CAMPO
NC Capital Area Metropolitan Planning Organization

GO Triangle

# Bus on Shoulder System (BOSS) Expansion Study

## Executive Summary

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DURHAM · CHAPEL HILL · CARRBORO
DCHC
METROPOLITAN PLANNING ORGANIZATION

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# BOSS Implementation Blueprint Executive Summary

## Who Is This Document Is For?

Are you a resident or leader of a community in North Carolina that would like to see its public transit buses run faster and more reliably? Are you a member of the business community, seeking to help employees get to work? Perhaps you are an employee of NCDOT, one of our Metropolitan Planning Organizations (MPOs) or Rural Planning Organizations (RPOs), or an employee of one of North Carolina's transit systems – trying to figure out how to get the most out of our roadway and transit networks.

If you fit any of these descriptions, this document is for you!

## What Is a Bus On Shoulder System?

A Bus On Shoulder System, or BOSS, as it is referred to throughout the document, is a cost-effective and comparatively easy-to-implement solution to improve bus service performance on limited access facilities. With BOSS, buses are allowed to drive on the shoulder when certain conditions are met. Buses operating in BOSS mode are able to bypass congestion, saving travel time and improving the on-time performance of the transit system. The BOSS concept has been used in the US for over 30 years safely and effectively.

## The BOSS Implementation Blueprint: A Game Plan to Help Bring BOSS to Your Community

While BOSS has been in use in the United States for decades, there is little documentation on how to implement BOSS in a community where it does not currently operate. The **BOSS Implementation Blueprint** (The Blueprint) is designed to provide guidance, critical background information, and partnering strategies to make the expansion of BOSS anywhere in North Carolina as straightforward as possible.

The Blueprint and its appendices address these questions:

- Which roadways in our community or region are good candidates to deploy BOSS on to improve bus service?
- Who can help evaluate the question of where BOSS would work best, and become partners to move a potential BOSS project forward?
- What design criteria and safety criteria need to be met to implement BOSS, and what are best practices to use?
- Are there opportunities for state-funded transportation projects to include BOSS elements?
- How can we communicate with the public about BOSS, whether they experience BOSS as a motorist driving next to the bus, or a passenger within the bus?

## CASE STUDY: Planning for BOSS Expansion in the Triangle Region

GoTriangle buses have been operating on shoulders along I-40 in the Triangle since 2012. This study recommended a technical approach and steps that the region can take to formalize the process of expanding the BOSS network in a data-driven and routine way.

Through a multi-jurisdictional project team led by CAMPO, with partnership from NCDOT, DCHC-MPO, and GoTriangle, the process described in the Blueprint was conducted for the Research Triangle region.

### CASE STUDY PART I: Peer Review – Putting NC and the Triangle In Perspective

To kick off the study, the project team brought in experienced BOSS experts from Minneapolis, California, Florida, and Oregon who had previously implemented BOSS projects and policies in other states to conduct a peer review of North Carolina's BOSS implementation and share insights from other communities.

Three key insights from the peer review were:

*Recognize Our Success:* While a few states and regions have broader BOSS networks than the Triangle, our community and NCDOT have still done more with BOSS than most other states

*Maintenance Matters:* One of the key phrases uttered in the peer review was "if you don't have maintenance, you don't have Bus On Shoulder." Our Triangle BOSS team has procedures in place to ensure shoulders remain clear, and staying vigilant will support future success

*Variety in BOSS Implementation:* Other leading BOSS states are implementing BOSS in a variety of settings. For example, we learned about inside lane BOSS applications on freeways in Florida, and how longer segments are crucial to making inside lane applications deliver travel time savings.

### CASE STUDY Part II: Developing Criteria

Building from the implementation examples in the Peer Review, and our own experience in the Triangle region, the project team worked to develop detailed design standards for BOSS expansion in the Triangle, with two types of criteria:

*Minimum criteria:* Minimum criteria to meet for each design criterion to operate Bus On Shoulder, very useful in evaluating existing facilities for BOSS use

*Recommended criteria:* Criteria that allow for robust BOSS operations, very useful in planning to design future facilities to be BOSS-ready from day one

*Example:* Shoulder width: Minimum 11 feet, Recommended 12 feet

NCDOT is currently working on studies that may update how they design roadway shoulders in general, independent of BOSS operations. When that work is complete, NCDOT can use the BOSS Design Criteria and their revised standards to update the BOSS Implementation and Operations Plan.

## CASE STUDY Part III: Choosing Roadways to Evaluate: Criteria Plus Staff Judgment

With the design criteria in hand, the project Technical Steering Committee worked on a process to select which roadways should be studied to assess the benefits of deploying BOSS. This process involved laying the region's anticipated transit 2035 network over Interstates, US and NC routes- which all have some level of limited access and curb cuts. Current transit services were used in Durham and Orange counties since those county plans are currently redeveloping their future networks.

Locations of future BRT corridors as described in regional plans were also included. An example would be NC 54 from Cary to the Regional Transit Center via Morrisville.

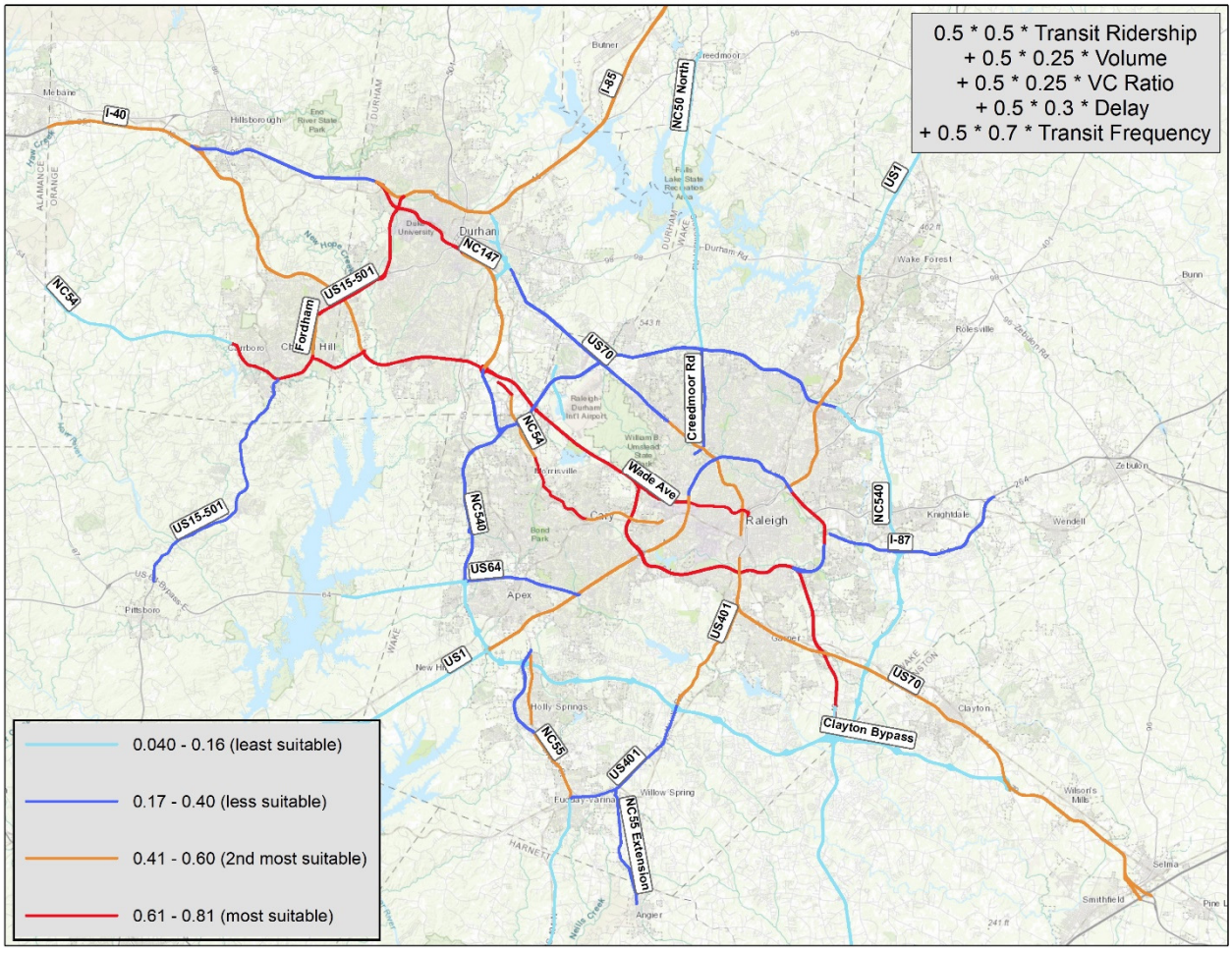
Finally, roadways in other counties within both CAMPO and DCHC-MPO jurisdictions that were recommended for analysis by MPO staff were also included, as were a few others in Wake, Durham, and Orange counties recommended by staff for evaluation.

## CASE STUDY Part IV: Which Projects Would Have the Most Benefit?

The team assessed each candidate Subject Road for BOSS using these metrics:

- Travel Demand Metrics
- Transit Ridership by Route
- Traffic Volume by Subject Road Segment
- Congestion Level by Subject Road Segment
- Transit Operations
- Travel Time Delay for all vehicles
- Transit Service Frequency

Corridors that had higher levels of demand, faced the greatest peak period delays, and had the most number of buses using the corridor score best in the evaluation. They are shown below:




*Key Insights*

Primary BOSS expansion opportunities occur mostly along major interstates which connect core destinations in the region, such as University of North Carolina-Chapel Hill, Duke University, Downtown Durham, Research Triangle Park, North Carolina State University, and Downtown Raleigh. These destinations anchor mature, core transit markets and therefore validate suitability to operate BOSS. These segments total 75 miles.

Second tier BOSS expansion opportunities link downtowns to core suburban markets through US 1, NC 54, US 70 and US 401. In the future, Park and Ride facilities strategically located at the intersection of these routes and heavily traveled secondary facilities could serve as collection areas during peak commute periods allowing suburban commuters to opt for transit service. Some of these routes coincide with proposed Bus Rapid Transit (BRT) locations in the Wake County Transit Plan (WCTP) providing an additional dimension of short and longer distance choice rider service opportunity. These segments total 139 miles.

### CASE STUDY Part V: Which Projects Are the Best Implementation Opportunities?

Having established which Subject Roads were most likely to offer benefits with BOSS deployment, the team then took a qualitative approach to screen for near-term projects in regional plans that had attributes that were supportive of BOSS implementation, including:

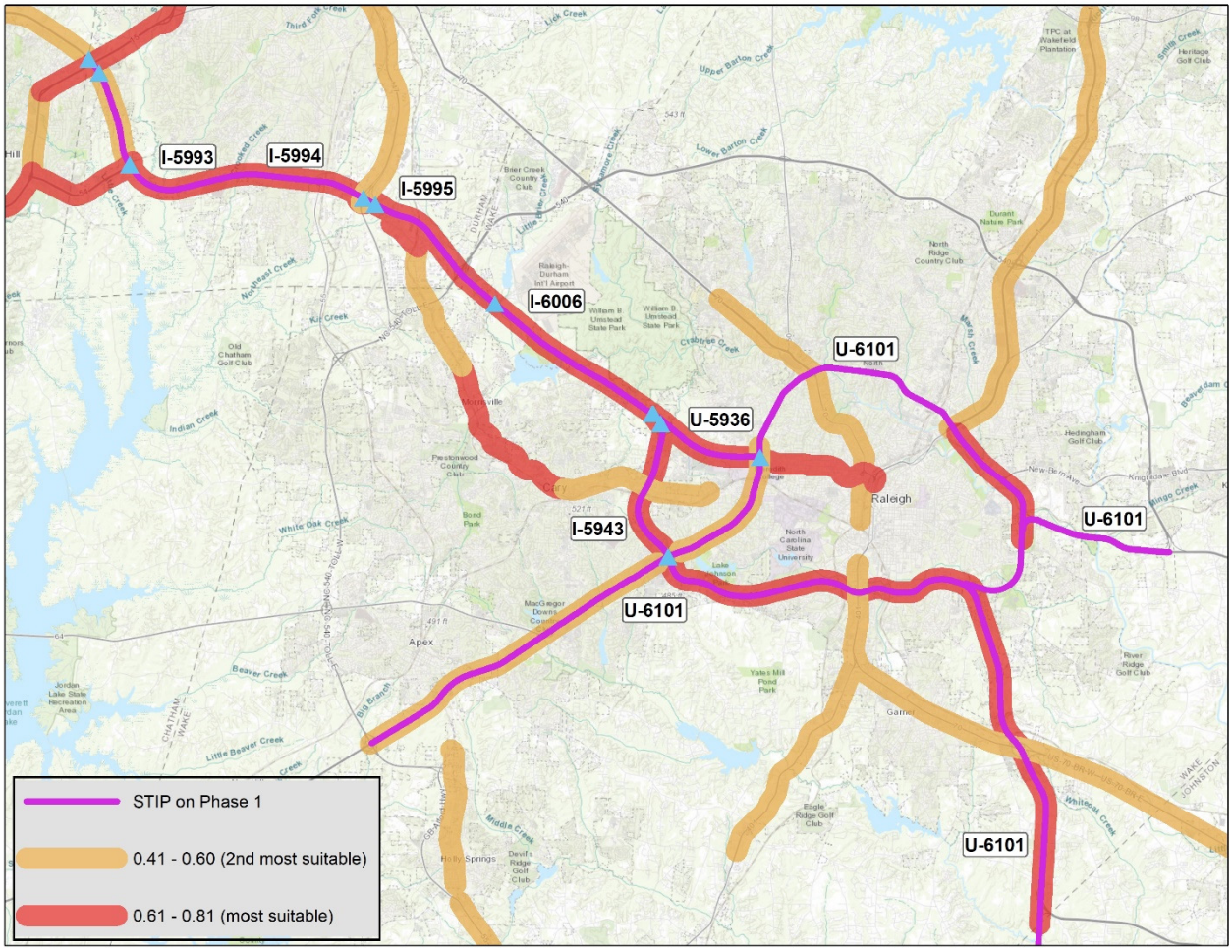
- Existing pavement conditions
- Regional traffic system operations
- 2020 - 2029 STIP Commitments and SPOT projects

Discussions with NCDOT experts revealed that the current pavement GIS data is not specific and complete enough in the appropriate metrics to draw distinctions in constructability through a data analysis exercise.

A more promising opportunity for the Triangle to consider an expanded BOSS network is through the collection of Traffic System Management and Operations (TSMO) investments that NCDOT has planned in the region to enhance travel time reliability. Phase 1 is 71 miles implemented over the next decade through STIP projects along I-40, I-440, I-87, and US 1. Phase 2 is implemented beyond the next decade encompassing 120 more miles resulting in an expanded, broader regional network along all of I-540 and parts of US 1, US 64, and US 70.

When reviewing the STIP for existing projects that are both planned for TSMO investment and also scored in the Most Suitable or Second Most Suitable group of segments for BOSS benefits, the projects in the map below with a purple centerline and red or orange outline offer particular promise. These facilities include:

- US 1 from I-540 in Apex to I-40 in Raleigh, continuing along I-440 to Wade Avenue
- I-40 from exit 289 to the Johnson County Line
- I-440 from US 1 North to I-87 in East Raleigh




This process can be repeated by the MPOs in the region for subsequent rounds of SPOT submission, and for ongoing planning coordination between TSMO strategies and BOSS deployment in the Triangle.

The next portion of the Executive Summary highlights how other communities within North Carolina could follow the process that has already been completed in the Triangle.

## Getting Started: Where Would BOSS Benefit Buses In Your Community?

The Blueprint begins by identifying the key information needed to evaluate a BOSS proposal, including identifying the purpose and need for BOSS. Some common reasons for BOSS implementation include but are not limited to the following:

- High congestion level in the corridor impacting bus schedule reliability
- Support for new express bus service strategy in the corridor
- Solution to a regional connectivity issue and, ultimately, a commuter solution for maintaining reliability through traffic congestion areas
- Interim measure until construction of managed lanes or widening of the highway
- Long-term transit solution for the corridor
- Short-term solution for non-typical congestion like in advance of construction projects

Next, it discusses how to identify Subject Roads to be evaluated for potential BOSS operations. A detailed application of the evaluation methodology used to assess BOSS expansion in the Triangle region can be found in Appendix XYZ.

After analyzing which transit services and roadway segments are most likely to benefit from BOSS operations, the Blueprint then discusses strategies for reviewing regional planning documents to identify which of these Subject Roads may have an opportunity to incorporate BOSS elements into planned improvements in the State Transportation Improvement Program, or STIP.

## Building Your BOSS Team

BOSS takes coordination. Running buses on the shoulder of a highway inherently engages multiple stakeholders, including:

- NCDOT
- Transit Agency(s)
- MPO(s)
- Federal Highway Administration (FHWA)
- State and Local Law Enforcement
- Emergency Responders
- Traffic Incident Management Professionals
- Local Jurisdictions

The Blueprint discusses roles and responsibilities of the BOSS team and how the BOSS team members can work together to develop a BOSS Concept Plan that identifies the problem BOSS is addressing, quantifies potential benefits, and identifies steps for implementation. Following the BOSS Concept Plan, detailed BOSS Operating scenarios should be developed and evaluated.

## Design Criteria for BOSS Operating Scenarios

To assemble realistic scenarios, the Blueprint contains detailed Design Criteria for BOSS in Appendix A to help members of the BOSS team understand what it will take to implement successful BOSS operations on the proposed route. Existing conditions of the roadway such as paved shoulder width, pavement condition, and identification of pinch points and potential obstacles in the bus path. Comparing the existing conditions of the roadway will provide key information of the level of capital investment needed to implement BOSS operations.

## BOSS Project Development and Implementation

Project development includes a high-level environmental screening of the BOSS corridor. The Blueprint identifies a letter sent from FHWA to NCDOT that confirms that BOSS projects do not require noise analysis or abatement measures, contained in Appendix F. As the project is developed, the NCDOT BOSS Implementation and Operations Plan (IOP) found in Appendix C can be used to develop a Regional Memorandum of Agreement (MOA) that documents how the different stakeholders that contribute to BOSS success, including the transit agency, NCDOT, the NC State Highway Patrol, first responders, and others – can work together to make BOSS operations work well without compromising other stakeholder operations and goals.

## BOSS Promotion, Communication, and Monitoring

To prepare for opening day, and to educate the public once BOSS is operational, the Blueprint contains a series of Messaging recommendations and marketing strategies for BOSS to address both those who wish to ride the bus, and motorists who are not used to seeing buses ride on the shoulder during congested periods.

Finally, the Blueprint identifies several performance measures to assess after the implementation of BOSS o ensure that the benefits of BOSS can be calculated and communicated. Specifically, the BOSS team should determine if there are changes that could be made to improve BOSS operations such as additional law enforcement and maintenance needs.

Shelby Powell – Deputy Director

**NC Capital Area Metropolitan Planning Organization**

421 Fayetteville Street

Raleigh, NC 27601

(919) 996-4393

Shelby.Powell@campo-nc.us