

improvements to improve the overall safety and comfort of transit users, and inadequate street crossing infrastructure can make it difficult for a transit rider to safely reach a transit stop—this is particularly true for riders who do not own cars.

The North Carolina Department of Transportation (NCDOT) provided funding in 2011 for the development of the Durham Pedestrian and Bicycle Access to Transit Plan, which focuses on improving the safety, access and comfort of transit users along three transit corridors in the city's central core area. A bond referendum passed for Durham County in October 2011, made funding available to add to federal and state funding for roughly \$6 million in improvements within these three transit corridors. Potential improvements include the construction of sidewalks, improvements at transit centers, and improvements at bus stops, (e.g. the provision of level landing surfaces, bus shelters, and benches, etc.) This funding opportunity prompted the City of Durham to more thoroughly examine infrastructure needs at transit centers and stops and provide funding for the plan. As the plan was not formally adopted at the time of publication of this article, the recommendations summarized in this article are general in nature.¹ The following synopsis includes information about how the plan was developed, significant variables for evaluation, public involvement methods, and preliminary recommendations.

Project Overview

Funds provided by NCDOT's Division of Public Transportation made possible the Durham Pedestrian and Bicycle Access to Transit Plan. The Division of Bicycle and Pedestrian Transportation managed the project, which is a pilot for how future access to transit plans may be developed by NCDOT. Staff from the City of Durham,

Transportation, Equity, and Access to Bus Transit

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Introduction

The goal of public transportation agencies is to provide safe, efficient, and reliable service for passengers to reach their homes, jobs, shopping and other destinations. In order to maintain and increase ridership levels, transit agencies must strive to ensure the physical safety of their passengers. This need for safety applies for both passengers on board the vehicle, as well as when they are accessing the system at a transit stop.

Transit users frequently confront a lack of sufficient infrastructure for walking and bicycling to bus transit stops. Bus stop locations are often in need of significant



Example of bus stop deficiencies: Lack of level lift areas can be an issue for wheelchair users at bus stops. *Image courtesy of authors.*

Durham County, NCDOT and Triangle Transit – the agency responsible for management of Durham’s bus transit system, known as “DATA” – guided the development of the plan. The planning process began in fall 2011 and will run through spring 2013, and is carried out with assistance from Toole Design Group.²

The plan started by identifying a critical-need study area, outlining existing conditions for transit users with special emphasis on safety information, and collecting user input through a variety of participation methods. Based on the information gained regarding existing conditions, and with input from the steering committee, the plan provides general recommendations based on prioritization models and specific infrastructure needed. These recommendations address safety, connectivity, infrastructure, and design as they relate to pedestrian and bicycle accessibility. The plan also recommends a series of policy and program changes in five areas: planning and design guidance, resources, operations, maintenance, and customer communication.

Study Area

In selecting the study area for this plan, the lead agency partners focused upon transit corridors in Durham with high transit ridership and that lack continuous and accessible pedestrian and bicycle infrastructure. Three Durham corridors were selected, Fayetteville, Holloway, and Roxboro streets, based on several criteria. The Fayetteville and Holloway corridors feature far lower household incomes and vehicle ownership rates than Roxboro. The Roxboro corridor is of interest because it connects with the two other corridors and features more suburban design. The predominant land use along each corridor is residential and supported by a fairly well-developed grid street pattern. Major transit trip generators in the study area include Durham Regional Hospital, located along northern Roxboro Street, North Carolina Central University located along Fayetteville Street, and “the Village,” a major commercial node on Holloway, as well as several schools located along side streets.

Existing Conditions

The Plan identifies existing conditions affecting walking and bicycling access to bus stops along the three study corridors, totaling roughly eleven miles. After collecting baseline information about the study area, the consultants used handheld portable GPS-enabled tablet computers to evaluate existing conditions in the study area, which included approximately 190 bus stops, 70

	PRIORITY RANKING		
	1	2	3
Safety	Overhead light at the bus stop.	A pedestrian signal where I cross the street.	A crosswalk striped where I cross the street.
Access	The sidewalks are better – wider, smoother and level.	Sidewalks or paved paths along the entire walking route to my stop.	No obstacles along the way, such as utility poles, bushes, tree roots, parked cars.
Comfort	A shelter to block the sun or rain while I wait for the bus.	A trash can at the stop.	A bench to sit on while I wait for the bus.

Table 1. Transit Passenger Intercept Survey Results

intersections, and a total of 180 center line miles. The field audit revealed significant deficiencies in all the corridors, including damaged sidewalks, gaps in sidewalks, overgrown vegetation, cars or trash cans obstructing the sidewalk, driveway access issues which pose safety concerns for pedestrians, and unsafe street crossing locations. The audit also noted deficiencies in the bus stop environment, including poor placement of stops, lack of level lift areas for wheelchair users, puddles and overgrown vegetation, lack of or poor lighting, and poor pole and flag condition. The consultants made note of existing features at each bus stop (e.g., bench, shelter, trash can, bicycle rack, etc.); available space to install shelter; location of bus stop (near side/far side/mid-block); ground surface type; curb type; and condition of sidewalks leading to the stop.

Descriptions of prescribed improvements per stop, as well as geo-referenced photographs for each bus stop, are included in a geospatial database, which will be made available to the city and transit agency upon completion of the plan. This database will be useful to Durham and transit providers in future planning efforts, and could be expanded by transit agency staff to include additional bus stops in the DATA system.

Crash Data Analysis

A detailed crash analysis revealed a high incidence of pedestrian crashes in the study area with a disproportionately large number among certain minority groups. A total of 181 pedestrian-vehicle crashes occurred in the study area for years 2004-2008, the majority of these (71%) involving African Americans as the injured or killed pedestrian. It is important to note that statewide, there is an over-representation of pedestrian crashes among African American populations. African Americans were involved as pedestrians in 41% of vehicle-pedestrian crashes, but accounted for approximately 22% of the overall state population in 2010. This overrepresentation may reflect greater amounts of walking by African Americans

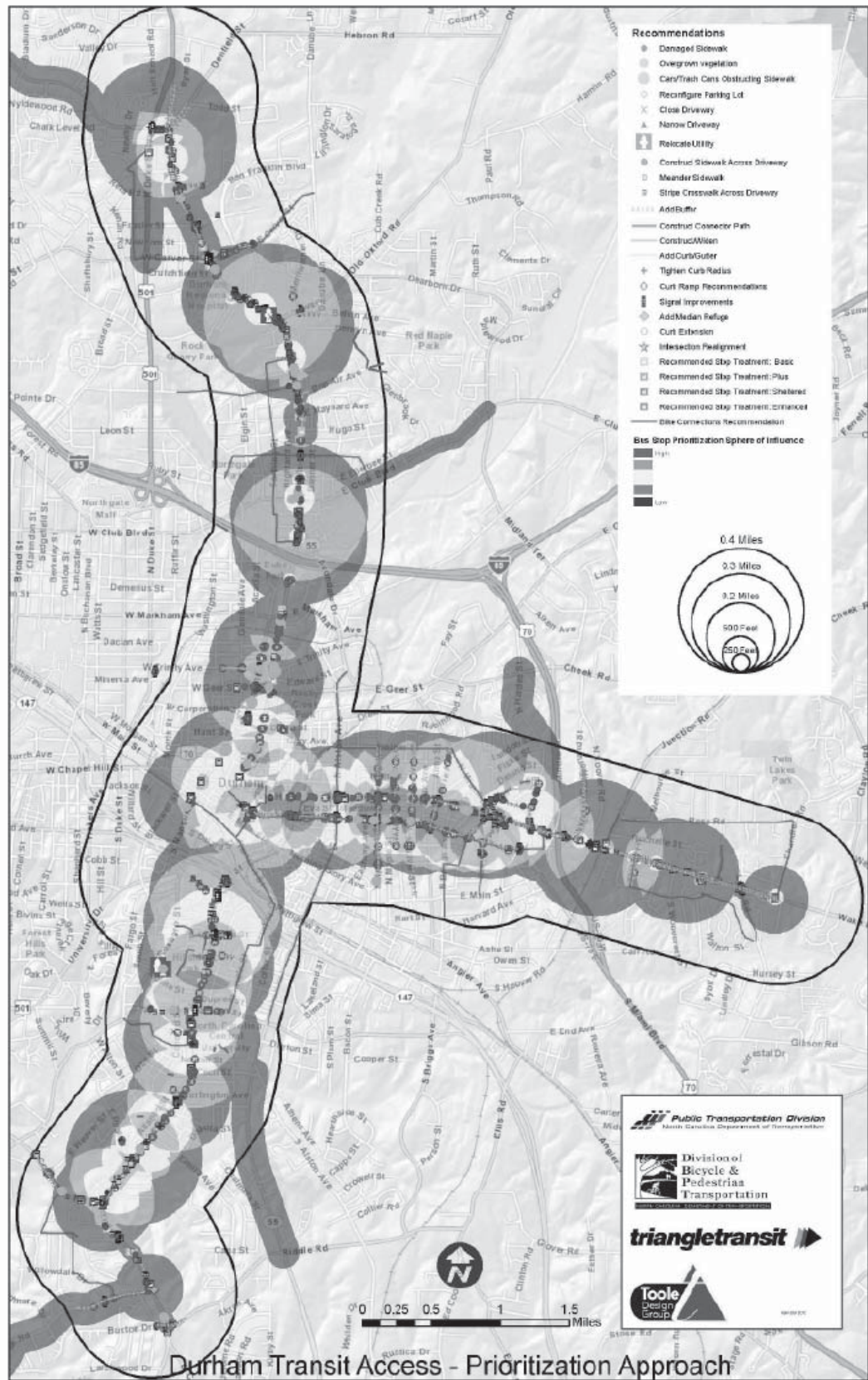


Figure 1. Project Prioritization “Heat Map”.

compared to other populations in the study area.

Public Input

As a public input strategy, the agency partners leading the planning process decided to request input from transit users while they were on board the bus. Leaders expected that this method would yield more input than a traditional open house event. Transit users on board the buses were requested to complete a survey ranking the need for improvements in three general categories: safety, access and comfort.³ After ranking the general categories, survey respondents were asked to rank the specific infrastructure improvements within each category. Safety was ranked as most important, with the desire for good lighting at the stop rated highest, followed by access and comfort improvements. Table 1 shows rider intercept ratings of improvements, revealing the top three priority items reported by respondents for each category of improvements. One compelling statistic was the rate of car ownership—nearly 85% of respondents indicated that they did not own a car and were therefore dependent on transit, as well as walk- or bike-only trips.

Determining Project Priorities

The ranking of infrastructure projects for the Access to Transit Plan employed four data inputs: household income, vehicle ownership rates, household density, and unemployment rate. A “heat map” (see Figure 1) was generated for the project study area, based upon the composite scores of these data inputs. The “heat map” shows high-need geographic zones in red, with yellow indicating medium priority and green indicating lower priority. Improvements to safety, access and comfort will receive relatively equal weighting within each priority category. However, the survey results from transit riders, and their weighting of these three aspects, will be used to inform the exact balance of priorities projects in these areas.

Plan Recommendations

Bus riders, regardless of their socio-economic status have the same basic needs for safety, comfort and access when traveling by public transit. Given this, the plan recommendations include:

- Strengthened collaboration among all entities to plan, design, build and maintain bus stops and access to them from the perspective of rider needs first, then to address operational needs. This collaboration includes using rider feedback from all sources to address safety, comfort, and access needs.
- Focused investment in basic access and stop features, such as sidewalks to/from a stop, a level landing pad, pedestrian-oriented street crossings (especially for companion stops), and increasingly infrastructure that supports bicycle transportation as an extension of public transit (bike parking, racks on

buses, bikeway connections within bus stop access sheds).

- Continued development of stop spacing and placement that encourages ridership, especially within the ½ mile access shed. Placement of stops at intersections, where possible, to encourage passengers to cross at intersections, as opposed to mid-block.
- The development and implementation of companion projects, programs and policies to support improved access to transit.

Conclusion

Public transit is a key factor in increasing equity through transportation, as it is, in part, designed to serve the needs of populations within limited access to transportation choices. Protecting the first and last mile of bicycle and pedestrian infrastructure is critical to the success of improving access to transit and equitable transportation options. The Durham Pedestrian and Bicycle Access to Transit Plan is meant to lead to meaningful improvements to the environment for transit users in Durham and contribute to the overall viability of the transit system, while also serving as a model for future planning efforts across state of North Carolina in years to come.

Endnotes

¹ The Plan will be made available on the City of Durham’s webpage, at www.durhamnc.gov

² Toole Design Group is a firm which specializes in pedestrian and bicycle planning, including access to transit, based in Silver Spring, Maryland.

³ Safety” related to connectivity between stop locations and other land uses; “Access” related to the width and condition of sidewalks; and “Comfort” was related to the size of the waiting area, the presence of a shelter, bench, and/or lighting

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