

Watch and Learn

*How observation can enhance
understanding of walkability and bikability
around transit stations*

Option Paper

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I. Introduction

Recently, walking and biking have become large-font-items on the word cloud of urban transportation. Residents, businesses, and governments alike have made active transportation a priority. All three groups recognize research on how active transportation can keep money in the local economy, reduce air pollution, support vulnerable populations, increase physical activity level, and ease pressure on public funds, among other benefits (Blue 2013). Transit is also reliant on good bikability and walkability around stations for first- and last-mile connectivity. Cities are reversing the trend of focusing on parking and highway access as the key to a popular downtown, and are instead adopting complete streets policies, installing bike infrastructure, and taking other measures to return a human presence to city streets.

Urban planners and transportation engineers have a relatively small toolbox for dealing with walking and biking compared to other modes. Professionals have a diverse and vast set of tools and regulations for motor vehicles that have gone through many renditions and have gone through rigorous tests. Conversely, the first national guidelines on bike infrastructure were not published until 2011 when the National Association for City Transportation Officials (NACTO) released the *Urban Bikeway Design Guide*. Since then, other federal agencies have published some of their own guidelines, such as the Federal Highway Administration's 2015 *Separated Bike Lane Planning and Design Guide*. However, there are still many questions on how to define or quantify bikability. Similarly, there are many unanswered questions about what it means for a place to be walkable. Researchers have tried to

develop pedestrian- and bicycle- level of service measures that mimic the level of service concept for vehicles but these methodologies have inspired a debate and discussion over the topic. The reality is that these modes are incredibly complex and it is difficult to understand why and how people walk and bike from a purely data driven perspective. City planners are figuring it out as they go and improvising where they must. A lack of data on walking and biking behavior compounds this issue. There are no federally mandated requirements for tracking biking and walking activity so methods are not transferable across agencies or jurisdictions the same way they are for transit or vehicles.

In the closely related field of urban design, there is a deeply-rooted philosophy that design needs to operate at human scale and respond to human behavior. Designers such as Jan Gehl and William H. Whyte emphasize the study of public life in their practice as a method for inspiring good design, introducing an anthropological spin on urban design. They counted things like people and activities, noting the pace of the environment and where its visitors tend to sit or stand. The resulting information allowed for more human-centric design. These techniques may prove to be useful not only for urban designers, but also for those furthering walking and biking in cities. This paper proposed a methodology for integrating these “observation-based” criteria into the more traditional approach as a way to get a more comprehensive and qualitative understanding of what it means to walk and bike in a particular place.

Measuring comfort of pedestrians and bicyclists should be of particular importance to transit operators and supporters. In Atlanta, most transit trips begin or end with a walking trip, so the suitability of walking in the area surrounding stations can

have a big impact on the overall trip satisfaction (ETC Institute, PBS&J, and DW & Associates 2010). If bikeways or bicycle availability were expanded in the city, it is reasonable to expect that more people would feel comfortable biking to or from transit, thus increasing the number of people transit could serve in Atlanta.

This paper examines the suitability of the environment for walking and biking around three of Atlanta's busiest rail stations based on availability of physical infrastructure and observation of public life surrounding the stations. Infrastructure includes elements like sidewalks and on- and off-street bike facilities. The life within the public realm also influences how comfortable different people feel walking or biking, so the analysis will include observations on behavior such as types of activities, level of interaction between people, and how quickly people move through the area. The result will be a holistic view of how the public realm supports last mile connectivity for people who choose to walk or bike to access rail transit in Atlanta. The following literature review addresses several questions regarding first and last mile connectivity (FLMC) and how to assess life in the public realm.

II. Literature Review

A. What's the problem with first and last mile connectivity around transit stations?

Transit users are unique in that their travel tends to involve several different modes that compose a single trip. The quality of the public realm around transit stations plays an important role in the overall travel experience for transit users. If someone who is walking to a transit station does not have access to comfortable sidewalks

and safe street crossings in a visually interesting environment, that person is likely to be dissatisfied with the trip before they even reach the transit station. In Atlanta, a recent study by the Atlanta Regional Commission found that almost three quarters of all transit trips begin with walking or biking (ETC Institute, PBS&J, and DW & Associates 2010). However, there is an “overwhelming need” for bike and walking facilities around transit, and the quality of the walking space leaves much to be desired, with many poorly maintained sidewalks and ADA violations (City of Atlanta 2015). While improvements for these modes tend to be relatively inexpensive, transit funding has historically focused on large-scale capital improvements that inadvertently the human scale elements of transportation (Hess and Lombardi 2005). As a result, the public spaces around transit lack the thoughtful design required for walking and biking activity.

Getting from the origin or destination to the transit stop is reliant on good first- and last-mile connectivity (FLMC). FLMC is, “the provision of travel service from a public transportation node to a home or workplace (‘last mile’) or vice versa (‘first mile’)” (Wang and Odoni 2014). “The unavailability of this type of service is one of the main deterrents to the use of public transport in urban areas, especially for certain demographic groups, such as school children, seniors, and people with certain physical disabilities” (Wang and Odoni 2014).

A 2014 study of transit commuters in Central Maryland found the following issues surrounding the last leg of the trip:

Among those using public transportation, only 27% report their stops are within a quarter-mile of work. Nearly half of them (46 percent) say they still must traverse at least a mile... Workers close this gap primarily by walking... The last mile problem was disproportionately reported by lower-

income individuals, i.e. those earning less than \$35,000 a year (The Central Maryland Transportation Alliance and The BWI Business Partnership Inc. 2014).

Those who are responsible for public space and streets can help make this last leg more enjoyable by designing a space for people, rather than cars. Since the burden of the last mile is disproportionately felt by lower income individuals, it is also an equity issue.

While the topic of biking and transit is on the table for many cities, there has not been a lot of research on the types of people who use these two modes together. In 2014, the Mineta Transportation Institute found that cyclist-transit users (CTUs) travel about 2.8 miles on bike in Philadelphia versus 5.4 miles in San Francisco. These users report that they choose to pair their bike with transit because the trip would be too long to do by a single mode, “but even experienced CTUs were anxious in some circumstances, suggesting the numbers of CTUs could rise significantly if bicycle-transit policies and conditions could be improved.” (Flamm and Rivasplata 2014).

B. What are the elements that contribute to a walkable and bikable first and last mile network?

The space for walking and biking around transit should make for a comfortable, safe, interesting and efficient experience. This is dependent on development form and land use patterns that support walking and biking, as well as the infrastructure to support that activity. Particularly important infrastructure types include bike facilities, sidewalks, bike parking, street furniture, bike share, signage, trails, transit accommodations, end of trip facilities, and traffic calming.

i. Sidewalks and paths

The most fundamental piece of the pedestrian network is the sidewalk. Sidewalks should comprise a connected and well-maintained space primarily for walking, but also for things like talking with neighbors and jogging. “Sidewalks must be safe and accessible for all users, regardless of physical abilities or age. They should be welcoming to people in wheelchairs, those pushing strollers, and those with carts or suitcases. Sidewalks should have continuous and unobstructed pathways and sight lines” (“Boston Complete Streets Guidelines” 2013). In order to maximize the benefits of the sidewalk, the design should respond to weather conditions in the region, with considerations for shade, snow storage and stormwater management. Sidewalks should form a connected network through use of safe street crossings, or underpasses or overpasses where appropriate.

ii. Elements of an interesting walking environment

The public realm can become more attractive and inviting for people on foot with public art, cafes, comfortable transit stops, trees, awnings and signage (“Boston Complete Streets Guidelines” 2013). Writers often use the term “amenities” to describe this category, but that vocabulary vastly underestimates the critical role this type of infrastructure plays in making walking more convenient, safe and comfortable.

In addition to providing space for walking, sidewalks need to accommodate lots of different amenities and elements to achieve ideal quality. In order to accomplish all of these different jobs and store all of the different types of items, there are four

distinct zones included within the width of the sidewalk (“Boston Complete Streets Guidelines” 2013):

- Curb: provides a clear threshold between the roadway and the sidewalk.
- Greenscape/Furnishing Zone: provides space for features like trees, benches, bus stops, mailboxes, or other stationary elements.
- Walking zone: provides space for through movement, with sufficient space for groups, people passing, and those in wheelchairs.
- Frontage zone: where applicable, provides space for outdoor seating or lingering in building entrances.

Different areas may have different requirements based on context, but the pedestrian circulation area is thought to be optimized when all are present.

iii. Bike Lanes

Designated bike facilities provide a right of way for people on bikes, and are a basic element of the bike network (“Urban Bikeway Design Guide” 2011, The Central Maryland Transportation Alliance and The BWI Business Partnership Inc. 2014, Advocacy Advance 2014). According to the Urban Bikeway Design Guide of 2011, there are four categories: bike lanes, buffered bike lanes, contra-flow bike lanes, and cycle tracks.

Standard bike lanes offer the most basic type of dedicated bike right of way. “Bike lanes designate an exclusive space for bicycles through the use of pavement markings and signage” (“Urban Bikeway Design Guide” 2011). Buffered bike lanes are bike lanes that are separated from adjacent traffic or parking with a horizontal buffer (“Urban Bikeway Design Guide” 2011). Generally, the buffer is a painted area

that allows for vehicles to pass through if need be. This allows for flexible design or pilot projects that test the concept before a more expensive redesign. Contra-flow bike lanes allow people on bike to ride in the opposite direction of vehicle traffic, providing a solution for areas with a lot of one-way streets (“Urban Bikeway Design Guide” 2011). Finally, cycle tracks offer the most protected facility in this category. “A cycle track is physically separated from motor traffic and distinct from the sidewalk” (“Urban Bikeway Design Guide” 2011). Cycle tracks come in many different forms but are often implemented as bike lanes separated from motor vehicles by some vertical element.

iv. End of trip facilities and transit accommodations

The network of bike lanes and paths must be supported by end-of-trip facilities like secure parking and showers at the workplace (Advocacy Advance 2014, Mineta Transportation Institute 2009).

For FLMC, it is particularly important that there be secure bike parking available at stations, turnstiles wide enough for bikes, signage, elevators, and space for bikes on transit vehicles (The Central Maryland Transportation Alliance and The BWI Business Partnership Inc. 2014). In a 2014 study of transit users who also bike for part of their trip in Philadelphia and San Francisco, security of bike parking was a key issue (Flamm and Rivasplata 2014).

v. Bike share

Bike share has rapidly spread across American cities, both large and mid-size. Bike share allows short term bicycle rental, with bikes that are owned and maintained by a government agency. Many consider bike share as a form of public transit,

complementing existing bus and rail networks (Kisner 2011). Los Angeles's bike share system, expected to launch mid-2016, is going to be owned and operated by Metro, Los Angeles's major transit operator (Barragan 2015). These systems make it easy for people to link biking with transit, without having to worry about secure parking, maintenance, or carrying the bike on transit.

vi. Traffic calming

Traffic flow is important to a healthy transportation network, but all too many of the roads designed for safely carrying large traffic volumes do not make the same safety improvements for people on foot or bike. Above 30 mph, the risk of pedestrian fatality when struck by a car increases rapidly with speed (D.C. Richards Transport Research Laboratory 2010). In assessing the bike suitability of roads, researchers have deemed lower traffic speed to be an important factor in assessing the bike-suitability of roads (Mingus 2015). Traffic calming encourages people to drive slowly and cautiously, thus improving safety for those on foot. Traffic calming measures are either horizontal or vertical. A horizontal deflection forces drivers to slow down, Design interventions are either horizontal or vertical, meaning that drivers have to go around something, such as a curb extension or chicanes (horizontal), or go over something, such as a speed bump or speed table (vertical) ("Boston Complete Streets Guidelines" 2013). Horizontal deflection devices include medians, pinchpoints, chicanes, lane shifts, roundabouts and diverters. Vertical deflection devices include speed bumps, speed tables, and raised intersections. Signal progression can also help calm traffic by timing lights such that drivers do not save any time by speeding between them (National Association of City Transportation Officials, 2012).

vii. Land use and built form

Another important element for both walking and biking is land use and development context. Portland, Oregon uses the concept of the “20 Minute Neighborhood” to help understand the walkshed and bikeshed of a certain district or neighborhood, and to evaluate what types of retail and services are missing (McNeil 2010). A 20 minute neighborhood is one where one can meet daily needs of life within walking distance. A similar framework could be imagined for biking, with longer distances included within the analysis since people general are willing to bike longer than they are willing to walk.

In 2006, a study found higher residential density, smaller street blocks around home, and shorter distances to food and daily retail from home have a positive association with walking (Moudon et al. 2006). The findings suggest that neighborhoods should have a finer mix of uses than the recreational and educational uses that are common in suburban contexts.

C. How do agencies and municipalities implement these programs?

i. Multimodal Planning

Multimodal planning efforts are an opportunity to think critically about how all modes of transportation work together. Metropolitan Planning Organizations (MPOs) have to complete certain requirements for FTA and the Federal Highway Administration (FHWA), for which FTA and FHWA contribute funds. Through long range planning efforts, MPOs can incorporate multimodal planning. Nashville and

Washington D.C. both have long range transportation plans with sections devoted to planning for transit, biking, and walking (Advocacy Advance 2014).

Findings from the aforementioned study on cyclist-transit users (CTUs) suggest that planning across several modes and agencies is of the utmost importance when it comes to linking bike and transit trips. The following excerpt describes the ways in which agencies should work together to plan a seamless multimodal network:

Policy makers, transportation planners, and transit agency managers may wish to strengthen bicycle-transit integration through the implementation of a set of proactive measures: They ought to make bicycle-transit coordination a high and funded priority and plan for a future in which demand for cycle-transit use increases, providing more, and more secure, bicycle parking and higher capacity bicycle facilities on transit vehicles. To do this, planners should develop joint transit agency/municipal bicycle parking facilities, support joint bicycle and transit planning and implementation at the local and regional level, improve transit agency data collection on the numbers and behaviors of CTUs, and develop better orientation materials (publications, web pages, and videos accessible online) through which to promote cycle-transit travel. (Flamm and Rivasplata 2014)

ii. Transit Oriented Development

Land use and development characteristics surrounding transit have a great impact on the experience of walking and biking to and from transit. First, a higher density of housing helps to support more businesses and services within a short proximity of one another. This makes it more convenient to walk and bike for daily errands, and it helps to make the walking and biking experience more interesting for those who choose to do so. The Leadership in Energy & Environmental Design for Neighborhood Development (LEED ND) awards credits for walkable streets where facades are close to the property line, have clear glass, and have frequent entryways. Residential first floor units should be elevated from the ground by at least two feet, and non-residential or mixed use buildings should have ground floor retail. Also, building height ratio for at least 40% of the block length should be at least two-

thirds of the distance from the property line to the street centerline (“Walkable Streets,” n.d.). A comprehensive assessment of the building form around transit should therefore look at the distance between the buildings and the property lines, façade transparency, and locations of entryways. Policies should encourage developers to utilize these techniques to make streets more walkable around transit.

Special planning and zoning for transit oriented development can help support better walking and biking networks near transit (Advocacy Advance 2014). Atlanta recently went through a transit oriented planning process, resulting in a report called “Transit Oriented Atlanta.” This report identified walking and biking infrastructure as a priority investment for the city moving forward. It suggests a “Better Station” program, based on the “Better Block” program, or a “Safe Routes to Transit” program, modeled after “Safe Routes to School” (City of Atlanta 2015).

iii. Funding

Of course, planning and implementation require funding. While funding is always an issue, there are several local and federal programs that can help. The Atlanta Regional Commission (ARC) has several funding programs that can go toward improvements for walking and biking to and from transit, such as the Livable Centers Initiative (LCI) and the Last Mile Connectivity program. The LCI includes a transportation program that funds the transportation projects associated with LCI development. ARC has committed \$500 million and has already funded \$175 million for LCI transportation projects (“LCI Transportation Program” 2015). The Last Mile Connectivity program had \$50 million allocation in the FY2012-2017 transportation improvement program (TIP), and awards range from \$50,000 to \$2 million. Safe

access to transit is among the recommended emphasis areas for this program. Other emphases include safe access to schools, hazardous roadway crossings, regional bicycle mobility network, local pedestrian and bike circulation in activity centers, bike and pedestrian planning assistance for local governments, and bicycle and pedestrian safety education. For example, projects might include ADA compatible sidewalks and crossings, bike lanes approaching transit stops, bike parking, and bike and pedestrian plans (Atlanta Regional Commission 2012).

In terms of funding, Transit-Oriented Atlanta recommended creating a TOD Infrastructure Fund and participating in a TOD Land Acquisition Fund (City of Atlanta 2015). The TOD Infrastructure fund would collect revenue from sources like parking districts, parking license fee or surcharge, or “swapping” federal funds. The funds would go toward improvements in the right of way, including matching funds for the Transportation Alternatives Program, Livable Centers Initiative, Last Mile Connectivity, and other sources.

Moving Ahead for Progress in the 21st Century (MAP-21) is the current federal transportation bill. In August 2014, it included several grant programs through the Federal Transit Administration (FTA) for local projects that support access to transit via walking and biking. These include Urbanized Area Formula Grants, Fixed Guideway Capital Investment Grants, Bus and Bus Facilities Formula Grants, Enhanced Mobility of Seniors and Individuals with Disabilities Grants (Advocacy Advance 2014). The FTA also administered a transit-oriented development (TOD) planning pilot program, which provided funds for TOD planning to concentrate growth around transit.

The Congestion Mitigation and Air Quality (CMAQ) Improvement Program is a federally funded program for surface transportation improvements that aim to reduce congestion and improve air quality. Many cities have used CMAQ funding for projects that improve walking and biking access to transit or build bicycle facilities that reduce automobile travel (Chicago Metropolitan Agency for Planning 2015). Since this program focuses on congestion and air quality, its projects are all about encouraging a switch from driving alone to other modes, particularly for commuting since that is the source of peak congestion. Currently, Georgia DOT is in charge of the CMAQ funds allocated to the state of Georgia and their policy is not to use those funds on walking and biking projects. They have mainly used them for congestion mitigation through road widening. However, the City of Atlanta is working with GDOT to find a solution that would make those funds more flexible (Katz 2016).

D. How does one gauge the bike and pedestrian friendliness of an area?

In order to prioritize FLMC enhancements, it is imperative to be able to understand the performance of the public realm regarding its support for walking and biking. Most recent efforts regarding this task focus primarily on retrofitting the vehicle Level of Service (LOS) analysis for walking, biking and transit. For professionals with an urban design or architecture background, there is a larger emphasis on the “softer” qualities of space, and the subtleties of how it supports public life. For example, one may be able to tell how safe people feel by how many women walk alone, or how quickly people walk through the area. If someone is interested in whether or not there is adequate seating, one may observe how much the existing

seating is utilized. Between analysis of available data and observation of public life, one may assemble a comprehensive understanding of the area and its needs.

i. Bicycle Level of Service (BLOS) and Level of Traffic Stress (LTS)

LOS has historically been the most popular method for measuring how successfully a facility meets transportation needs. Though this was originally a vehicle-focused methodology, recent efforts by various agencies and firms have attempted to apply the method to walking, biking, and transit. There has been much debate over the best models to describe quality of the walking, biking or transit environment, but all agree that there are a complex set of factors that go into these models. As part of the National Cooperative Highway Research Program, the Transportation Research Board released a report titled, “Multimodal Level of Service Analysis for Urban Streets,” in 2008. This document provides the basis for much of the discussion below on LOS measurements for biking, walking and transit.

Sprinkle Consulting, Inc. developed one of the earliest attempts at a transferable, calibrated model for BLOS (Landis, Vattikuti, and Brannick 1997). In this study, participants rated their perception of various arterials, collectors, and a few local streets that were chosen based on their ability to represent roads throughout the US. The study found the following factors to be significant indicators of BLOS:

- Traffic volume
- Total number of through lanes
- Vehicle speed
- Presence of trucks
- Adjacent land use & trip generation intensity

- Frequency per mile of unsignalized intersections
- Pavement condition
- Width of outside through lane and any space for bikes

In 2003, a similar group developed a LOS model for bicycle through movement at intersections, again in coordination with Florida Department of Transportation (FDOT) (Landis et al. 2003). The study chose signalized intersections to use as cases based on their transferability to other parts of the U.S. The analysis resulting in the following primary variables in the model determining the intersection LOS:

- Roadway traffic volumes
- Total width of the outside through lane
- Intersection (cross street) crossing distance

Sprinkle Consulting teamed up with FDOT again in 2007 to develop a bicycle LOS along urban and suburban arterials. The analysis found the presence of bike lanes, traffic volume, pavement condition, number of through lanes, presence of trucks, and available space for bicyclists as significant factors. The model they developed uses the distance-weighted average BLOS along each segment of road between signalized intersections and the number of unsignalized intersections per mile (Petrish et al. 2007):

$$\text{BLOS} = 0.797 (\text{Average SegLOS}) + 0.131 * (\text{unsig/mile}) + 1.370$$

Sprinkle Consulting and FDOT also developed a model for predicting the Segment BLOS (SegLOS), which considers traffic volume, number of through lanes, speed, presence of trucks, surface condition, and space for cyclists (Petrish et al. 2007).

The resulting model is as follows:

$$\text{SegLOS} = 0.507 * \ln(\text{Vol}_{15}/L) + 0.199 * \text{SP}_t * (1 + 10.38 * \text{HV})^2 + 7.066 \\ (1/\text{PC}_5)^2 - 0.005 * (\text{W}_e)^2 + 0.760$$

Vol_{15} = Volume of Directional Traffic in a 15-minute time period (vol_{15})

L = Total number of through lanes

SP_t = Effective speed limit = $1.12 * \ln(\text{SP}_f - 20) + 0.81$, where SP_f = posted speed limit in mph

HV = percentage of traffic that is heavy vehicles

PC_5 = FHWA's five-point surface condition rating

While the LOS measures make sense within the existing framework of understanding vehicle LOS, there are challenges associated with data availability. Another challenge is that the A through F scale does not provide an absolute figure for what is required in order to serve the mainstream population (Mekuria, Furth, and Nixon 2012). The Mineta Transportation Institute developed the Level of Traffic Stress (LTS) measurement scale as an alternative to the Level of Service methodology. MTI's objective in developing this tool was to develop measures of low-stress connectivity that can be used to evaluate and guide bicycle network planning. LTS ranges from one, the level most children will tolerate, to 4, the level for the "strong and fearless" cyclists. LTS 2 signifies the level at which most adults feel comfortable, and LTS 3 is a facility deemed appropriate for the "enthused and confident" (Mekuria, Furth, and Nixon 2012). With these categories, LTS is more easily understood in terms of what types of people feel comfortable using it. LTS is based on the following factors:

- Road width
- Traffic speed
- Presence of a parking lane
- Whether or not bikes are in shared travel lanes or designated bike lanes

ii. Pedestrian Level of Service (PLOS)

As of 2001, there was no common consensus on what street design elements that have a statistically significant impact on the walking experience. Ironically, the only consensus is over the fact that the walking experience is dependent on a complex set of factors, including (Landis et al. 2001):

- Personal safety
- Personal security
- Architectural interest
- Pathway or sidewalk shade
- Pedestrian-scale lighting and amenities
- Presence of other pedestrians
- Conditions at intersections

Pedestrian LOS was estimated for signalized crosswalks in Hong Kong commercial areas. The focus on the study was to determine the effect of bi-directional flow, which was found to be insignificant. The findings of pedestrian LOS were similar to those that do not account for bi-directional flow (Lee, Lam, and Goh 2005). This study is not appropriate to use for a comparison for American cities. In the U.S., several models have noted the conflict between pedestrian crossings and right turning vehicles, some using the percentage of affected pedestrians as the measure

for LOS. This phenomenon is most disruptive to people on foot at intersections where there is an exclusive right turn lane and a wide turn radius. A potential solution is leading pedestrian signalization (Hubbard and Bullock 2007, Bullock, Hubbard, and Clark 2006, Muraleetharan 2004). Another study recognized right turning vehicles as a strong determinant, along with permissive left turns from the street parallel to the crosswalk, motor vehicle volumes on the street being crossed, midblock 85 percentile speed of the vehicles on the street being crossed, the number of lanes being crossed, the pedestrian's delay, and the presence or absence of right turn channelization islands (Petritsch et al. 2005). Another study found determinants of pedestrian intersection LOS to be area occupancy, pedestrian flow, and walking speed (Lee, Lam, and Goh 2005).

There is currently little consensus over what factors determine pedestrian LOS on sidewalks or paths. A model developed in 2001 used the following formula to estimate pedestrian LOS (Landis et al. 2001):

$$\text{Ped LOS} = -1.2021 \ln (W_{ol} + W_l + f_p \times \%OSP + f_b \times W_b + f_{sw} \times W_s) + 0.253 \ln (Vol_{15/L}) + 0.0005 SPD^2 + 5.3876$$

Where,

W_{ol} = Width of outside lane (feet)

W_l = Width of shoulder or bike lane (feet)

f_p = On-street parking effect coefficient (=0.20)

$\%OSP$ = Percent of segment with on-street parking

f_b = Buffer area barrier coefficient (=5.37 for trees spaced 20 feet on center)

W_b = Buffer width (distance between edge of pavement and sidewalk, feet)

f_{sw} = Sidewalk presence coefficient = $6 - 0.3W_s$ (3)

W_s = Width of sidewalk (feet)

Vol_{15} = Traffic count during a 15-minute period

L = total number of (through) lanes (for road or street)

SPD = Average running speed of motor vehicle traffic (mi/hr)

Critiques of this approach point to that fact that the pedestrian LOS model changes depending on context. What makes for a comfortable walking environment may not be the same along a neighborhood side street, suburban arterial, and downtown main street. Some of the common factors resulting from various studies include (Yang et al. 2007, Muraleetharan and Hagiwara 2007, Hummer et al. 2005, Petritsch et al. 2006):

- Lateral separation from vehicles
- Vehicle volume
- Vehicle speed
- Bicycle Volume
- Bicycle speed
- Pedestrian volume

-
- Obstructions
 - Driveway frequency
 - “Flow rate”
 - Path width
 - Number of meeting and passing events
 - Presence of a centerline
 - Adjacent roadway width

It is important to recognize the challenges associated with a solely data-driven approach to understanding the area. The above list includes several items for which the data may be unavailable. Even when the data is available, there are some problems with the LOS approach. For example, the list above contains pedestrian volume as a factor that contributes to LOS but there could be a scenario where pedestrian traffic improves the walking experience up to a certain level before it starts to detract from it. This approach of retrofitting a driving-oriented metric like level of service is problematic, and therefore it should be paired with an observation of public life, as discussed below.

iii. Transit Level of Service

As previously discussed, many transit users begin and/or end their trips by walking or biking, so the walking and biking environments should be a factor in transit LOS. “Recent LOS research has focused on developing methods that incorporate more than just the characteristics of the available transit service, but measures of the environment in which that service operates” (Dowling et al. 2008). Early models focused on data that is readily available from transit agencies. These indices reflect

the availability of transit rather than convenience and demand distribution (Fu and Xin 2007).

In Morpace International, Inc. and Cambridge Systematics developed the following list of ten items that determine service quality:

- “Reliability involves consistency of performance and dependability;
- “Responsiveness concerns the willingness or readiness of employees to provide service. It also involves timeliness of service; (etc)
- “Competence means possession of the required skills and knowledge to perform the service.
- “Access involves approachability and ease of contact.
- “Courtesy involves politeness, respect, consideration, and friendliness of contact personnel.
- “Communication means keeping customers informed in language they can understand and listening to them. It may mean that the company has to adjust its language for different consumers – increasing the level of sophistication with a well-education customer and speaking simply and plainly with a novice.
- “Credibility involves trustworthiness, believability, and honesty. It involves having the customer’s best interests at heart.
- “Security is the freedom from danger, risk, or doubt.
- “Understanding / knowing the customer involves making the effort to understand the customer’s needs.
- “Tangibles includes the physical environment and representations of the service” (Morpace International, Inc. and Cambridge Systematics, Inc. 1999).

The third edition of the Transit Capacity and Quality of Service Measures manual lists the following six factors in considering transit quality of service (Kittelson & Associates, Inc. et al. 2013):

- Frequency
- Service Span
- Access
- Passenger Load
- Reliability
- Travel Time

Both of these sources cite access as an important factor. Without a strong walking and biking realm, that access deteriorates for all users walking and biking to the station.

iv. Study of Public Life

Those professionals more focused on buildings and urban design have tended to favor a “softer” approach to measuring the public realm. This generally manifests as information like counts of pedestrians in groups, counts of parents with children, where people tend to sit or stand, how fast people walk or bike, or what types of staying activities people are doing (Gehl and Svarre 2013). With human observation as the tool, one can get a sense of urban life and its impulsiveness. The following list describes the tools used in studying public life:

- Counting
- Mapping
- Tracing

- Tracking
- Looking for traces
- Photographing
- Keeping a diary
- Test walks

This type of public life study began in the 1950s and 60s, largely influenced by Jane Jacobs's *Death and Life of Great American Cities*, responding to the displacement of neighborhoods for highways. Her book highlighted streets as the public realm, critiquing the prolific movement toward recreational green space in the suburbs (Jacobs 1961). With the introduction of more traffic into city streets, street life dissolved. Showing that inverse relationship between public life and street traffic was important for technical experts, as well as politicians and activists so leaders could make more informed decisions (Appleyard, Gerson, and Lintell 1981).

An important part of studying public life is noting activities, which is difficult to do with any readily available data. Activities fall somewhere along a range from necessary to optional. Necessary activities include errands, commuting, standing at a red light, or waiting for the bus. On the other end of the scale, optional activities include strolling, standing to enjoy life, sitting to enjoy life, and sitting to enjoy sunshine (Gehl 1968).

William H. Whyte was another leader in this type of research. His methodology involved time lapse photography of urban spaces, and studying how people prefer to place themselves in relation to their surroundings and others (Whyte 1980).

This methodology really emphasizes the user by observing them for clues as to how the space could be better designed. The critique of planners and engineers solving problems for local users is that they tend to not understand and nuances and complexities of city life (Alexander, Ishikawa, and Silverstein 1977).

E. How will this paper further research on assessing walkability and bikability for FLMC?

As described above, the walking and biking realm around transit is closely related to the success of the transit service. In order to assess the walking and biking realm, one should incorporate an anthropological perspective into the analysis. A comprehensive inquiry relies both on available data and observation of public life. The approach based in secondary data has grown in recent years, with models that are similar to the LOS models developed for measuring traffic performance. Unfortunately, many of them rely on data which cities are not in the habit of collecting and maintaining. Even getting decent sidewalk availability can be difficult in some jurisdictions. Cities and transit agencies can couple this with observation of public life to get a more holistic understanding of how people walk and bike in the area, and what improvements would make the biggest impact. This paper details such a process for assessing the walking and biking realm around three of Atlanta's busiest MARTA rail stations.

III. Methodology

This methodology was designed to produce a profile of what it means to walk and bike around the three of Atlanta's busiest transit stations based on collected or secondary data and data collected through observation at the station.

A. Station Selection

The three MARTA rail stations highlighted in this paper are Five Points, Peachtree Center, and Midtown. These three stations represent three of Atlanta's busiest stations. They are also all in major employment centers and have other trip generators and attractors, so they would provide a relatively high concentration of activity to observe around commute periods. Table 1 shows basic numbers on total activity for each station, along with the proportion of people who access those stations by walking and biking according to the 2010 On-Board Transit Survey.

Table 1. Activity figures for each selected station (Sources: City of Atlanta 2015, ETC Institute, PBS&J, and DW & Associates 2010)

	<i>Midtown</i>	<i>Peachtree Center</i>	<i>Five Points</i>
<i>Average weekday boardings</i>	5,532	7,532	23,647
<i>Walk</i>	74.41%	91.22%	81.00%
<i>Bike</i>	0.71%	0.24%	0.13%

B. Secondary data collection

Table 2 shows the various data that were collected from publically available sources and how they inform the walkability and bikability assessments for each station.

Table 2. Secondary data and sources

<i>Description</i>	<i>How it was used</i>	<i>Source</i>
--------------------	------------------------	---------------

<i>Estimates of how many riders access the stations by walking or biking</i>	Station selection; feasibility of walking and biking; desirability of walking and biking	Regional On-board Transit Survey Final Report, 2010, Atlanta Regional Commission
<i>Total average weekday boardings</i>	Total station demand	City of Atlanta, 2015
<i>City of Atlanta Roads Bikeways in the City of Atlanta</i>	Connectivity Bikeway availability	City of Atlanta, 2015 Cycle Atlanta 1.0, 2014, courtesy of Alta Planning and Design
<i>Impervious surfaces designated as sidewalk in the City of Atlanta</i>	Sidewalk availability	City of Atlanta, 2015
<i>Location of parks in the City of Atlanta</i>	Greenspace availability	City of Atlanta, 2015
<i>Inflow and Outflow of commuters</i>	Basic travel patterns	U.S. Census, Longitudinal Employment and Housing Data

The road network, sidewalk data, bikeway, and greenspace data all required some checks on the ground and in Google Maps to correct errors. The roads data included some roads which appear to no longer be available for public use. Sidewalk data was saved only as shapes showing where impervious surfaces exist for the purpose of pedestrian circulation, so the roadways had to be coded with whether or not there were sidewalks available to truly understand sidewalk coverage. Certain parks were simply not included in the parks data downloaded from the city's GIS clearinghouse, so those had to be added.

C. Observation-based Data collection

Observation data were collected on three consecutive weekdays from 4:30 pm to 6:30 pm. Each day had relatively warm and dry weather. This schedule was designed to

maximize the density of transit users. Details on the data collection days are provided in table 3.

Table 3. Details of observation schedule

	<i>Peachtree Center</i>	<i>Midtown</i>	<i>Five Points</i>
<i>When</i>	Monday February 28, 2016 4:30 – 6:30 pm	Tuesday February 29, 2016 4:30 – 6:30 pm	Wednesday March 1, 2016 4:30 pm – 6:30 pm
<i>Weather</i>	Sunny, 70 degrees	Partly cloudy, 70 degrees	Sunny, 50 degrees
<i>Observer location</i>	Intersection of Peachtree Street and Ellis Street	On Peachtree Place across of station entrance	In front of the Peachtree Street station entrance

Figures 1, 2, and 3 show the observer’s position with more precision. The red lines in these figures represent where pedestrian counts were taken. That is, the pedestrian count totals represent the number of pedestrians who crossed either of those lines.

Cyclist counts represent the number of cyclists that the observer saw from the positions in figures 1, 2, and 3. These positions were chosen to minimize interference with others and maximize view of the surrounding area. It should be noted that counts include both transit users and non-transit users, because there is evidence that higher numbers of cyclists and pedestrians increase safety and comfort for those groups.



Figure 1. Peachtree Center observation location and pedestrian cross-lines



Figure 2. Midtown observation location and pedestrian cross-lines

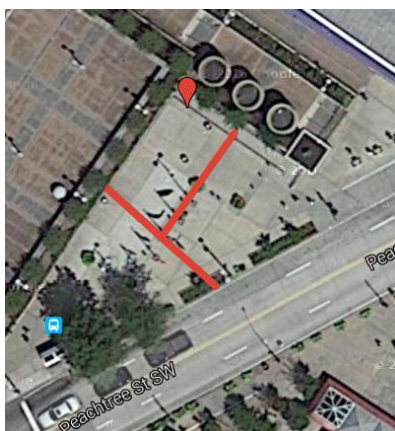


Figure 3. Five Points observation location and pedestrian cross-lines

Table 4. Observation based criteria for assessing the public realm for walking and biking

Variable	Method	Indication
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<i>Variable</i>	<i>Method</i>	<i>Indication</i>
<i>Average walking speed</i>	Time pedestrians along a specified road segment with predetermined distance.	Lower walking speed indicates both comfort and lack of deadline
<i>Bicyclist attire</i>	Count type of clothing bicyclists are wearing (athletic, casual, or business attire); whether or not they carry bags or panniers; whether or not they are wearing a helmet	Casual or business attire clothing and backpacks or panniers (indication of a commute) may indicate lower levels of traffic stress
<i>Bicyclist location</i>	Count how many cyclists are riding on road versus sidewalk	Indicates how the current allocation of space for cyclists is meeting need based on cyclist comfort
<i>Frequency of activities</i>	Note what people are doing within view of the station at given moment, for example: looking at phone, talking on phone, talking to stranger, talking to a friend/acquaintance, sitting for pleasure, standing for pleasure, reading, jogging, supervising children, walking dogs.	Can indicate whether people are there out of necessity or pleasure
<i>Number of security officials</i>	Count number of people in security uniform	Can indicate whether or not the leadership feels security is warranted in this area

<i>Variable</i>	<i>Method</i>	<i>Indication</i>
<i>Proportion of women to men on foot/bike</i>	At given time, note how many men I can see and how many women I can see in the space.	Indicates how safe women feel in the area and whether or not women are equally represented in the area's work or residential population
<i>Proportion of children</i>	Count people who are obviously under the age of 18 separately	Indicates whether or not children should be a consideration in the planning process, and whether or not people feel comfortable bring their children here or allowing them to be here
<i>Proportion of people in groups</i>	When counting pedestrians, note when people are in groups	Indicates how social the space is
<i>How frequently do people bump in to people they know</i>	From some position, count how many times this is observed	Indicates how social the space is and how likely it is for people to see someone they know

Paired with a qualitative assessment of the area's atmosphere, these variables provide a more observation-based profile of walkability and bikability in the area.

IV. Results

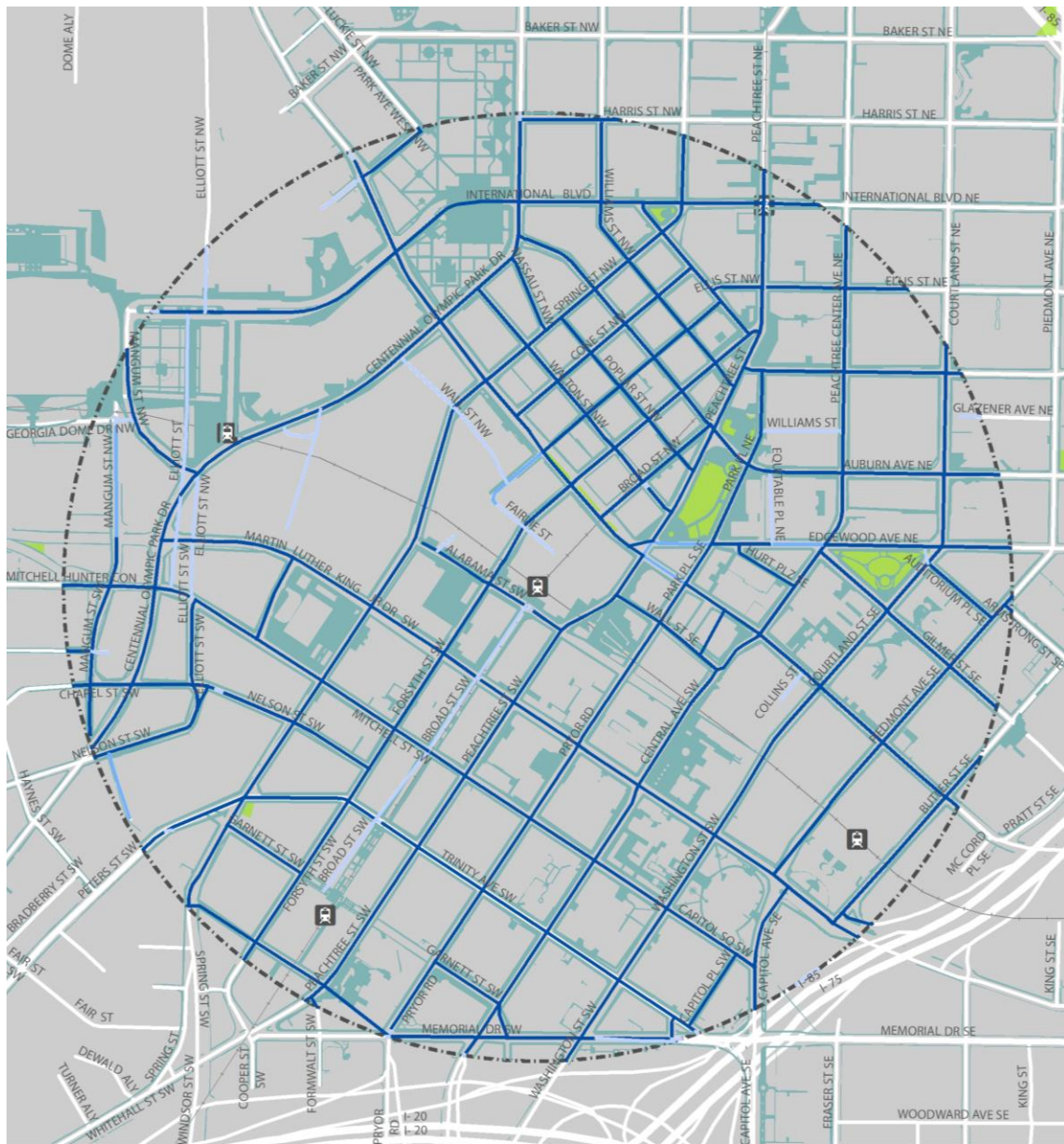
The following sections provide a brief overview of each station area and the overall significance to the region.

A. Five Points Station

i. Station Overview

Five Points is arguably one of the most important rail stations in MARTA's system. It is the crossing point for the east-west and north-south MARTA rail lines, serves as a drop off point for many commuter buses, and is close to many of the region's jobs. It currently has 23,647 average weekday boardings, the most of any station by far (City of Atlanta 2015). This high demand is due in part to over 83,000 jobs in the area and the connection opportunities for rail, local buses, and regional buses (City of Atlanta 2015). It is an area facing major change in the near future, with several developments proposed for implementation in the near future. Historically, Five Points is a major commercial area. There were several department stores such as Rich's department store. Relics from this era still exist, such as the large advertisement for furniture that's painted onto the side of the M. Rich building. Despite this prominent position in Atlanta past and present, the area has unfortunately experienced sharp decline. Five Points is the northern end of southern downtown, which has relatively high crime rates compared to the rest of the city and loitering is an issue that makes some feel unwelcome or unsafe. Figure 4 shows an orthographic view of the area.

Peachtree Street MARTA entrance over a one hour time period. Results from the ARC On-board Transit Survey found that 81% of respondents who were leaving from or entering the Five Points rail station arrived by walking.



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Sidewalk availability

- No sidewalk
- One side of street
- Both sides of street
- Pedestrian space

MARTA Rail Stations

1/2 mi Station Buffer

Parks

Figure 5. Five Points sidewalk availability

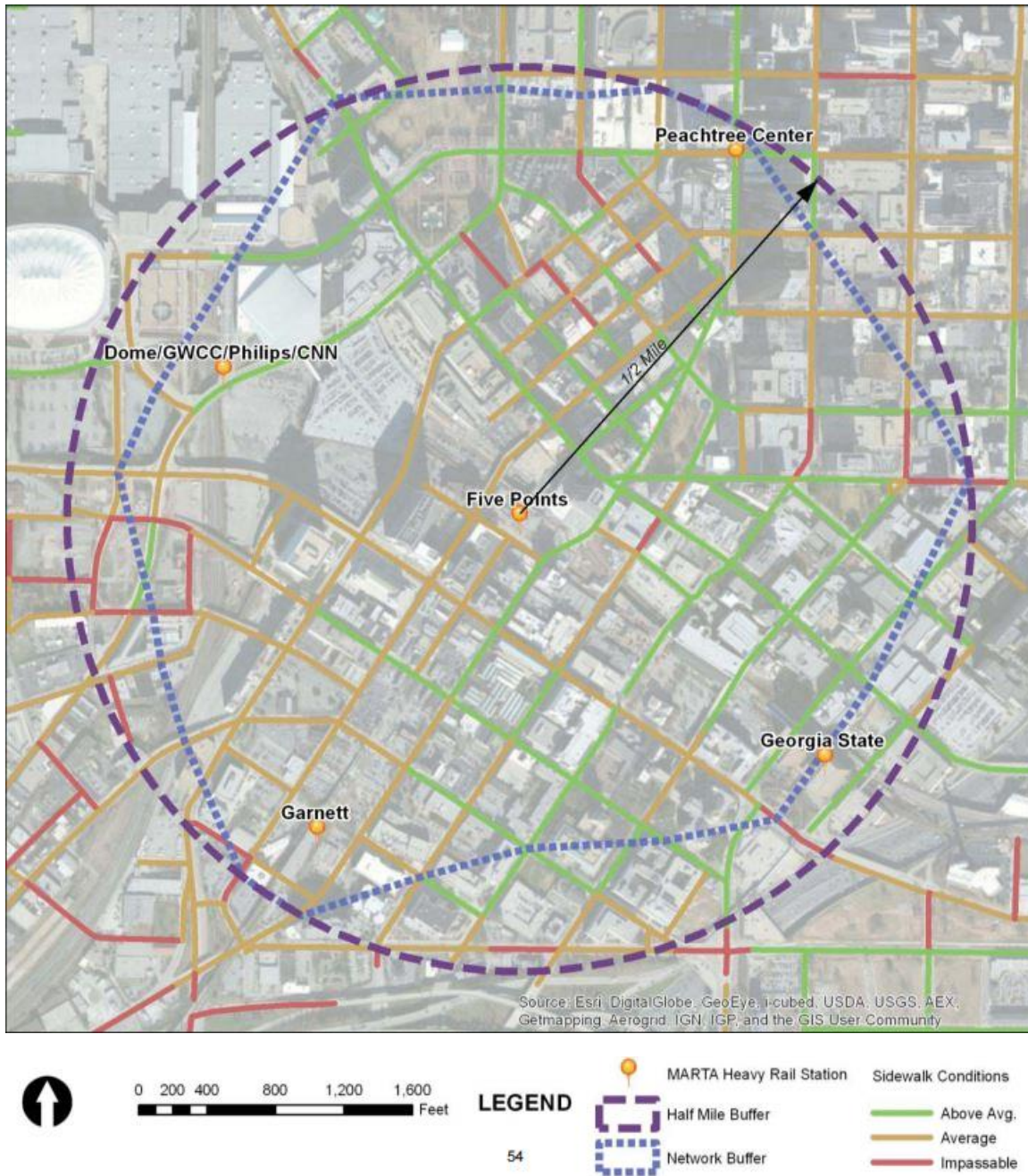
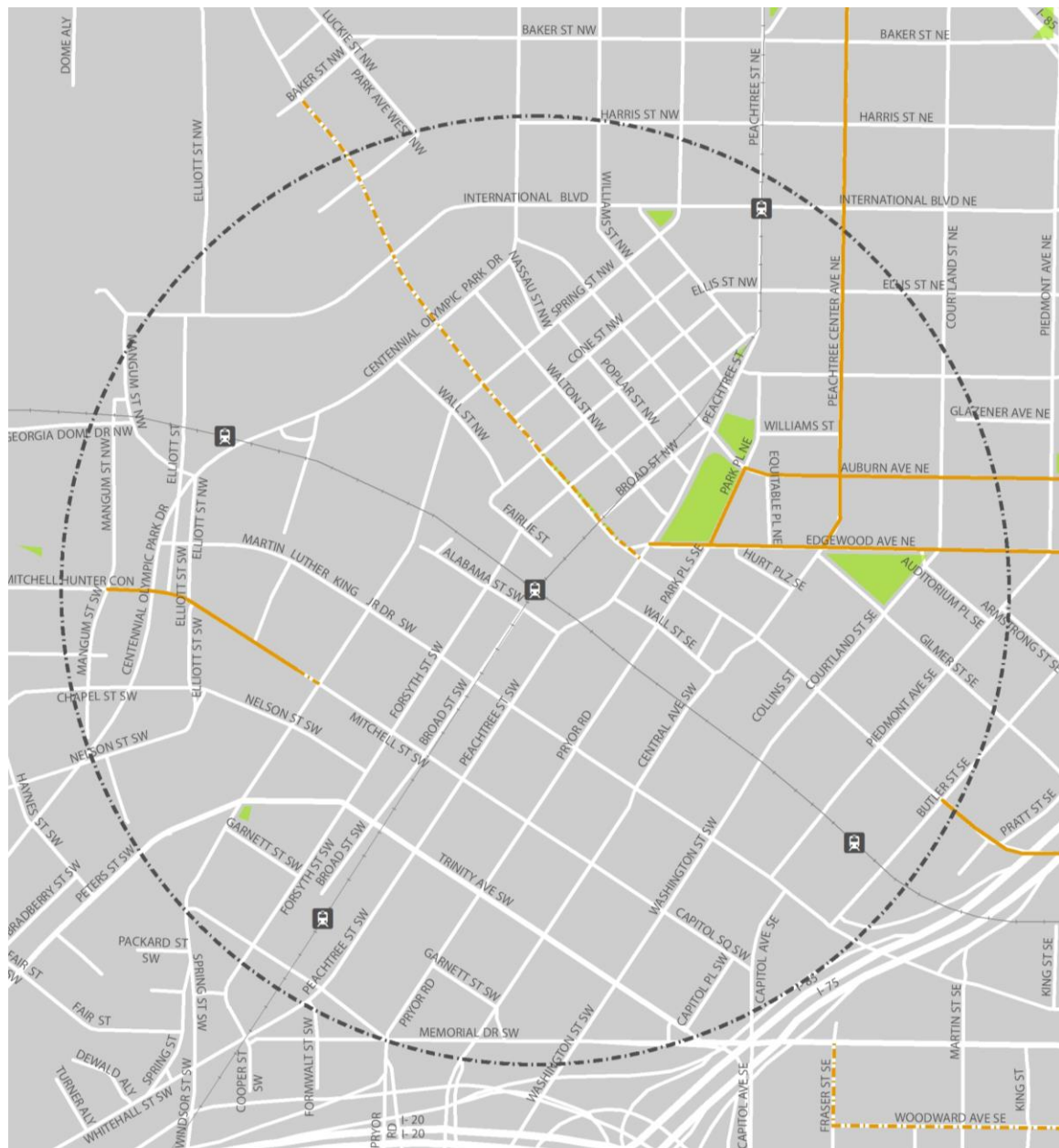


Figure 6. Sidewalk quality in the Five Points station area (Source: City of Atlanta 2015)

While there is good sidewalk coverage for the area, the bikeway coverage lags. There are 1.4 miles of designated on-street bikeway, covering only 7% of roadway miles.

The locations of these facilities, along with shared road markings or “sharrows”, are shown in figure 7.



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- MARTA Rail Stations
- 1/2 mi Station Buffer
- Sharrows
- Dedicated Bike Lane or Path
- Parks

Figure 7. On-street bikeways in the Five Points station area

Besides the poor coverage, there are many one-way pairs of roads and streets that filter drivers onto and off of freeways which may contribute to drivers speeding and driving aggressively. Additionally, there are often large trucks sitting in the right lane or bike lanes while waiting to move into the designated loading area. During one hour of observation, a mere 11 cyclists passed by or entered the Peachtree Street MARTA station entrance. The ARC On-board survey showed that just 0.1% of surveyed riders going to or from the Five Points station access by bike. These low shares confirm the theory that the low availability of bike infrastructure makes it unfeasible for a lot of people to bike in the area.

Straight streets with parallel routes and frequent right-angle intersections tend to be good for people on foot and bike because they minimize the distance for most trips and provide options (Ewing and Cervero 2010). In the Five Points area, three of the city's historic street grids meet. This makes for high intersection density, with about 165 intersections per square mile. Because of this high intersection density, the network-based $\frac{1}{2}$ mi buffer comprises 83% of the straight line $\frac{1}{2}$ -mile buffer (City of Atlanta 2015). Figure 8 shows that the three grids are oriented to different angles and the block size varies. The transitions between grid sections can be confusing as the roads reconcile alignment differences. This does have each section of this area its own unique character, but may dampen the benefits of a logical linear street grid. Intersection density is very variable throughout the area. The area in the west has some significant network gaps due to depressed railroad tracks and an elevated street network that flies over the Gulch. In closer proximity to the station, the street grid works well for pedestrians.



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Figure 8. Street grid diagram for Five Points station area

Overall, the availability of sidewalks would suggest that walking for transportation is feasible. While parts of the street network presents some barriers for connections

into the neighborhoods to the west and there may be some challenge to wayfinding with the intersecting unique street grids, the area as a whole has a high intersection density and traditional urban street grid. These conditions allow for walking as a feasible transportation choice. The lack of bikeways would suggest that it is a high-stress area for biking, and that therefore it would not be feasible for most.

iii. Trip generators and attractors

Of course, it is not enough to just have infrastructure. Demand for walking and biking, as with all other transportation, is an induced demand. That is, people tend to not travel simply for the sake of traveling. Trips generally serve the purpose of getting people from their origins to their destinations. Therefore, an assessment of what it means to walk and bike in a certain area must also consider the origins and destinations.

Table 5 provides figures that describe the amount of trip generators and attractors in the area. While there is a high density of jobs, the diversity of activities is not very high. There are no grocery stores, no schools, and only four dry cleaners. These represent some of the other daily trips people need to make besides commuting.

Figure 9 shows the locations of the dry cleaners, and the lack of grocery stores and schools. It also shows the available greenspace in the area, which totals over 506,000 SF.

Table 5. Trip generators and attractors in the Five Points station area

ATTRACTOR/GENERATOR	FIVE POINTS QUANTITY
TOTAL JOBS WITHIN ½ MI	83,841
TOTAL HOUSING UNITS WITHININ ½ MI	1,289

ATTRACTOR/GENERATOR	FIVE POINTS QUANTITY
# DRY CLEANERS WITHIN 1/2 MI	4
# GROCERY STORES WITHIN 1/2 M (SOURCE: GOOGLE MAPS)	0
# SCHOOLS WITHIN 1/2 MI (SOURCE: GOOGLE MAPS)	0
SF OF PARKS WITHIN 1/2 MI (SOURCE: CITY OF ATLANTA)	506,534



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- Dry cleaners
- Grocery stores
- Schools
- MARTA Rail Stations
- 1/2 mi Station Buffer
- Parks

Figure 9. Availability of dry cleaners, grocery stores, and schools in the Five Points Station area

According to the U.S. Census Bureau's Longitudinal Employer-Household Dynamics (LEHD), there is a daily inflow of 62,925 people and outflow of 885 people. This means that commuting generates 62,925 trips to and then from the area and 885 trips from and then back to the area. There are also 126 internal commute trips. Overall, there is a lot of activity here.

iv. Public realm and public life assessment

This section considers the more nuanced elements of the walking and biking environment that could only be collected through direct observation, such as the presence of children or how many people were carrying groceries. Table 6 summarizes some of the key statistics that were collected through public life observation and that are discussed in this section.

Table 6. Key figures to describe the public realm around the Five Points station

VARIABLE	FIVE POINTS
# OBSERVED PEDESTRIANS	1,165
TRANSIT USERS WHO ACCESS TRANSIT BY WALKING (SOURCE: ARC ON-BOARD TRANSIT SURVEY 2010)	81.00%
% FEMALE	52%
% CHILDREN	2%
# "BUMP-INS"	5
% IN GROUPS	19%
AVERAGE WALKING SPEED	4.22 ft/s
# DOG WALKERS	0
# WITH GROCERIES	0
# WITH DRY CLEANING	0
# RUNNERS, JOGGERS, AND POWER- WALKERS	0
# OF SECURITY OFFICERS	1

VARIABLE	FIVE POINTS
% CYCLISTS WEARING CASUAL OR BUSINESS ATTIRE	100%
% OF CYCLISTS CARRYING BAGS	100%
# OBSERVED BICYCLISTS	11
TRANSIT USERS WHO ACCESS TRANSIT BY BIKING (SOURCE: ARC ON-BOARD TRANSIT SURVEY 2010)	0.13%

As previously mentioned, Five Points had by far the most activity of any observed station, with 1,165 people on foot. This group was very mixed, with 52% women and 2% children. This indicates that women feel safe walking here at this time of day, and the fact that several had children with them would support a sense of security. However, children are clearly underrepresented in this area compared to the overall population. Since there are no schools in the area, this is to be expected.

There were no people observed running or jogging in the area, which may be due to the low residential population or the perceived and/or real safety risk people feel in this area. Average observed walking speed was 4.22 feet/second, or roughly 2.9 mph. This is somewhat slower than the 3.1mph generally recognized as an average for the U.S (Franek 2013). Public life theorists would suggest that this means people are not in a hurry here and feel comfortable (Gehl and Svarre 2013). Despite “loitering” being listed as the greatest challenge to this area, only one security official was observed in the area during the observation hour. However, he was an Atlanta Police Officer and he remained in the vicinity of the plaza throughout the observation period.

In the station plaza where observation took place, there were five instances observed of people who knew each other bumping into one another and stopping to interact. Of the 1,165 pedestrians observed, 19% were walking with at least one other person. Most were in relatively small groups of two or three people, dressed in work attire, suggesting it was a group of coworkers taking transit together. This would suggest a reasonable level of sociability in the transit area. It should be noted that both the plaza on the other side of the transit station and the block to the south of the observation location appear to have a more constant social atmosphere. Relatively large groups congregate on the sidewalks on either side of Peachtree Street. Again, this could be an area for further investigation.

Because there are no grocery stores in the area, it should come as no surprise that no observed pedestrians were carrying groceries. Despite the fact that there are four dry cleaners in the area, no one was observed carrying dry cleaning either. This suggests that daily errands are not a substantial part of the picture of public life in this area.

As for cycling, there were merely 11 observed cyclists. This represents the lowest bike total for the three station, even though this station has by far the highest pedestrian total. This may confirm the findings from the infrastructure analysis that showed it was not a comfortable place for most people to bike. Unlike the other stations, all observed cyclists were either boarding or alighting transit and were using the sidewalk instead of the road. Peachtree Street does not have any bike infrastructure here, so cyclists likely felt unwelcome on the road. Five of the eleven were walking their bikes, and four of those five did not have helmets. All observed

cyclists were wearing casual or business attire and were carrying some kind of baggage, so none of them appeared to be riding for purely athletic motivation.

The observation reveals some new information about the area not revealed through analysis of the infrastructure and trip intensity. That analysis recognizes this must not be a good place for cycling, but does not consider that there are cyclists in this area that choose to get around the infrastructure issues by riding or walking their bikes on the sidewalk. It also overlooks the social aspect of the environment.

B. Peachtree Center Station

The following sections provide an assessment of walkability and bikability around Peachtree Center station.

i. Station Overview

Peachtree Center is another one of the busiest stations in the MARTA rail network, with 8,260 average daily boardings. It is one stop north of Five Points on the Gold and Red lines. The area is arguably Atlanta's most important place for employment, with over 83,000 jobs within a half-mile radius of the station. This employment population supports MARTA service but there is a very low residential population with only 2,784 housing units. Attractions like Centennial Olympic Park, the Center for Civil and Human Rights, the Georgia World Congress Center, and the Georgia Aquarium bring many visitors to the area. There are several hotels to serve these people. The recently completed streetcar line runs through this area, connecting to Peachtree Center station. This streetcar line is intended to propel economic investment and redevelopment which would hopefully add residential density and

create more of a jobs-housing balance. Figure 10 shows an orthographic image of the area.

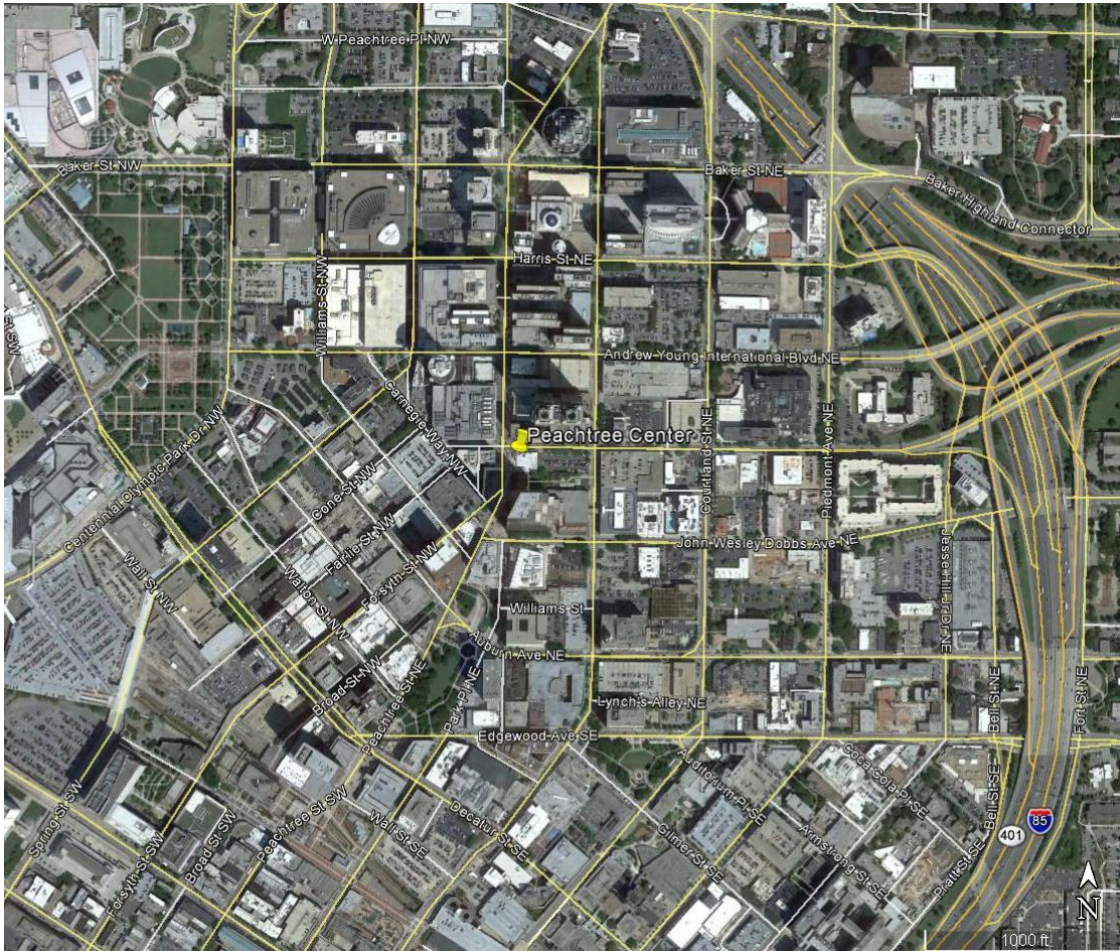


Figure 10. Orthographic imagery of the Peachtree Center station area

ii. Availability of infrastructure

This area has very good sidewalk coverage, with sidewalks on both sides of 72% of roadway miles. Another 1% of roadway have sidewalk on one side of the street. The proportion of roads with sidewalk is lowered by the limited access highways and its associated ramps. A map of sidewalk availability and area reserved for pedestrian circulation is provided in Figure 11. Half of these sidewalks are in average condition and another 43% are in above average condition (City of Atlanta 2015). A map of the

sidewalk quality is provided in figure 12. The ARC On-board Survey results from 2010 found that 91% of respondents who started or ended their trips at Peachtree Center station accessed or departed the station by walking. The good quality and coverage of sidewalks help support this large group of people who get to the station by walking. However, during one hour of observation in 2016, 471 pedestrians were counted. This total count was low compared to the other two stations observed, and it somewhat surprising given the 91% of survey respondents who reported walking to or from Peachtree Center station. The low observation count may be attributable to a number of factors, including the fact that it was done on a Monday instead of during the middle of the week. Regardless, the availability of facilities would suggest that this area is supportive of walking.

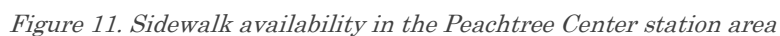
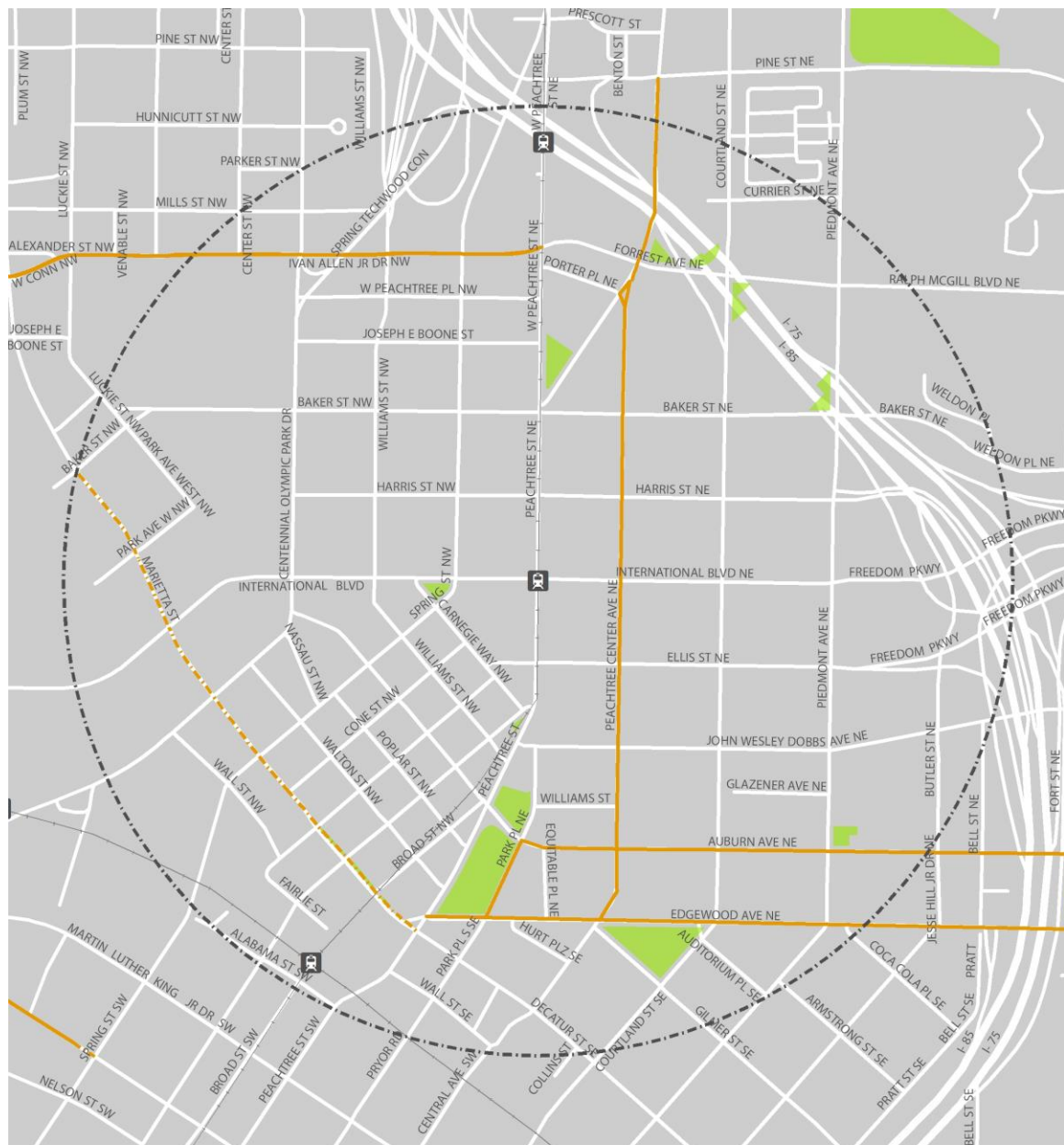




Figure 12. Sidewalk Quality in the Peachtree Center station area (Source: City of Atlanta 2015)

As is the case with Five Points, bikeway coverage lags behind sidewalk coverage in the Peachtree Center station area but the area does have comparatively better coverage, with designated bikeways on 11% of roadway miles. A map of on-street

designated facilities and shared lane markings is provided in figure 13. This includes the Peachtree Center Avenue cycle track, one of Atlanta's newest protected bicycle lanes. While this is an innovative and admiral move, it has been met with a great deal of contempt from both cyclists and drivers. Cyclists criticize the configuration of the bike traffic signals and frequency of parked cars in the dedicated facility. Motorists say that it makes the corridor less safe and causes congestion. Other protected lanes are planned, funded and under construction in the area. There are also 0.6 mi of shared lane markings on Marietta Street. During observation, 15 cyclists passed the area in one hour. The 2010 On-transit survey found that 0.2% of respondents biked to or from Peachtree Center station. While this is a very low rate, it is double that of Five Points, suggesting the area way be more conducive to bike access.



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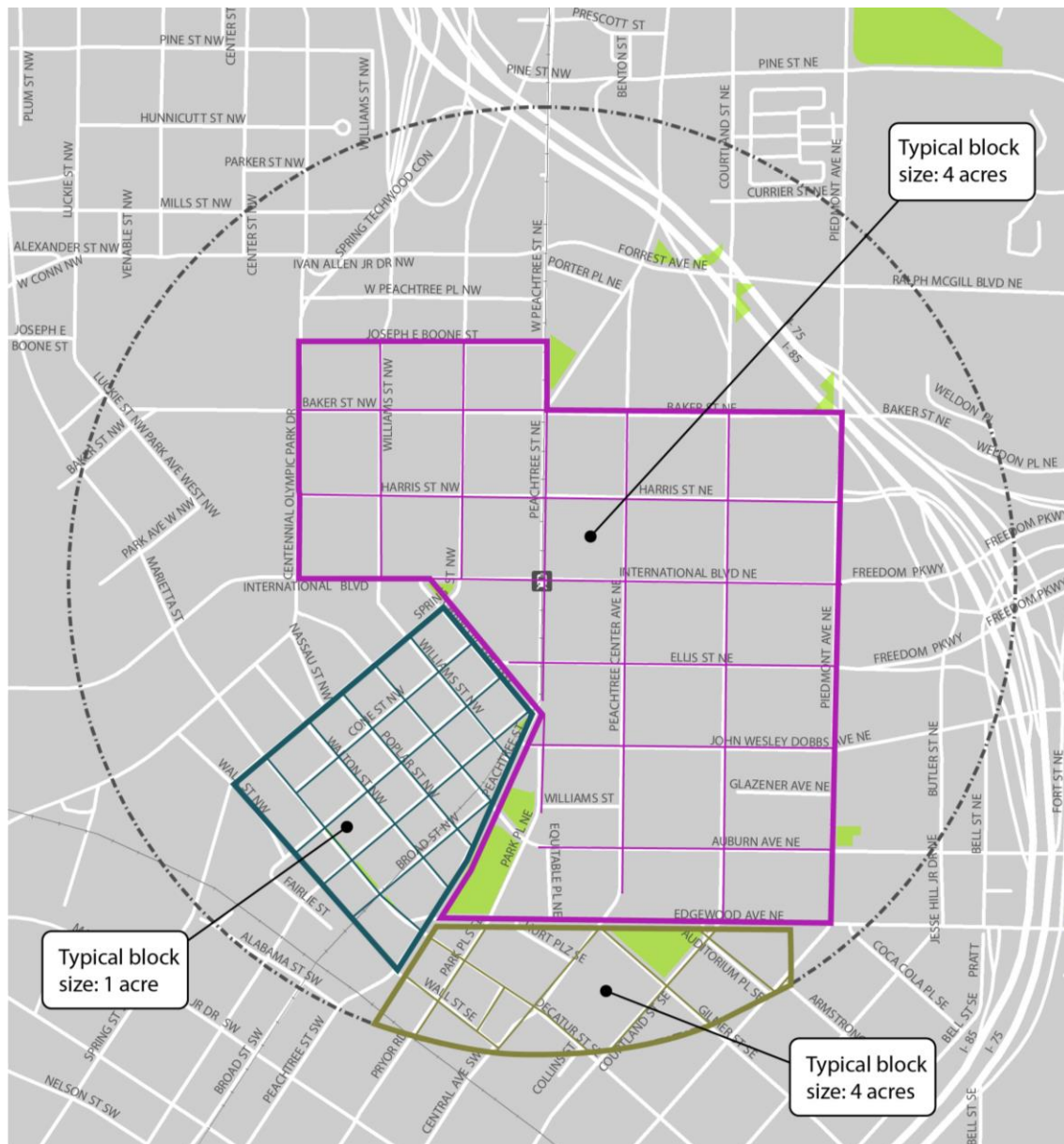


- Sharrows
- Dedicated Bike Lane or Path
- M MARTA Rail Stations
- 1/2 mi Station Buffer
- Parks

Figure 13. On-street bikeways in the Peachtree Center station area

The ½ mile buffer areas for Five Points and Peachtree Center stations overlap so they share many characteristics in the street grids. A diagram of the Peachtree Center area street grid is shown in figure 14. As is the case with Five Points, the three historic street grids intersect in this area. The average intersection density is about 144 intersections per square mile. The network-based ½-mile buffer comprises 70% of the whole straight-line ½-mile buffer (City of Atlanta 2015). Those intersections are not evenly distributed across the area, however. There is a good logical grid with parallel routes and right-angle, four-way intersections closer to the station, but further out the highways, rail yards, and the gulch create barriers to accessing other neighborhoods.

Overall, the intersection density, grid alignment, and availability of sidewalks indicate that this is a suitable place to walk. The fact that 91% of transit riders arriving at or departing from the station did so on foot would support that theory (ETC Institute, PBS&J, and DW & Associates 2010). However, there may be some concern in the fact that observation showed a relatively low number of pedestrians, with only 471 in one hour. Even though bikeways only cover 11% of roads and only 0.2% of transit riders access or depart the station on bike, these numbers are relatively high for Atlanta (ETC Institute, PBS&J, and DW & Associates 2010). An analysis of the facility availability would indicate that this is a relatively good place for biking and walking.



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1/2 mi Station Buffer
 Parks



Figure 14. Street grid diagram for Peachtree Center station area

iii. Trip generators and attractors

Understanding where people are going to and from, and how many of them there are is also an important element of understanding travel behavior. Demand for walking and biking, as with all other transportation, is an induced demand. That is, people tend to not travel simply for the sake of traveling. Trips generally serve the purpose of getting people from their origins to their destinations. Therefore, an assessment of what it means to walk and bike in a certain area must also consider the origins and destinations.

Table 7 provides figures that describe the amount of trip generators and attractors in the area. Like Five Points, there is a high density of jobs, but diversity of activities is not very high. There are three dry cleaners, but no grocery stores or schools. Peachtree Center has somewhat more diversity because of the higher concentration of hotels and restaurants. These represent some of the other daily trips people need to make besides commuting. Figure 15 shows the locations of the dry cleaners, and the lack of grocery stores and schools. It also shows the large amount of greenspace in the area, totaling just less than 2 million SF.

Table 7. Trip generators and attractors for the Peachtree Center area

ATTRACTOR/GENERATOR	PEACHTREE CENTER QUANTITY
TOTAL JOBS WITHIN ½ MI	83,420
TOTAL HOUSING UNITS WITHININ ½ MI	2,784
# DRY CLEANERS WITHIN 1/2 MI	3
# GROCERY STORES WITHIN 1/2 M (SOURCE: GOOGLE MAPS)	0
# SCHOOLS WITHIN 1/2 MI (SOURCE: GOOGLE MAPS)	0
SF OF PARKS WITHIN 1/2 MI (SOURCE: CITY OF ATLANTA)	1,908,828

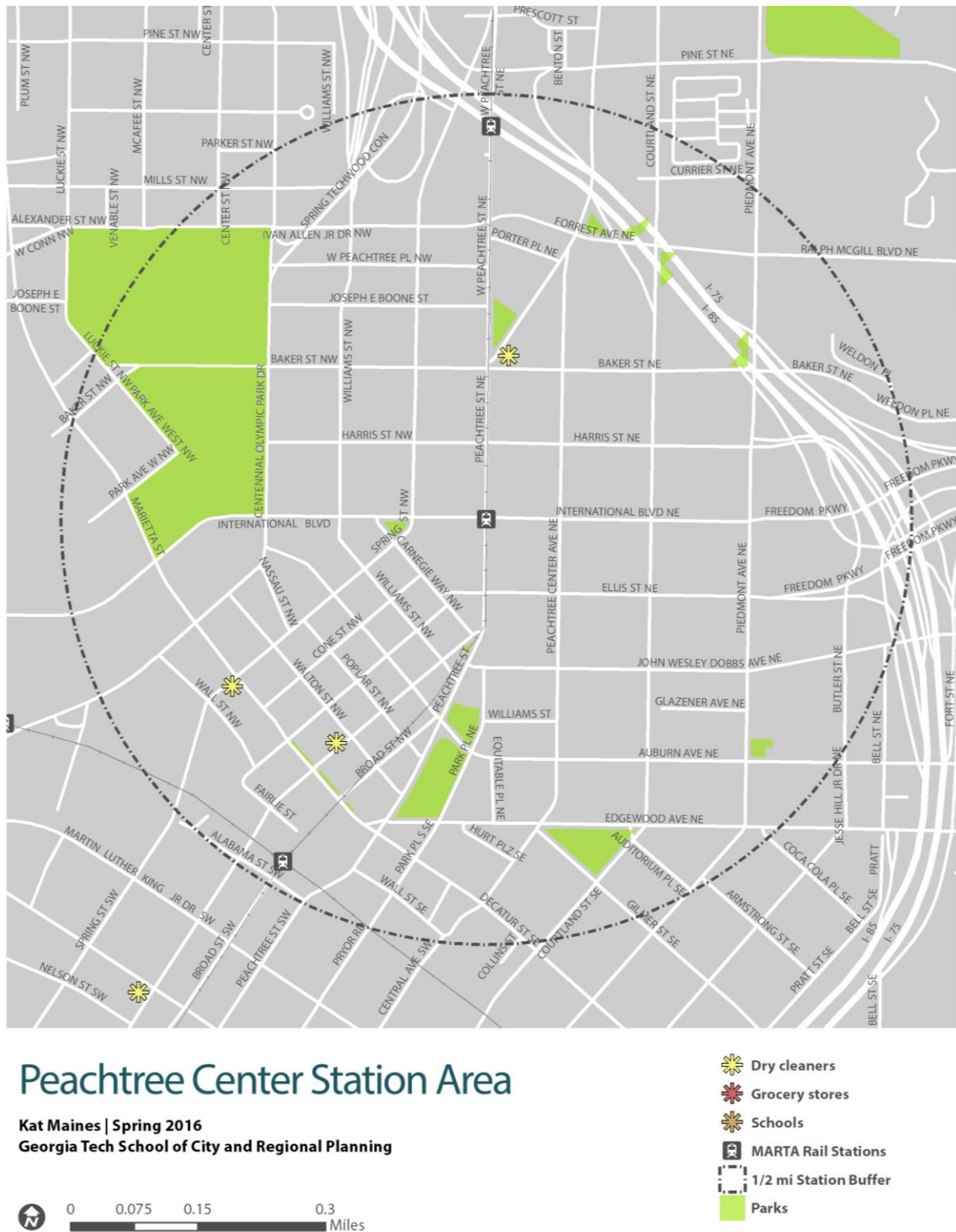


Figure 15. Availability of dry cleaners, grocery stores, and schools in the Peachtree Center Station area

According to the U.S. Census Bureau's Longitudinal Employer-Household Dynamics (LEHD), this area experiences a daily inflow of 73,519 commute trips and a daily outflow of 1,577 commute trips. There are 248 internal commute trips. This is a major activity center with the travel to match.

iv. Public realm and public life assessment

This section contrasts the prior section by analyzing not only the availability of infrastructure but also the quality of the public realm and the life that fills it. It provides figures on the more nuanced elements of the public space that could only be collected through direct observation, such as the presence of children or how many people were carrying groceries. Table 8 summarizes these figures.

Table 8. Key figures to describe the public realm in the Peachtree Center station area

VARIABLE	PEACHTREE CENTER QUANTITY
# OBSERVED PEDESTRIANS	471
TRANSIT USERS WHO ACCESS TRANSIT BY WALKING (SOURCE: ARC ON-BOARD TRANSIT SURVEY 2010)	91.22%
% FEMALE	52%
% CHILDREN	10%
# "BUMP-INS"	6
% IN GROUPS	67%
AVERAGE WALKING SPEED	3.86 ft/s
# DOG WALKERS	0
# WITH GROCERIES	0
# WITH DRY CLEANING	1
# RUNNERS, JOGGERS, AND POWER- WALKERS	9
# OF SECURITY OFFICERS	8
% CYCLISTS WEARING CASUAL OR BUSINESS ATTIRE	80%

% OF CYCLISTS CARRYING BAGS	93%
# OBSERVED BICYCLISTS	15
TRANSIT USERS WHO ACCESS TRANSIT BY BIKING (SOURCE: ARC ON-BOARD TRANSIT SURVEY 2010)	0.24%

Peachtree Center had the least total activity observed compared to Midtown and Five Points, with 471 pedestrians. Just over half of observed pedestrians were female, indicating that women do not feel unwelcome or unsafe enough to be deterred from walking. Two thirds of pedestrians were observed in groups and 10% were children. Both of these figures were positively influenced by the fact that there were two large groups of children there on some kind of organized activity. As far as business districts go, groups and children are not infrequent in this area due to the tourism draw of the hotels, Centennial Olympic Park, Georgia Aquarium, and other attractions.

Nine runners, joggers and power walkers were observed. It is interesting that this number is so high compared to that of Five Points (which was zero) because the areas both have low residential density and are less than half a mile from one another. It may have some relation to the proximity to the larger amount of greenspace available, but buffer zones do include part or all of Centennial Olympic Park. Regardless, this may indicate that there is something more pleasant about exercising in this buffer zone than in the one just to the south.

Average walking speed in the zone was recorded as 3.86 feet per second, or 2.6 mph. This, like Five Points, is somewhat lower than the average of 3.1 mph, perhaps suggesting that people are not hurrying and/or feel welcome (Franek 2013, Gehl

and Svarre 2013). A total of eight security guards were observed in this area, either standing outside of corporate buildings, leaving their posts for the day, or rolling along the sidewalks on segways.

The high percentage of people in groups would suggest a strong social aspect to this place. Other than the large groups of supervised children, there were many people in groups of two to seven people who appeared to be walking to transit together or taking an opportunity to socialize with people they work with or near after work. With so many people working in this area and the high number of restaurant, there is an opportunity to keep people in the area past 6:00 pm when they leave their jobs. That is, this may be ground zero for happy hour in Atlanta.

Within the ½ mile buffer of the station, there are no grocery stores so, like those walking by Five Points, none were carrying groceries. However, there was one observation of a pedestrian carrying dry cleaning, likely from one of the three dry cleaners in the area. Daily errands do not appear to be a big part of the activity taking place in this area.

Cyclists totaled 15 in this zone. They appeared to mostly be commuters, as 80% were wearing business attire or casual clothing and 93% were carrying backpacks or had paniers. All observed cyclists were male, and only four were observed on the sidewalk, all of whom were following the rules by walking their bikes. This location also has streetcar tracks in the road which can be an impediment to biking. Two of the fifteen cyclists were observed riding in the same lane with the streetcar tracks. Only three of cyclists were observed without headphones.

The observation reveals some new information about the area not revealed through analysis of the infrastructure and trip intensity. Observation revealed the strong social elements of the area, and the fact that it is a good place to concentrate efforts to keep people downtown past their work schedule through programming. It also shows that even though there are no schools in the area, it is a popular place for organized groups of students and that therefore children should be considered and planning and design for the area. The high number of security officials implies that eyes on the street are a concern here. Keeping people downtown later would help with that. Observation also shows that even though biking is restricted on the new streetcar route, bikers are not necessarily following these rules and better design may be required to get these cyclists out of danger.

C. Midtown

The following sections describe the Midtown MARTA station, its significance in the overall network, and how it addresses walking and biking.

i. Station Overview

The Midtown MARTA station, three and four stops north of Peachtree Center and Five Points respectively. The station has an average of 5,532 weekday boardings and offers connections to several local buses as well as the Georgia Tech Trolley. The area is a major employment center but it strikes a good balance between jobs and housing, with 7,300 housing units and over 20,500 jobs within a half-mile. This residential density is the highest for any MARTA rail station. Figure 16 shows an orthographic view of the area. The real estate market is strong in this area.

Construction sites are a major presence in the area, transforming surface parking or

under-utilized lots into high-rise condo, office, and retail. Since Atlanta does not have an ordinance requiring construction sites to maintain a walkway on both sides of the street, this can cause disturbance in the short term for pedestrians who are requested to cross the street, but often just opt to walk in the street. Overall, this area has a stronger mix of destination and origins which help it maintain more of a 24-hour vibrancy compared to Peachtree Center and Five Points.

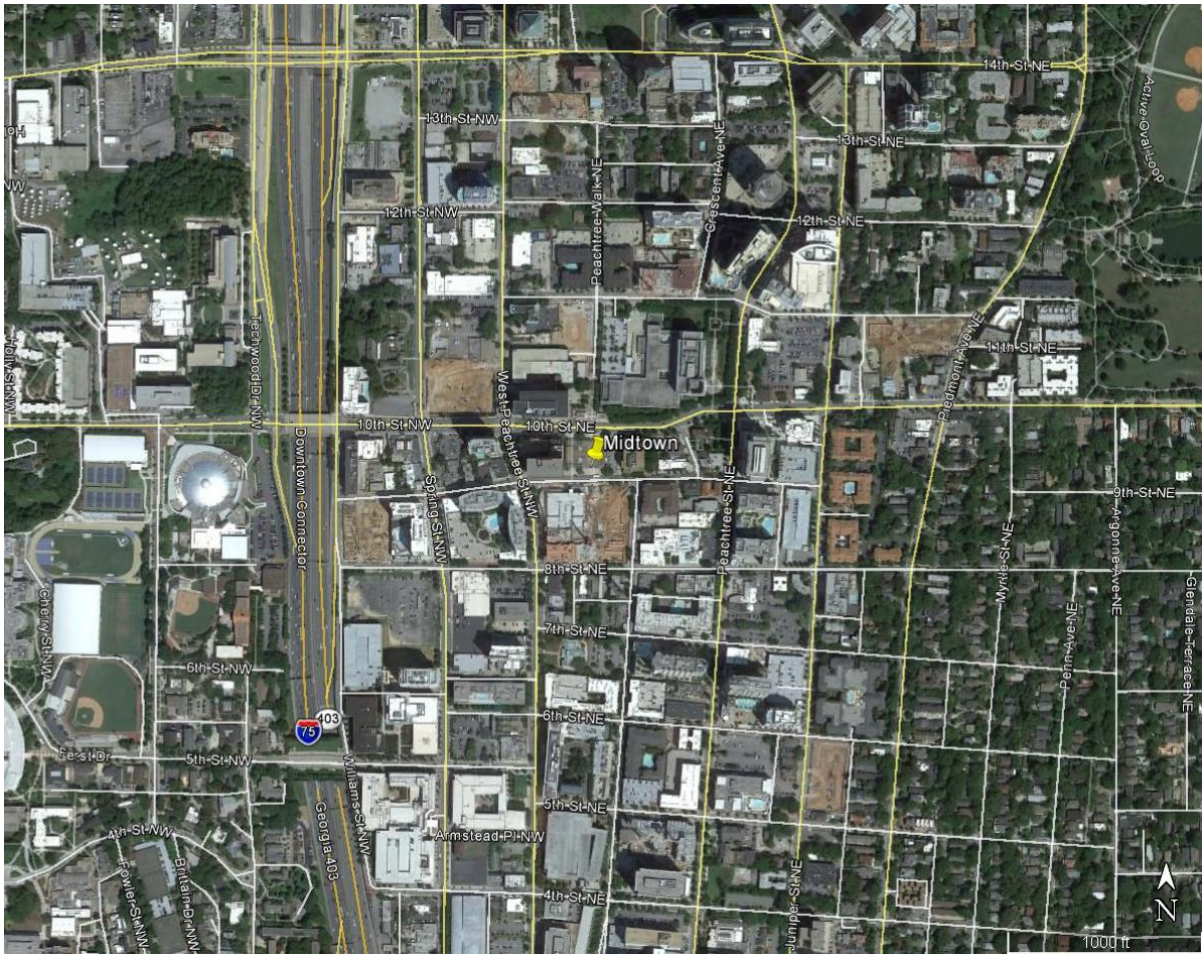
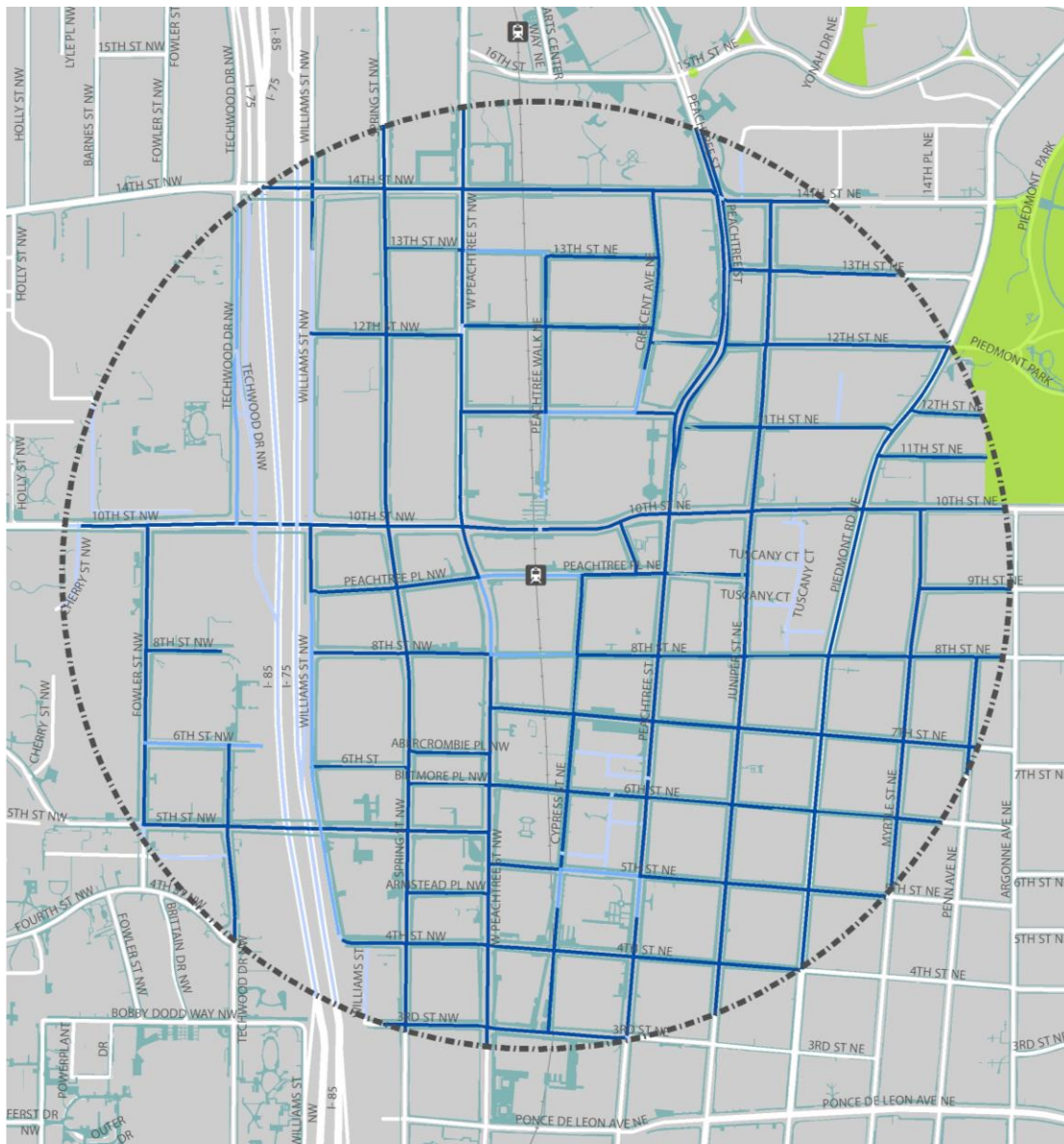


Figure 16. Orthographic view of the Midtown station area

ii. Availability of infrastructure

The Midtown area has a smaller proportion of streets with sidewalks on both sides of the street, mainly due to the high frequency of construction sites that occupy all or

most of a block and close up to three segments of sidewalk on different sides of the block. While these will likely make improvements to the pedestrian realm in the long run, they cause temporary disturbances. Overall, 69% of streets currently have sidewalk on both sides and 7% have sidewalk on one side. A map of this sidewalk availability is provided in figure 17. As for quality, 48% of sidewalk in this area are rated as above average and 40% are considered average. A map of sidewalk quality is provided in figure 18. One impedance to sidewalk quality is the use of hexagonal and brick pavers on many residential streets. These give the area a unique and historic character, but they are difficult and expensive to maintain.



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- Pedestrian space
- Sidewalk availability**
- No sidewalk
- One side of street
- Both sides of street
- MARTA Rail Stations
- 1/2 mi Station Buffer
- Parks

Figure 17. Sidewalk availability and pedestrian circulation space in the Midtown station area

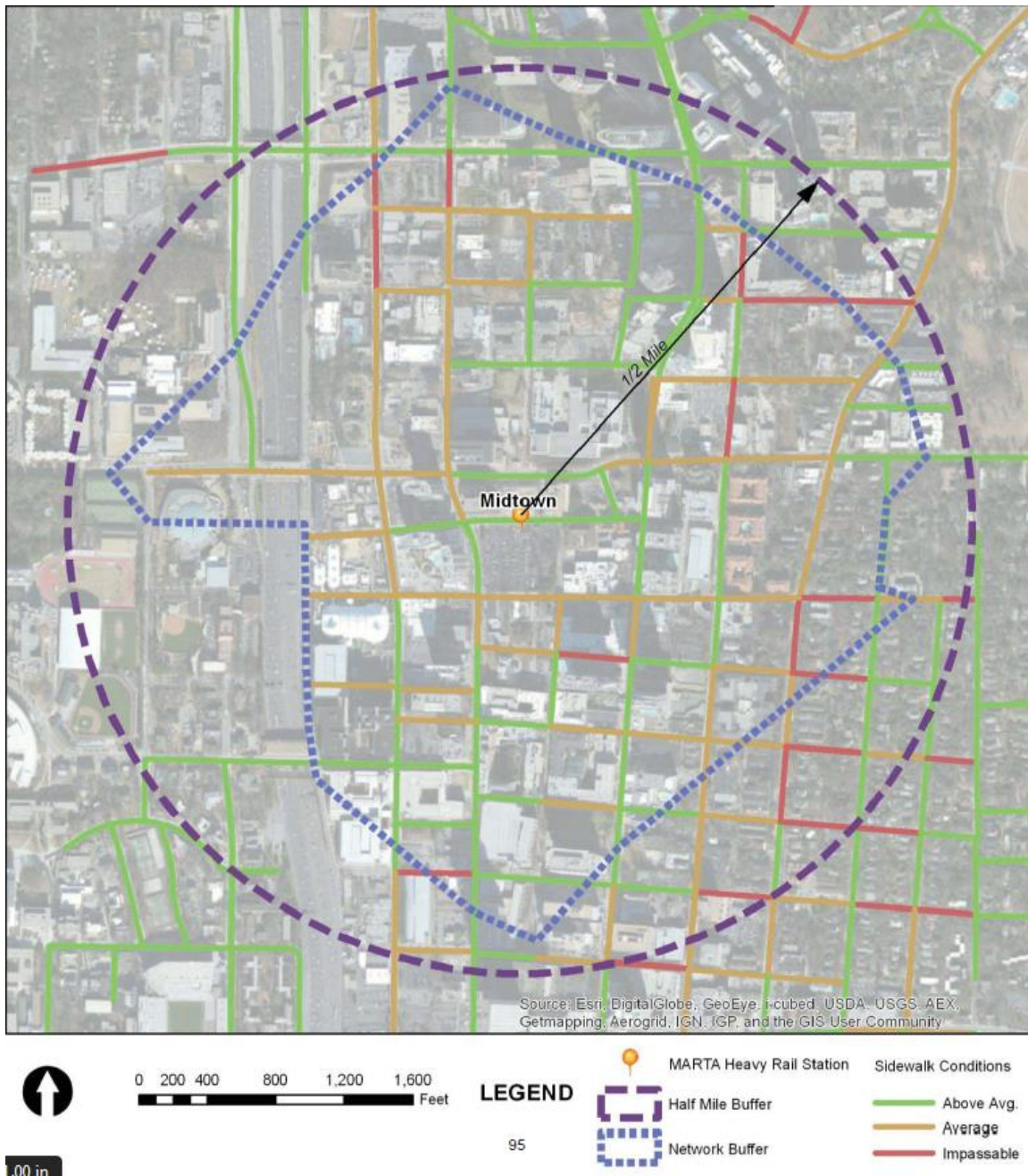


Figure 18. Sidewalk quality in the Midtown station area (Source: City of Atlanta 2015)

Following the trend from Five Points and Peachtree Center, bikeway coverage is not as built out as the sidewalk network. Here, bike lanes are present on 9% of the total roadway miles in this area. Shared lane markings are painted on another 2% of the

area's roadway miles. Figure 19 shows the locations of these facilities. There are no other forms of designated bike infrastructure at present. Just to the east of the buffer area, there is a protected bike facility that leads to the popular Eastside BeltLine Trailhead at 10th St NE and Monroe Dr NE. The osmosis of having cyclists come into the area from these facilities inherently helps to make biking more approachable by calming traffic, showing others that it's feasible, and making drivers more aware of cyclists.

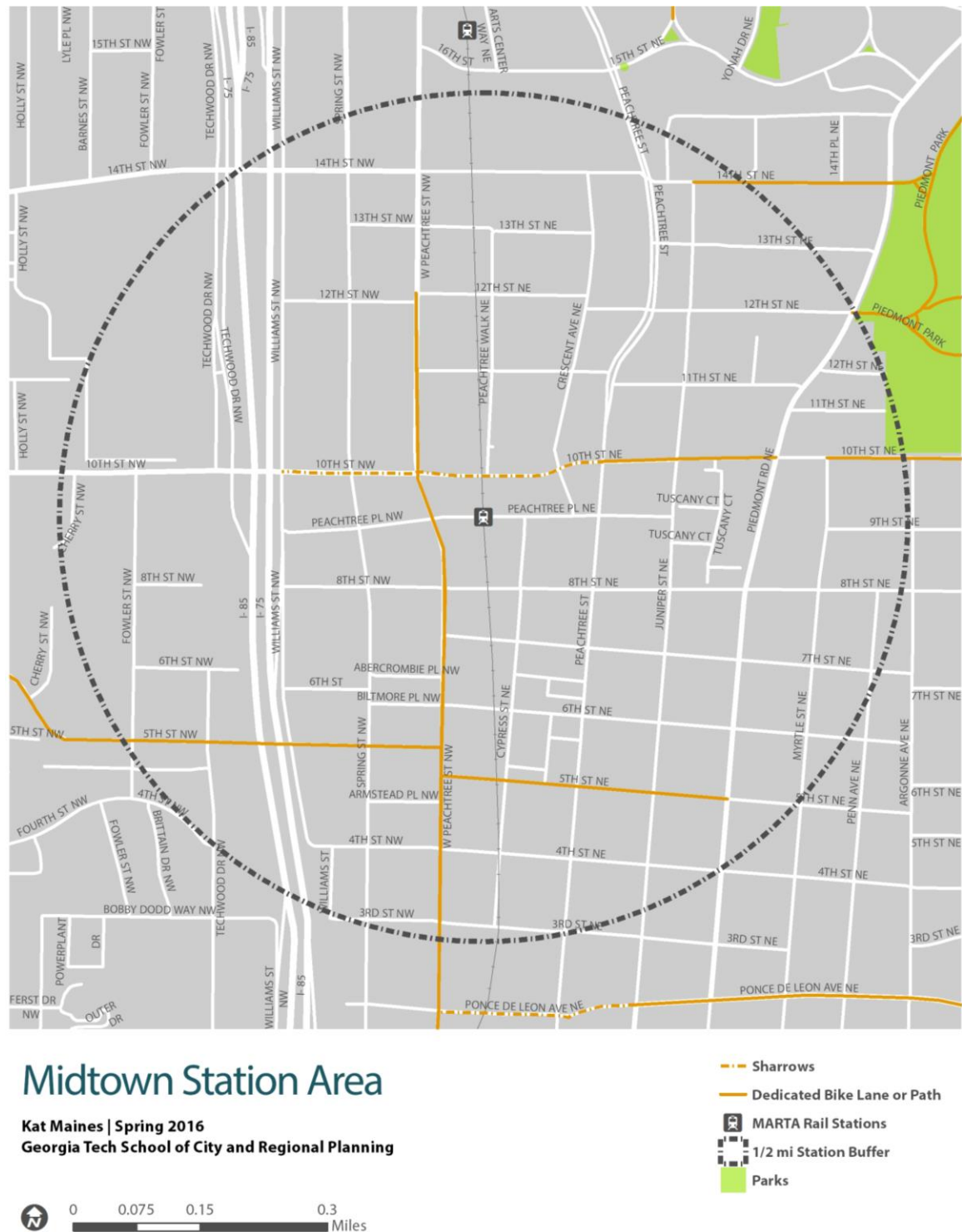


Figure 19. Map of bikeways in the Midtown station area

This area has a somewhat fluid street grid. Block sizes vary but for the most part, streets follow a north-south or east-west orientation. Furthermore, the east-west streets are numbered which helps with wayfinding. Intersection density is about 134 intersections per square mile, meaning that there is less connectivity here than at Peachtree Center or Five Points. The highway runs through the western side of the area and there are also three points at which bicyclists or pedestrians could cross it. On the other side is Georgia Tech's campus which has lower intersection density. These two factors lower the average, though there is a good connected grid on the east side of the highway.

iii. Trip attractors and generators

Infrastructure availability confirms feasibility of walking, and to a certain extent reveals that biking may be somewhat uncomfortable, but it is also important to examine why people would choose to walk or bike in the first place. Most of the time, it is not for the sake of walking and biking but rather because people need to be somewhere or do something. Therefore, it is important to understand the trip attractors and generators in the area. Table 9 describes these elements of the Midtown station area.

Table 9. Trip attractors and generators in the Midtown station area

GENERATOR/ATTRACTOR	MIDTOWN QUANTITY
TOTAL JOBS WITHIN ½ MI	20,510
TOTAL HOUSING UNITS WITHIN ½ MI	7,316
# DRY CLEANERS WITHIN 1/2 MI	10
# GROCERY STORES WITHIN 1/2 M (SOURCE: GOOGLE MAPS)	1
# SCHOOLS WITHIN 1/2 MI (SOURCE: GOOGLE MAPS)	2

SF OF PARKS WITHIN 1/2 MI (SOURCE: CITY OF ATLANTA)	27,713
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Midtown, compared to the other stations, has a much better balance between jobs and housing. There are 20,510 jobs and 7,316 housing units in the area. Midtown station's buffer zone also includes a major grocery store, just a few minutes' walk from the station, and two early childhood schools. The higher availability of these amenities also reflects the higher residential density and land use diversity. While there is less total area of greenspace in the area, with only 27,000 SF, the entrance to Piedmont Park is within the buffer. Piedmont Park is one of Atlanta's most visited parks and is host to many popular festivals and weekly activities, so it does generate foot traffic in this area. Figure 20 shows the locations of these amenities.

According to the U.S. Census Bureau's Longitudinal Employer-Household Dynamics (LEHD), this area experiences a daily inflow of 26,331 trips and a daily outflow of 5,618 trips. There are 462 internal commute trips. There are fewer overall trips compared to the other stations, but it is much more balanced. This eases pressure on the transportation network and allows for local retail to serve employees during the day, but also stay open at night so they can serve residents.



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- Dry cleaners
- Grocery stores
- Schools
- MARTA Rail Stations
- 1/2 mi Station Buffer
- Parks

Figure 20. Amenities in the Midtown station area

iv. Public realm and public life assessment

This section contrasts the prior section by analyzing not only the availability of infrastructure but also the quality of the public realm and the life that fills it. It incorporates figures on the more nuanced elements of the public space that could only be collected through direct observation, such as the presence of children or how many people were carrying groceries. Table 10 summarizes these figures.

Table 10. Key figures describing the quality of the public realm in the immediate vicinity of Midtown station

VARIABLE	MIDTOWN QUANTITY
# OBSERVED PEDESTRIANS	664
TRANSIT USERS WHO ACCESS TRANSIT BY WALKING (SOURCE: ARC ON-BOARD TRANSIT SURVEY 2010)	74.41%
% FEMALE	41%
% CHILDREN	1%
# "BUMP-INS"	6
% IN GROUPS	22%
AVERAGE WALKING SPEED	5.03 ft/s
# DOG WALKERS	4
# WITH GROCERIES	5
# WITH DRY CLEANING	0
# RUNNERS, JOGGERS, AND POWER-WALKERS	13
# OF SECURITY OFFICERS	4
% CYCLISTS WEARING CASUAL OR BUSINESS ATTIRE	81%
% OF CYCLISTS CARRYING BAGS	63%
# OBSERVED BICYCLISTS	16
TRANSIT USERS WHO ACCESS TRANSIT BY BIKING (SOURCE: ARC ON-BOARD TRANSIT SURVEY 2010)	0.71%

A total of 664 pedestrians passed through during an hour of observation at the Midtown station. Women represent 41% of this figure, indicating they may not be as represented in either the workforce or the residential population here or that there is some other factor influencing their freedom to walk in the area. Children only represent 1% of the observed pedestrians, the lowest such figure for the three stations. While there are schools in the vicinity, the observation occurred at 5:00 pm, well after children would have left. Groups represented 22% of the overall population, revealing some sociability in the area.

Thirteen of the observed pedestrians were running, jogging and/or power-walking. This is the highest such figure for the three station areas, revealing that recreation is more of a presence. Since there is a major grocery store just west of the station, it makes sense that there were five instances of people carrying groceries. There were no people carrying dry cleaning, but there were four dog walkers.

The average observed walking speed was 5.03 feet per second, or 3.4 mph. This is a faster pace than the national average of 3.1 mph, indicating that perhaps people are in a hurry to be somewhere or that they do not want to linger on the street (Franek 2013, Gehl and Svarre 2013). Four security officers were in the station plaza during observation, there to monitor activity. While Midtown has a reputation as a safer place compared to downtown, there has been a recent increase in crime which may have influenced the perception of security in the area.

There were 16 observed cyclists, most of whom did not appear to be interacting with the transit service. Only 5 of the 16 were boarding or alighting, all of whom rode

their bikes onto the sidewalk and almost completely into the station. There were no clear conflicts between these cyclists and the pedestrians entering or exiting the stations. Nine of the 16 were carrying bags, paniers, or a purse and 13 of the 16 were wearing casual or business attire, suggesting more commute activity than athletic activity.

The relatively high frequency of exercise, dog walking, and groceries reveals that the station area has a much more residential neighborhood atmosphere than that of Peachtree Center or Five Points. The observational data helps reveal this quality. It also helps to confirm that even though the station has less bikeway coverage, it appears to be a more popular place to ride a bike.

V. Policy recommendations

As shown in the previous section, observation and counting provides a more nuanced way of understanding how and why people walk and bike in a particular area. The data driven approach is still important, especially for large study areas. But while transportation planners and engineers tinker with specific methodologies based on whatever data is available, it is important to not completely neglect the study of public life. There are many ways cities could incorporate these techniques into their planning policies. Walking and biking should not purely be treated as transportation initiatives. First of all, cities should recognize the important link between urban design and active transportation, specifically the focus on human-scale design. This is especially true around transit stations, which should become nodes of walkability and bikability. Planning initiatives should consider public space as a whole, with fewer siloes separating roads, sidewalks, plazas, and parks. Second, these planning

initiatives should use observation and counting in the existing conditions analysis of planning initiatives where appropriate. Third, public life observation and direct interaction with the study area can be incorporated into public engagement methods as a way to interact with people that are not inclined to show up to a public meeting. In addition to these recommendations, the city should also take steps toward securing funding for first- and last-mile connectivity, such as creating the TOD Infrastructure Fund recommended in the Transit Oriented Atlanta report and working with GDOT to make CMAQ funds available for a wider variety of projects (City of Atlanta 2015).

A. Collaboration across planning disciplines

First of all, engaging all city departments who have their hands in the public realm is key to understanding the best allocation of valuable public right of way. For example, the Copenhagen government structure has far fewer departments than most U.S. cities that combine fields often thought of as separate units. The administration that deals with planning is the Technical and Environmental Administration, and it encompasses traffic, district planning, urban renewal, building projects, road maintenance, park maintenance, and parking. This structure allows for more open conversation between these groups. For established cities like Atlanta, reorganizing city departments may not be feasible, but the city could find ways to have departments like parks and recreation, planning and community development, and public works all co-sponsor planning initiatives. For communities looking to incorporate as independent cities, leadership should consider a more open approach to establishing governance over the built environment.

Establishing this collaborative atmosphere amongst the public realm stewards will help remind those in charge that streets can sometimes be plazas, and sidewalks can sometimes be parks. The public realm and the life that fills it is complex.

Observation and counting should aim to capture as many complexities as possible, which requires collaboration of the various departments that traditionally just focus on one component of the public realm.

B. Observation and counting as a part of the existing conditions analysis

For any planning initiative with some place-based component, the project planners should consider ways to integrate public life study into the existing conditions analysis. For example, transit-oriented development planning should take a similar approach as outlined in this paper. Planners should take time to first observe the area. Then, deduce who this area serves, what activities they are most prone to, and what places people appear to favor. Then, planners should go back and count specific items to substantiate the notions developed through observation. That information should be used to help identify what components of the design work well and which should be altered. Or it may reveal that there is a user group that is not being met. For example, if there are more school-age children than expected, perhaps the new transit oriented development should try to incorporate playfulness into the public space, or a retail space optimal for an after-school care provider or daycare.

For both planning and design work, the information about people and their tendencies should inform the proposed design solution or recommendations.

C. Public engagement at the site

Cities demonstrate intrinsic respect for their communities when they make the effort to go to the community directly for input rather than convening a meeting and inviting them. Going to the site of interest and interacting with the people there is similar. Being at the site shows commitment, captures input from different types of people than at community meetings, and may be able to capture different types of information.

Cities recognize the need for effective public engagement, but traditional methods of holding public meetings tend to only attract people who are very passionate about a particular project, or people who have an excess amount of time on their hands. Younger cohorts and people with little free time tend to not attend those meetings. This problem is confounded by the imbalance between employment and housing in places like Peachtree Center and Five Points, because people who just work in the area and may not be as motivated to go to a public meeting about proposed changes. New online tools are helping to reach a wider audience, but engaging people at the place of interest is a way to reach even more people.

In 2013, Arlington County decided to set up a “pop-up community meeting” at the entrance of a transit station in Rosslyn, a major business district with relatively few residents. The result was that people could stop and chat with them, absorbing information and sharing their responses (Arlington County 2015). This simply added ten or fifteen minutes to their evening commutes instead of forcing them to go spend one or two hours at some community facility.

As part of the Atlanta Regional Commission's recent plan for walking and biking the project team used on the ground public engagement to get individual perspectives on what motivates them to walk and bike (Atlanta Regional Commission 2015).

Through this process, the planners targeted different types of places such as an urban walking and biking trail, a MARTA station, and a suburban downtown. They asked questions like, "Why did you choose to walk/bike?" and "What about your trip did you like?" These answers and the one-on-one questions with community members help to understand the day-to-day reality of walking and biking in the region. Individuals also tend to give more specific responses about what they did or did not like about the trip because it was fresh in their minds.

Atlanta and other cities should incorporate more strategies like this into the public engagement process in order to engage a broader base of people, including those who may not generally have the time or passion to attend a community meeting but still have valuable input. It can also help the team collect different types of information, like specifics about the walking experience.

VI. Conclusion

As active transportation becomes more important to cities and their residents, analytics on the topic evolves quickly. However, there is still a great deal of controversy over specific methodologies, and there is a challenge in the lack of availability and consistency of that data. There is much to be learned from these data-driven methods, but walking and biking are intrinsically complex activities that have much more to do with the public realm and human behavior than driving does. Therefore, transportation planning and projects should take a cue from urban

designers like Jan Gehl and William H. Whyte who popularized the tradition of observation as a way to better understand and enhance the urban environment. Transit stations are an optimal place to use this strategy because they attract a lot of walking activity already, with 75% of transit trips beginning or ending with a walking trip (ETC Institute, PBS&J, and DW & Associates 2010). Plus, better bikability and walkability around transit stations has the potential to improve the perceived transit service by improving the first or last leg.

Observation techniques, like measuring walking speed, counting activities, noting the attire of cyclists, and counting total activity can be useful in understanding a more refined profile of an area. Urban areas are especially complex and it can be difficult to surmise a unique understanding just through the approach driven by traditional community meetings, infrastructure availability, and pairing origins with destinations. The methodology used here demonstrates hybrid methodology for assessing walkability and bikability of the public realm that combines the data driven approach with observation techniques that have historically been more associated with urban design. This methodology was specifically tested in the vicinity of three of Atlanta's transit stations because transit is a powerful tool in the urban transportation portfolio, but it relies heavily on whether or not the surrounding area supports walking and biking.

Layering this type of observation-based analysis on top of a more traditional analysis of infrastructure and trip generators and attractors, the process revealed a more nuanced understanding of the area. It showed that despite the lack of bike infrastructure in Five Points, people were biking and relying heavily on the sidewalk for a feeling of protection. In Peachtree Center, it revealed the high levels of

socializing taking place and that it was a popular place for school-age children despite a lack of schools or residential units. In Midtown, it revealed that some elements of a neighborhood atmosphere were very prevalent, like exercising, dog walking, and grocery shopping, while other elements were relatively low, like children and socializing.

Cities should find ways to interweave these techniques into their planning initiatives by observing the area in question for place-based planning projects. They should note how people use the space: Are they walking quickly? Is the space sufficient? What are they doing besides walking or biking? Do there appear to be conflicts between bicyclists and drivers? These and many more questions can help planners understand more beyond how many commuters need to get into and out of an area on a daily basis, or how far bicyclists can get on a dedicated bikeway.

This on-the-ground approach can also be used to enhance public engagement. By engaging the people while they take their lunch break or head home from work, planners can make it easier for people to provide input and can reach a broader user group than is typically in attendance at public meetings.

Transportation professionals have spent the past century removing any humanity from roads in the interest of traffic flow and safety. Now there is a confluence of elements bringing out attention back to human scale. Environmentally, economically, and socially, it makes sense for cities to support walking and biking. By observing public life and using it to inform recommendations, city planners and designers can help restore that human element that shows people respect and

reminds them that the space between buildings are some of the most valuable public spaces cities have.

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