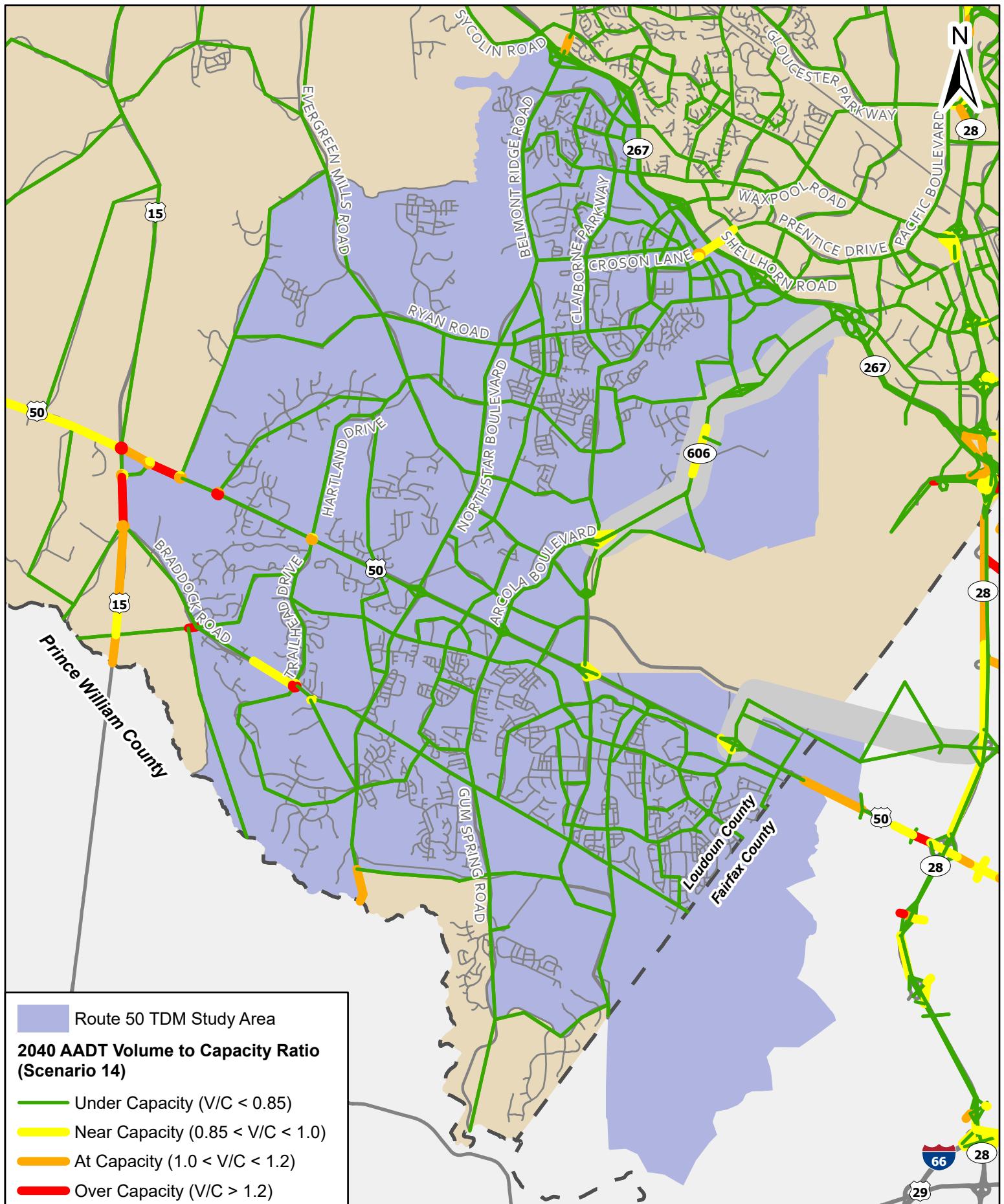
ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA

0 0.75 1.5 3 Miles

Kimley » Horn



0 0.75 1.5 3 Miles



ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA

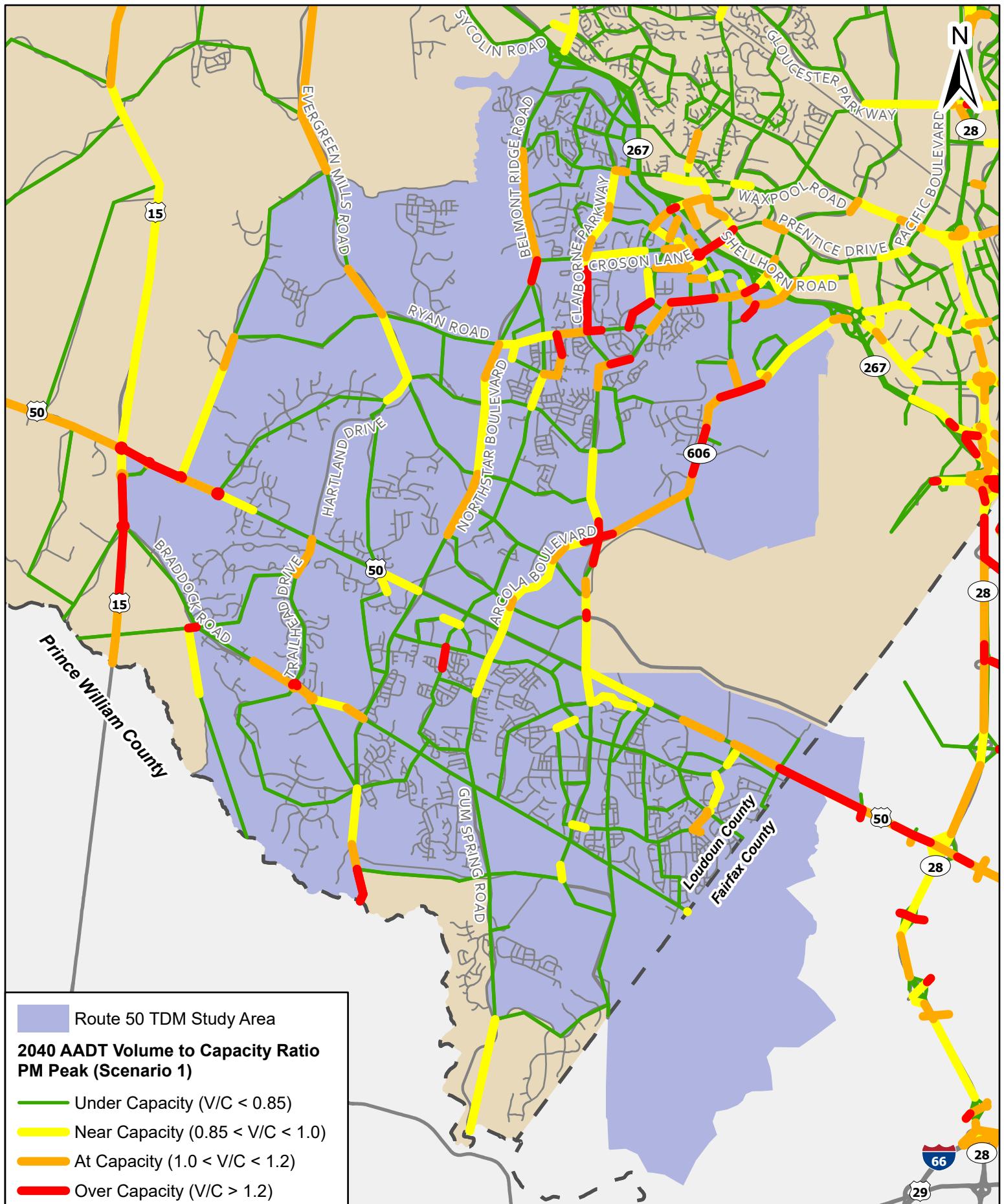
0 0.75 1.5 3 Miles

Kimley » Horn



APPENDIX A-4

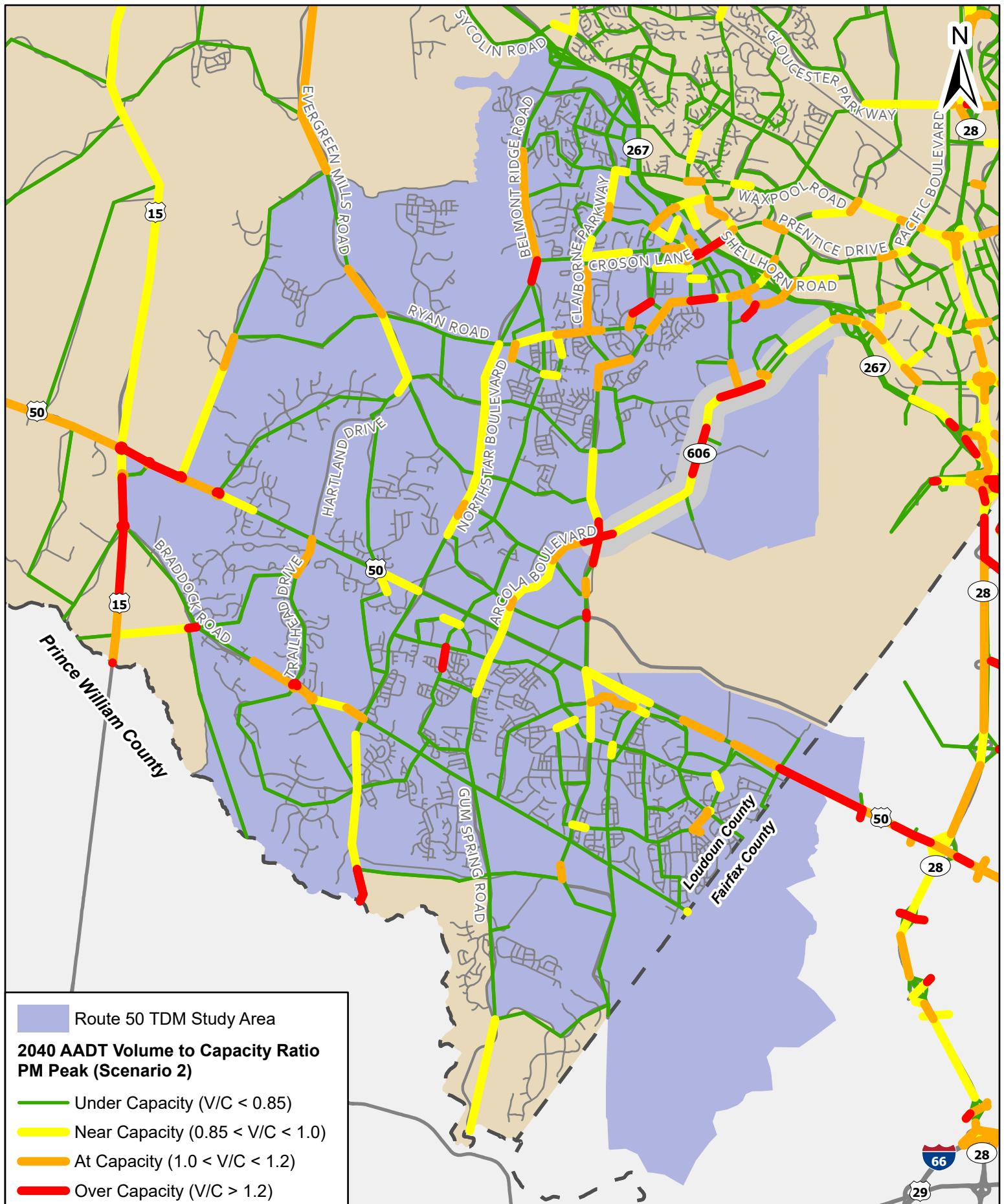
2040 PM Peak Volume to Capacity Ratios within the Study Area



**ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA**

0 0.75 1.5 3 Miles

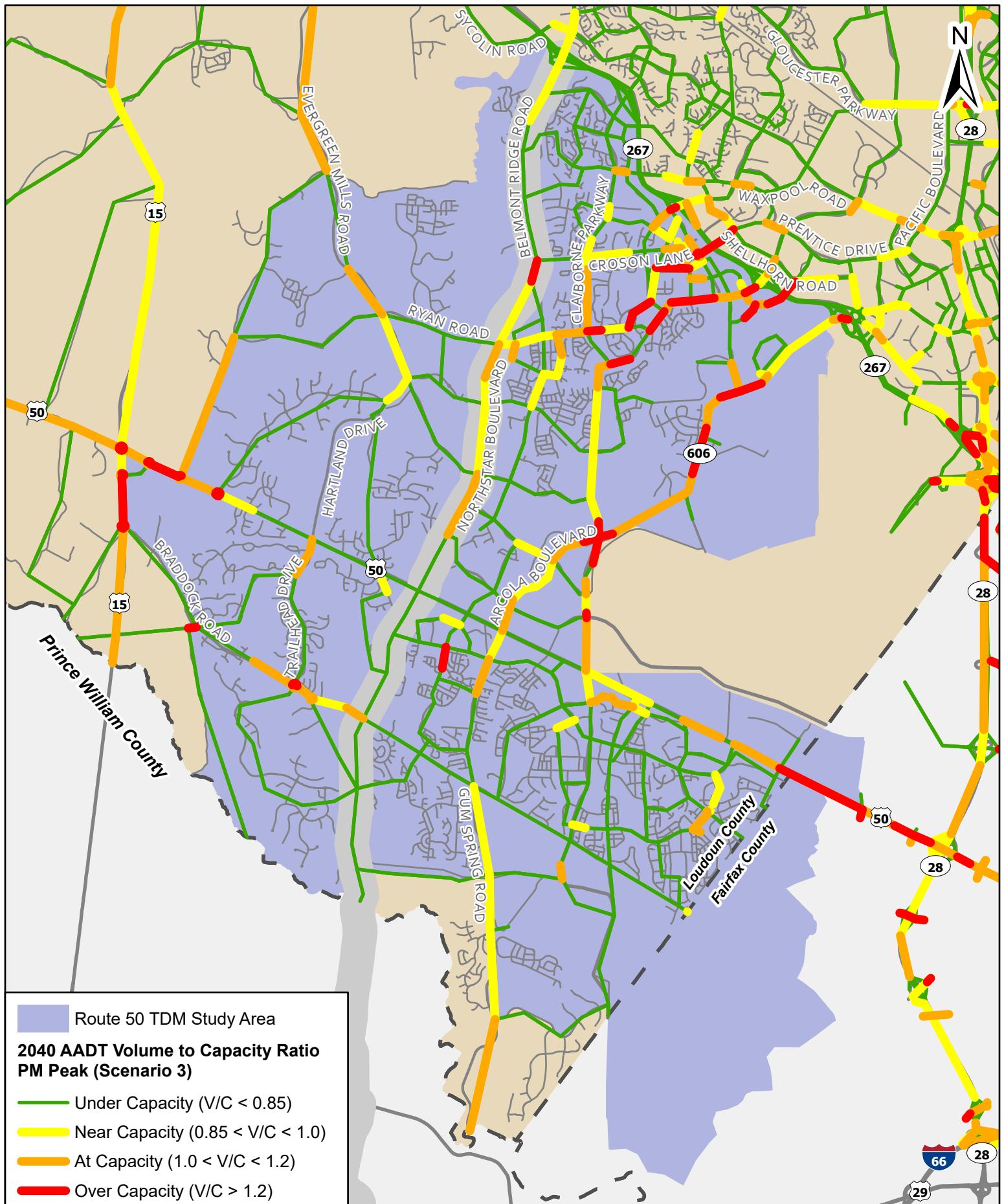
Kimley » Horn



**ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA**

0 0.75 1.5 3 Miles

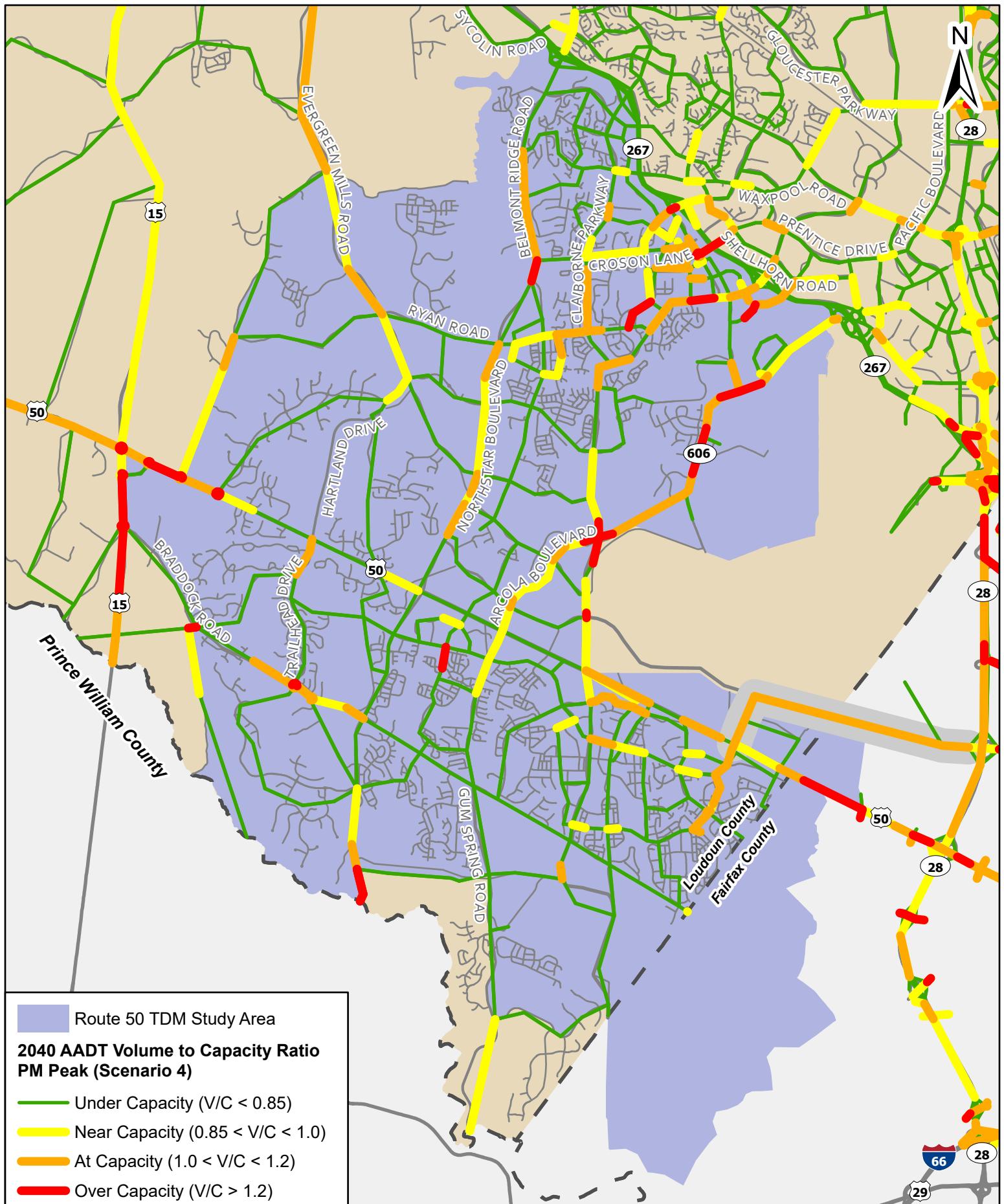
Kimley » Horn



ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA

0 0.75 1.5 3 Miles

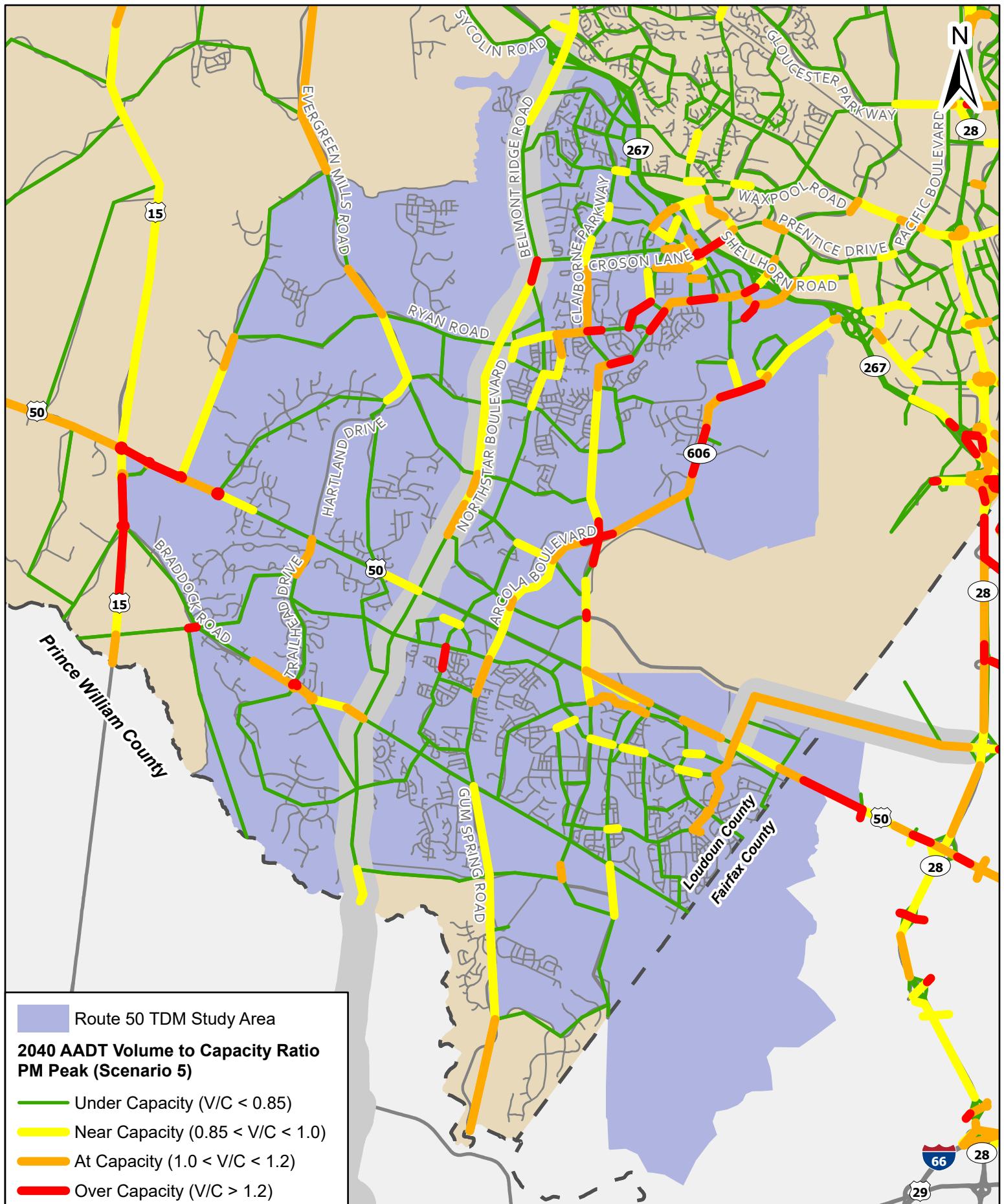
Kimley » Horn



ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA

0 0.75 1.5 3 Miles

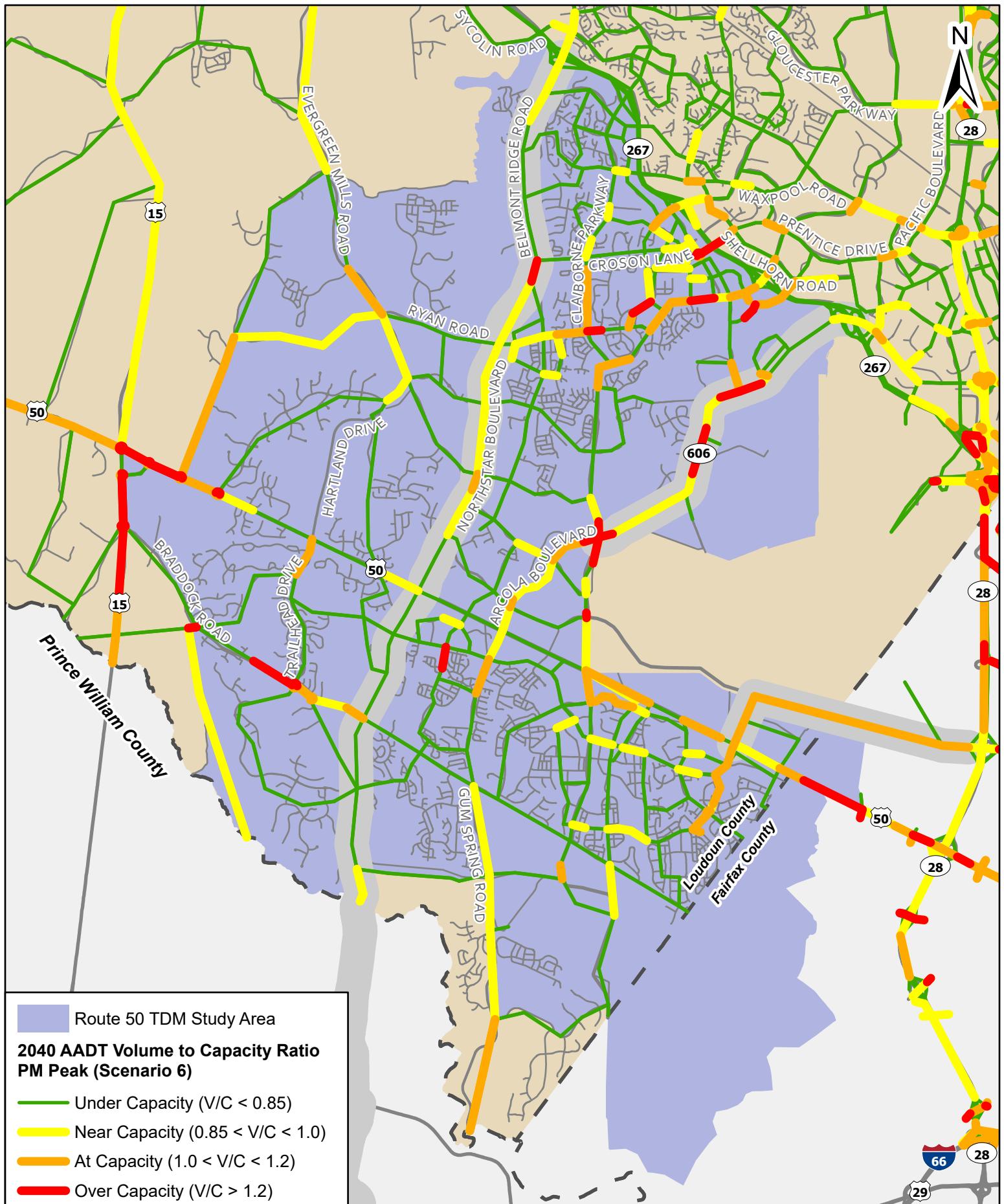
Kimley » Horn



**ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA**

0 0.75 1.5 3 Miles

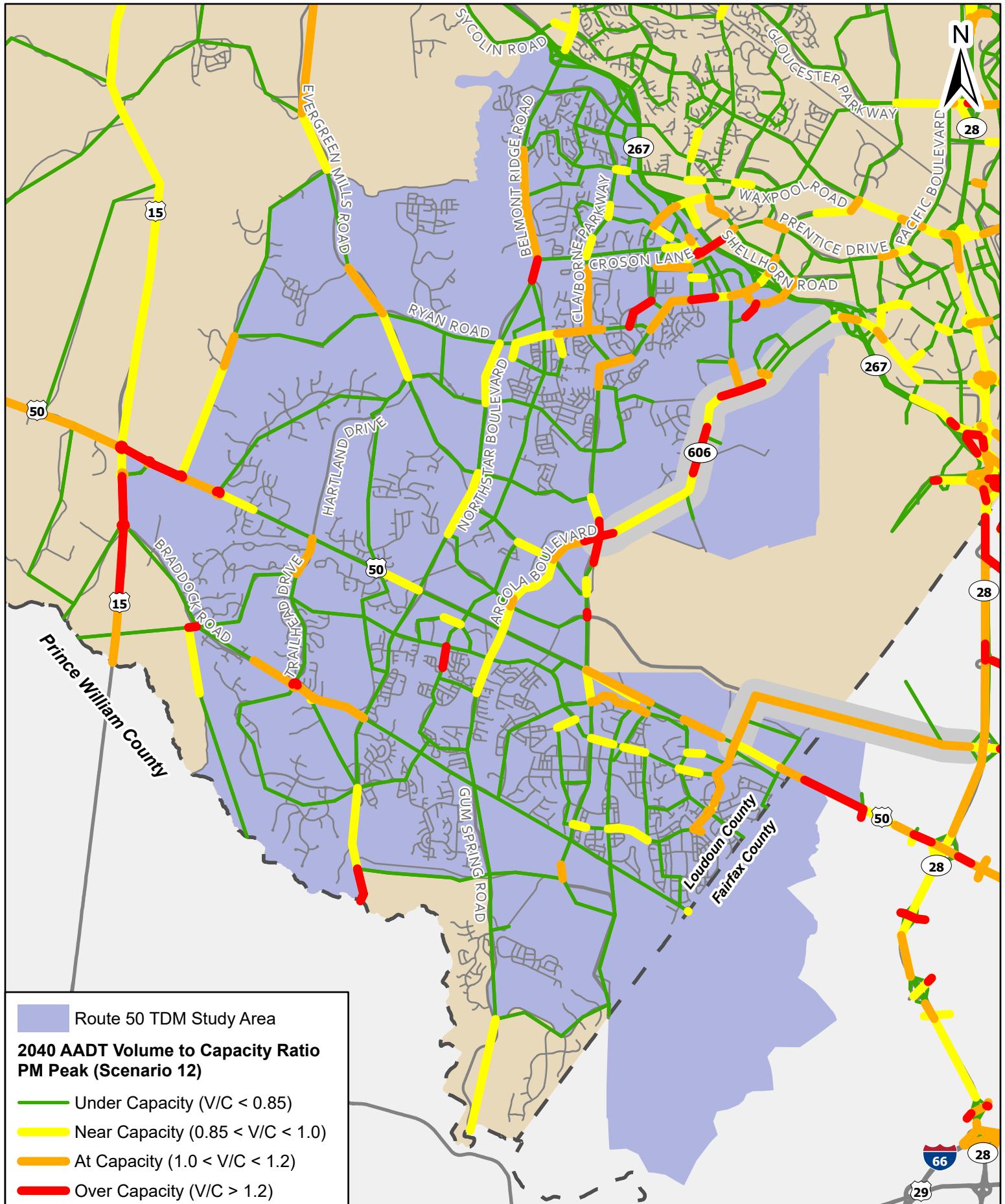
Kimley » Horn



ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA

0 0.75 1.5 3 Miles

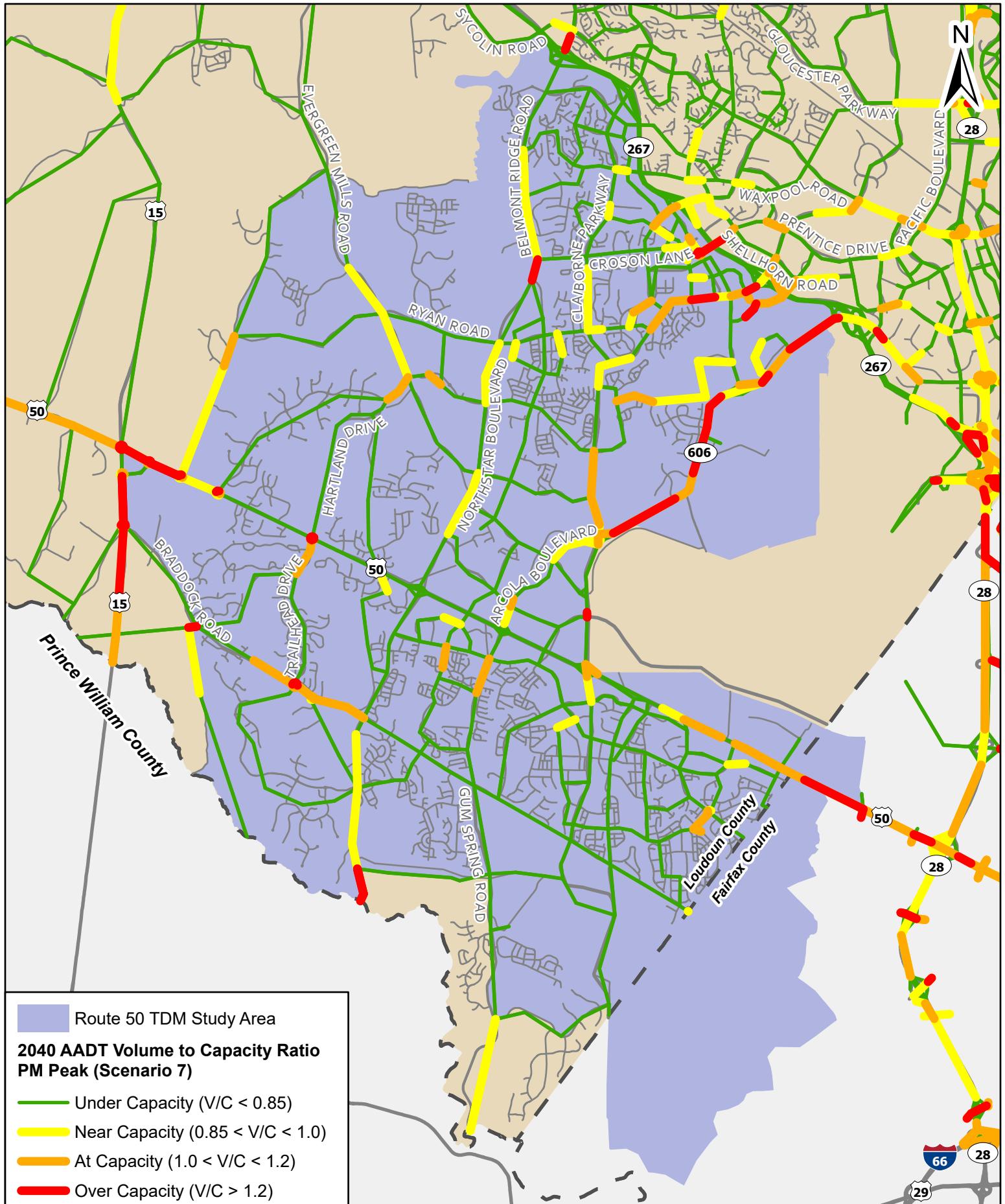
Kimley » Horn



ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA

0 0.75 1.5 3 Miles

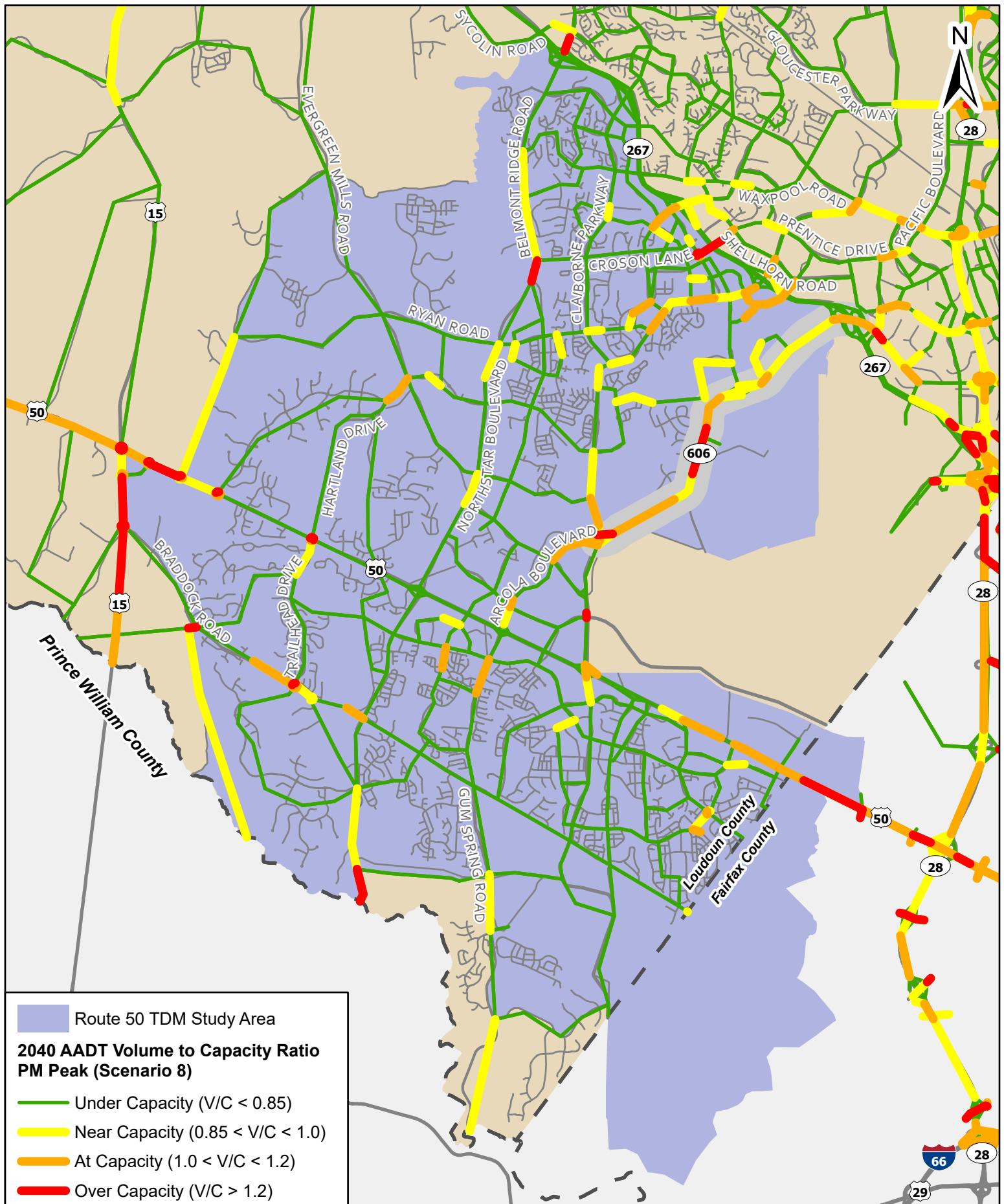
Kimley » Horn



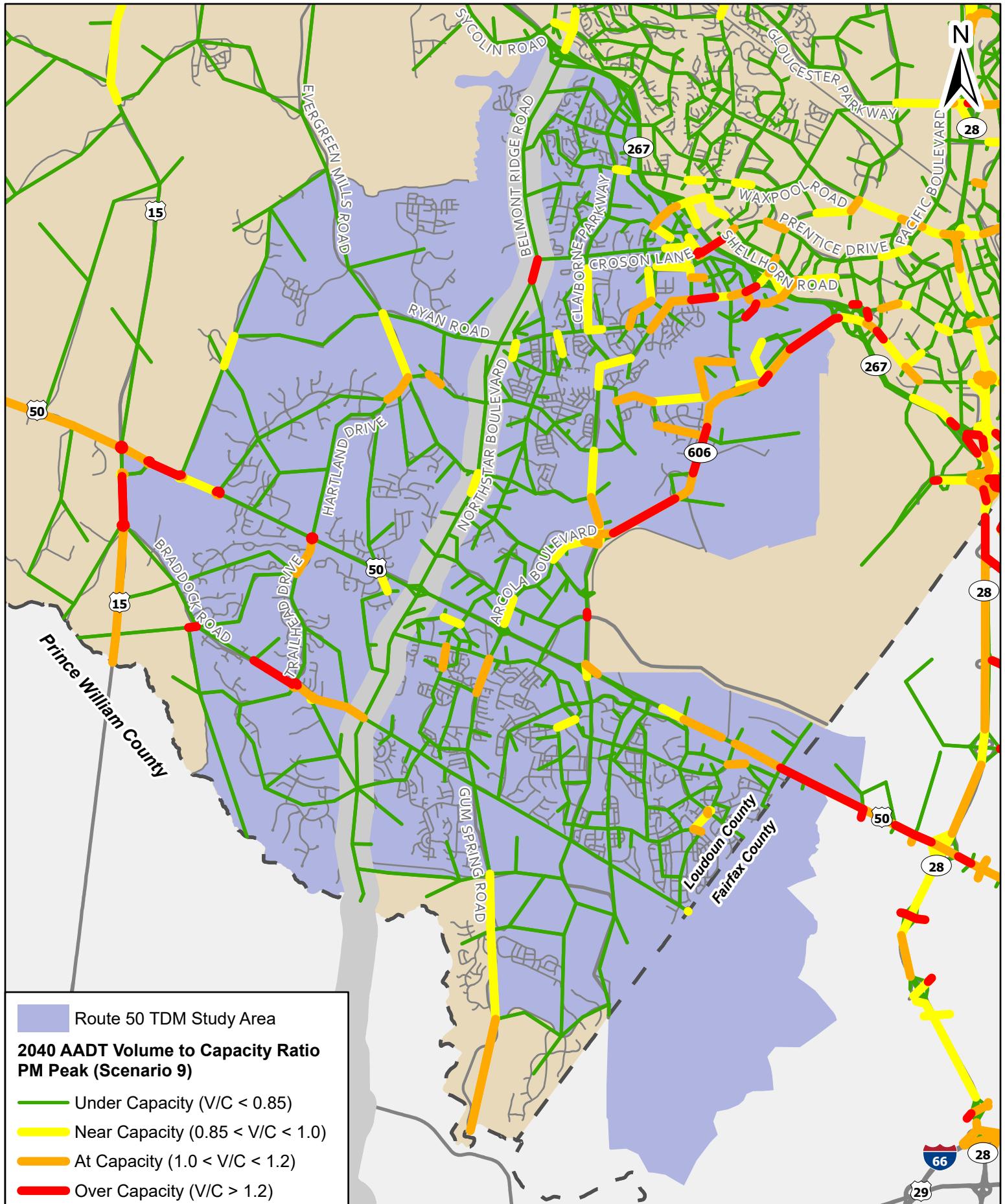
**ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA**

0 0.75 1.5 3 Miles

Kimley » Horn



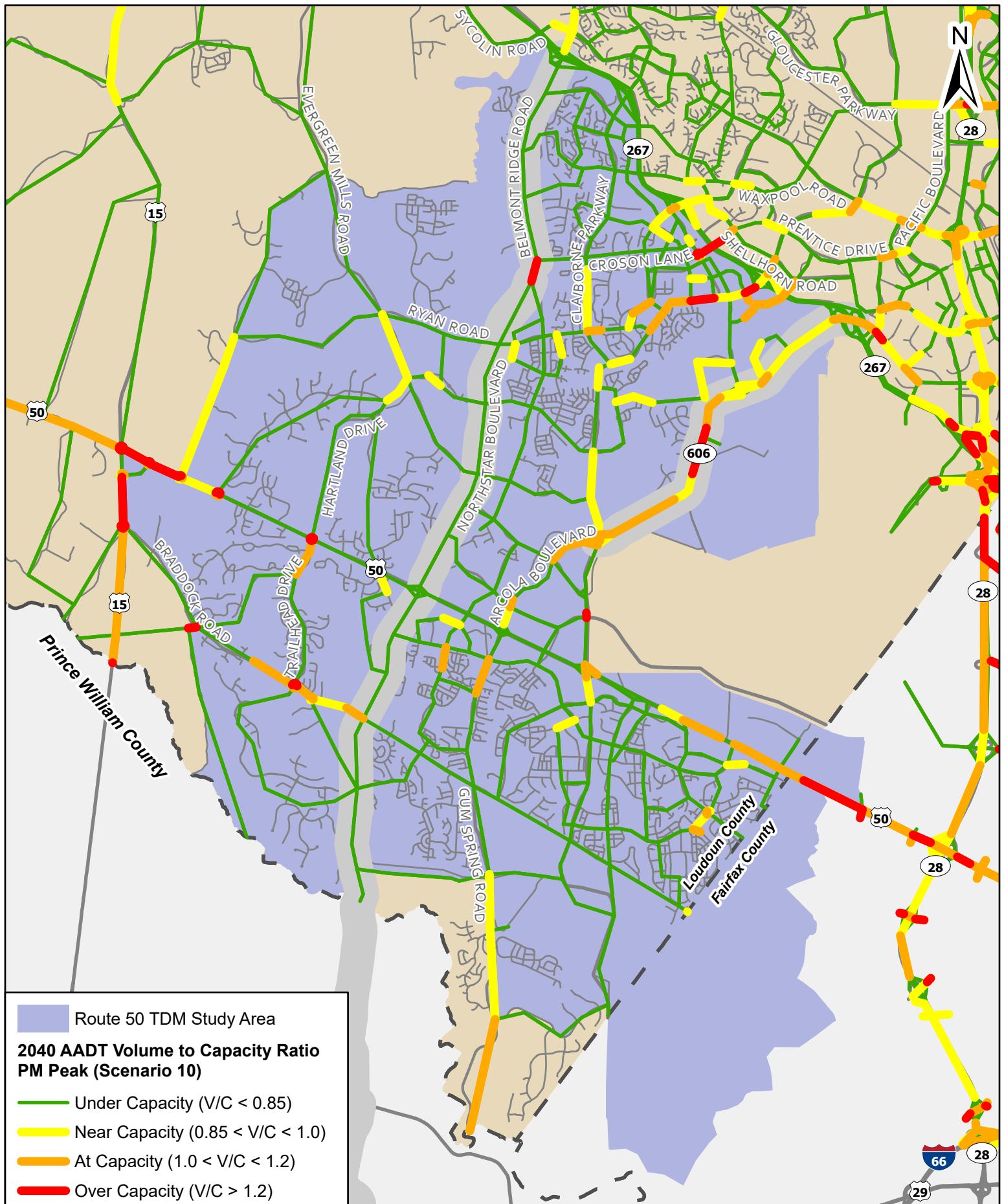
0 0.75 1.5 3 Miles



**ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA**

0 0.75 1.5 3 Miles

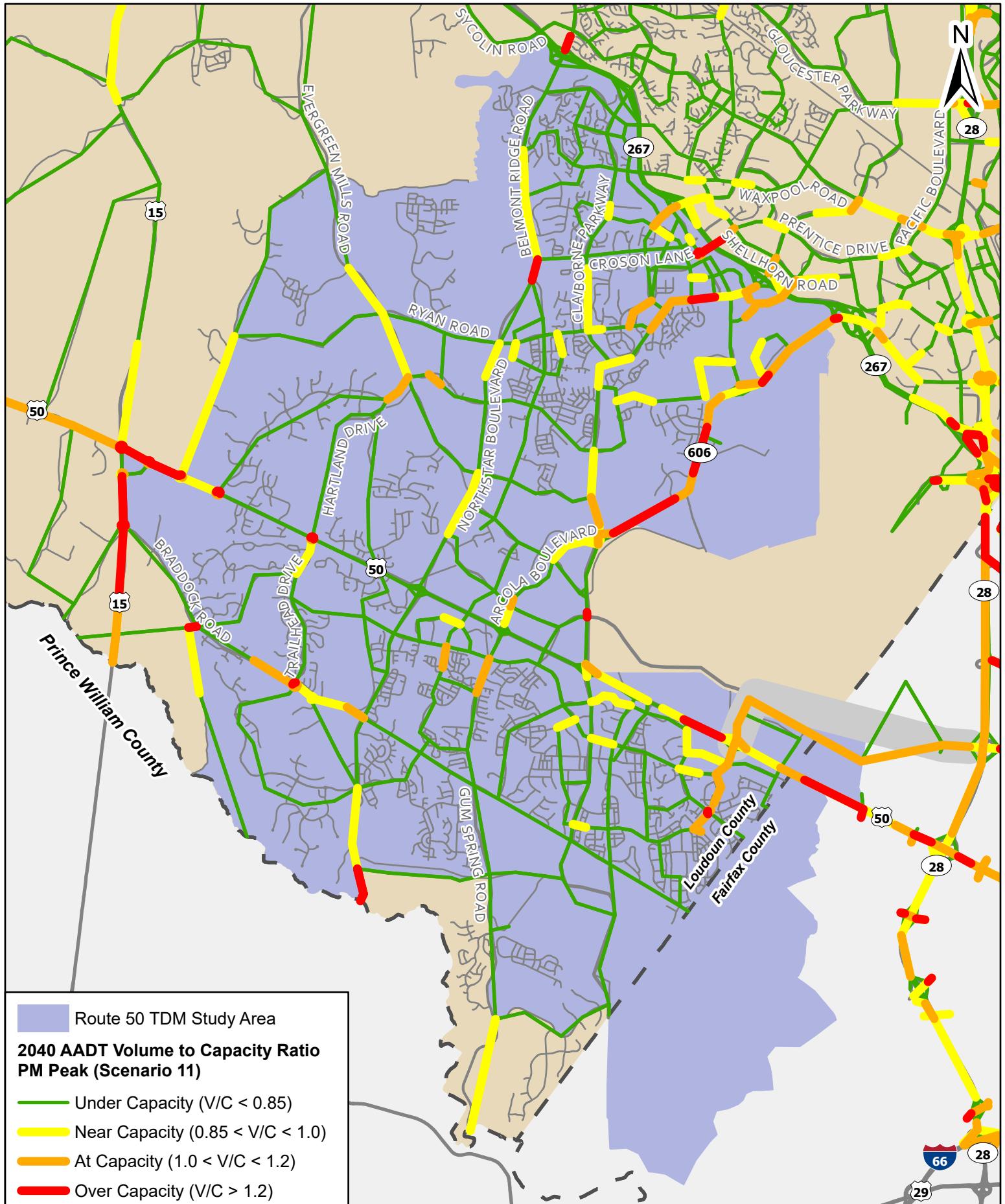
Kimley » Horn



**ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA**

0 0.75 1.5 3 Miles

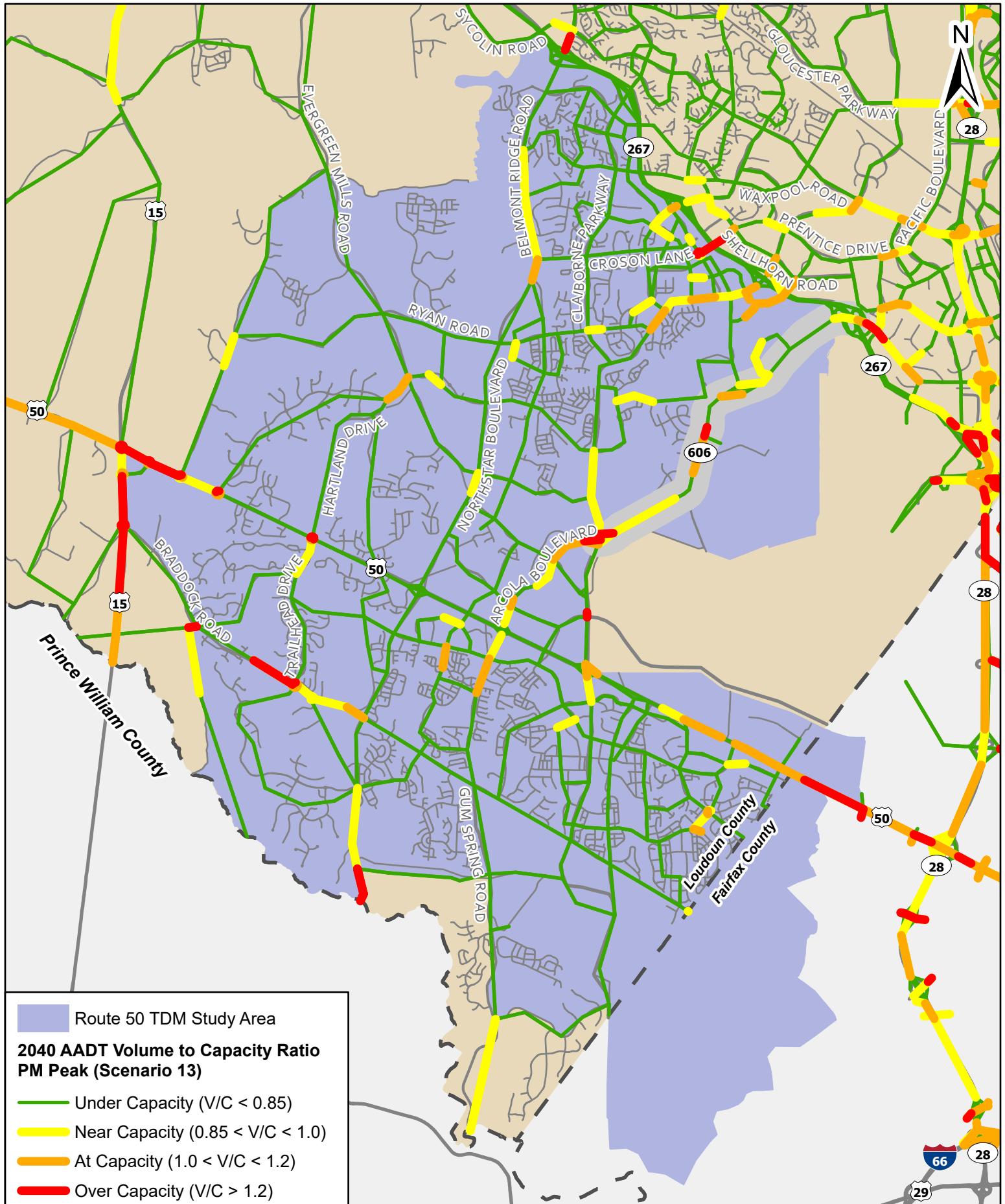
Kimley » Horn



ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA

0 0.75 1.5 3 Miles

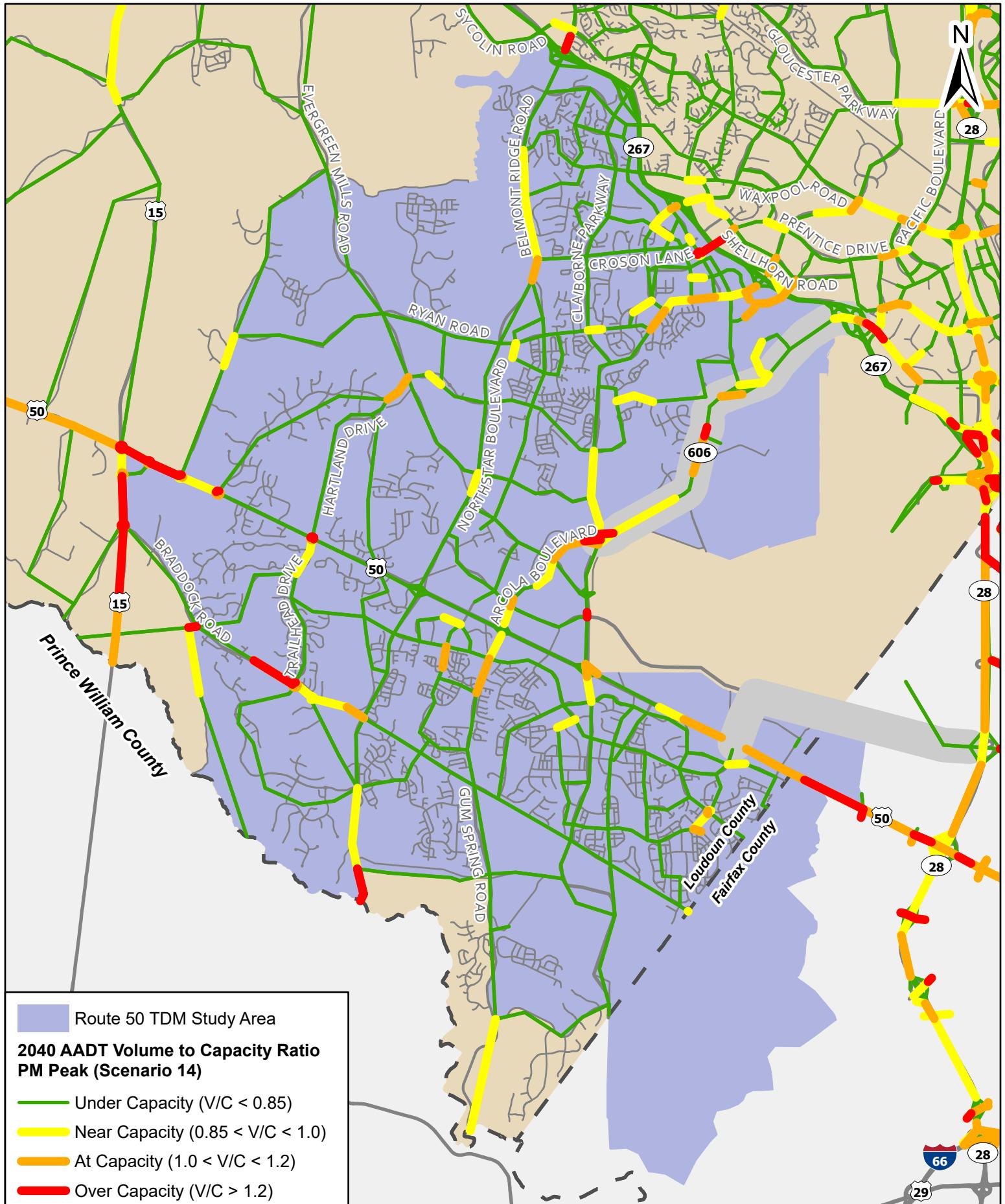
Kimley » Horn



ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA

0 0.75 1.5 3 Miles

Kimley » Horn



**ROUTE 50 CORRIDOR
SEQUENCING STUDY UPDATE
LOUDOUN COUNTY, VA**

0 0.75 1.5 3 Miles

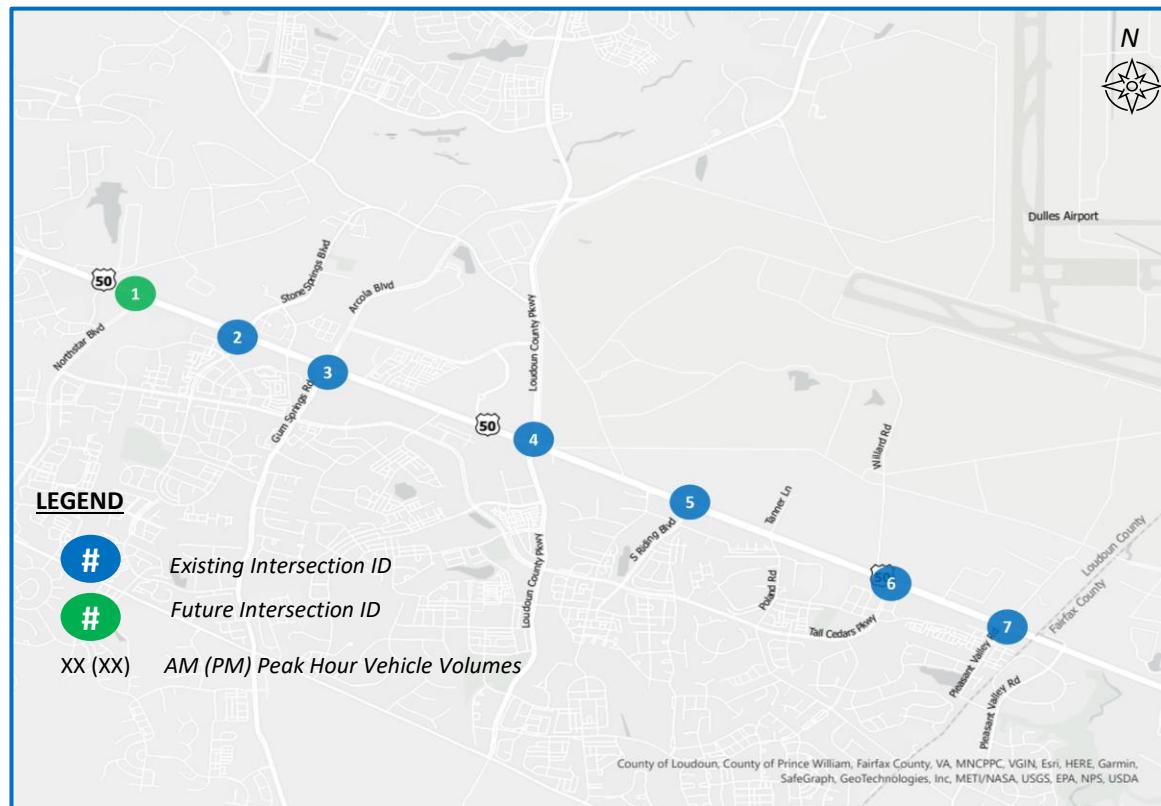
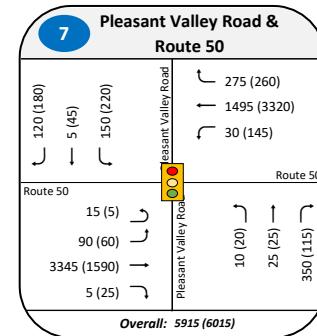
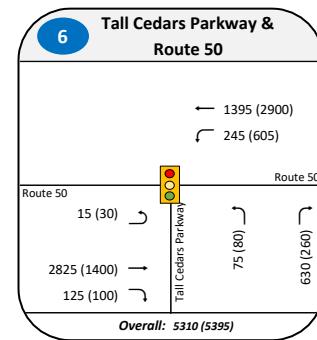
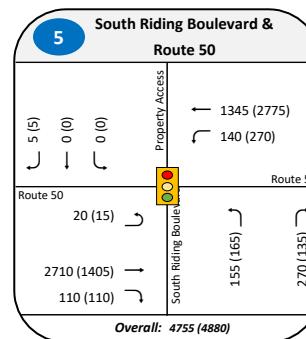
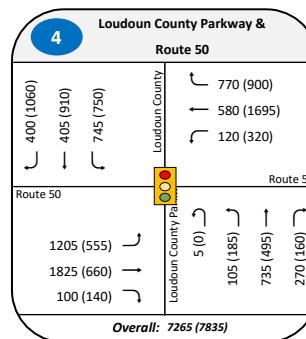
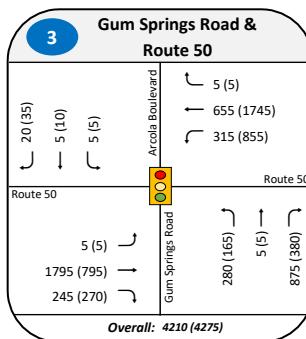
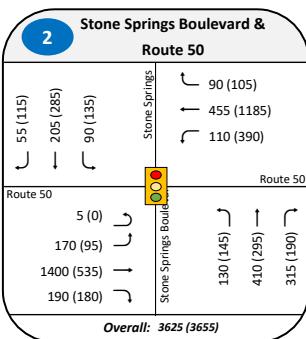
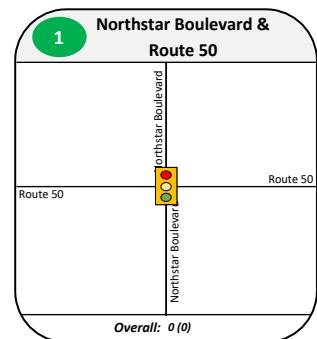
Kimley » Horn



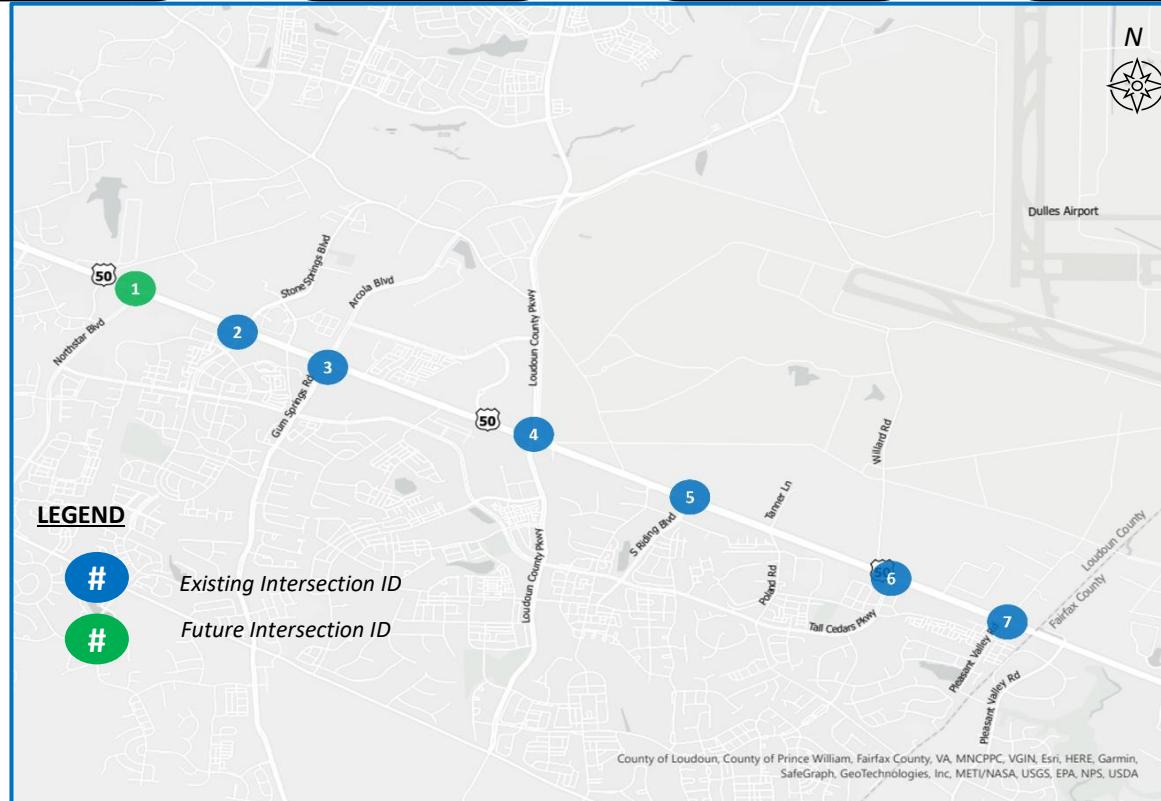
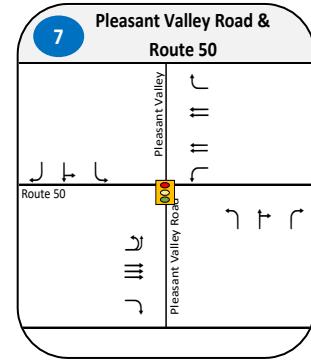
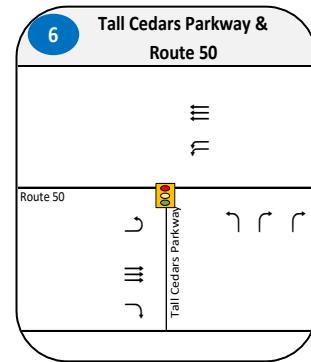
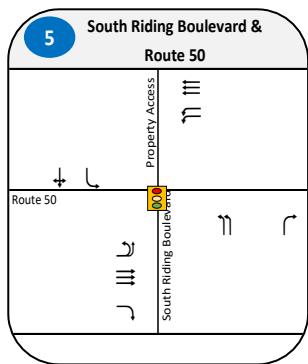
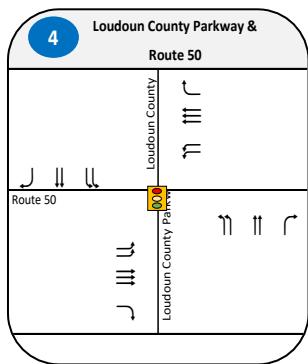
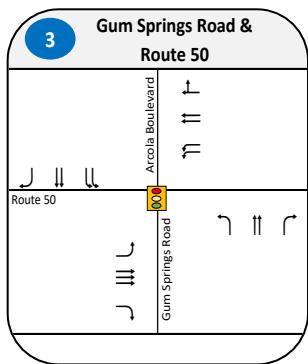
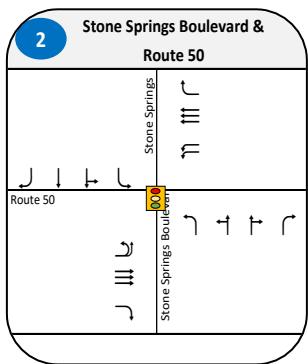
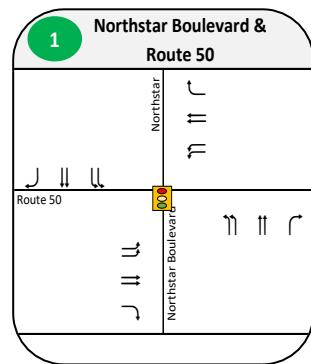
APPENDIX B

Roadway Network Scenario Peak Hour Turning Movement Forecasts

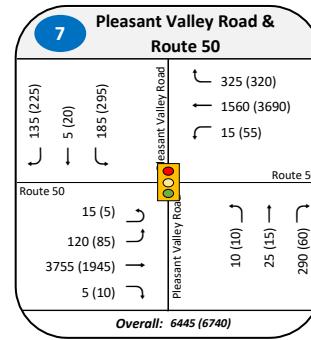
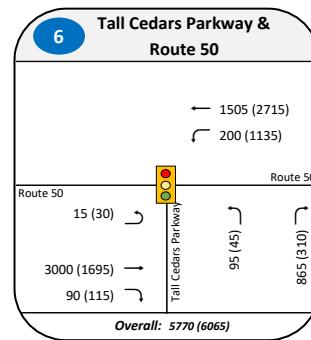
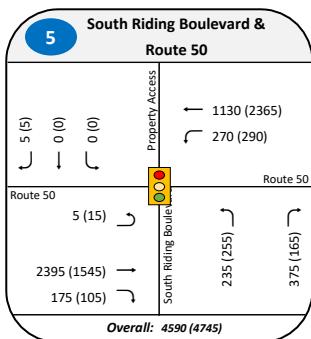
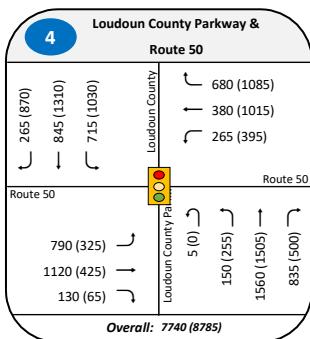
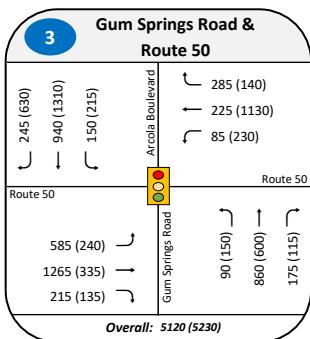
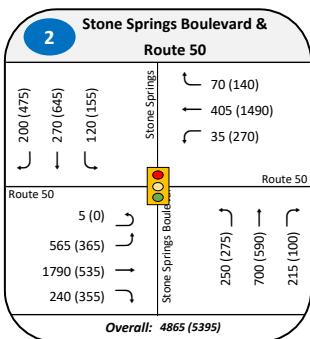
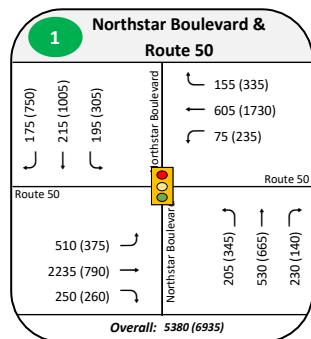
Existing Conditions AM & PM Peak Hour Vehicle Volumes



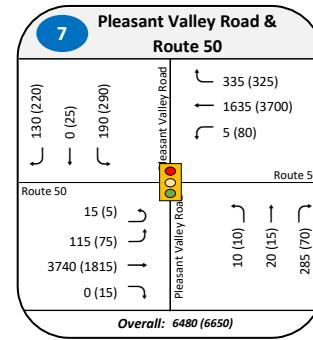
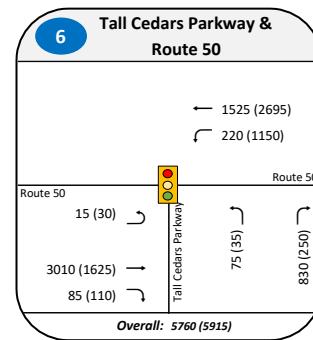
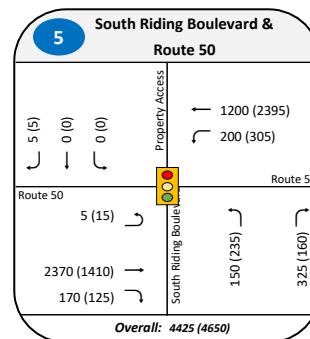
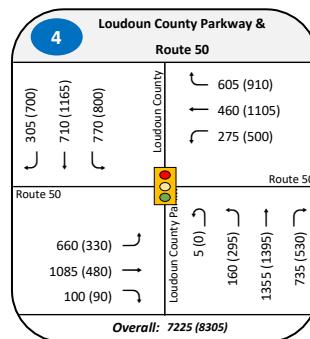
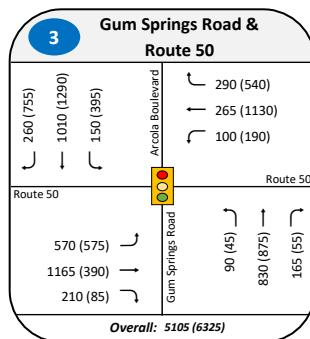
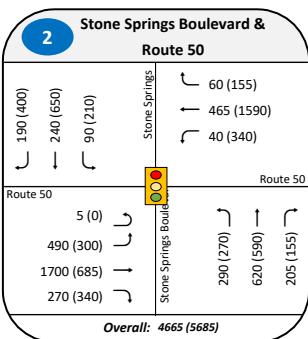
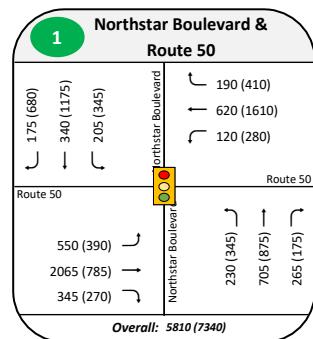
Scenario 1 AM & PM Peak Hour Vehicle Volumes



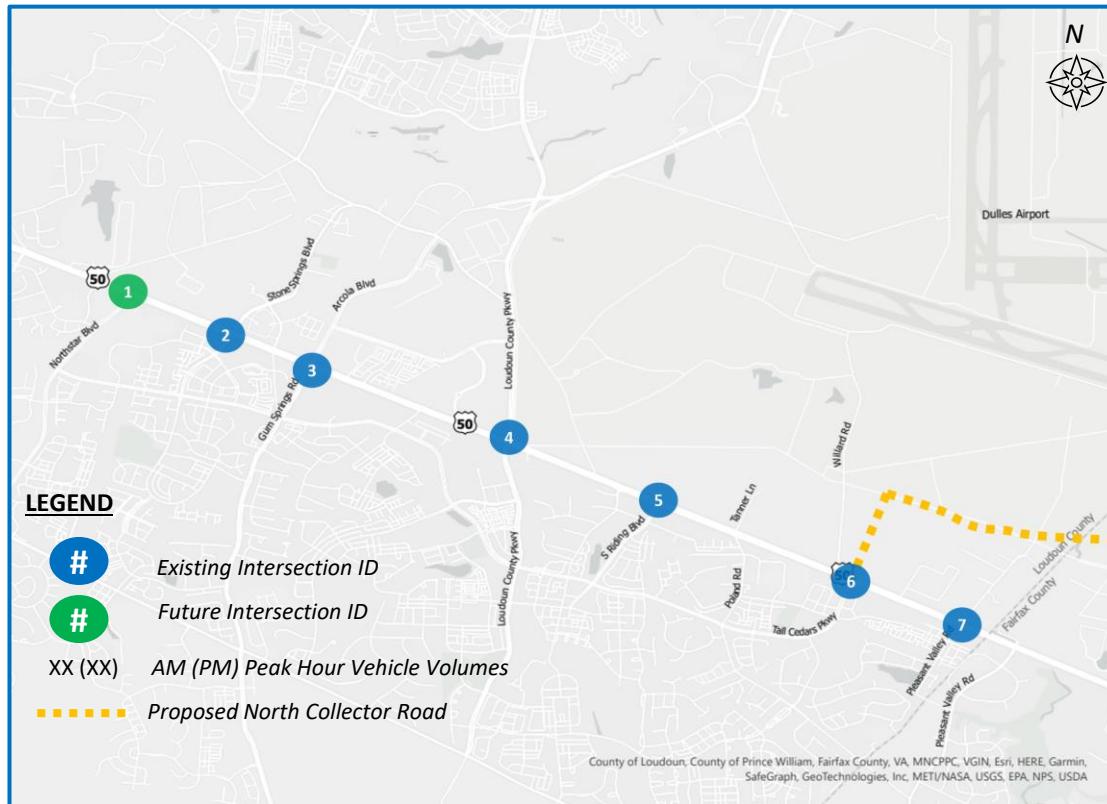
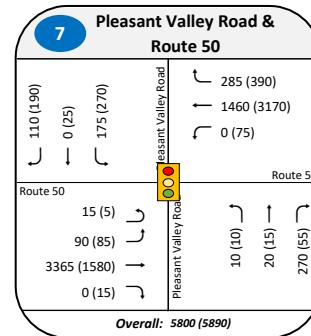
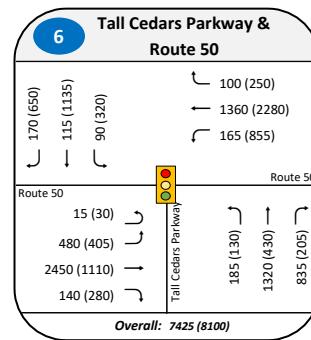
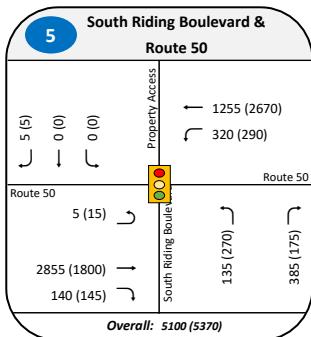
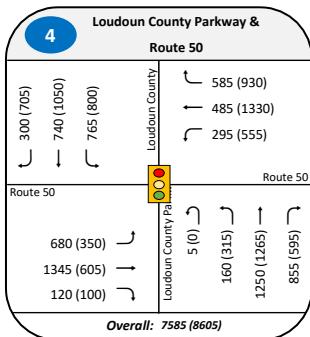
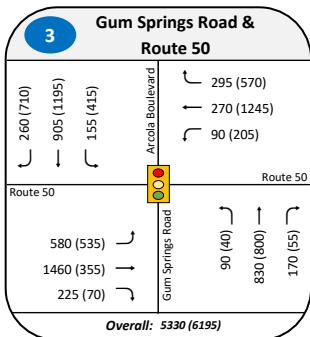
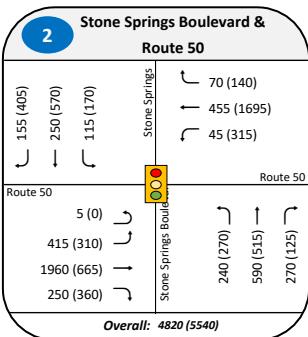
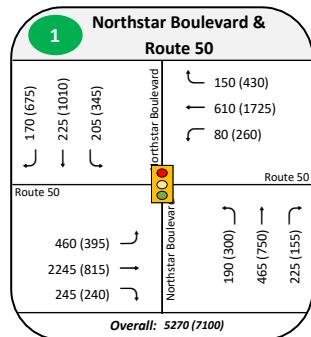
Scenario 2 AM & PM Peak Hour Vehicle Volumes



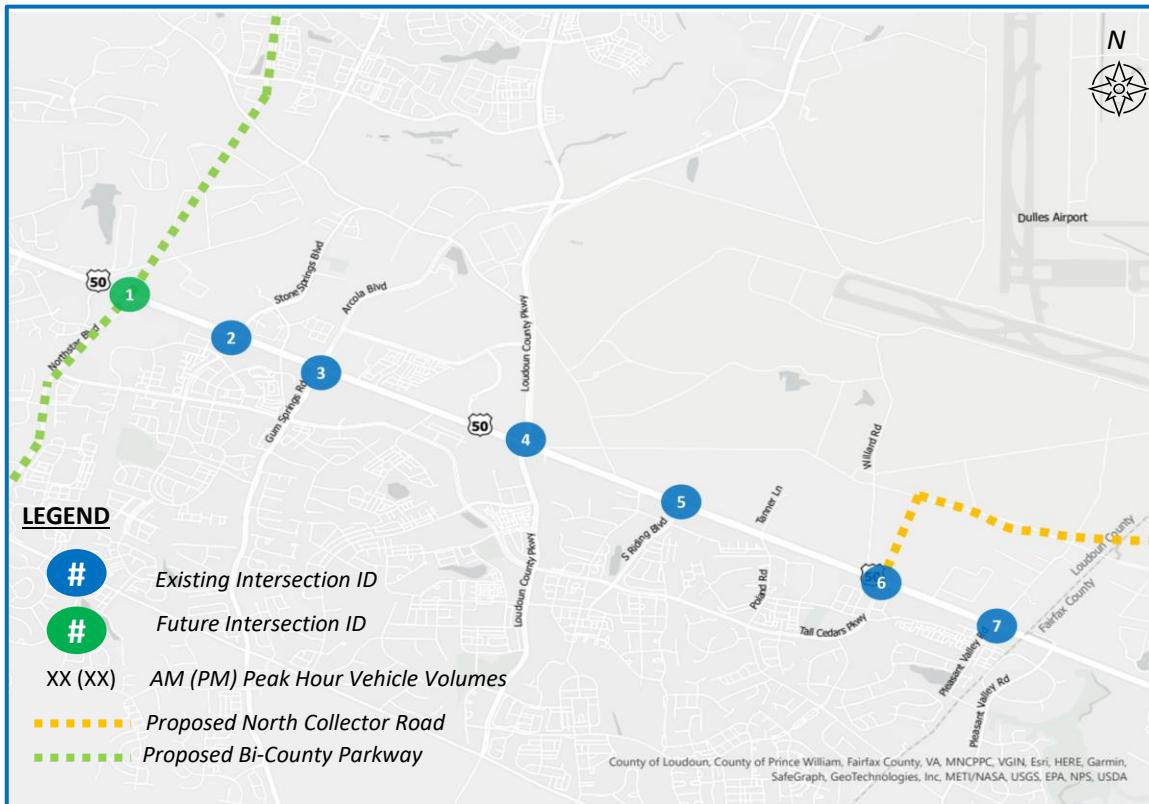
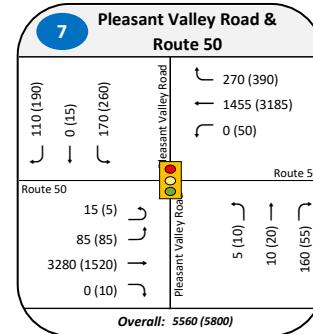
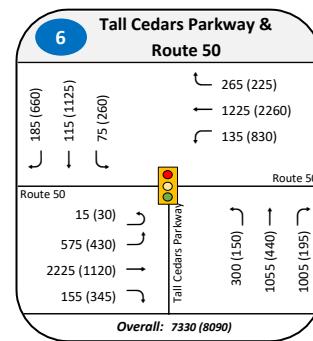
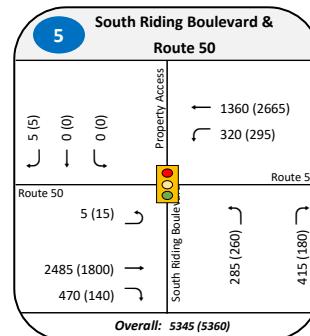
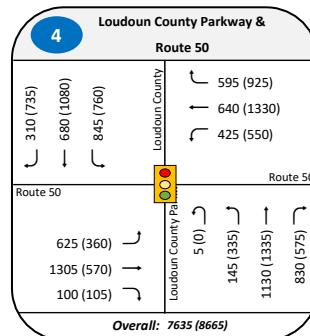
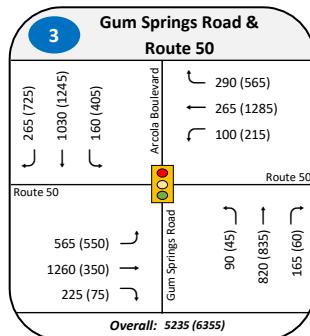
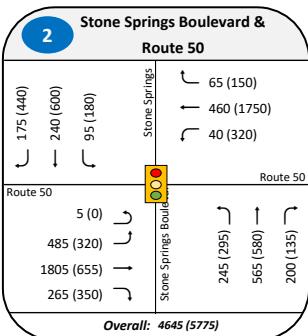
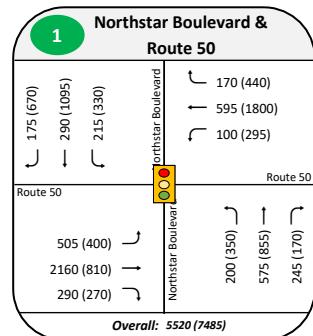
Scenario 3 AM & PM Peak Hour Vehicle Volumes



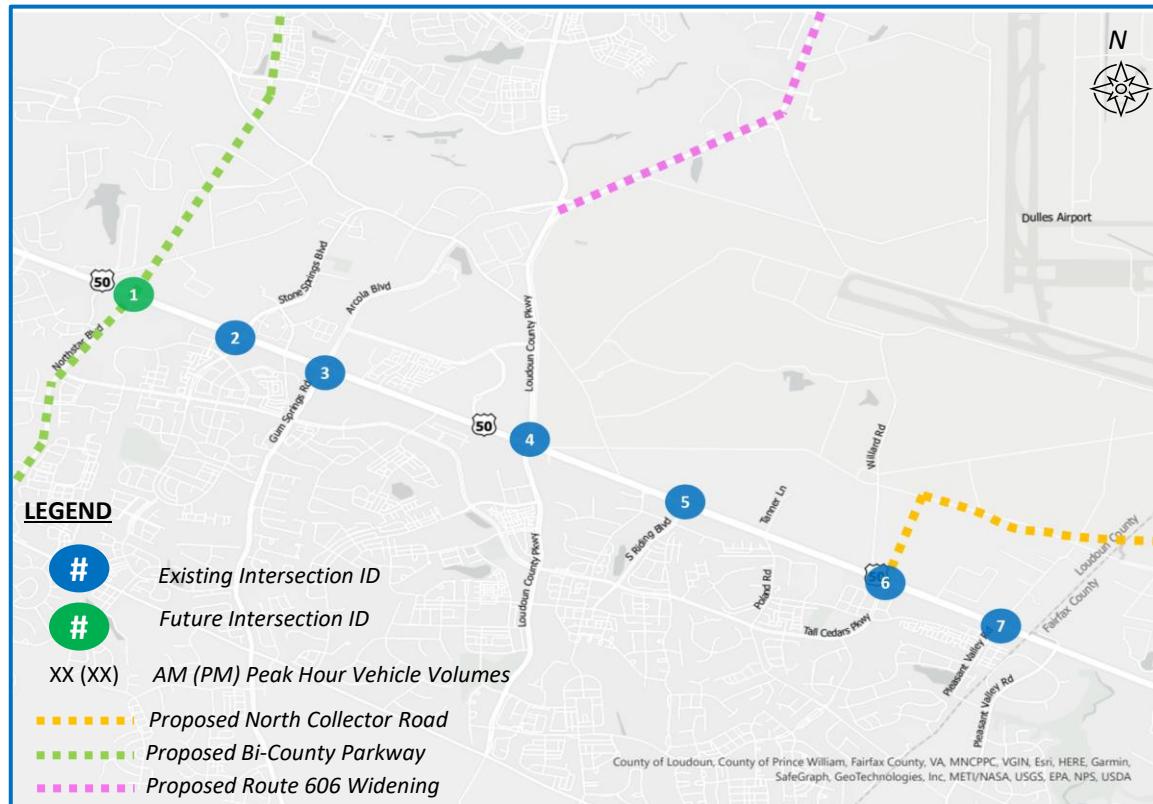
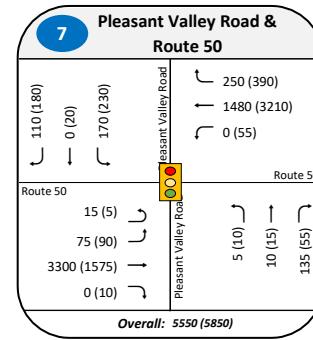
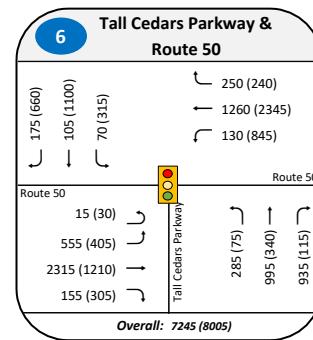
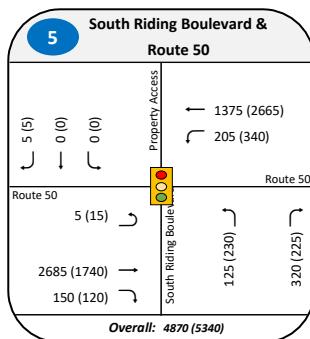
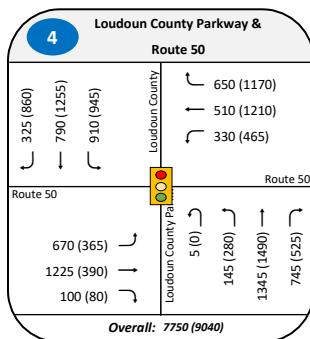
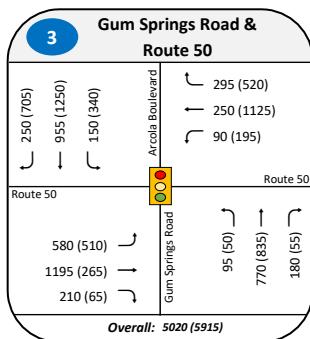
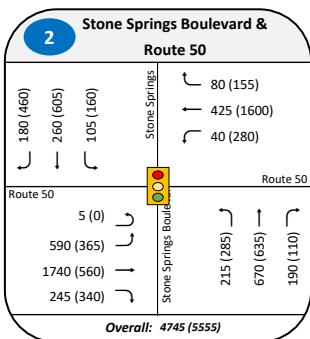
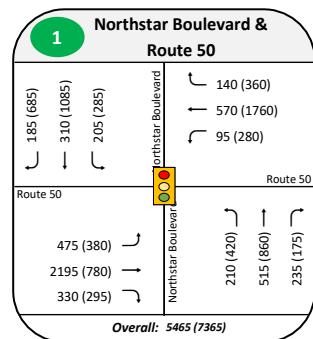
Scenario 4 AM & PM Peak Hour Vehicle Volumes



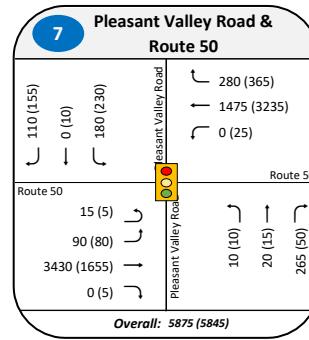
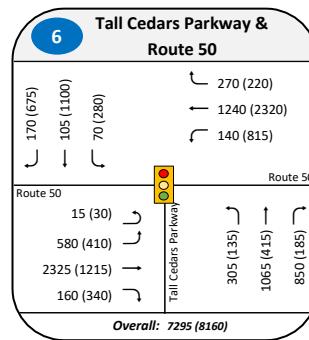
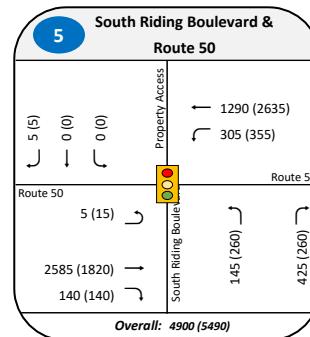
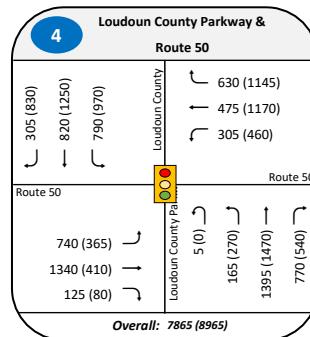
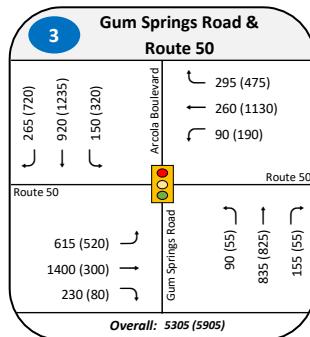
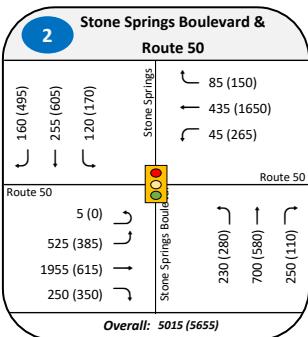
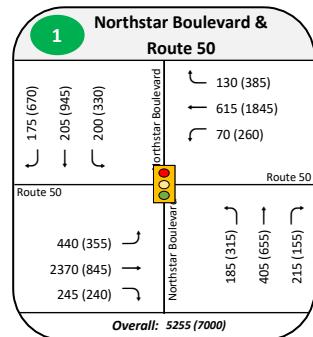
Scenario 5 AM & PM Peak Hour Vehicle Volumes

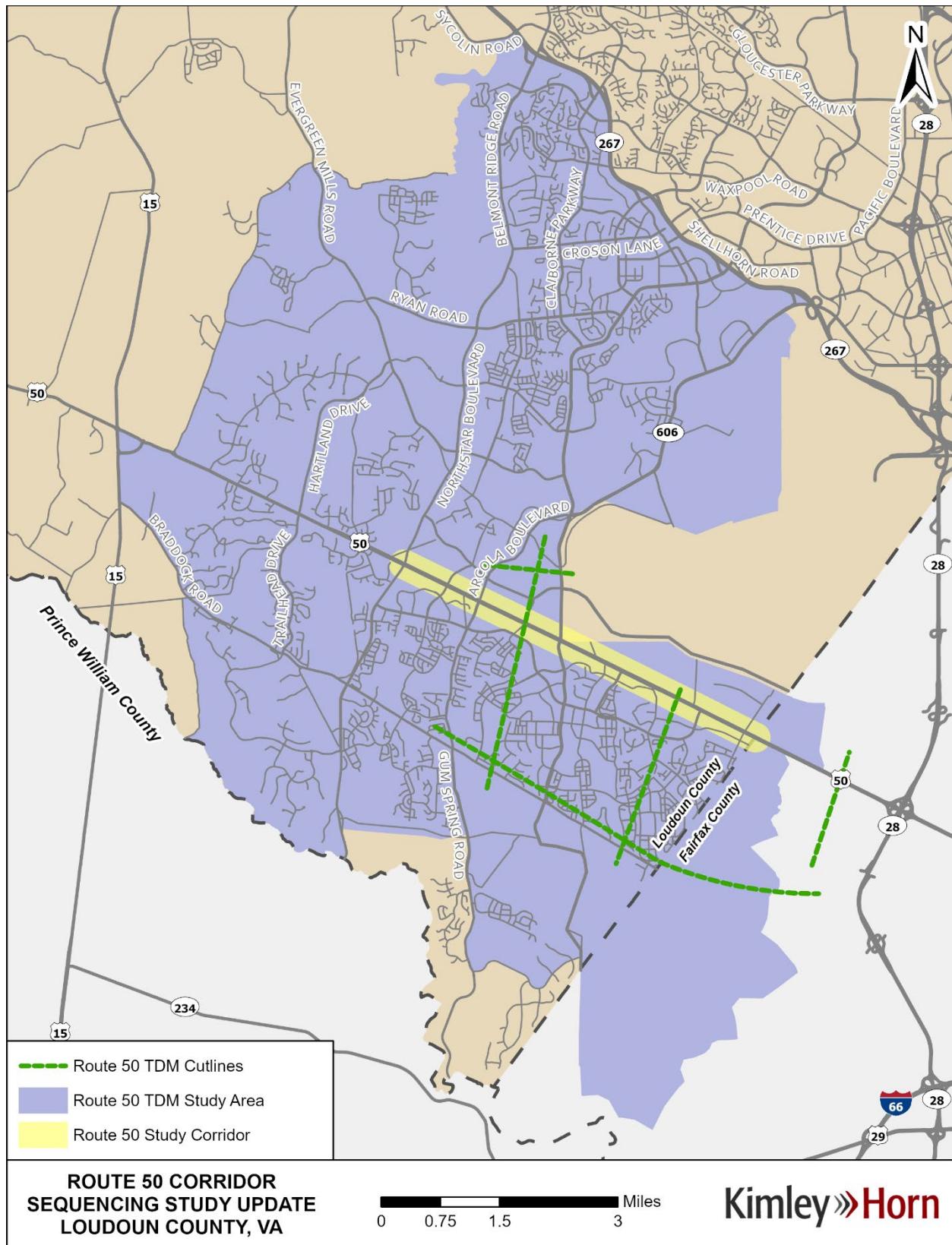


Scenario 6 AM & PM Peak Hour Vehicle Volumes

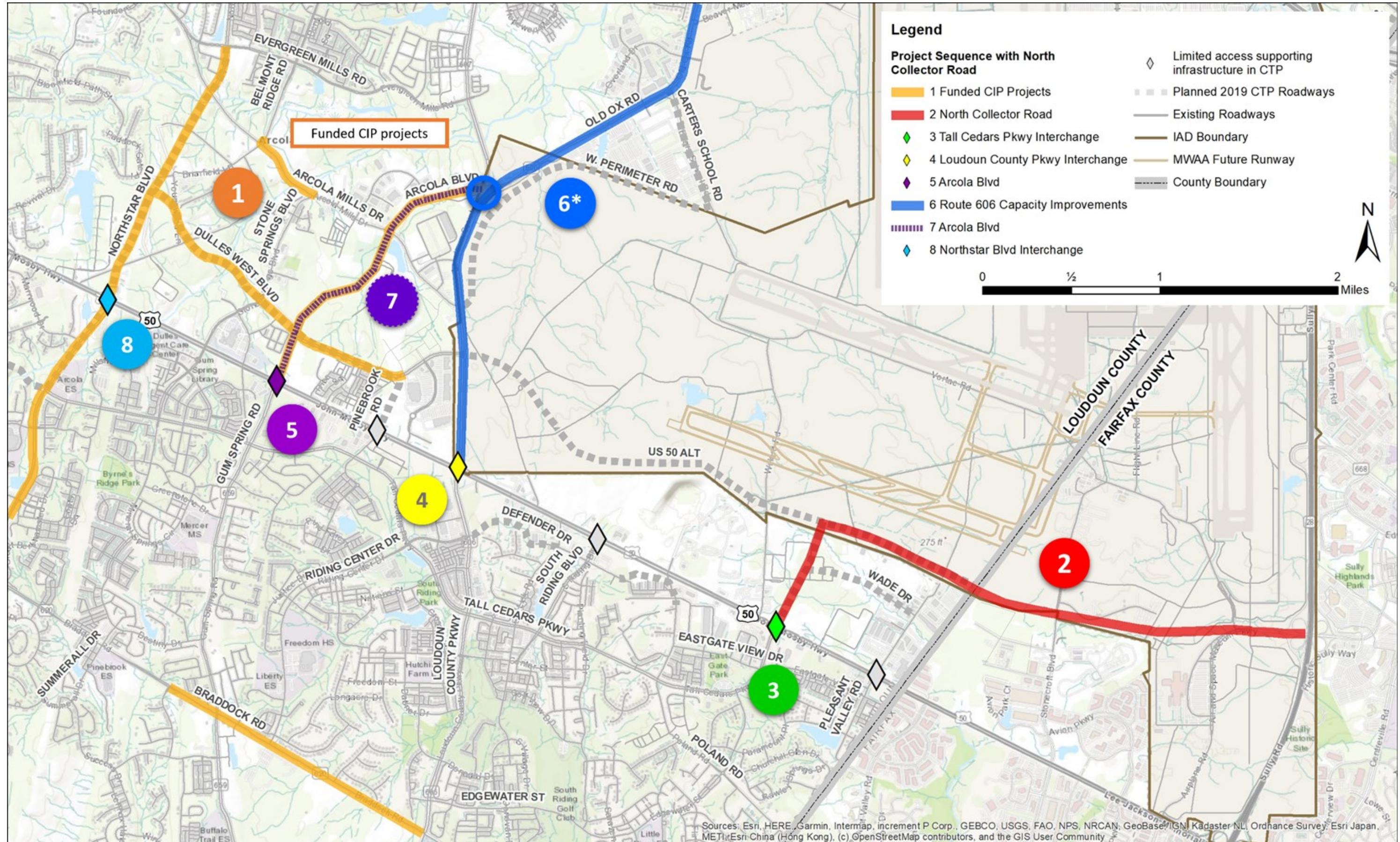


Scenario 12 AM & PM Peak Hour Vehicle Volumes

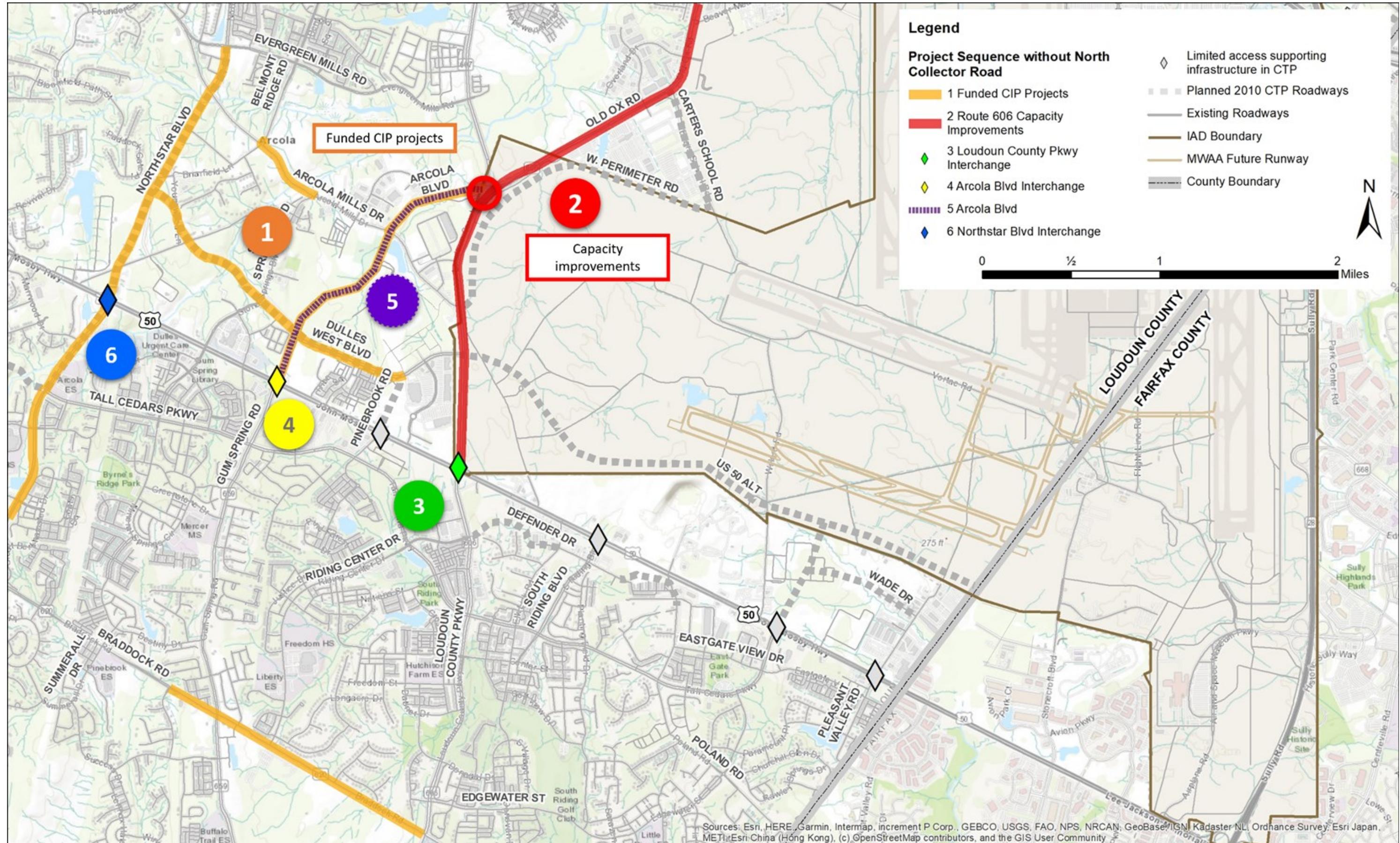




Study Area Map



Scenario 1 - With North Collector Road



Scenario 2 - Without North Collector Road