COMPLETE CORRIDORS STUDY: ASHEVILLE, NORTH CAROLINA

by

LEAH AMELIA GRAHAM STEWART

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ABSTRACT

For the first time in history in 2008 more than half of the world's population lives in towns and cities and this trend is expected only to continue and with the paradigm shift in urbanization the need to understand that the urban form directly affects habitat, ecosystems, endangered species, and water quality through land consumption, habitat fragmentation and replacement of natural cover with impervious surfaces becomes critical. Actions taken on a single parcel of land can have a ripple effect on the end user of the space, the adjacent property owners, the neighbors, the community and ultimately the region. This is a crucial l time to make people aware of the connections of the built and natural environment. Environmental opportunities exist for energy conservation, material resources efficiency and indoor air quality primarily at the scale of buildings. Additional opportunities for land, air and water quality occur at the scale of regional land use and transportation patterns. By focusing on neighborhoods, the most accessible and ubiquitous form of urbanization, the possibility for positive change is created because it is the environment that widely shared and influenced by the decisions and actions of everyday people. There are countless works of literature and studies devoted to the issue of sustainable neighborhood design but their focus lies mainly among "greenfields," a blank canvas. However, with projected population

growth and finite land, these greenfield-focused sustainable neighborhood design manuals are not adequate solutions. The reality and challenges today lie with retrofitting existing neighborhoods and the abandoned developments within existing infrastructure with little to no houses; a residual of the housing market collapse of 2008 for sustainability. The key question is how to create a system that helps cities plan for livable neighborhoods by devising streets and corridors that benefit the environment, economic and social fabric of the city. This study will focus those efforts by creating a sustainability index to measure key commercial corridors in the City of Asheville, North Carolina.

INDEX WORDS: Corridors, Asheville, COMPLETEcorridors, Sustainability Index

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A Practicum Submitted to the Graduate Faculty of the University of Georgia in Partial Fulfillment of the Requirements for the Degree

MASTERS OF

ENVIRONMENTAL PLANNING & DESIGN

ATHENS, GEORGIA

2011

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May 2011

ACKNOWLEDGEMENTS

A practicum is a project that allows the student be immersed in an actual planning practice experience that includes the experience itself and the development of a planning document of professional and archival quality. This project is a component of the requirements to receive a Masters of Environmental Planning and Design of the University of Georgia and made possible through the support and collaboration with the City of Asheville's Planning and Development Department. A copy of the planning document in its original form can be found at http://issuu.com/l.grahamstewart/docs/completecorridors. Special thanks to Judy Daniel, Blake Esselstyn and other City Staff that made this project possible.

Thanks to Lara Mathes, my *Planning Morning Show* co-host, my planning 'yoda', editor and creative muse.

I would like to also thank my best friend and husband Jeff Stewart for being more than I could have ever imagined; no words could ever capture the essence of your soul and how much you mean to me. I would also like to thank my dog Okra, who spent many hours in the TannerSTUDIO and reminded me to take a break and go for a walk.

I would also like to thank Art and Isla, my parents and the most giving people I have ever met. They instilled in my brothers and me the desire to make the world a better place through service.

I also recognize that I am supported by a phenomenal group of friends and family. Special thanks to my fellow MEPD classmates, we embarked on this journey as classmates but

are leaving as so much more. I am going to miss Athens but in some ways I am taking you all with me wherever I go as you have become a part of my heart.

Thank you all.

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CHAPTER 1

PROJECT OVERVIEW

The Bigger Picture

As of 2008, more than half of the world's population lived in towns and cities and this trend is expected to continue. The U.S. Environmental Protection Agency's *Our Built and Natural Environments* warned that "urban form directly affects habitat, ecosystems, endangered species, and water quality through land consumption."[1] We must understand our impact to the existing natural systems and nurture a relationship between ourselves, the built environment, and the ecosystem that sustains us.

This study examines these relationships by examining corridors that connect a city's neighborhoods. "Between the building and the region, the scale of neighborhoods provides the most accessible and ubiquitous form of urbanization to generate opportunity for collective improvement. It is where people live; it is the environment most widely shared and most likely to be positively influenced by the decisions and actions of everyday people."[2] Ecosystems are closed systems with fluxes that must be understood in the context of their surroundings. Actions taken on a single parcel of land can have a ripple effect on the end user of the space, the adjacent property owners, the neighbors, community and ultimately the region (Figure 1.1).

[1] Kellett, Cynthia Girling and Ronald. Skinny Streets & Green Neighborhoods: Design for Environment and Community. Washington DC: Island Press, 2005. Print.
[2] Ibid.

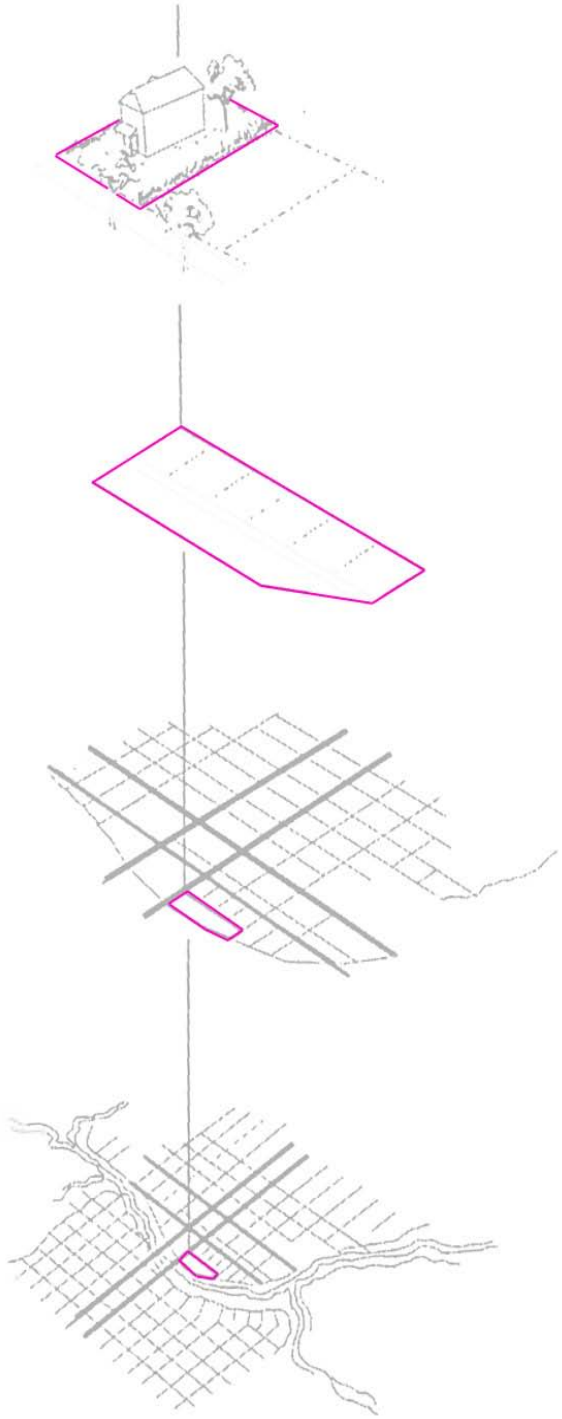


Figure 1.1: Urban Morphology from Parcel to Neighborhood. Data Source: Adapted from Kellett, Cynthia Girling and Ronald. Skinny Streets & Green Neighborhoods: Design for Environment and Community. Washington DC: Island Press, 2005. Print.

There are numerous studies devoted to the issue of sustainable neighborhood design, but their focus lies mainly among 'greenfields.' However, with projected population growth and the limitation of finite land, these greenfield-focused sustainable neighborhood design manuals are not adequate solutions. The reality and challenges faced today lie in retrofitting our existing neighborhoods and abandoned developments with existing infrastructure for increased sustainability. The question is how do we transform existing neighborhoods into more sustainable neighborhoods? This develops a system that helps plan for livable neighborhoods by devising streets and corridors that benefit the environment, economic and social fabric of the city by creating an index to measure the sustainability of commercial corridors in Asheville, North Carolina. The index is intended to illustrate, articulate and guide capital improvements, inform development choices and potentially provide incentives that can encourage the evolution into COMPLETEcorridors for the corridors in the study as well as other corridors similar in character and context. More sustainable corridors that provide the goods and services for the neighborhoods connected by them could reciprocate into more sustainable neighborhoods.

The Asheville Scene

Asheville, North Carolina is nestled in the Blue Ridge Mountains and the Great Smoky Mountains and is known for its natural beauty. The City of Asheville is the largest city in Western North Carolina and the county seat of Buncombe County. Asheville serves as the regional hub for business, health and human services, the arts, shopping, dining and other community amenities for citizens and visitors. The U.S. Census Bureau determined that Asheville's population in 2010 was 83,318. Asheville is a part of the four-county Asheville Metropolitan Statistical Area, the population of which was estimated by the Census Bureau in 2010 to be 417,012. Several of the largest employers in the area focus on the tourist industry and

many people locate to the area because of the renowned natural setting. The economic importance of the natural environment as well other factors such as health, safety and welfare for the City of Asheville and its visitors are a driving force behind the study. This study examines how to make an existing neighborhood more sustainable; provide a safe, convenient place to support everyday needs and access services. However, this will occur in a larger scale than a neighborhood for several reasons. First, neighborhood boundaries can be ambiguous; how a resident identifies his or her neighborhood boundaries can be different from an adjacent property owner's interpretation, a real estate agent's interpretation or even a planner's. Second, if these corridors serving various purposes for varying users can become more sustainable, they may have a ripple effect on the neighborhoods, the city and the region; providing opportunities for change and choices for a more sustainable natural and built environment. Finally, neighborhoods have unique nuances; perhaps so unique and specialized that translating changes from one neighborhood to the next might be difficult. This is not to say that corridors qualify for a one-size-fits-all solution.

This study will examine three major corridors in Asheville, North Carolina. These corridors serve as commercial hubs, thoroughfares, boundaries, and transportation spines that several neighborhoods in Asheville. Corridors, streets, highways, and parkways connect and serve all types of land uses, constantly shaping the built and natural environment. The design and redesign of this built environment can have a large impact on community form and sustainability. This study is not just about roads, it's about the context that surrounds them; the corridors' urban form, alternative transportation options, access to everyday necessities, densities, etc. The goal is to better integrate transportation and land use, minimizing the amount of travel required and encouraging higher levels of self-containment and livability.

The primary methodology is the constructed sustainability index and its measure that quantify the livability and connectivity of the selected corridors. The index is intended to document, illustrate, articulate and guide capital improvements, inform development choices and potentially provide incentives that can encourage the evolution of the corridors within the study into COMPLETEcorridors as well as other corridors similar in character and context, so that the community of Asheville receives the 'greenest' 'bang for the buck' and a more sustainable Asheville for future generations. The study examines existing conditions along three corridors. Based on what is discovered, recommendations will be prepared which may include changes in public policies and development regulations, which are designed to improve, enhance, alter and/or conserve the future quality of these corridors.

What are COMPLETEcorridors?

In this paper the concepts of COMPLETEcorridors is derived from the organization Complete Streets. "Complete Streets promotes the idea that roadways should be designed and operated to enable safe, attractive, and comfortable access and travel for all users. Pedestrians, bicyclists, motorists and public transport users of all ages and abilities are able to safely and comfortably move along and across a complete street."[3]

For this study the term of 'complete' is expanded to include the use of corridors; which is defined as a broad geographic areas served by various transportation systems. Examining the corridor's 'completeness' will produce findings that allow for a comparative study about the corridors, but also provide information about the neighborhoods that are connected by them. Complete is defined in *Webster's Dictionary* as "having all necessary parts, elements or steps."[4] In other words COMPLETEcorridors that provide essential amenities and services would serve

[3] *Complete Streets*. Web. Accessed 14 Feb. 2011. <http://www.completestreets.org/>.
[4] Webster's Dictionary (http://www.merriam-webster.com/dictionary/complete, Accessed 15, Dec. 2010.).

as a catalyst into more ‘complete’ neighborhoods. The ability to access these daily needs and services could influence the choices made at the parcels level which then in turn creates a chain-reaction at the neighborhood level, the city level, the regional level and beyond. Secondly it looks beyond the roads; it also focuses on the context that surrounds them; the corridors’ urban form, alternative transportation options, access to everyday necessities, densities, etc. COMPLETEcorridors integrate transportation and land use, minimizing the amount of travel required and encouraging higher levels of self-containment. Figure 1.2 illustrates the spatial relationship of the commercial business district, corridors and neighborhoods.

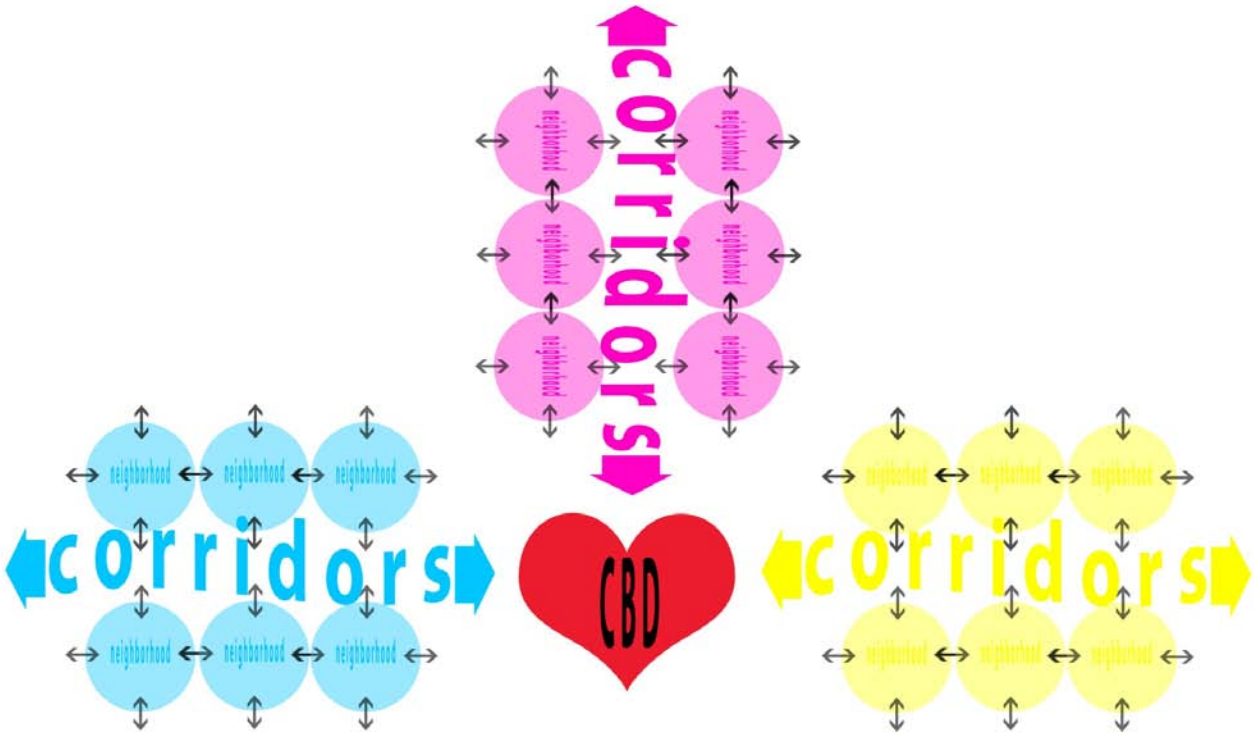


Figure 1.2: COMPLETEcorridors Anatomy. Data Source: Created by Author, L. Graham Stewart.

Initial Study Areas

Merrimon Avenue, Haywood Road and Tunnel Road radiate from downtown Asheville. These three corridors share a common characteristic, their linkage to Interstate 240 (I-240), which forms a half-circle around the north of the city's downtown district. In the *2009 Sustainability Management Plan* it was recommended that the City "adopt a policy that embraced the Complete Streets philosophy, as roadways that are truly multimodal greatly reduce the consumption of energy and output of emissions. In addition to being an environmentally sustainable choice, Complete Streets roads set the groundwork for urban design patterns that create or reinforce more traditional neighborhoods. Merrimon, Haywood, and Tunnel corridors were identified as logical places to consider. Each has central thoroughfares lined with commercial activity."[5] However, many segments are inaccessible to pedestrians and bicycles. The corridors, or portions of the corridors, are state roads, and are controlled and maintained by North Carolina Department of Transportation. Merrimon Avenue, Haywood Road and Tunnel Road were included in the study based on preliminary practicum meetings with the City of Asheville's Planning Department on January 15, 2011.

Figure 1.3: Excerpt from City of Asheville's 2009 Sustainability Management Plan

[5] Asheville, City of. Sustainablity Management Plan. (2009). Web. Accessed 5. Dec. 2010. <http://www.ashevillenc.gov/docs/sustainability/AVL.Sust.Plan.pdf>

The initial study areas are as follows:

Merrimon Avenue (North Asheville):

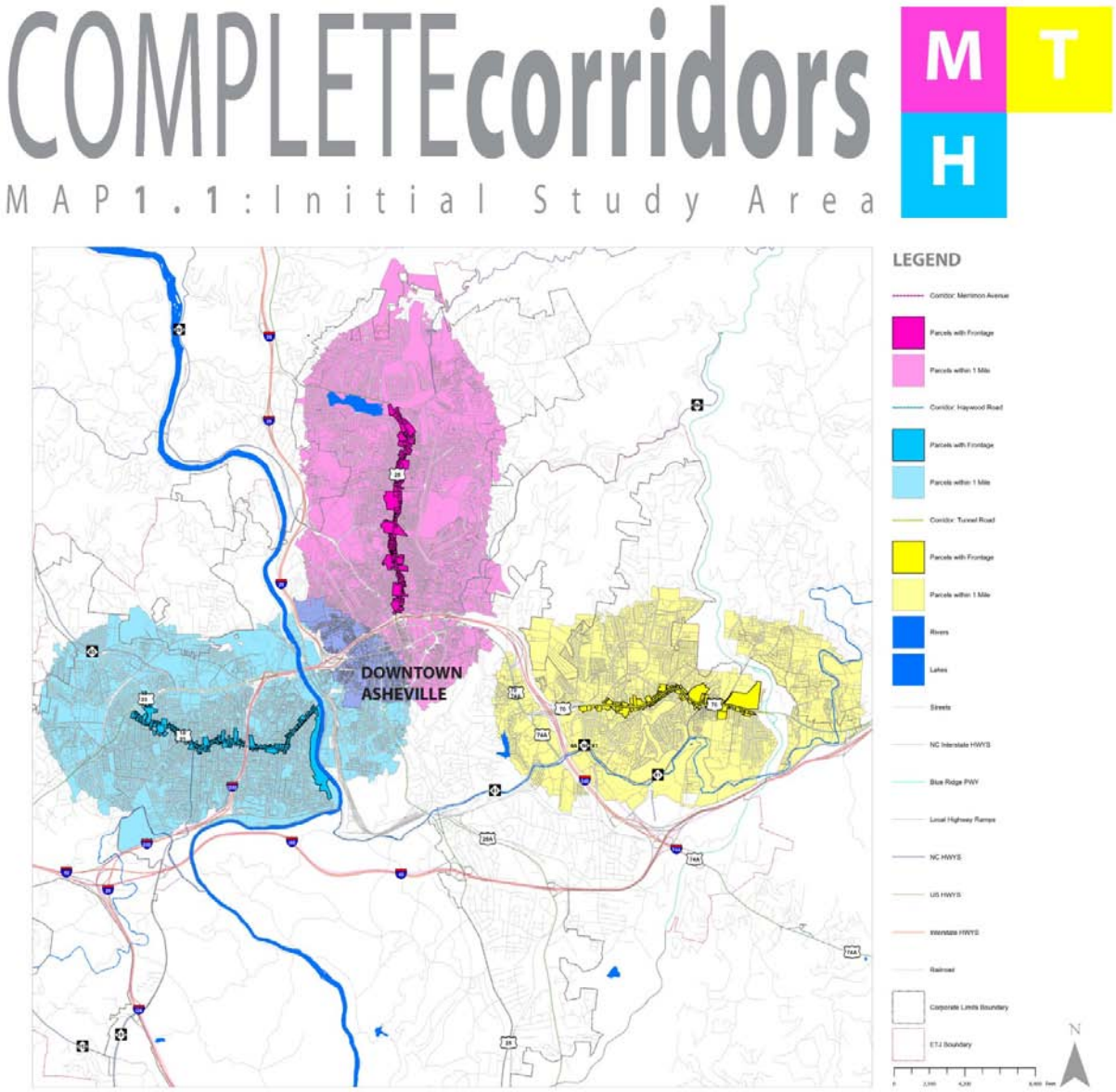
The project boundary includes an area on either side of the corridor from the intersection with I-240, north to the intersection with Dover Road. The parcels that directly have street frontage along the corridor are the main component of the study. However, in order to truly understand the context of the corridor, information about other parcels that may not directly front the parcel may be explored.

Haywood Road (West Asheville):

The project boundary includes an area on either side of the corridor from the intersection with Patton Avenue, south and then east to its crossing of the French Broad River. The parcels that directly have street frontage along the corridor are the main component of the study. However, in order to truly understand the context of the corridor, information about other parcels that may not directly front the parcel may be explored.

Tunnel Road (East Asheville):

The project boundary includes an area on either side of the corridor from the intersection with I-240 West, east to the intersection of the Blue Ridge Parkway. The parcels that directly have street frontage along the corridor are the main component of the study. However, in order to truly understand the context of the corridor, information about other parcels that may not directly front the parcel may be explored.



Map 1.1: Initial Study Areas. Data Source: City of Asheville's GIS data. Created by Author, L. Graham Stewart.

Map 1.1 identifies the initial study areas. Merrimon Avenue is shown in magenta, Haywood Road is shown in cyan and Tunnel Road is shown in yellow. These colors will be used through the study to identify that specified corridor.

What is Sustainability?

The term sustainability has been referenced in the lexicon of Architecture, Ecology, Landscape Architecture, Planning, and design fields for many years. In recent times, it has become a buzz word in contemporary American culture. Its definitions, uses and applications are as varied as the number of people who use it. However, for this study we will use the City of Asheville's definition found in the *2009 Sustainability Management Plan*, which states that being sustainable means:

> Making decisions that balance the values of environmental stewardship, social responsibility and economic vitality to meet our present needs without compromising the ability of future generations to meet their needs.[6]

It is important to point out that while new construction, redevelopment and other reinvestment in established areas inevitably affects the stability of property values and may raise questions about affordability and gentrification, the focus of this study will be limited to the "physical environment," highlighting design, regulatory, land use and environmental issues and opportunities. In addition in this study the term sustainability, sustainable development, sustainable community will be one in the same.

Why Study Corridors?

The New York City Department of Transportation's *The New York City Street Design Manual* describes the role that streets have played in the America's urban landscape:

> Urban streets have always fulfilled multiple functions. Early in the twentieth century, they served not only as transportation routes but as the front yards and public squares of cities. Horse–drawn carriages, people on foot or horseback, and, later, bicycles and streetcars shared the streets with pushcart vendors, outdoor markets, children playing, and neighbors socializing. As vibrant as it was, this diverse set of uses and users of the street created a variety of problems for safety, sanitation, and mobility. Reformers of the day effected changes in street design and zoning, stormwater management, sanitary

[6] Asheville, City of. Sustainablity Management Plan. (2009). Web. Accessed 5. Dec. 2010. <http://www.ashevillenc.gov/docs/sustainability/AVL.Sust.Plan.pdf>

sewers, and traffic controls to improve safety and sanitation and to promote mobility and economic growth.

Over time, street design focused primarily on motor vehicle movement, and the emerging discipline of traffic engineering worked to safely integrate cars and trucks into pre–existing urban forms. While there were clear benefits to accommodating automobile movement through the city, the negative effects became increasingly evident over the last forty years. The focus on autos resulted in unsustainable land development patterns, fewer transportation choices, increased noise, pollution, and greenhouse gases, as well as a decline in social, civic, physical, and economic activity on streets.

Engineering, planning and urban design best practices over the last ten years have emphasized a more balanced idea of street design, giving equal weight to transportation, community, and environmental goals. Practitioners (and the public) have learned that investment in high–quality street infrastructure can yield benefits well beyond simple mobility: public health, improved physical environment, and (particularly relevant in lean fiscal times) economic benefits in the potential for increased residential and commercial property values and retail activity.[7]

[7] Transportation, The New York City Department of. The New York City Street Design Manual, 2009. Print.

Photo 1.1: Pack Square, Asheville's City Center in 1890. Data Source: Pack Memorial Library.

Photo 1.2: Pack Square, Asheville's City Center in 1930, Courtesy of Pack Memorial Library. Data Source: Pack Memorial Library.

Asheville's Corridors

Transportation plays the largest role in shaping the built environment. Transportation played a large role in the establishment, preservation, ebb and flow of the City of Asheville's urban form. Asheville's urban form is a cross between three archetypes known as a dispersed city, nodal city and corridor city[8]. The dispersed city is characterized by outward expansion at relatively low densities, random infill and remaining dominated by a central city as the key economic node. In the nodal city and corridor city archetype can be characterized in Asheville by its primary nuclei; the Downtown District (CBD-Commercial Business District) with an increased population, housing densities and employment in secondary nodes across the city. Growth occurs along the corridors while they also serve as links to these secondary nodes (i.e. neighborhood centers or neighborhoods). In all of these archetypes the linkage and treatment of the land use along these corridors are extremely important. Figure 1.4 illustrates various archetypes of a city that are applicable to the urban form of Asheville, North Carolina.

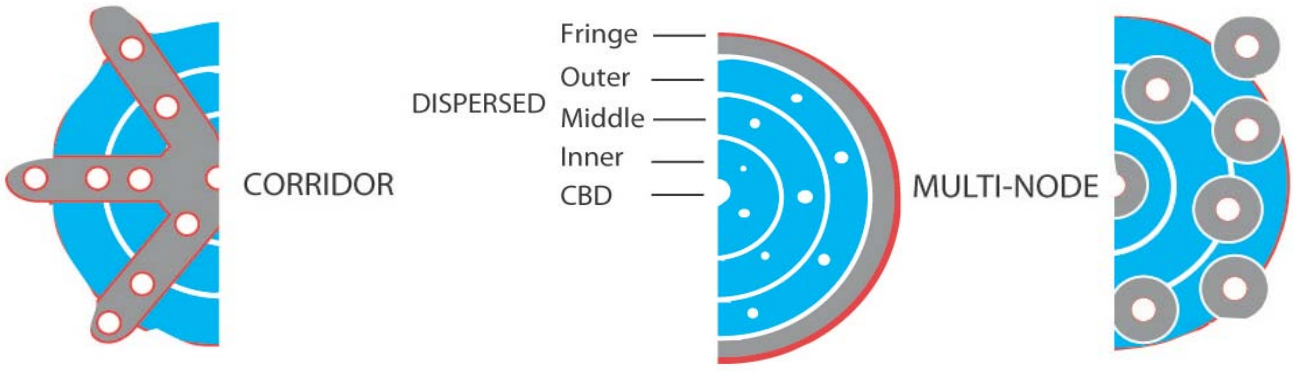


Figure 1.4: Archetypes of a City. Data Source: Adapted from http://www.environment.gov.au/atmosphere/airquality/publications/urban-air/pubs/chapter5.pdf. Created by L. Graham Stewart.

[8] Archetypes of a city adapted from "Urban Air Pollution in Australia." Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) - Home Page. N.p., n.d. Web. 27 Feb. 2011. <http://www.environment.gov.au/atmosphere/airquality/publications/urban-air/pubs/chapter5.pdf>.

Introduction of transportation infrastructure can have negative effects on urban form as well as positive, or both. There is no doubt that the construction of HWY 26 and HWY 40 helped to relieve the growing congestion in the downtown area in 1968, but could have contributed to downtown Asheville seven decades of economic struggle. "Asheville is nestled in the valley of Western North Carolina between the French Broad River and the Swannanoa River. This unique location, topography and natural aesthetics have contributed to its attractions to natives and visitors alike. Asheville's development patterns since 1950 and its hilly topography make interstates and state roads the main travel routes for local traffic."[9]

Reconstructing our notions that form and cities are difficult to modify is key component to positive change. But strategic urban policies and infrastructure investments can lead, in a finite time, to a re-shaping of cities to a more positive and sustainable form.

[9] Asheville, City of. Asheville City Development Plan 2025 Comprehensive Plan. (2007). Web. Accessed 5. Dec. 2010. <http://www.ashevillenc.gov/business/development_services/planning_zoning/default.aspx?id=1144>.

CHAPTER 2

BACKGROUND

Existing Plans and Policies

Asheville has numerous plans and policies that articulate the vision, needs and desires of the community for Asheville's future growth. They include the progressive planning document *City Plan 1925* by John Nolen, as well as more contemporary plans like the *Smart Growth Land Use Policies*; *City of Asheville Pedestrian Plan 2005 Update*; *Asheville City Development Plan 2025*; *Asheville Downtown Master Plan*; *2008 Comprehensive Bike Plan*; *2009 Sustainability Management Plan*; *2009 Transit Master Plan* and the Land-of-Sky Regional Council's *Linking Land and Communities*. These documents were researched and serve as a guide to this study. It was also important to understand the whole Community of Asheville, which meant researching past efforts, plans, reports, issues, opportunities and goals. Community input was a key component during the development of these plans. In most instances designers, planners, researchers, consultants sometimes have a "reputation of being 'an expert outsider' taking their position of power of translating their observations of place, people and culture with no mechanism for the observed to participate in the findings."[10]

It is important for the designer, planner, researcher to truly grasp the notion that local native residents "in effect create a place. They do this by celebrating it in the original sense of the term: they frequent it; they become familiar with a place by participating in its natural and human events."[11] Common Ground, a community-based planning organization in the United

[10] Franklin, Wayne and Steiner, Michael, ed. Mapping American Culture. University of Iowa, 1992.
[11] Ibid.

Kingdom, always reminds the community that is participating in a project that they must never forget that they are the expert of their place[12]. Kevin Lynch's study of mental maps reiterates the importance of the native perspective; he "suggested that such images could be combined into a composite portrait of a city, useful to urban designers."[13]

In contrast "William Grass said that 'we soon cease to see what we are accustomed to seeing,' and yet there are times when it is necessary to see the land and how we've changed it before its true character is lost. It is understood that a degree of environmental blindness may be necessary in order to be at ease and function. Cultural products such as the map or the built environment encourage us to see reality in terms of simplified wholes. Naturally, the urban geographer or planner is in a better position to do so than are local residences who must struggle with the day-to-day incoherence to survive; nevertheless, they too must rationalize-that is, see some kind of underlying reason or pattern- if they are to retain a foothold on sanity.

If approached correctly the stranger can see the separateness and connections to a place. But the connections of people to place can only be discovered from the native's point of view. Therefore the native's role is just as important in the development, creation, redevelopment, or reinforcement of sense of place as the strangers. This process for the stranger learning the native's collective image of a place can transform the undifferentiated space into place as we get to know it better and endow it with values."[14]

[12] Hayden, Dolores. The Power of Place: Urban Landscapes as Public History. MIT Press, 1995.
[13] Franklin, Wayne and Steiner, Michael, ed. Mapping American Culture. University of Iowa, 1992.
[14] Ibid.

The presence of both the Stranger and the Native in the design, research and planning process is thought to be critical to the development, creation, redevelopment, reinforcement and/or understanding of the built and natural environment.[15] [16]

A summary of the above plans as they pertain to this study can be found in the appendixes. Data from the following, studies will also be utilized in the study: *2005 update to The City of Asheville Pedestrian Plan; 2008 Comprehensive Bike Plan; 2009 Transit Master Plan; 2009 Sustainability Management Plan* and the Land-of-Sky Regional Council's *Linking Lands and Communities.* Their methodology and findings were found to be relevant, realistic and applicable to this study.

The synthesis of all these studies is that Asheville has a clear vision of its needs and desires for the community's future growth; a delicate balance of preserving its natural resources, while growing responsibly with the ultimate goal of preserving the area's unique culture and enhancing quality of life for all who live, work, play and visit the area. The existing plans were examined and have been condensed into the following key principles that will guide the study's examination of Asheville's corridors, their evaluations and the creation of the COMPLETEcorridors' index.

The conflux of these ideas is the following:

- Incorporate sustainability into the City decision making process.
- Support entrepreneurship, especially local small businesses and home occupations;
- Increase property investment, particularly along our commercial corridors;

[15] Hufford, Mary. One Space, Many Places: Folklife and Land Use in New Jersey's Pinelands National Reserve. American Folklife Center: Library of Congress, 1986. Print.
[16] Franklin, Wayne and Steiner, Michael, ed. Mapping American Culture. University of Iowa, 1992.

- Increase accommodation of population growth within the City, particularly along commercial corridors, in compatible neighborhood infill, and in urban villages;
- Support and encourage mixed-use land use pattern;
- Increase safe multi-modal transportation opportunities;
- Preserve the unique character of Asheville;
- Encourage development that occurs in a pattern that is sensitive to the natural environment

Since the adoption of these plans, their implementation has begun. But there is always more to be done. This study uses the common thread that runs through the plans, polices and studies to vindicate and reinvent the elements of the built and natural environment examined in Asheville's urban corridors.

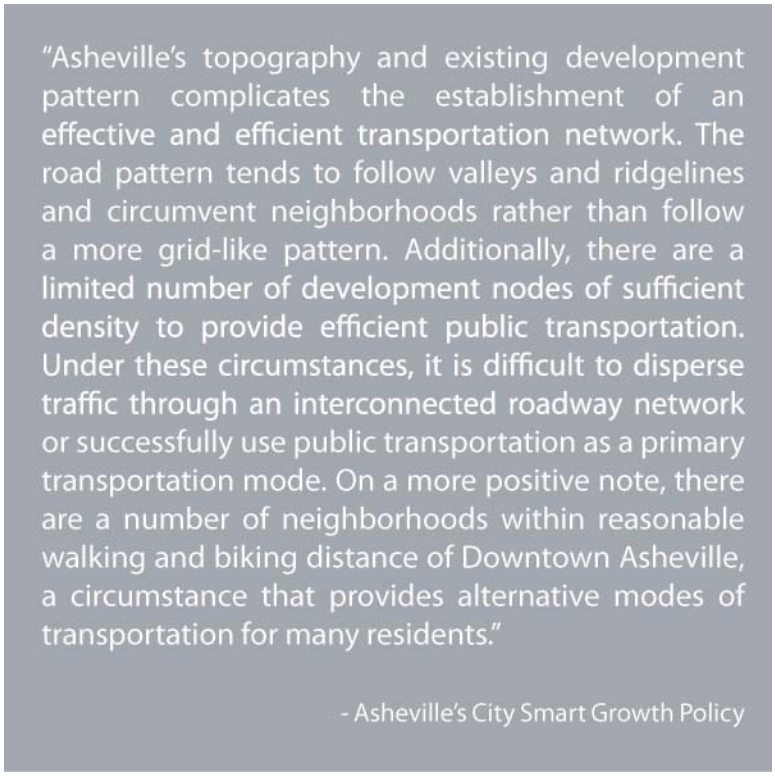


Figure 2.1: Excerpt from City of Asheville's Smart Growth Policy.

Existing Indexes and Studies

The study's index for COMPLETEcorridors is based on existing methodologies for sustainability, walkablity, access to transit and land uses, etc. (including Walk Score, Walk shed, LEEDS ND, Twin Cities CTLUS Initiative, Portland's 20 Minute Neighborhoods). The index created and used in the study is a combination of the existing methods but refined to be applicable to the corridors within the study as well as corridors through the City of Asheville, North Carolina. The index is intended to illustrate, articulate and guide capital improvements, inform development choices and potentially provide incentives that can encourage the evolution into COMPLETEcorridors for the corridors in the study as well as other corridors similar in character and context, so that the community of Asheville receives the 'greenest' bang for the buck making it a more sustainable Asheville and region for future generations. Communities across the country have been searching and developing ways to rate and analyze the policies and regulations that determine their development patterns. Various organizations and a number of municipalities have developed indexes that help communities assess their policies and proposed development projects. A summary of the above existing indexes and studies as they pertain to this study can be found in the appendix.

There are reoccurring elements and measures consistently used to rate and evaluate development growth regardless of the scale of the evaluee, whether it is a municipality, development properties or components such as bicycles or pedestrians. The existing indexes were examined and have been condensed into the following key principles that will guide the creation of the COMPLETEcorridors' index, its elements and measures that will be used to examine Asheville's urban corridors for completeness.

The consistent elements of the evaluated studies:

- Environmental Protection
- Economic Development
- Housing Choice
- Mixed Use
- Connectivity
- External Connections
- Proximity
- Location
- Streetscapes
- Civic Space
- Architectural Aesthetics
- Priority Funding Areas
- Density and Compactness
- Transportation
- Walkable and Transit Friendly
- Community Character and Design

It is interesting to see the similarity in the needs and desires for Asheville's future growth and the elements used to measure smart growth, sustainability and walkablility. These elements will be used to construct the COMPLETEcorridors' index, evaluating how Merrimon Avenue, Haywood Road and Tunnel Road measure up.

CHAPTER 3

ESTABLISH BOUNDARIES

Establish Boundaries

The initial study areas were created by radiating 1 mile out from the centerline of the corridors, parcels within the 1 mile buffer were considered to be in the study area. But once closer examination of the corridors began a reduction in the number of parcels due to barriers and lack of connectivity was warranted. Barriers like jurisdiction lines and the French Broad River. Lack of connectivity for pedestrians to cross highways and underpasses were just some of the considerations. Photos 3.1-3.3 are examples of barriers and connections across them.

Photo 3.1: Example of Barrier and Connection, I-240 at Haywood Road Study Area. Data Source: L. Graham Stewart.

Photo 3.2: Example of a Connection (pedestrian bridge) over a Barrier (I-240) at Merrimon Avenue Study Area. Data Source: L. Graham Stewart.

Photo 3.3: Example of a Connection and Barriers. Data Source: L. Graham Stewart.

Frequent Measures

Walkscore is an online walkablility rating system which states that "transportation planning guidelines commonly cite .25 miles as a goal for distance between transit stops (Ontario Ministry of Municipal Affairs and Housing 1992, Transit Supportive Development (No date given)), while Destinations 2030 and Turner, Shunk and Hottenstein (1998) give evidence that 1.5 miles is a reasonable upper bound. Distances in these ranges are common in the literature (Lee and Moudon 2006, Cerrin et al. 2006, Kockelman 1996, Iacono et al. 2010). Walkscore also provides an illustration of the distance decay function (Figure 3.1); which helps communicate the use of these 'walk-measures.' The x-axis is the distance from the address of interest or origin, and the y-axis is the percentage of a full score that an amenity will receive from the online rating system."[17]

[17] Get Your Walk Score - A Walkability Score For Any Address. Web. Accessed 10 Dec. 2010. <http://www.walkscore.com/how-it-works.shtml>

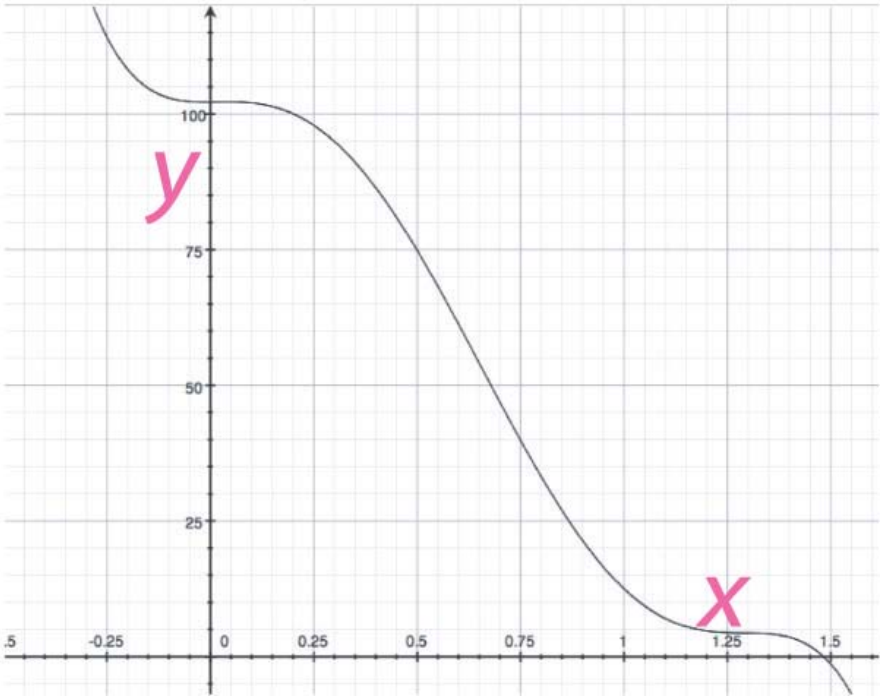


Figure 3.1: Distance Decay Function. [18]

Figure 3.1 illustrates the following measures that will be used to establish the boundaries as measurements throughout the study:

> The Five Minute Walk: The ¼ mile (1,320 feet) is also known as the Five Minute Walk and is a standard measure in the planning and transportation profession. The Five Minute Walk is the average distance that a pedestrian is willing to walk before opting to drive.
>
> The Ten Minute Walk: Research also shows that people will walk 1/2 mile (2,640), also known as the Ten Minute Walk to more specialized shops or civic uses.
>
> The Twenty Minute Walk: 20-minute walk equates to approximately 1 mile walking at a fast pace; however, the average person could walk between ¼ to ½ a mile under safe, conducive walking conditions, (e.g. sidewalks and short blocks).

[18] Get Your Walk Score - A Walkability Score For Any Address. Web. Accessed 10 Dec. 2010. <http://www.walkscore.com/how-it-works.shtml>

Merrimon Avenue

The project boundary includes an area on either side of the corridor from the intersection with I-240 north to the intersection with the Dover Road. The parcels that have direct street frontage along the corridor are the main component of the study. However, in order to truly understand the context of the corridor, information about other parcels that may not directly front the parcel may be explored. Parcels outside of City of Asheville limits, located across highways with no pedestrian crossing were excluded as well as parcels within the 1 mile buffer were located across I -240 that were not within a ½ mile radius of a pedestrian crossing were also excluded. The measure of ½ mile was used with the idea that Downtown Asheville may have a larger appeal than other pedestrian crossing elsewhere; in those cases ¼ mile increments were used. Map 3.1 represents the initial study area while Map 3.2 illustrates the actual study area once barriers and connections were taken into consideration.

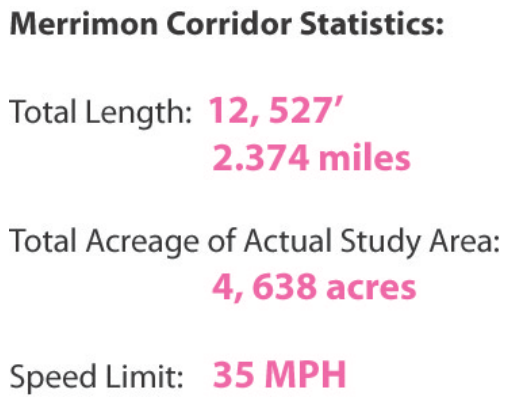
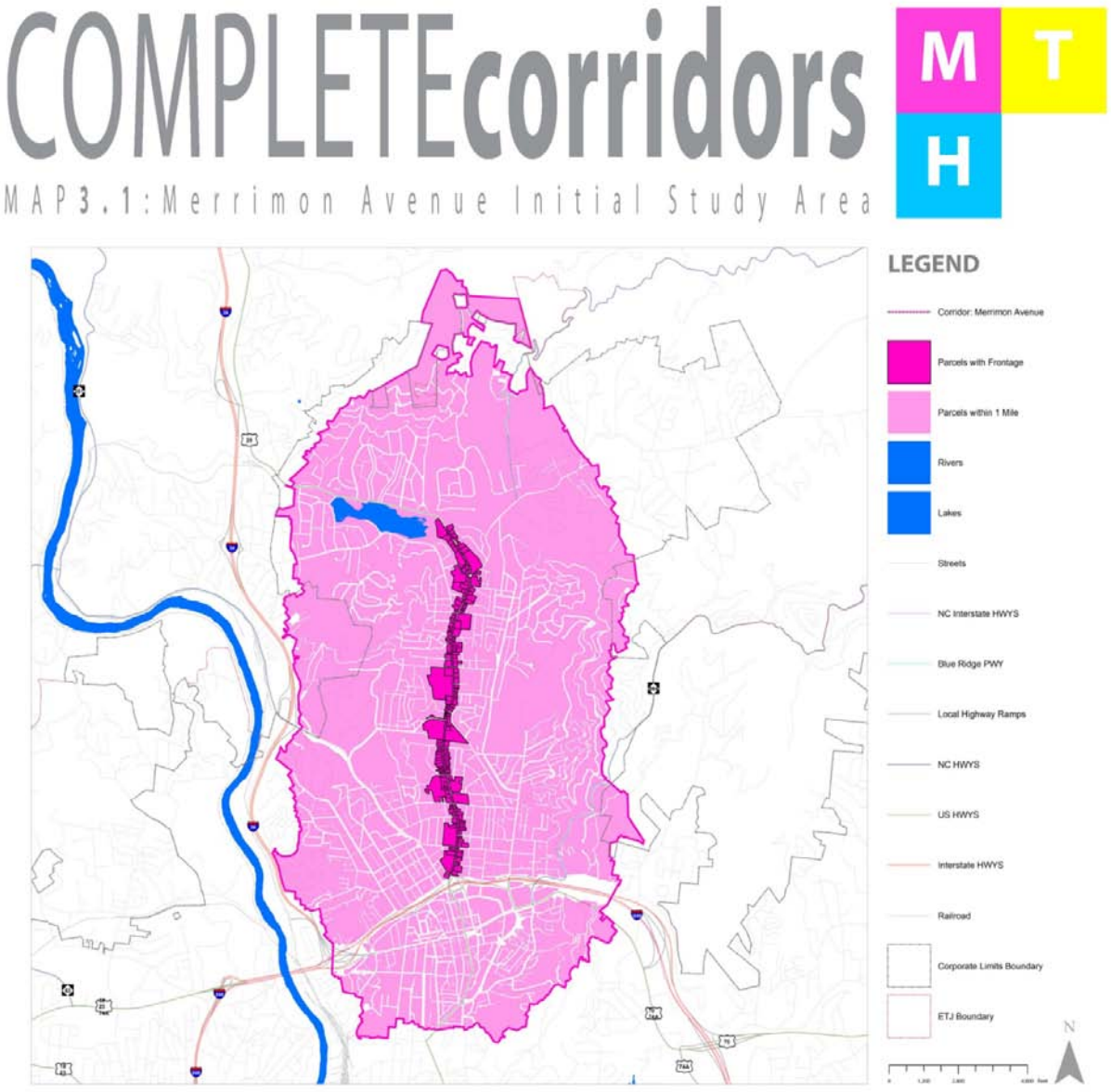
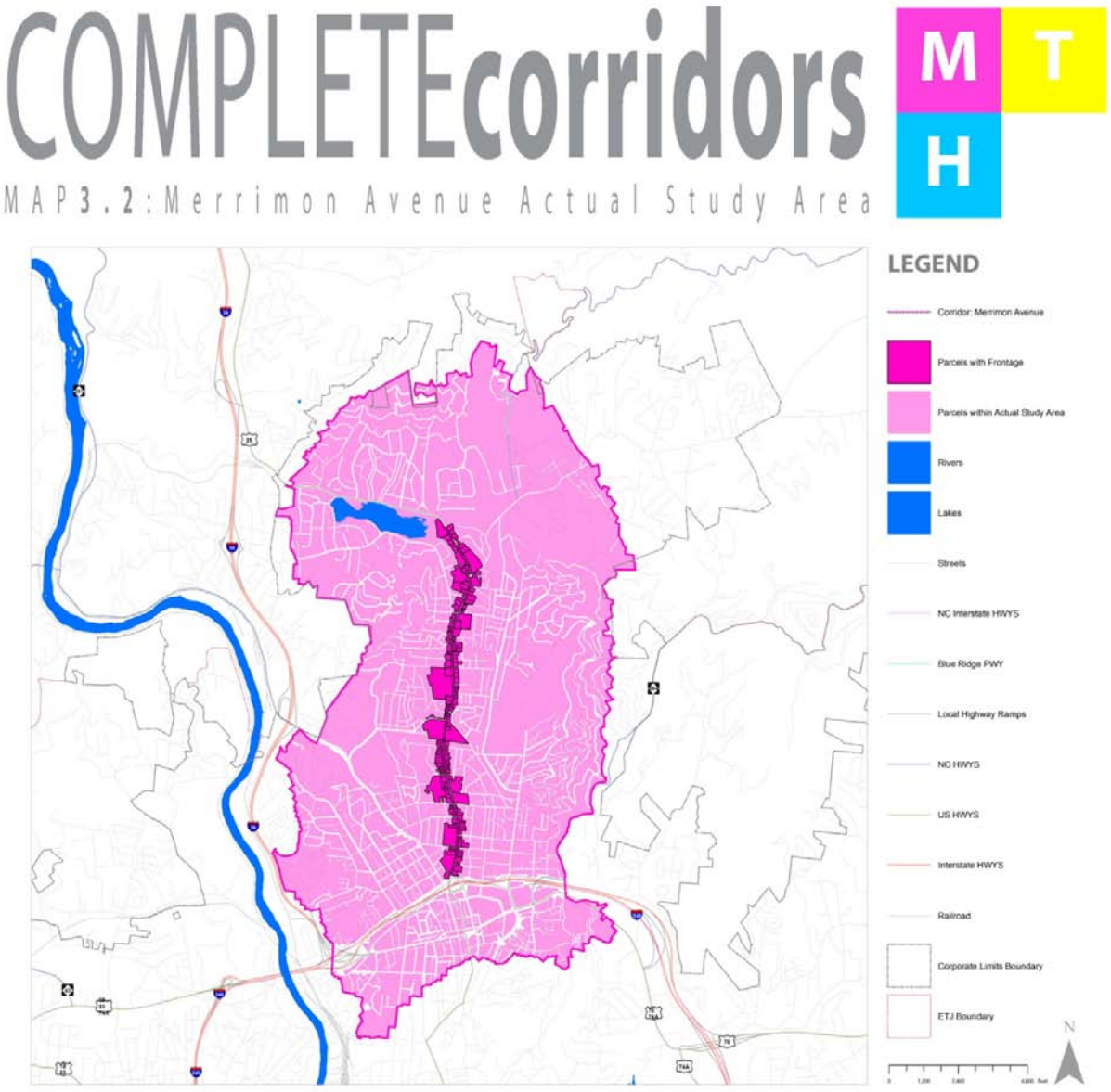


Figure 3.2: Merrimon Corridor Statistics. Data Source: COA GIS data.



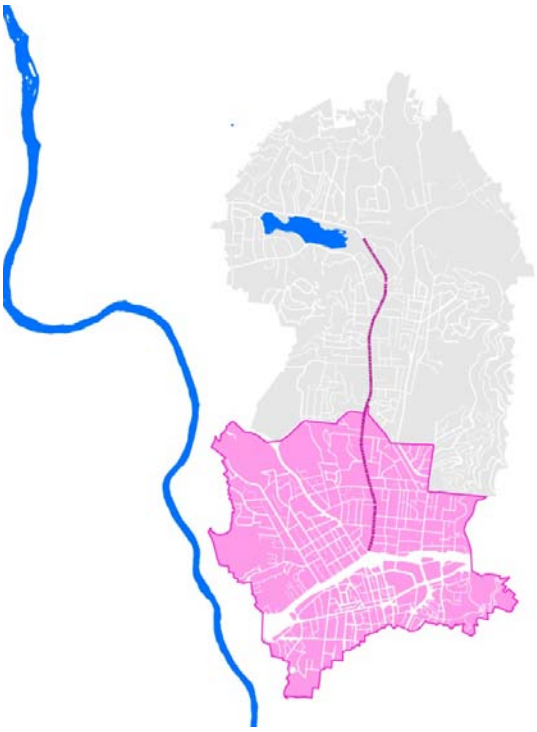
Map 3.1: Merrimon Avenue Initial Study Area. Data Source: COA GIS data. Created by L. Graham Stewart.



Map 3.2: Merrimon Avenue Actual Study Area. Data Source: COA GIS data. Created by L. Graham Stewart.

Merrimon Avenue corridor was then divided into three study areas based on their contextual similarities, their unique character and consultation with the City of Asheville Planning Department. Contextual similarities such as setbacks, barriers and character of the built environment were derived from a windshield survey by the author, as well as exploration of the area on foot and by using aerial photographs.

Merrimon Avenue Study Area A portion of the corridor stretches from the I-240 bypass to the intersection of WT Weaver Boulevard and Murdock Avenue. This Study Area is bound by Town Mountain Road to the east, I-26 to the west, approximately two blocks past Pack Square to the south and WT Weaver Boulevard and Murdock Avenue to the north (Figure 3.3). Once a windshield survey and site visits were completed by the author, the initial descriptions of the corridors' study area was that this section of the corridor encompasses a large portion of the downtown; it also includes one of the oldest neighborhoods in Asheville, Historic Montford. This study area is the most urban of all the study areas.



Average Lot Size (along corridor):
Merrimon Avenue Study Area A: 0.94ac

Average Length of Frontage (along corridor):
Merrimon Avenue Study Area A: 106'

Modal Year Building Built (along corridor):
Merrimon Avenue Study Area A: 1920

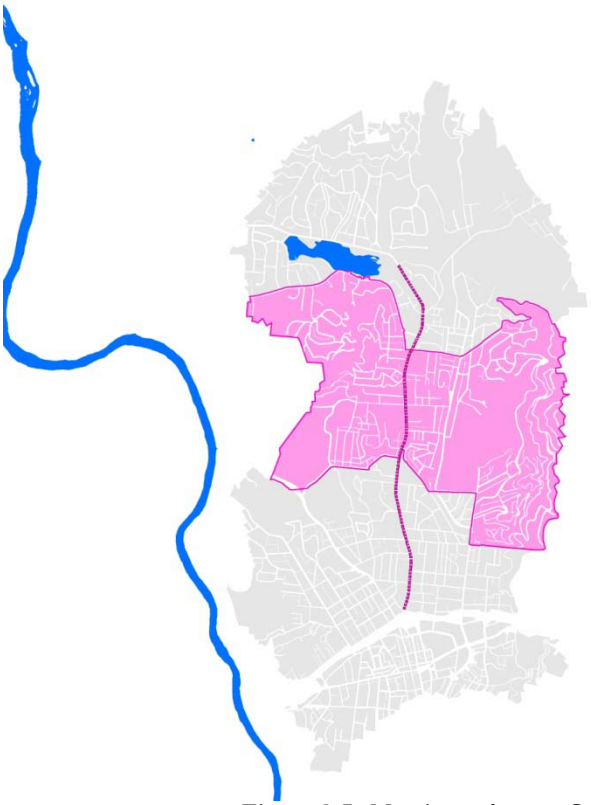
Figure 3.3: Merrimon Avenue Study Area A. Data Source: COA GIS data.

Figure 3.4: Merrimon Avenue Study Area A Statistics. Data Source: COA GIS data.

Photo 3.4: Merrimon Avenue Study Area A. Data Source: L. Graham Stewart.

Photo 3.5: Merrimon Avenue Study Area. Data Source: L. Graham Stewart.

Merrimon Avenue Study Area B portion of the corridor stretches from intersection of WT Weaver Boulevard and Murdock Avenue to Colonial Place. The study area is bound by Town Mountain Road to the east, as well as the city limits, and I-26 to the west (Figure 3.5).This section of the corridor includes the University of North Carolina's Asheville Campus and the greenway also traverses the corridor here. Many portions of the corridor have large homes that were converted into businesses, which now lie vacant. By converting residences to businesses increased front yard parking and curb cuts proliferated. One portion of the area along the corridor has two- story buildings that flank one side of the street; the remaining buildings serve as bookends to the once full block of buildings. Parking spaces between the building and the street were visible in this portion of the corridor.



Average Lot Size (along corridor):
Merrimon Avenue Study Area B: 0.73ac

Average Length of Frontage (along corridor):
Merrimon Avenue Study Area B: 112'

Modal Year Building Built (along corridor):
Merrimon Avenue Study Area B: 1949

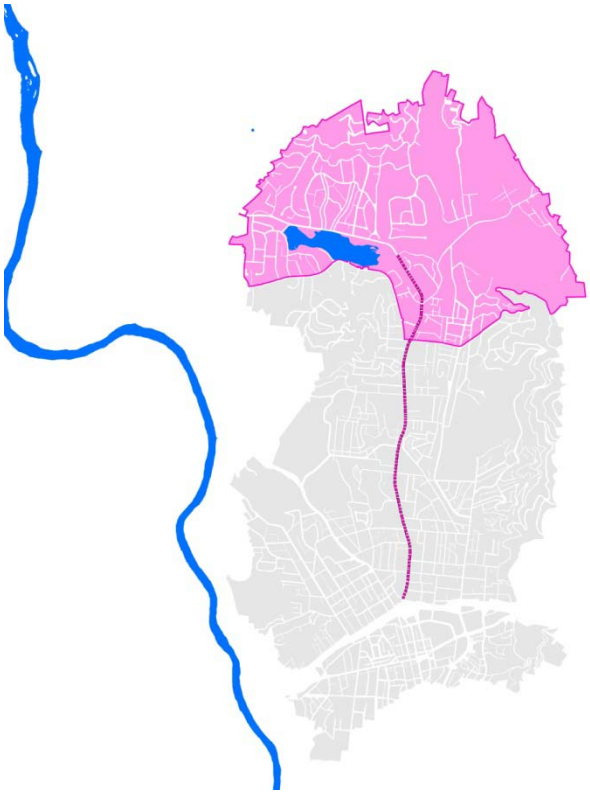
Figure 3.5: Merrimon Avenue Study Area B. Data Source: COA GIS data.

Figure 3.6: Merrimon Avenue Study Area B Statistics. Data Source: COA GIS data.

Photo 3.6: Merrimon Avenue Study Area B. Data Source: L. Graham Stewart.

Photo 3.7: Merrimon Avenue Study Area B. Data Source: L. Graham Stewart.

The Merrimon Avenue Study Area C portion of the corridor stretches from Colonial Place to Dover Street. The study area is bound by Town Mountain Road to the east, Elkmont Road and I-25 to the west, and Brookwood Road the north (Figure 3.7) and is the most suburban portion of the Merrimon Avenue corridor. Strip commercial development and large parking lots flank the corridor. Banks with drive-thru services are prevalent; the public library is visible. The Beaver Lake neighborhood is just to the north of study area. A school, churches and retaining walls line the street's edge.



Average Lot Size (along corridor):
Merrimon Avenue Study Area C: 1.12ac

Average Length of Frontage (along corridor):
Merrimon Avenue Study Area C: 163'

Modal Year Building Built (along corridor):
Merrimon Avenue Study Area C: 1969

Figure 3.7: Merrimon Avenue Study Area C. Data Source: COA GIS data.

Figure 3.8: Merrimon Avenue Study Area C Statistics. Data Source: COA GIS data.

Photo 3.8: Merrimon Avenue Study Area C. Data Source: L. Graham Stewart.

Photo 3.9: Merrimon Avenue Study Area C. Data Source: L. Graham Stewart.

Haywood Road

The project boundary includes an area on either side of the corridor from the intersection with Patton Avenue, south and then east to the French Broad River. The parcels that directly have street frontage along the corridor are the main component of the study. However, in order to truly understand the context of the corridor, information about other parcels that may not directly front the parcel may be explored. Parcels outside of City of Asheville limits, located across highways, streams or rivers with no pedestrian crossing were excluded. Parcels within the 1 mile buffer, located across Patton Ave and the French Broad River that were not within a 1/4 mile radius of a pedestrian crossing were also excluded. Map 3.3 represents the initial study area while Map 3.4 illustrates the actual study area once barriers and connections were taken into consideration.

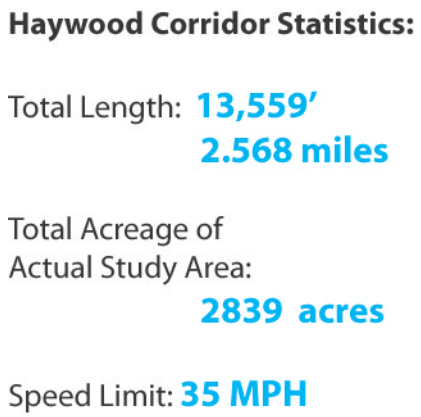
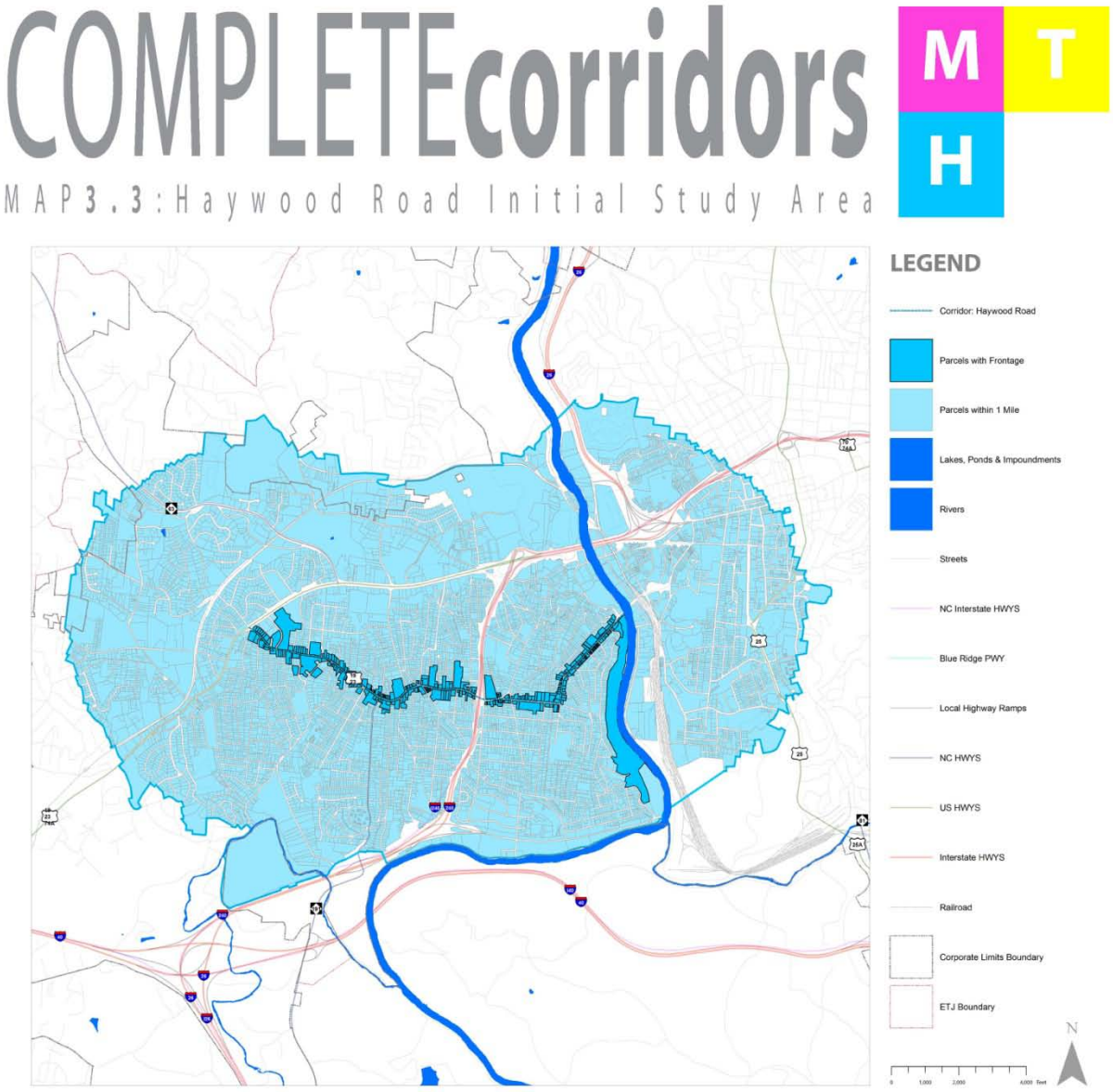
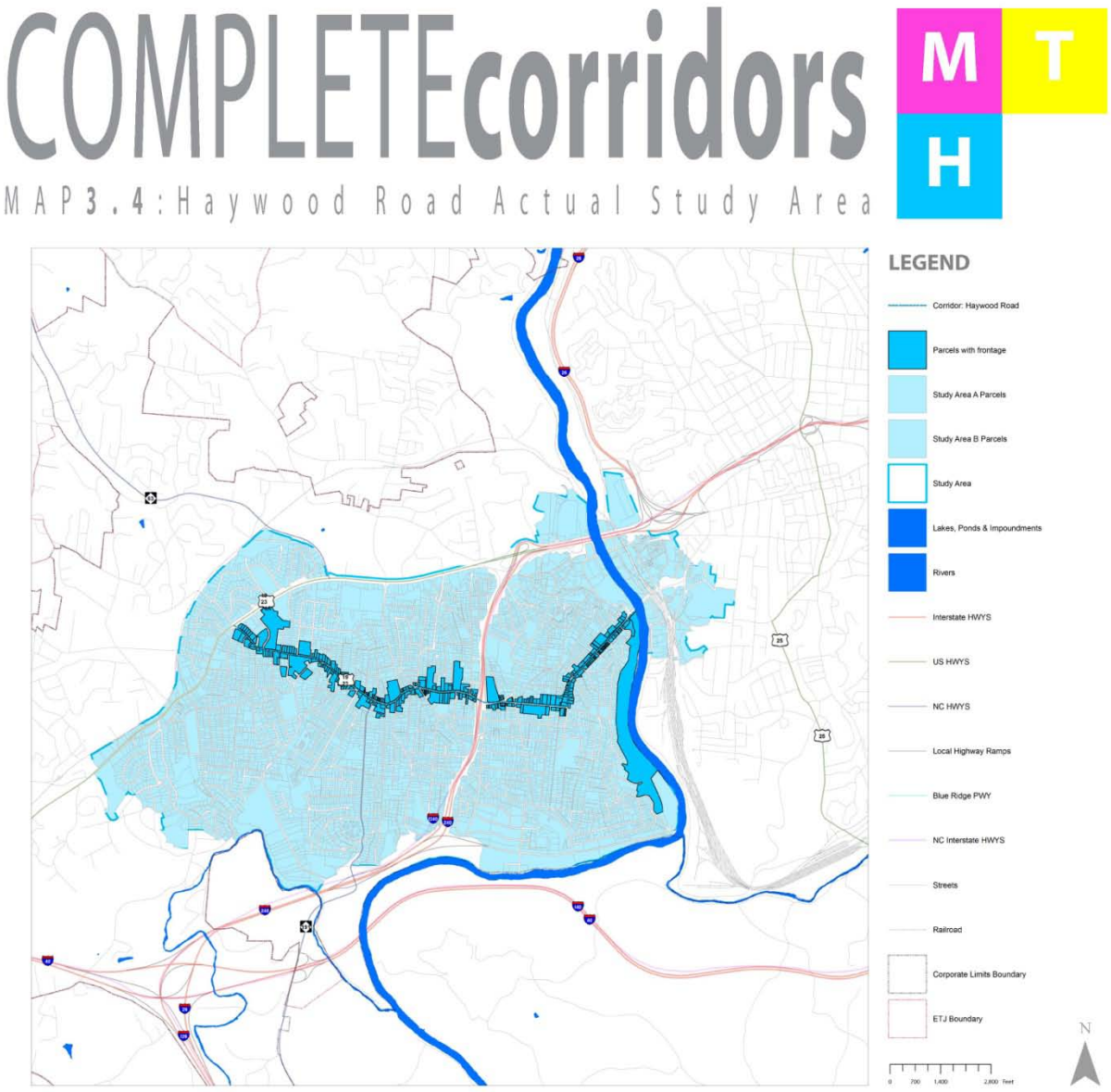


Figure 3.9: Haywood Corridor Statistics. Data Source: COA GIS data.



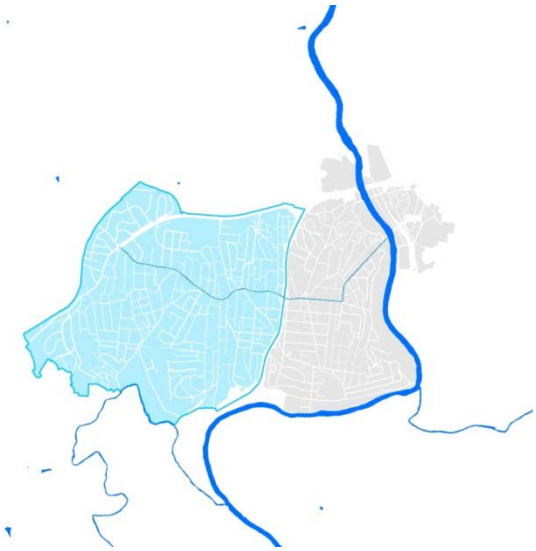
Map 3.3: Haywood Road Initial Study Area. Data Source: COA GIS data. Created by: L. Graham Stewart.



Map 3.4: Haywood Road Actual Study Area. Data Source: COA GIS data.
.Created by L. Graham Stewart.

The Haywood Road Study Area was divided into two study areas based on their contextual similarities, and unique character as well as consultation with the City of Asheville Planning Department. Contextual similarities such as setbacks and general character of the built form were derived from a windshield survey of the area. The author also explored of the area on foot and used aerial photographs to broaden understanding of the area.

The Haywood Road Study Area A portion of the corridor stretches from Patton Avenue to the I-240. The study area is bound by Patton Avenue to the west and north and I-240 to the east and south (Figure 3.9). This portion is vibrant with pedestrian use and bicyclists. Pockets of two-story buildings create a defined pedestrian realm; with little to zero setbacks, large display windows, and on-street parking create the most pedestrian friendly environment of all the corridors. Some mixed-use buildings appear to be empty. As the corridor approaches Patton Avenue, setbacks and parking increased between the building and the street. Few strip commercial centers are present; local small businesses dominate the streetscape.



Average Lot Size (along corridor):
Haywood Road Study Area A: 0.47ac

Average Length of Frontage (along corridor):
Haywood Road Study Area A: 179'

Modal Year Buildings Built (along corridor):
Haywood Road Study Area A: 1927

Figure 3.10: Hywood Road Study Area A. Data Source: COA GIS data.

Figure 3.11: Haywood Road Study Area A Statistics. Data Source: COA GIS data.

Photo 3.10 - 3.14: Haywood Road Study Area A.
Data Source: L. Graham Stewart.

The Haywood Road Study Area B portion of the corridor stretches from I-240 to the French Broad River. This Study Area is bound by I-240 to the west, the French Broad River to the south and east. The study are also includes parcels approximately two blocks past the river and the Westgate shopping center (Figure 3.11). This section of the corridor is also vibrant with pedestrian use and bicyclists. Pockets of two story buildings line the street, large display windows, and on-street parking engender the most pedestrian-friendly environment of all the corridors. However some mixed use buildings appear to be empty. This corridor appears to have once been industrial in some areas. As the corridor approaches the River, sidewalks become less consistent and steep vacant residential lots line one portion of the road.

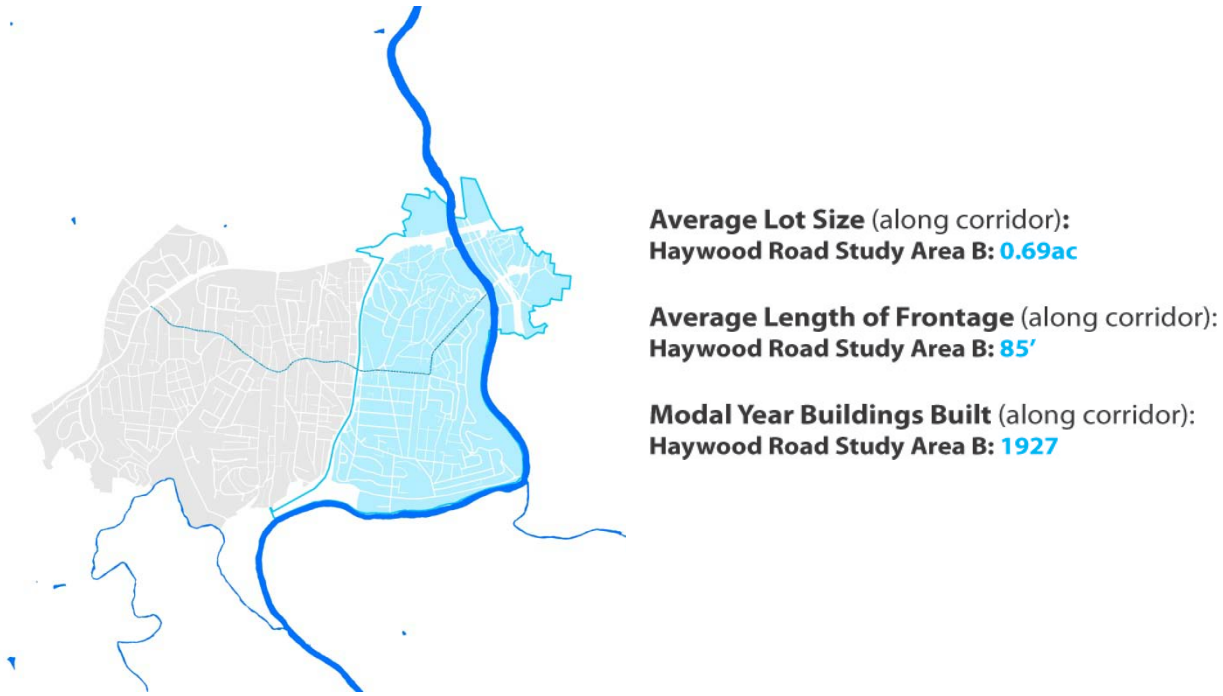


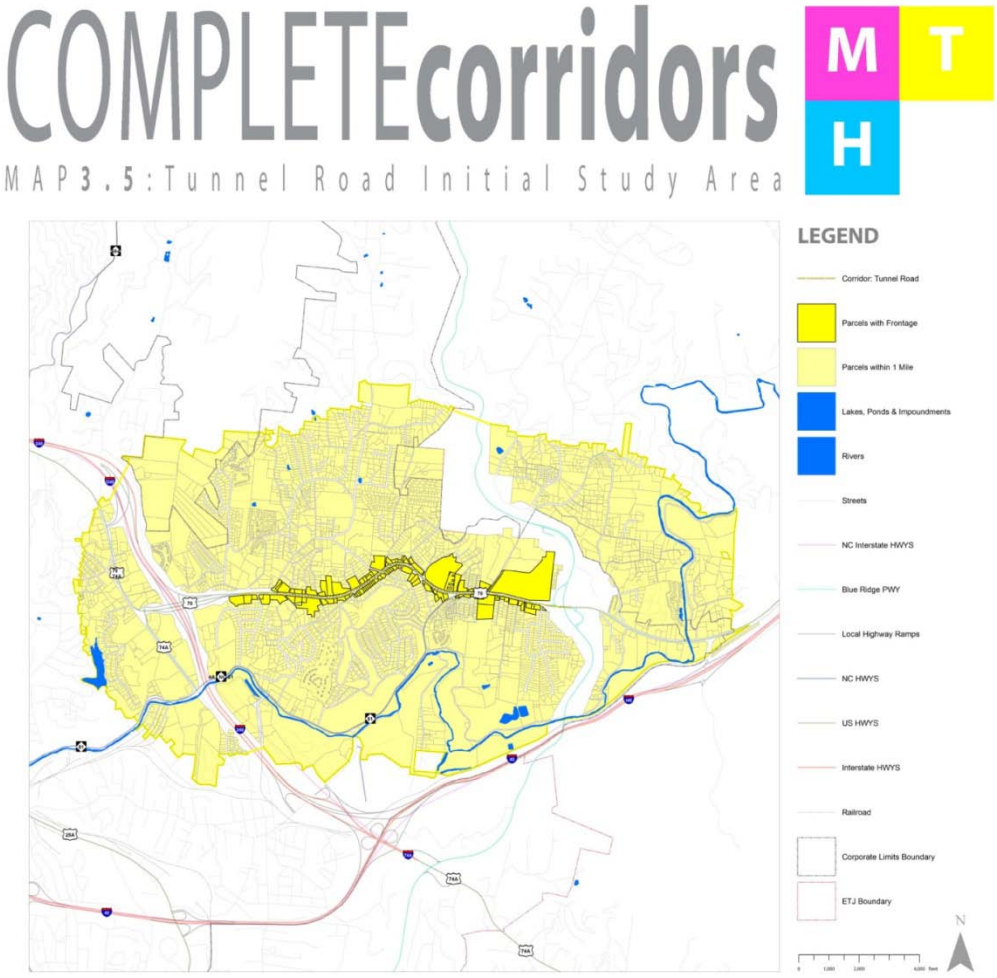
Figure 3.12: Haywood Road Study Area B. Data Source: COA GIS data. Created by: L. Graham Stewart.

Figure 3.13: Haywood Road Study Area B Statistics. Data Source: COA GIS data. Created by: L. Graham Stewart.

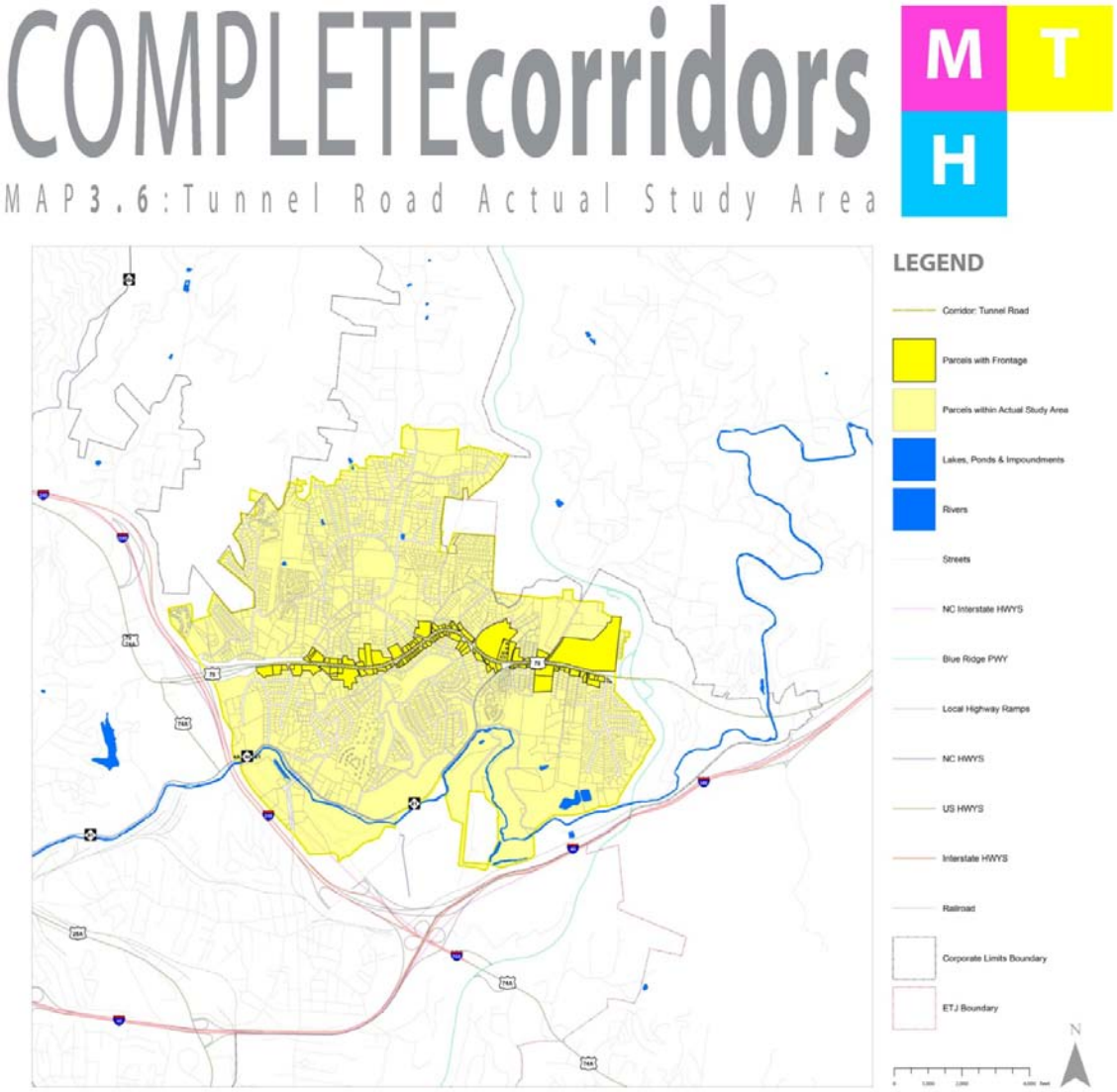
Photo 3.15 - 3.18: Haywood Road Study Area B.
Data Source: L. Graham Stewart.

Tunnel Road

The project boundary includes an area on either side of the corridor from the intersection with I-240 West, east to the intersection of the Blue Ridge Parkway. The parcels that have street frontage along the corridor are the main component of the study. However, in order to truly understand the context of the corridor, information about other parcels that may not directly front the parcel may be explored. Parcels outside of City of Asheville limits, located across highways with no pedestrian crossing were excluded. Map 3.5 represents the initial study area while Map 3.6 illustrates the actual study area once barriers and connections were taken into consideration.



Map 3.5: Tunnel Road Initial Study Area. Data Source: COA GIS data. Created by L. Graham Stewart.



Map 3.6: Tunnel Road Actual Study Area. Data Source: COA GIS data. Created by L. Graham Stewart.

Tunnel Corridor Statistics:

Total Length: 11,719'
2.210 miles

Total Acreage of
Actual Study Area:
2,490 acres

Speed Limit: 45 MPH

Figure 3.14: Tunnel Road Corridor Statistics. Data Source: COA GIS data. Created by: L. Graham Stewart

The Tunnel Road corridor was then divided into two study areas based on their contextual similarities, their unique character as well as consultation with the City of Asheville Planning Department. Contextual similarities such as setbacks, character of the built form were derived from a windshield survey of the area, exploration of the area on foot and aerial photographs.

The Tunnel Road Study Area A portion of the corridor stretches from the I-240 bypass to the intersection of Beverly Road. This study area is bound by Beverly Road to the east, I-240 to the west, approximately one mile to the north of the corridor and State Road 81 and Swannanoa River to the south (Figure 3.14).

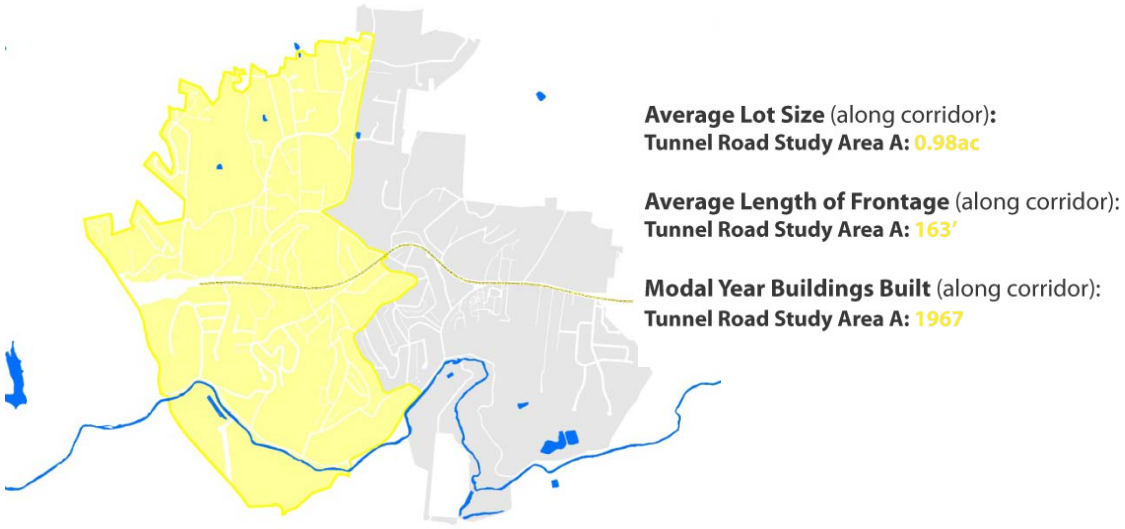


Figure 3.15: Tunnel Road Study Area A. Data Source: COA GIS data.

Figure 3.16: Tunnel Road Study Area A Statistics. Data Source: COA GIS data.

The Tunnel Road Study Area B portion of the corridor stretches from Beverly Road and the Blue Ridge Parkway. This study area is bound by Beverly Road to the west, the Blue Ridge

Parkway to the east and north and State Road 81 and Swannanoa River to the south (Figure 3.16).

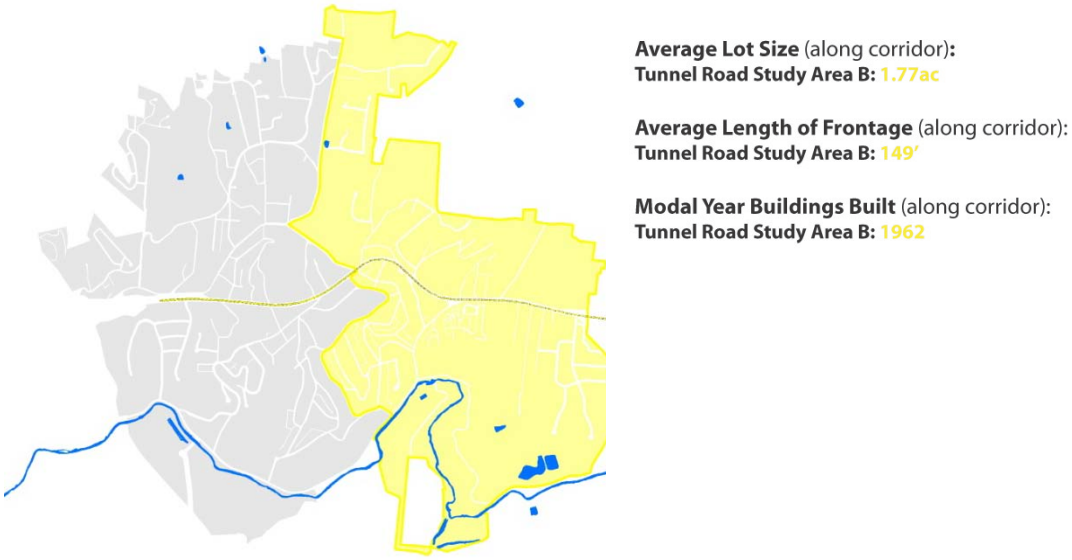


Figure 3.17: Tunnel Road Study Area B. Data Source: COA GIS data.

Figure 3.18: Tunnel Road Study Area B Statistics. Data Source: COA GIS data.

Both Tunnel Road Study Areas A & B were the most difficult to examine physically because of the lack of pedestrian infrastructure and the high speed limit for vehicular traffic. Strip commercial centers, car dealerships and gas stations dominate the street edge. The high levels of auto-centric uses impede the street edge definition.

Photo 3.19 - 3.22: Tunnel Road Study Area A. Data Source: L. Graham Stewart.

Photo 3.23 - 3.27: Tunnel Road Study Area B. Data Source: L. Graham Stewart.

CHAPTER 4

THE INDEX

Categories of Connections

The index for COMPLETEcorridors will be derived from on existing methodologies for sustainability, walkability, access to transit and land uses. These are taken from existing indexes and guided by previous plans and policies. The index created and used in the study will be an amalgamation of these existing methods but refined to be applicable to the corridors within the study and corridors similar in character. The COMPETEcorridors' index focuses on connections: connections to utilities, developed land, land uses, buildings, sidewalks etc. It also considers limiting these connections in areas not suitable for higher density developments. Fostering these connections, while limiting connections in other areas could lead to a more sustainable city. The elements used are based on existing indexes, studies and Asheville's desires found in previous and relevant plans.

The elements are arranged into four categories of connections:

Location, Location, Location

Land Use

Multi-Modal

Neighborhood Pattern, Design & Character

The *Location, Location, Location* category analyses the study areas connections to utilities, developed land, and high priority area(s). Limited connections to environmentally

sensitive land were also examined for each corridor and their study areas. Areas identified for sustaining wildlife and biodiversity, agriculture and water quality were considered as environmentally sensitive land.

The *Land Use* category examines the corridors' connections to employment, density, housing types, services, mix-use, schools, civic or passive-use space and community –based food production for each corridor's study areas.

The *Multi-Modal* category explores the corridors' connections for transit, bicycles, and pedestrians for each corridor's study areas.

The *Neighborhood Pattern, Design & Character* category analyses the corridors' connections that manifest themselves in physical characteristic such as intersections, blocks, on-street parking, parking lot locations, direct paths, building setbacks, fenestration, height-to-street ratios, drive-thru, and shade for each corridor's study areas. Character was also examined through presence of established boundaries, existence of art, existence of gateways/ wayfinding and history.

It should be noted that the built and natural environment are interdependent and so are the elements of the index. Their organization was determined based on research in other communities and other indexes, as well as observations made by the author. In order to make the information more accessible to readers and users of the study, the elements of the index have also been divided into four categories of infrastructure type.

Gray, Green, Blue and Neighborhood Infrastructure

Infrastructure is defined as the basic, underlying framework or features of a system or organization. Planners and other design professionals divide neighborhoods, cities and regions

into two categories: the built and natural environment. This is done to critique, analysis and develops a broader and deeper understanding between the two entities.

The infrastructure categories are as follows: The built environment, also known as the *gray infrastructure* consists of buildings, roads, parking lots, sidewalks, bike paths and utilities. *Green infrastructure* includes parks, natural areas, trees, shrubs and grass. *Blue infrastructure* consists of water bodies; among them rivers, streams, lakes and wetlands. *Neighborhood infrastructure* is considered to be the 'personality' of a place or its intangible qualities. Although these aspects of place that combine to give it character are difficult to quantify qualities are just as important as the Grey, the Green and the Blue. James Rojas, architect and planner said that designers "have missed the role of people in creating a 'place' because they are trained to look at people as users of space…People are both users and creators of place."[19] People make the place. The existence of neighborhood infrastructure will be mentioned but will not be quantified in this index.

The index is divided into these four categorizes connections; those aspects that create the connections are the grey, the green, the blue and the neighborhood infrastructure (Table 4.1). Each type of infrastructure is then broken down further into the elements used to construct the COMPLETEcorridors index. This will help communicate how Merrimon Avenue, Haywood Road and Tunnel Road measure up.

[19] Hayden, Dolores. *The Power of Place: Urban Landscapes as Public History.* MIT Press, 1995.

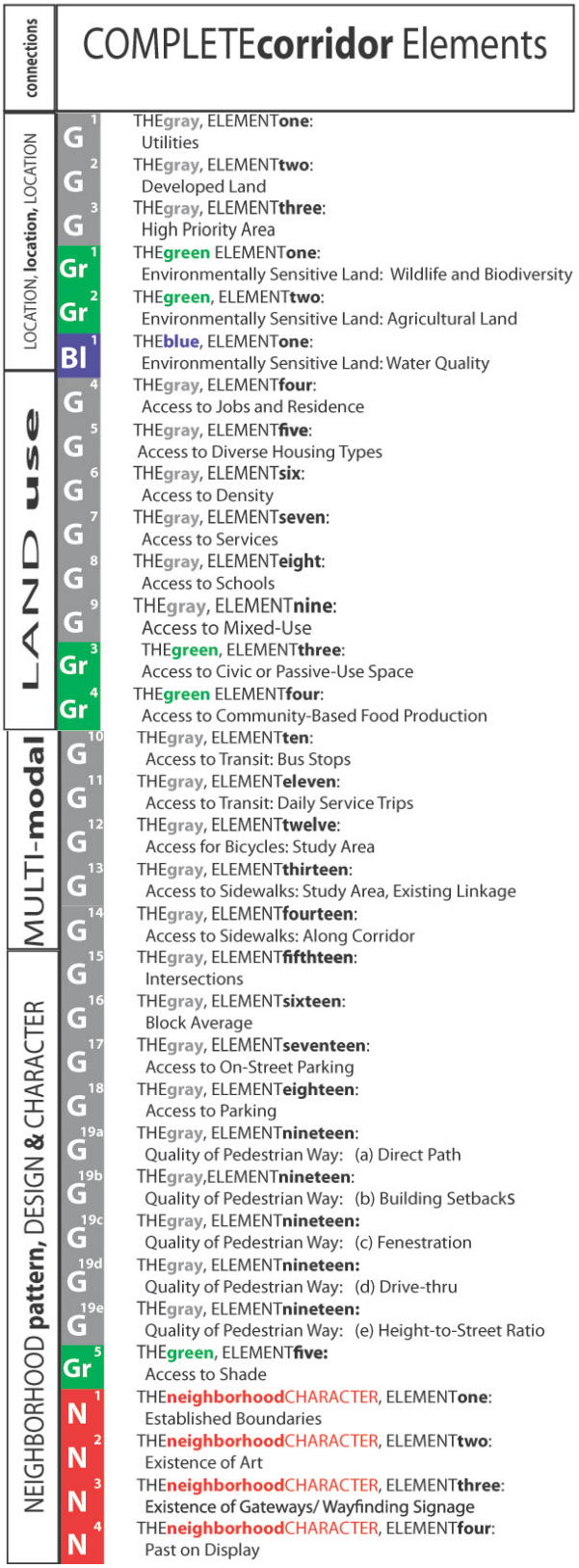


Table 4.1: COMPLETEcorridor Elements. Data Source: Created By L. Graham Stewart

The Icon

The index will illustrate, articulate and guide capital improvements, inform development choices and provide incentives that encourage the evolution to 'complete' neighborhoods. The index will utilize an icon to help simplify this complex process of measuring the corridors. The icon's color represents the infrastructure type. The corridor name is signified by the largest letter on the icon; which corresponds to the first letter in the corridors' name. The smaller letters located to the right represent that particular corridor's study area. The number located in the right, top corner of the icon represents the element number.

The index's pages consist of type of infrastructure, the element number and name and the use of the element, the measure being used, the measurement, an explanation (if needed) and the findings for each corridor. Each corridor's overall character is summarized at the end of the elements page(s) using the icon.

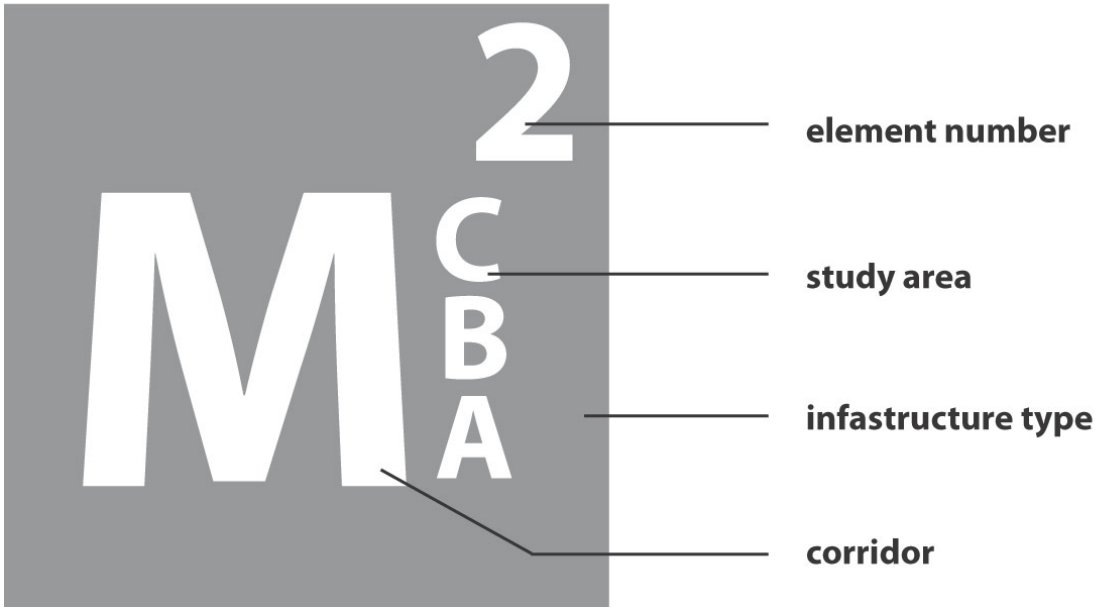


Figure 4.1: COMPLETEcorridor Icon. Data Source: Created By L. Graham Stewart

CHAPTER 5

FINDINGS

Conclusion

According to the COMPLETEcorridors' index the corridors' study areas rankings from highest to lowest are as follows (calculations and weighting can be found in Figure 5.1: COMPLETEcorridors's Index Findings):

Merrimon Avenue Study Area A: 29.5

Haywood Road Study Area A: 23

Haywood Road Study Area B: 19

Merrimon Avenue Study Area C: 12.75

Merrimon Avenue Study Area B: 10.75

Tunnel Road Study Area B: 6

Tunnel Road Study Area A: 5

With attention to this particular layer of urban morphology (corridors), we are able to have a broader impact across the various sizes and complexities amongst the study areas. These corridors or study areas are "large enough in scale to intrigue and question the systems, networking and planning, yet small enough in scale and built from sufficiently small enough parts to require design. Issues of design and the relationship of well- designed parts to well-planned systems are both visible and manageable. They challenge us to think and work across scopes (from regions to rooms), across disciplines (from environmental science to economics),

and across professional domains (from planning to real estate development)."[20] The idea is for the sustainable, COMPLETEcorridor changes to start a ripple effect that grows and expands to the larger layers but also adjusts to the smaller levels of urban morphology, the neighborhood and eventually the parcel layer. The placement of a building, parking, or installation of a sidewalk, and the planting of a tree affect not only these isolated decisions, but they are part of interdependent built and natural environment, and these systems shape our future for the generations to come. And if nothing more the study strives to illustrate and articulate the delicate balance and the idiosyncrasies of the built and natural environment need to be seen as a system, with the macro and the micro both being crucial parts.

LOCATION, location, LOCATION

Proper location is necessary for a COMPLETEcorridor, which will contribute to COMPLETEneighborhoods. More complete neighborhoods will then contribute to a COMPLETEasheville. The proper location embodies the goals and objectives identified in the existing plans and polices for the City of Asheville of:

- Incorporate sustainability into the City decision making process.
- Increase property investment, particularly along our commercial corridors;
- Increase accommodation of population growth within the City, particularly along commercial corridors, in compatible neighborhood infill, and in urban villages;
- Increase safe multi-modal transportation opportunities;
- Preserve the unique character of Asheville;

[20] Kellett, Cynthia Girling and Ronald. *Skinny Streets & Green Neighborhoods: Design for Environment and Community*. Washington DC: Island Press, 2005. Print.

- Encourage development that occurs in a pattern that is sensitive to the natural environment.

This connection category of LOCATION, location, LOCATION demonstrated that all corridors' study areas were in the proper location to be considered for development, redevelopment and/or investment.

The Road and beyond…

These corridors are in the right place, so the next step for Asheville would be to focus on the elements that define these areas more than any other characteristic, the road itself. Although previously mentioned in the *Asheville City Development Plan 2025 Comprehensive Plan* that the City should work with NCDOT and adopt a Complete Street Policy, this study only reinforces that previously stated need. It would also be beneficial to take a broad view of the City's corridors with the intention of articulating a consistent approach to applying guidelines for corridor management. Context sensitive approaches are warranted based on urban, suburban, and rural characteristic. There are numerous plans that look at sidewalks, bicycle lanes, transit, roadways, etc. A useable, working document compiled by a multi-disciplinary task force (by staff persons representing departments such as the Sustainability Office, Planning, Transit, Transportation and Public Works, Public Utilities, Landscape Management, etc) should be created for the purpose of:

- Develops a systematic approach to corridor improvement projects that address all users
- Improve and/or maintain appearance of cities' roadways
- Identify gateway opportunities

- Establish clear expectations for (public and/or private) development of ROW outside of the travel lanes
- Reinforce character and identity of Asheville.

This manual should look at the roadways from various perspectives- the engineer, the planner, the arborist, the walkers, the bicyclist, the commuter, the bus rider, neighborhood members, the tourist etc….

Appropriate design speeds, context sensitive street design, street trees, landscape verges, landscape medians and road diets are design choices that need to be considered in the roadway requirements overhaul. This is by far the most ambitious approach and most likely the most expensive. But the results would have the largest breadth. Reconstructing our notion that form and cities are difficult to modify is key component to positive change. But strategic urban policies and infrastructure investments can lead, in a finite time, to a re-shaping of cities to a more positive and sustainable form. Funding to assist with these recommended steps exists and should be explored.

Recommendation:

- Adopt a Complete Streets Policy;
- Create and implement a Design Manual for Asheville's roadways.

NEIGHBORHOOD Pattern, DESIGN & CHARACTER

In order for the City of Asheville's to meet their sustainable goals of "making decisions that balance the values of environmental stewardship, social responsibility and economic vitality to meet the city's present needs without compromising the ability of future generations to meet their needs."[21] it is essential to understand that the connection to the physical built environment

[21] Asheville, City of. *Sustainablity Management Plan*. (2009). Web. Accessed 5. Dec. 2010. <http://www.ashevillenc.gov/docs/sustainability/AVL.Sust.Plan.pdf>

such as intersections, blocks, on-street parking, parking lot locations, direct paths, building setbacks, fenestration, height-to-street ratios, drive-thru, and shade can/will impact use, users and adjacent properties of a place. Social connections may also be enhanced and/or hindered with these physical connections.

Physical design that enhances the connections between the spatial and social realm is a key component to a COMPLETEcorridor although not always visible or obvious and as such, they will be listed thought the conclusion when appropriate.

MULTI-modal

In order for the City of Asheville's sustainable goals to be met it is essential to foster physical connections to employment, density, housing types, services, mixed-use, schools, civic or passive-use space and community –based food production were examined for each corridor's study areas. The COMPLETEcorridors' element for multi-modal examines the corridors from the built environmental perspective in order to:

- Encourage development within and near existing communities and public transit infrastructure
- Reduce vehicle trips and vehicle miles travelled (VMT).
- Reduce the incidence of obesity, heart disease, and hypertension by encouraging daily physical activity associated with walking and bicycling.

Alternative transportation options lead to a more vibrant and sustainable community. In terms of opportunity for alternative transportation options Merrimon Avenue Study Area A has the highest percentage of access to public transit, largest amount of existing sidewalks and existing bicycles facilities but it was also the area identified by the City of Asheville Pedestrian Plan and the 2008 Comprehensive Bike Plan as one of the areas with the most needed linkage.

This is noted to demonstrate that there are areas of improvement even thought Study Area A has the most COMPLETEcorridor score. Travelling north at the Merrimon Avenue from Study Area A thorough Study Area B to Study Area C the building setbacks transition away from the right-of-way, and so do the COMPLETEcorridor scores for Merrimon Avenue, the link between the physical environment and walkablility/ bike-ability scores become apparent..

Haywood Road Study Area A and Study Area B received a high and moderate score with access to public transit, respectively. Both received moderate scores in terms of existing bicycle facilities. High and moderate in terms of existing pedestrian infrastructure but the 'needed linkage' was one of the highest in Study Area A and moderate in Study Area B, there are definitely areas for improvement. Haywood road had the most pedestrians, bicyclist traffic, and transit users during the observation. Perhaps the existing urban form of shallow setbacks with larger amount of fenestration, access to mixed-use, small block lengths, on-street parking contributes to the corridors activity.

Tunnel Road's lack of pedestrian facilities is obvious, i.e the desire lines that flank the right-of way. The large street width, limited crosswalks, large setbacks and lack of services all contribute to the corridors low ranking in the COMPLETEcorridors' index. However while observing Tunnel Road a number of sidewalks were being installed along Study Area A. This will enhance pedestrian safety but this is only one aspect of walkablity other physical characteristics of the built environmental are still lacking. Encouraging redevelopment or development along the corridor that enhances not detracts from the public realm.

Continue bicycle and sidewalk infrastructure installation. With redevelopment requirements of sidewalk installation along parcel street frontage triggered, perhaps bicycle infrastructure should also be required. Viewing these components of circulation with the same fervor as vehicular

traffic might lead to a better overall design for the parcel. During the development review process vehicular circulation plans are sometime requested for view. Requiring a pedestrian and cycling plan could enable the designer and the review to see the plan from a comprehensive transportation plan. How a pedestrian navigates through parking to the sidewalks to the bus stop or once the cyclist arrives where they can store their vehicle- are just some of the possible scenarios that could be brought to light.

One way to encourage alternative transportation choices is through incentives and education. The City of Asheville currently is promoting and incentives city employees to employ alternative transportation choices perhaps this same idea could be filtered out into the other employers in the Community. P artner with business leaders and owners on w ays of incentivizing their employees to change their means for commuting to work (well over half of jobs within the city are held by those whom live outside). Promote and offer education to community members and visitors on a lternative transportation options. W ebsites, maps, promotional materials that articulate and explain information in an articulate and pleasing manner can be effective. 'Testing' these methods on us ers can illuminate shortfalls and successes.

Incentivize shared parking opportunities and reducing parking requirements can contribute to alternative transportation choices as well as the reduction of stormwater runoff. Incentivize pervious pavement use, increase ratio of tree islands to parking spaces and plant more street trees.

A roadways purpose needs to serve more than vehicular traffic, access to and for, bicycles, and pedestrians. Encouraging infrastructure that promotes those ideas is essential to a COMPLETEcorridor, which will then contribute to COMPLETEneighborhoods. More complete

neighborhoods can then contribute to a COMPLETEasheville. Making the 'right thing to do the easy thing to do' can transform a person's habits and ideas of social norms. Begin with the roadways, which will serve as a catalyst for COMPLETEcorridors, but this is only one of the many aspects needed.

Recommendations:

- Consider the possibility of requiring an alternative transportation plan for projects during the plans review process
- Partner with business leaders and owners on incentives that change employees means of commuting to work
- Promote and Educate community members and visitors on alternative transportation options
- Encouraging redevelopment or development along the corridor that enhances not detracts from the public realm
- Incentivise shared parking opportunities
- Incentivize pervious pavement use
- Increase the ratio of tree islands to parking spaces
- Plant street trees.

LANDuse

In order for the City of Asheville's sustainable goals to be met, it is essential to foster spatial connections to employment, density, housing types, services, mix-use, schools, civic or passive-use space and community –based food production were examined for each corridor's study areas. The COMPLETEcorridors' elements for ;and use examine the corridors from the built and natural environmental perspective in order to:

- Encourage development within and near existing communities and public transit infrastructure
- Reduce the incidence of obesity, heart disease, and hypertension by encouraging daily physical activity associated with walking and bicycling
- Encourage development in existing areas to conserve land and protect farmland and wildlife habitat, promote livability, walkablility, and transportation efficiency, including reduced vehicle miles travelled (VMT)
- Improve public health encouraging daily physical activity associated with alternative modes of transportation and compact development
- Promote community interaction and engagement by integrating schools into the neighborhood
- Support students' health by encouraging walking and bicycling to school
- Improve physical and mental health and social capital by providing a variety of open spaces close to work and home to facilitate social networking, civic engagement, physical activity, and time spent outdoors
- Promote community-based food production, improve nutrition through increased access to fresh produce, support preservation of small farms producing a wide variety of crops, reduce the negative environmental effects of large-scale industrialized agriculture, and support local economic development that increases the economic value and production of farmlands and community gardens.

Access to employment, density, housing types, services, mix-use, schools, civic or passive-use space and community –based food production is essential to a COMPLETEcorridor, which can

then contribute to COMPLETEneighborhoods. More complete neighborhoods can then contribute to a COMPLETEasheville.

In the LANDuse connections category the elements of density (THEgray, ELEMENTfour: Access to Jobs and Residence, THEgray, ELEMENTfive: Access to Diverse Housing Types, THEgray, ELEMENTsix: Access to Density) can be esoteric. Density is one of those elements that all corridors and study areas could improve upon. The study found that 14.2 persons per acre reduce automobile dependency considerably however Asheville highest ratio of people per acre within the study area was nine (at the census block group level, and five at the study area level. As mentioned earlier "density is the hot button issue for sustainable urbanism. In one regard, it is a sustainability silver bullet, moving across the broad reduction in per-capita resource use. These reductions occur in proportion to increasing development density. Even better, this same density silver bullet provides local region and global benefits."[22] Many times lack of understanding causes fears. Most often if an increase of density is discussed in the public realm, neighborhoods will oppose a development with great fervor. The debate usually centers on preconceived notions of inevitable traffic congestion, expanses of parking and the aesthetics of the building rather that the actual increase in population. Perhaps the resistance comes from a lack of understanding the benefits higher densities can bring such as walkablility; a broad mix of uses, less dependency on the automobile.. According to Sustainable Urbanism: Urban Design with Nature by Douglas Farr –"the average density of most new developments in the United States is two dwelling units per acre, which is too low to support walk to destinations (1/4 mile radius)." Density is a key component in the shaping of the built environment and is typically expressed as a number of dwelling units per acre. Most zoning maps use two-dimensional maps

[22] Farr, Doug. *Sustainable Urbanism: Urban Design with Nature*. Hoboken, New Jersey: John Wiley & Sons, Inc., 2007. Print.

and color blocking to illustrate the specific characteristic of each zoning designation. Density can be difficult for communities to visualize and understand, so what if density was presented in another way—not as a color or a numerical phrase, "the number of dwelling units per acre" but relating to the scale of development, either in person or by looking at a picture. Education and incentives are powerful tools although they are often overlooked. Asheville is headed in the right direction with the Sustainable Development Project Eligibility Map which identifies properties with 1/8 mile of a high frequency transit corridor with make them possibly eligible for incentives such as density bonuses, parking reduction, etc. But perhaps more can be done. Accessory dwellings such as a in-law suite or a garage apartment are other ways to increase density while maintain a single family neighborhood character. Design is extremely important but even more so when a density development is proposed. Scale, massing, and fenestration that enhance the public realm are vital. Merrimon Avenue Study Area A is the densest of all the COMPLETEcorridor study areas and it is also the most complete, DENSITYmatters.

An increase in housing types is needed on all corridors that vary in size, income, culture and lifestyle and contribute to the economically sustainable of a neighborhood and a city as well as support community vitality and affordability.

The study shows that a higher FAR can also contributed to COMPLETEcorridors, which will allow for more mixed-use developments and higher density and possibly less impervious surface, leading to less runoff which can lead to higher water quality (it's all connected). Merrimon Avenue Study Area A, Haywood Road Study Area A & B had the highest percentages of building with a high FAR as well as higher instances of mixed-use development. The existing plans and policies had several instances of the desire for mixed- use (live-works). More often than not municipality encourages mixed-use and communities request them but it's the financing

aspect that can be the most daunting. It seems that the desire of mixed-use is not sufficient ; perhaps Planners, Developers, City Leaders, Community Members and members of the financial world need multi-disciplinary education on these obstacles, incentives, issues and opportunities that mixed-use can bring the a community- never under estimate the power of education, MIXED-USEmatters.

THEgray, ELEMENTseven: Access to Services identified nodes along Merrimon Avenue Study Area A & C and Haywood Road where neighborhood shops, services, and facilities were within ¼ mile walk distance of at least five diverse uses. These areas might be a place for an urban village to occur or to continue to be encouraged. These areas have the synergy of people and place already occurring perhaps enhancing them with density, open space, mixed-use, pedestrian facilities could contribute to a more COMPLETEcorridor and COMPLETEneighborhoods. Merrimon Study Area B did not have a node that met the criteria of at least five diverse uses within ¼ mile. However this area could be another ideal place for an urban village due to its proximity to University of North Carolina –Asheville. Tunnel Road had no nodes that met the criteria of THEgrey, ELEMENTSseven: Access to Services but at the intersection of Tunnel Road and Riceville Road (the VA hospital is also located at this intersection, one of the largest employers on the Tunnel Road corridor). There were diverse uses just not five and no pedestrian infrastructure. So perhaps this area could serve as a possible urban village location. Urban Villages could allow for more density, architecture that promotes the public realm, civic space, shared parking, access to services, etc.

Access to Schools, Civic Spaces and Community Based Food Production were highest in both Merrimon Avenue Study Areas A and Haywood Road Study Area A & B. These areas are also the oldest of the study areas, developed in an era when the automobile was not 'king.'

Tunnel Road Study Area A & B had a moderate amount of civic spaces but no pe destrian infrastructure to support the close proximity. These elements of connection categories of land use are more than just uses that foster community, and in turn offer a sense of identity. One could argue that the lack in the neighborhood character category of connection could be because of the deficiencies in this category or vice versa.

Recommendations:

- Education and continue the incentives for increasing density
- Explore accessory dwellings
- Encourage home occupations, small businesses, existing employers to locate, relocate in these areas
- Promote and allow for diverse housing type (where appropriate)
- Encourage and continue higher FAR
- Educate and incentives Mixed-Use
- Explore the idea for Urban Villages- should allow more density, architecture that promotes the public realm (i.e. high fenestration percentages, no or limited parking between the building and the street. etc.), civic space, shared parking, access to services, etc.

COMPLETEcorridors findings

MTH

M_A M_B M_C H_A H_B T_A T_B

				pts.		pts.		pts.		pts.		pts.		pts.		pts.
LOCATION, **location,** LOCATION	G 1	THE**gray**, ELEMENT**one**: Utilities	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a
	G 2	THE**gray**, ELEMENT**two**: Developed Land	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a
	G 3	THE**gray**, ELEMENT**three:** High Priority Area	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a
	Gr 1	THE**green** ELEMENT**one**: Environmentally Sensitive Land: Wildlife and Biodiversity	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a
	Gr 2	THE**green**, ELEMENT**two**: Environmentally Sensitive Land: Agricultural Land	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a
	Bl 1	THE**blue**, ELEMENT**one**: Environmentally Sensitive Land: Water Quality	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a
		LOCATION, **location,** LOCATION Total Points: **n/a** No Points Awarded, if the answer is No to any of the elements in this category then then another urban corridor should be considered.														
LAND **use**	G 4	THE**gray**, ELEMENT**four**: Access to Jobs and Residence	Moderate	1	Moderate	1	Low	0	Low	0	Low	0	Low	0	Low	0
	G 5	THE**gray**, ELEMENT**five**: Access to Diverse Housing Types	High	2	Low	0	Low	0	Moderate	1	Moderate	1	High	2	Moderate	1
	G 6	THE**gray**, ELEMENT**six**: Access to Density	High	2	Low	0	Low	0	High	2	High	2	Low	0	Low	0
	G 7	THE**gray**, ELEMENT**seven**: Access to Services	High	2	Low	0	High	2	Moderate	1	Low	0	Low	0	Low	0
	G 8	THE**gray**, ELEMENT**eight**: Access to Schools	High	2	n/a	n/a	High	2	Low	0	Moderate	1	Moderate	1	Low	0
	G 9	THE**gray**, ELEMENT**nine**: Access to Mixed-Use	Moderate	1	Low	0	Moderate	1	High	2	Low	0	Low	0	Moderate	1
	Gr 3	THE**green**, ELEMENT**three**: Access to Civic or Passive-Use Space	High	2	Moderate	1	Low	0	Low	0	Low	0	Moderate	1	Moderate	1
	Gr 4	THE**green** ELEMENT**four**: Access to Community-Based Food Production	Yes	1	Yes	1	No	0	Yes	1	Yes	1	No	0	No	0
		LAND **use** High=2 Yes= 1 Moderate=1 No= 0 Low= 0 Total Possible Points= **15**														
MULTI-**modal**	G 10	THE**gray**, ELEMENT**ten**: Access to Transit: Bus Stops	High	2	High	2	Moderate	1	High	2	Moderate	1	Low	0	Low	0
	G 11	THE**gray**, ELEMENT**eleven**: Access to Transit: Daily Service Trips	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	High	2	Moderate	1
	G 12	THE**gray**, ELEMENT**twelve**: Access for Bicycles: Study Area	High	2	Moderate	1	Moderate	1	Moderate	1	Moderate	1	Low	0	Low	0
	G 13	THE**gray**, ELEMENT**thirteen**: Access to Sidewalks: Study Area, Existing Linkage	High	2	Low	0	Moderate	1	Moderate	1	High	2	Low	0	Low	0
	G 14	THE**gray**, ELEMENT**fourteen**: Access to Sidewalks: Along Corridor	High	2	Moderate	1	High	2	Moderate	1	Moderate	1	Moderate	1	Low	0
		MULTI- **modal:** High=2 Yes= 1 Moderate=1 No= 0 Low= 0 Total Possible Points= **9**														
NEIGHBORHOOD **pattern,** DESIGN **&** CHARACTER	G 15	THE**gray**, ELEMENT**fifthteen**: Intersections	High	2	Low	2	Low	2	High	2	Low	0	Low	0	Low	0
	G 16	THE**gray**, ELEMENT**sixteen**: Block Average	High	2	Low	2	Low	2	High	2	High	2	Low	0	Low	0
	G 17	THE**gray**, ELEMENT**seventeen**: Access to On-Street Parking	No	0	No	0	No	0	Yes	1	Yes	1	No	0	No	0
	G 18	THE**gray**, ELEMENT**eighteen**: Access to Parking	Moderate	1	Moderate	1	Moderate	1	High	2	High	2	Low	0	Moderate	1
	G 19a	THE**gray**, ELEMENT**nineteen**: Quality of Pedestrian Way: (a) Direct Path	High	.5	Moderate	.25	Moderate	.25	High	.5	Moderate	.25	Low	0	Low	0
	G 19b	THE**gray**,ELEMENT**nineteen**: Quality of Pedestrian Way: (b) Building Setbacks	High	.5	Low	0	Low	0	Moderate	.25	Moderate	.25	Low	0	Low	0
	G 19c	THE**gray**, ELEMENT**nineteen:** Quality of Pedestrian Way: (c) Fenestration	Moderate	.25	Moderate	.25	Moderate	.25	High	.5	High	.5	Low	0	Low	0
	G 19d	THE**gray**, ELEMENT**nineteen:** Quality of Pedestrian Way: (d) Drive-thru	Moderate	.25	Moderate	.25	Moderate	.25	High	.5	High	.5	Low	0	Low	0
	G 19e	THE**gray**, ELEMENT**nineteen:** Quality of Pedestrian Way: (e) Height-to-Street Ratio	Yes	1	Yes	1	No	0	Yes	1	Yes	1	No	0	No	0
	Gr 5	THE**green**, ELEMENT**five:** Access to Shade	Low	0	Low	0	Low	0	Low	0	Low	0	Low	0	Low	0
	N 1	THE**neighborhood**CHARACTER, ELEMENT**one**: Established Boundaries	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a
	N 2	THE**neighborhood**CHARACTER, ELEMENT**two**: Existence of Art	Yes	n/a	Yes	n/a	No	n/a	Yes	n/a	Yes	n/a	No	n/a	No	n/a
	N 3	THE**neighborhood**CHARACTER, ELEMENT**three**: Existence of Gateways/ Wayfinding Signage	No	n/a	No	n/a	No	n/a	Yes	n/a	Yes	n/a	No	n/a	No	n/a
	N 4	THE**neighborhood**CHARACTER, ELEMENT**four**: Past on Display	Yes	n/a	Yes	n/a	No	n/a	Yes	n/a	Yes	n/a	No	n/a	No	n/a
		NEIGHBORHOOD **pattern,** DESIGN **&** CHARACTER**:** High=2 Moderate=1 Low=0 Yes= 1 No= 0 **the** grey, ELEMENT**nineteen** (a)-(d): High=0.5 Moderate=0.25 Low=0 **neighborhood**CHARACTER, ELEMENT**one-four**: no points awarded Total Possible Points= **12**														
COMPLETE**corridor** Total Points (Total Possible Points **35**):			**29.5**		**10.75**		**12.75**		**23**		**19**		**5**		**6**	

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APPENDIX

A: THE INDEX: LOCATION, LOCATION, LOCATION

THEgray, ELEMENTone: Utilities

The Intent:

To encourage development within and near existing communities/neighborhoods and public transit infrastructure, as well as to encourage improvement and redevelopment of existing cities, suburbs, and towns while limiting the expansion of the development footprint in the region to appropriate circumstances.[22]

The Measure:

(a) Corridor is located in an area served by existing *water and wastewater infrastructure* or

(b) Locate the project within a legally adopted, publicly owned, planned water and wastewater service area, and provide new water and wastewater infrastructure for the project. [23]

The Measurement:

Investing in the improvement and redevelopment of existing cities, suburbs, and towns is vital to the success for a sustainable future. The City of Asheville's *Sustainability Management Plan* states that being sustainable means "making decisions that balance the values of environmental stewardship, social responsibility and economic vitality to meet our present needs without compromising the ability of future generations to meet their needs" and it is with that

[22] Adapted from Congress for the New Urbanism, Natural Resources Defense Council, and the U.S. Green Building Council. *LEED 2009 for Neighborhood Development Rating System*. 2010 ed, Updated 2010. Print.
[23] Ibid.

idea in mind that this category is considered to be a prerequisite for an urban corridor to be considered for development, redevelopment and/or investment. If the answer is no, then another corridor should be considered for development, redevelopment and/or investment.

The Findings:

The majority of all the Corridor Study Areas have water and sewer lines with capacity for future growth.[24] [25]

Figure A.1: Findings for THEgray, ELEMENTone: Utilities.[26]

[24] Based on information from GIS data from the City of Asheville.
[25] Due to security concerns no illustration was created to depict the existing water and sewer utilities.
[26] Based on information from GIS data from the City of Asheville.

THEgray, ELEMENTtwo: Developed Land

The Intent:

To encourage development within and near existing communities/neighborhoods and public transit infrastructure as well as to encourage improvement and redevelopment of existing cities, suburbs, and towns while limiting the expansion of the development footprint in the region to appropriate circumstances.[27]

The Measure:

At least 75% of land area within 1/2 mile of corridor that is previously developed.[28]

The Explanation:

To determine the percentage of land area that is previously developed in the corridor study areas the City of Asheville's GIS Data was used. Specifically the Buncombe County Property Class Codes was the feature used to determine the activity on the land. It should be noted that the BC Class Code classifies parks under Community Services.

The Measurement:

Investing in the improvement and redevelopment of existing cities, suburbs, and towns is vital to the success for a sustainable future. The City of Asheville's *Sustainability Management Plan* states that being sustainable means "making decisions that balance the values of environmental stewardship, social responsibility and economic vitality to meet our present needs without compromising the ability of future generations to meet their needs" and it is with that idea in mind that this category is considered to be a prerequisite for an urban corridor to be considered for development, redevelopment and/or investment. If the answer is no, then another corridor should be considered for development, redevelopment and/or investment.

[27] Adapted from Congress for the New Urbanism, Natural Resources Defense Council, and the U.S. Green Building Council. *LEED 2009 for Neighborhood Development Rating System*. 2010 ed, Updated 2010. Print.
[28] Ibid.

The Findings:

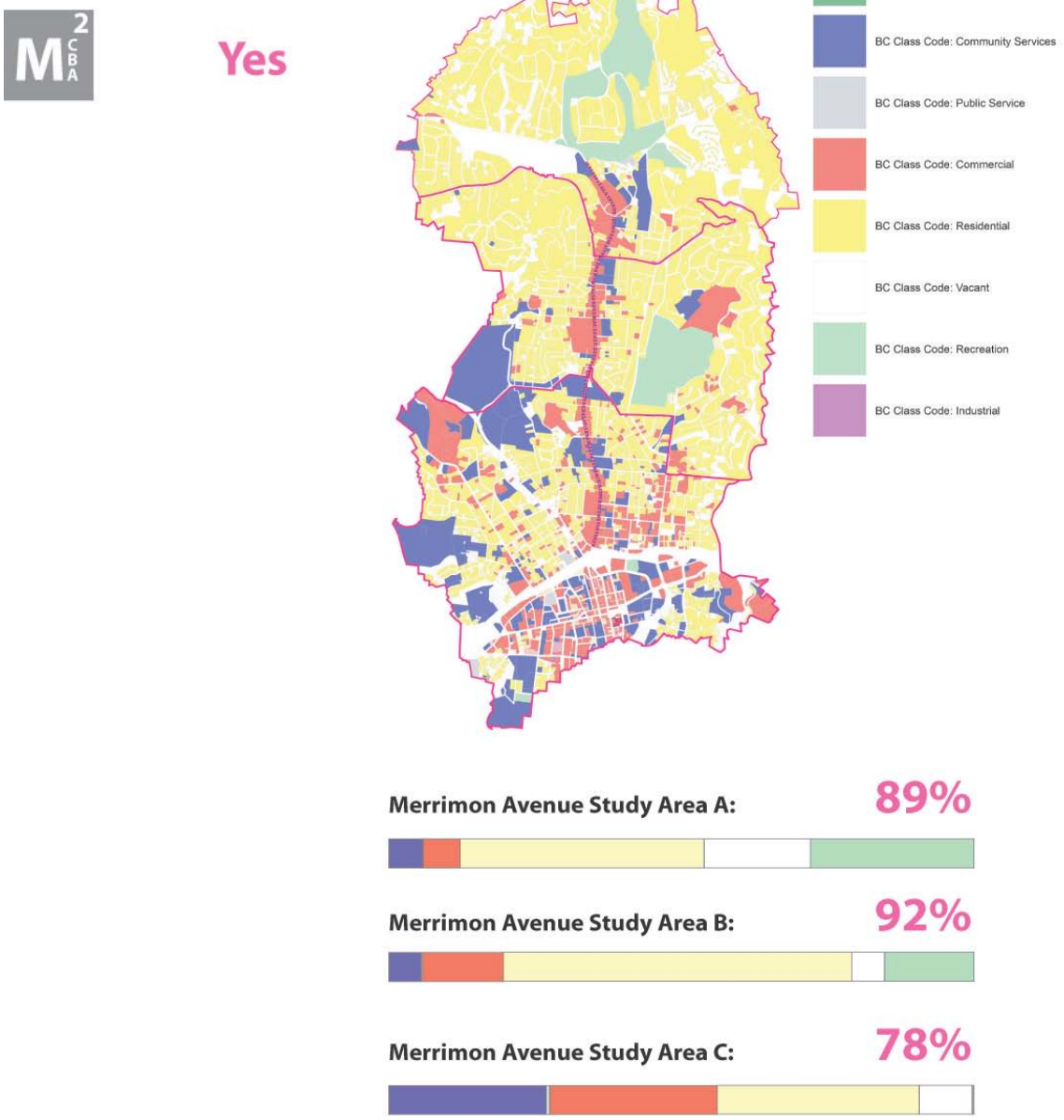


Figure A.2: Merrimon Avenue's Findings for THEgray, ELEMENTtwo: Developed Land. [29] [30]

[29] Based on information from GIS data from the City of Asheville.
[30] Created By L. Graham Stewart.

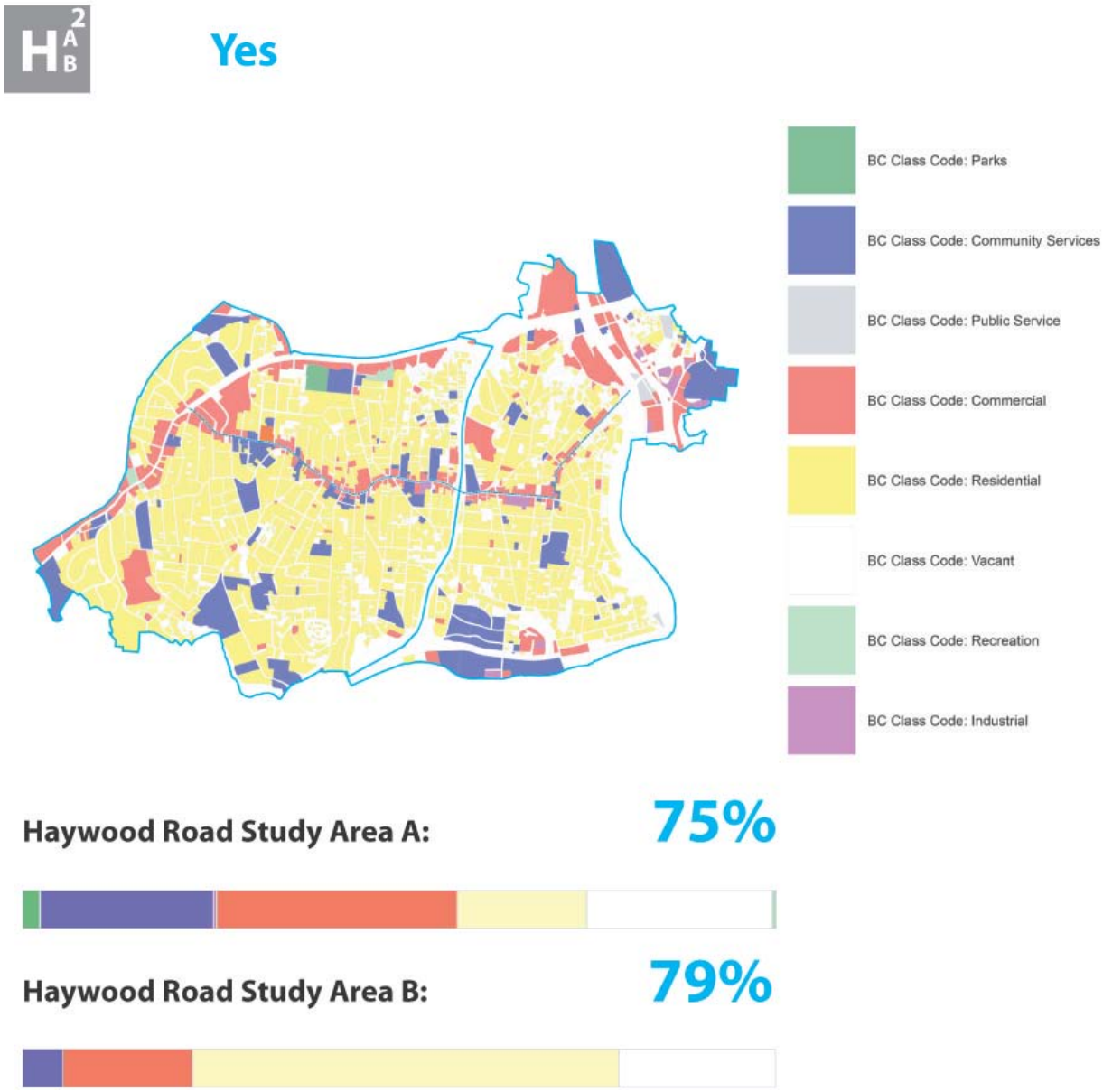


*Figure A.3: Haywood Road's Findings for THE**gray**, ELEMENT**two:** Developed Land.* [31] [32]

[31] Based on information from GIS data from the City of Asheville.

[32] Created By L. Graham Stewart.

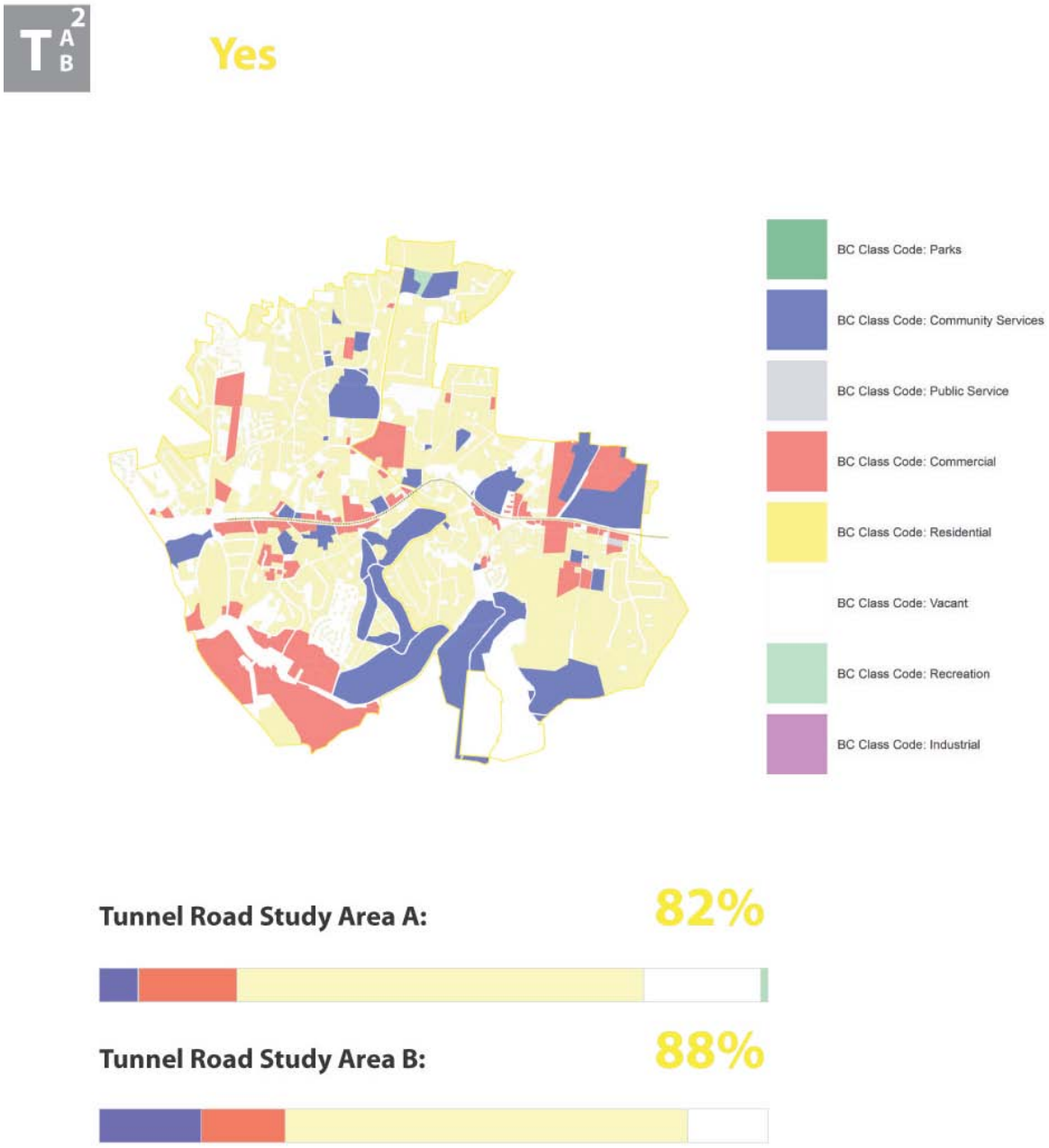


Figure A.4: Tunnel Road's Findings for THEgray, ELEMENTtwo: Developed Land. [33] [34]

[33] Based on information from GIS data from the City of Asheville.

[34] Created By L. Graham Stewart.

THEgray, ELEMENTthree: High Priority Area

The Intent:

To encourage development within and near existing communities and public transit infrastructure as well as reduce vehicle trips and vehicle miles travelled (VMT).[35]

The Measure & The Measurement:

The corridor has areas along them that are designated as a high-priority redevelopment areas such as: EPA National Priorities List, Federal Empowerment Zone, Federal Enterprise Community, Federal Renewal Community, Department of Justice Weed and Seed Strategy Community, Department of the Treasury Community Development Financial Institutions Fund Qualified Low-Income Community (a subset of the New Markets Tax Credit Program), or the U.S. Department of Housing and Urban Development's Qualified Census Tract (QCT) or Difficult Development Area (DDA) or other similar local designation such as locations eligible for Sustainable Development Projects.[36]

The Findings:

All corridor study areas contain properties eligible for Sustainable Development Projects., making them possibly eligible for incentives such as density bonuses, parking reduction, etc.

[35] Adapted from Congress for the New Urbanism, Natural Resources Defense Council, and the U.S. Green Building Council. *LEED 2009 for Neighborhood Development Rating System*. 2010 ed, Updated 2010. Print.
[36] Ibid.

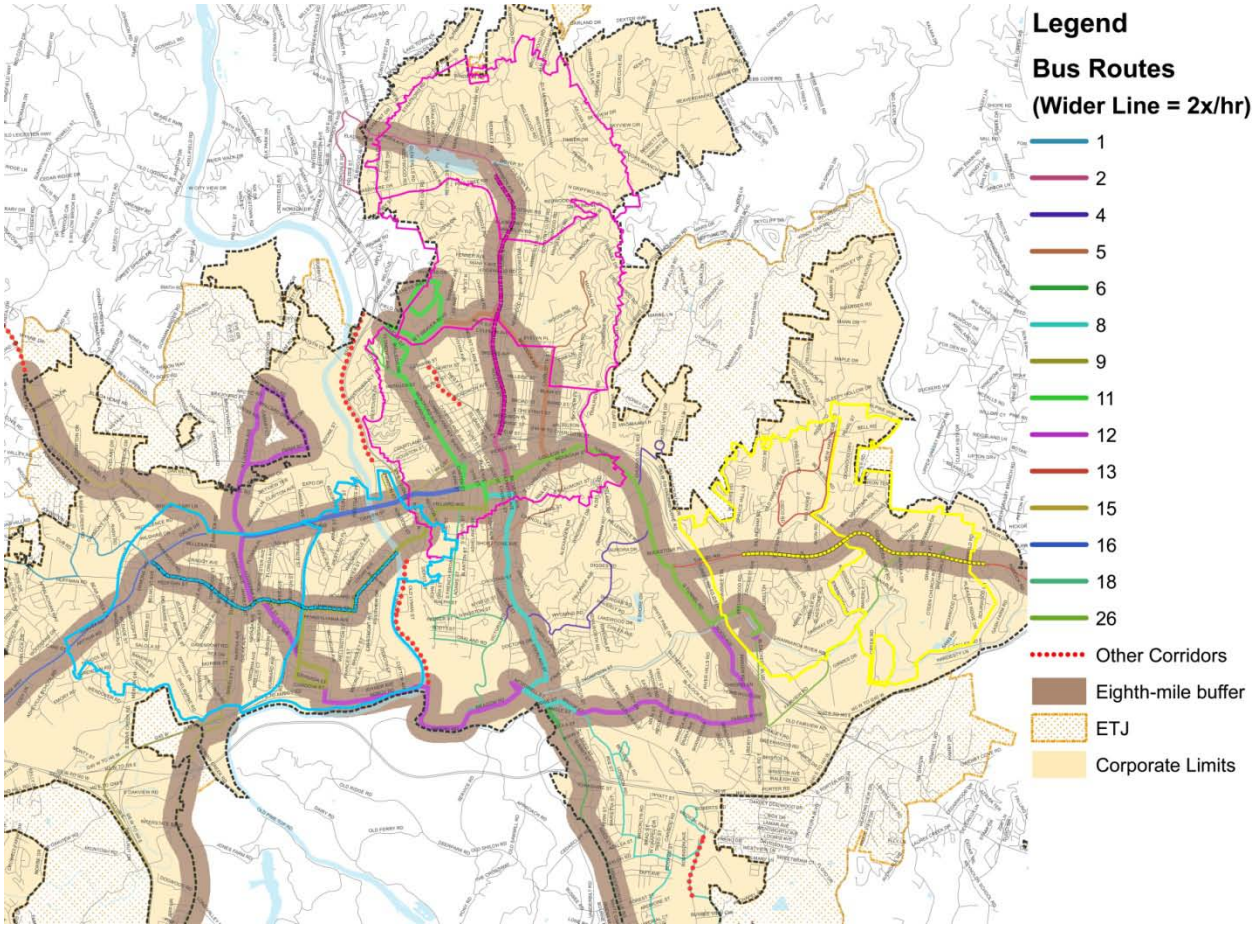


*Figure A.5: Findings for THE**gray**, ELEMENT**three:** High Priority Area.*[37] [38]

[37] Based on information from GIS data from the City of Asheville.

[38] Adapted from the COA's Sustainable Development Projects Map.

THEgreen, ELEMENTone: Environmentally Sensitive Land; Wildlife and Biodiversity

The Intent:

To encourage development within and near existing communities/neighborhoods and public transit infrastructure as well as to encourage improvement and redevelopment of existing cities, suburbs, and towns while limiting the expansion of the development footprint in the region to appropriate circumstances as well as to conserve imperiled species and ecological communities.[39]

The Measure:

The study area has been identified on the Land-of-Sky Regional Council's *Linking Land and Communities' Wildlife Habitat and Biodiversity Assessment Map* as Low Value.[40]

The Measurement:

According to the Land-of-Sky Regional Council's *Linking Land and Communities'*

> "Wildlife habitat is an indicator of intact, health ecosystems so preservation of these areas is paramount. These areas provide habitat and natural areas that support ecosystem functions that are necessary to the survival of all life. The cumulative result of these ecosystem functions are a complex web of food, water, shelter and interrelationships that plants, animals and humans depend on for survival.
>
> Although this Land-of –Sky Regional Council's Linking Land and Communities' project is at a regional scale it looks at nature as a system. Like any system, a healthy ecosystem is dependent on the ability of its parts to collectively

[39] Adapted from Congress for the New Urbanism, Natural Resources Defense Council, and the U.S. Green Building Council. *LEED 2009 for Neighborhood Development Rating System*. 2010 ed, Updated 2010. Print.
[40] Council, Land-of-Sky Regional. *Linking Lands and Communities in the Land-of-Sky Region*. Print. Asheville, 2010. Ed. Council, North Carolina's Land-of-Sky Regional.

> function as a whole. Our ecosystems in nature function very much the same way - with many different systems - wetlands, forests, streams, riparian areas - all contributing to the larger landscape's ability to function. When we serve these interconnected systems, or damage them - other parts of landscape are affected. A new road that bisects a forested area or a wetland that is removed or filled for another land use changes the very manner in which the broader natural system functions. Lands that once provided habitat for certain species or services for human populations become fragmented and lose their ability to do so. The degradation of natural systems occurs site by site and parcel by parcel, until the cumulative effects of the fragmentation, pollution, or infestation become so great that the entire ecosystem suffers. In order to keep our ecosystems healthy, we must work to maintain and/or restore connections between the various natural communities of our region, preserving a network of forests, streams, grassy balds, wetlands, agricultural areas, and other open spaces. It serves as the ecological framework that supports our economic, social, physical, and psychological health and well-being."[41]

The use of this regional assessment is not to usurp the importance of a micro assessment of each corridor but to reiterate the importance of examining both the micro and macro context of a study area. Investment in the improvement and redevelopment of existing cities, suburbs, and towns while preserving natural areas and farm land is vital for a sustainable future. The City of Asheville's *Sustainability Management Plan* states that being sustainable means "making decisions that balance the values of environmental stewardship, social responsibility and

[41] Council, Land-of-Sky Regional. *Linking Lands and Communities in the Land-of-Sky Region*. Print. Asheville, 2010. Ed. Council, North Carolina's Land-of-Sky Regional.

economic vitality to meet our present needs without compromising the ability of future generations to meet their needs" and it is with that idea in mind that this category is considered to be a prerequisite for an urban corridor to be considered for development, redevelopment and/or investment. If the answer is no, then another corridor should be considered.

The Findings:

A majority of all study areas are identified on the Land-of-Sky Regional Council's *Linking Land and Communities' Wildlife Habitat and Biodiversity Assessment Map* as Low Value, with the exception of the southern portion of the Tunnel Road Study Areas A & B. Although not directly located along the corridor these southern areas located in the Tunnel Road Study Area are identified as Medium Value and should therefore be studied at a more detailed level should any regulatory changes be brought into consideration that might impact these environmentally sensitive land areas.

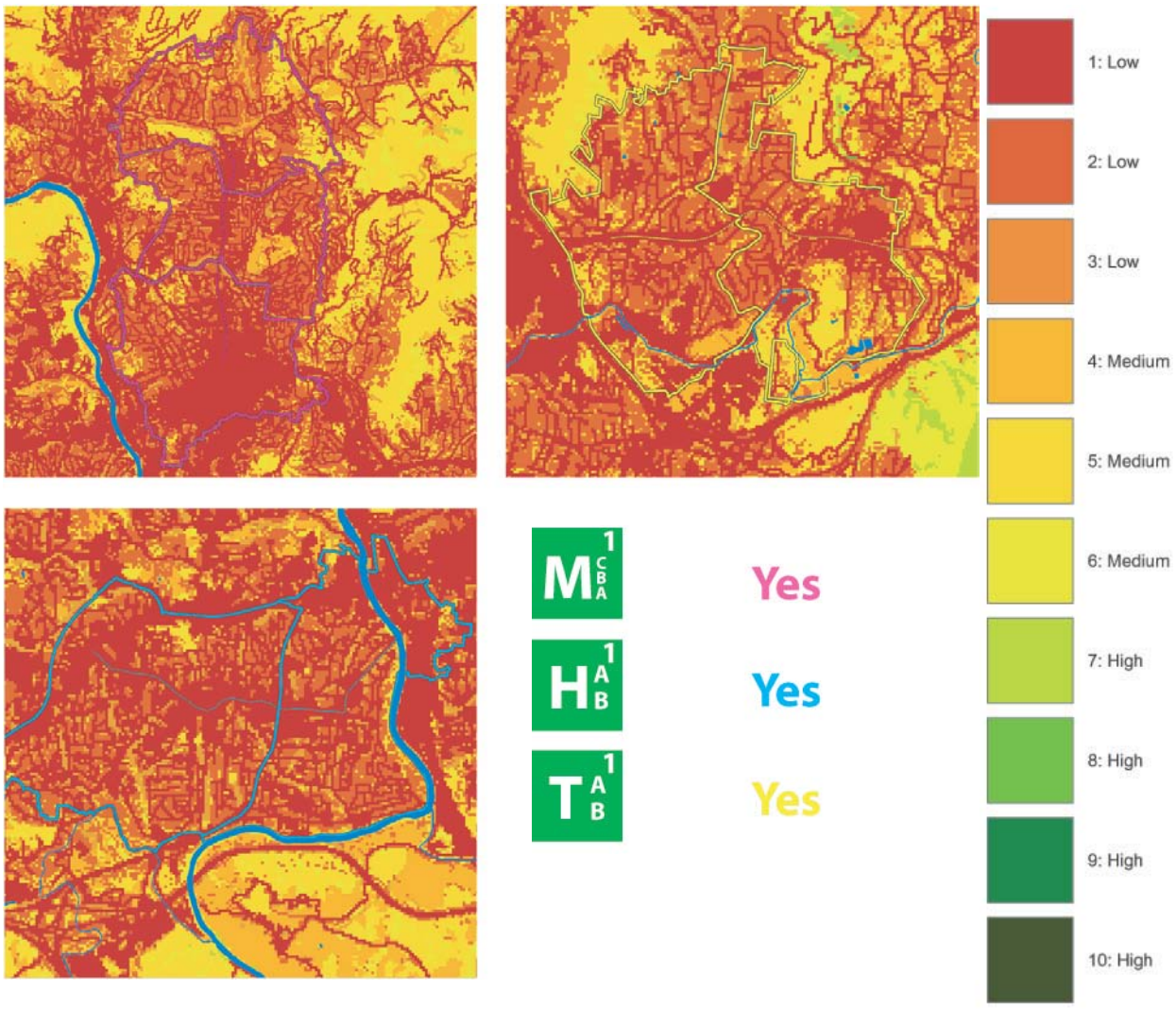


Figure A.6: Findings for THEgreen, ELEMENTone: Environmentally Sensitive Land; Wildlife and Biodiversity[42] [43]

[42] Based on information from GIS data from the City of Asheville.

[43] Council, Land-of-Sky Regional. *Linking Lands and Communities in the Land-of-Sky Region.* Asheville, 2010. Ed. Council, North Carolina's Land-of-Sky Regional. <http://www.linkinglands.org>.

THEgreen, ELEMENTtwo: Environmentally Sensitive Land; Agricultural Land

The Intent:

To encourage development within and near existing communities/neighborhoods and public transit infrastructure as well as to encourage improvement and redevelopment of existing cities, suburbs, and towns while limiting the expansion of the development footprint in the region to appropriate circumstances as well as to conserve imperiled species and ecological communities.[44]

The Measure:

The study area has been identified on the Land-of-Sky Regional Council's *Linking Land and Communities' Agricultural Assessment Map* as low value.[45]

The Measurement:

According to the Land-of-Sky Regional Council's *Linking Land and Communities*

> "Agricultural lands (farming and forestry) provide products and services such as food, fibers, pollination, habitat, clean water, cultural heritage and aesthetic benefits that contribute to the areas tourism industry so preservation of these areas is paramount.
>
> Although this Land-of –Sky Regional Council's *Linking Land and Communities'* project is at a regional scale it looks at nature as a system. Like any system, a healthy ecosystem is dependent on the ability for its parts to collectively function as a whole. Ecosystems in nature functions consists of wetlands, forests, streams, riparian areas- all contributing to the larger landscape's ability to

[44] Adapted from Congress for the New Urbanism, Natural Resources Defense Council, and the U.S. Green Building Council. *LEED 2009 for Neighborhood Development Rating System*. 2010 ed, Updated 2010. Print.
[45] Council, Land-of-Sky Regional. *Linking Lands and Communities in the Land-of-Sky Region*. Print. Asheville, 2010. Ed. Council, North Carolina's Land-of-Sky Regional.

> function. When we sever these interconnected systems, or damage or remove them- other parts of landscape are affected. A new road that bisects a forested area or a wetland that is removed or filled for another land use change the very manner in which the broader natural system functions. Lands that once provided habitat for certain species or services for human populations become fragmented and lose their ability to do so. The degradation of natural systems occurs site by site and parcel by parcel, until the cumulative effects of the fragmentation, pollution, or infestation become so great that the entire ecosystem suffers. In order to keep our ecosystems healthy, we must work to maintain and/or restore connections between the various natural communities of our region, preserving a network of forests, streams, grassy balds, wetlands, agricultural areas, and other open spaces. It serves as the ecological framework that supports our economic, social, physical, and psychological health and well-being."[46]

The use of this regional assessment is not to usurp the importance of a micro assessment of each corridor but merely to reiterate the importance of examining both the micro and macro context of a study area. Investment in the improvement and redevelopment of existing cities, suburbs, and town while preserving natural areas and farm land is vital for a sustainable future. The City of Asheville's *Sustainability Management Plan* states that being sustainable means "making decisions that balance the values of environmental stewardship, social responsibility and economic vitality to meet our present needs without compromising the ability of future generations to meet their needs" and it is with that idea in mind that this category is considered to

[46] Council, Land-of-Sky Regional. *Linking Lands and Communities in the Land-of-Sky Region*. Print. Asheville, 2010. Ed. Council, North Carolina's Land-of-Sky Regional.

be a prerequisite for an urban corridor to be considered for development, redevelopment and/or investment. If the answer is no, then another corridor should be considered.

The Findings:

The majority of all study areas are identified on the Land-of-Sky Regional Council's *Linking Land and Communities' Agricultural Assessment Map* as Low Value. Although not directly located along the corridor these southern areas located in the Tunnel Road Study Area are identified as Medium to High Value and should therefore be studied at a more detailed level should any regulatory changes be brought into consideration that might impact these environmentally sensitive land areas.

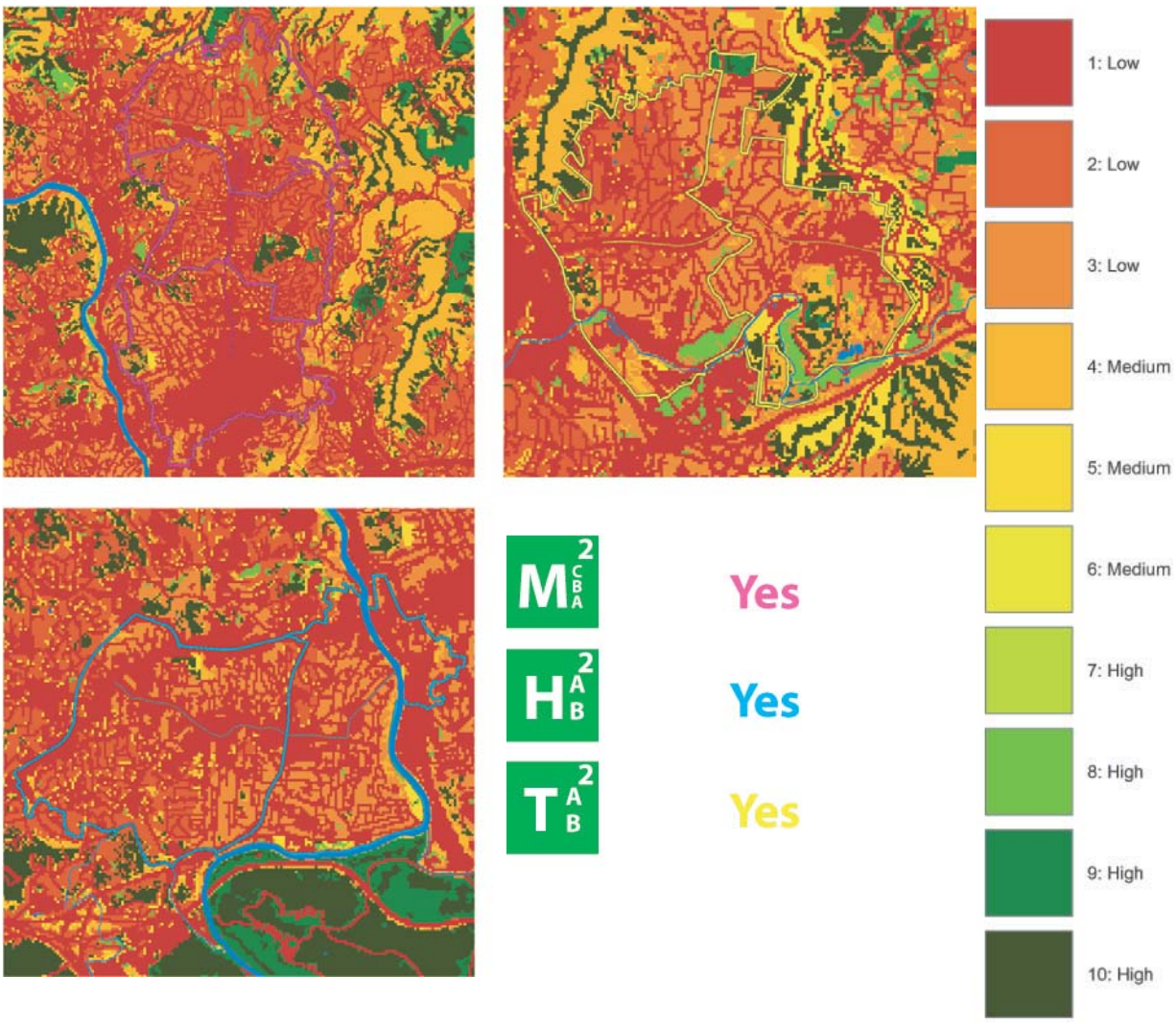


Figure A.7: Findings for THEgreen, ELEMENTtwo: Environmentally Sensitive Land; Agricultural Land.[47] [48]

[47] Based on information from GIS data from the City of Asheville.

[48] Council, Land-of-Sky Regional. *Linking Lands and Communities in the Land-of-Sky Region.* Asheville, 2010. Ed. Council, North Carolina's Land-of-Sky Regional. <http://www.linkinglands.org>.

THEblue, ELEMENTone: Environmentally Sensitive Land; Water Quality

The Intent:

To preserve water quality, natural hydrology, habitat, and biodiversity through conservation of *wetlands* and *water bodies* as well as protect life and property, promote open space and habitat conservation, and enhance water quality and natural hydrological systems.[49]

The Measure:

The study area has been identified on the Land-of-Sky Regional Council's *Linking Land and Communities' Water Quality Assessment Map* as low value.[50]

The Measurement:

According to the Land-of-Sky Regional Council's *Linking Land and Communities*

> "Water is the required for life therefore excellent water quality is important to maintaining a high quality of life, economic vitality, and for keeping streams, lakes and other aquatic systems healthy. Naturally occurring ecosystems have been filtering, cycling and ensuring the availability of clean water to people and animals since the beginning of time. Forest, meadows and wetlands all have mechanism that filter out potentially harmful particles, slow water movement across the landscape and return water to the air and beneath the ground where it can be recycled back into the water. Growing population means more demands on the region's water resources and changes in land use that can stress the natural systems that significantly contribute to water quality. There is an innate connection between land and water, the recognition of this fact and protecting,

[49] Adapted from Congress for the New Urbanism, Natural Resources Defense Council, and the U.S. Green Building Council. *LEED 2009 for Neighborhood Development Rating System*. 2010 ed, Updated 2010. Print.
[50] Council, Land-of-Sky Regional. *Linking Lands and Communities in the Land-of-Sky Region*. Print. Asheville, 2010. Ed. Council, North Carolina's Land-of-Sky Regional.

managing our natural systems can ensure access to clean water and healthy streams today and for future generations.

Although this Land-of –Sky Regional Council's *Linking Land and Communities'* project is at a regional scale it looks at nature as a system. Like any system, a healthy ecosystem is dependent on the ability for its parts to collectively function as a whole. Our ecosystems in nature function very much the same way - with many different systems - wetlands, forests, streams, riparian areas - all contributing to the larger landscape's ability to function. When we sever these interconnected systems, or damage or remove them - other parts of landscape are affected. A new road that bisects a forested area or a wetland that is removed or filled for another land use change the very manner in which the broader natural system functions. Lands that once provided habitat for certain species or services for human populations become fragmented and lose their ability to do so. The degradation of natural systems occurs site by site and parcel by parcel, until the cumulative effects of the fragmentation, pollution, or infestation become so great that the entire ecosystem suffers. In order to keep our ecosystems healthy, we must work to maintain and/or restore connections between the various natural communities of our region, preserving a network of forests, streams, grassy balds, wetlands, agricultural areas, and other open spaces. It serves as the ecological framework that supports our economic, social, physical, and psychological health and well-being."[51]

[51] Council, Land-of-Sky Regional. *Linking Lands and Communities in the Land-of-Sky Region*. Print. Asheville, 2010. Ed. Council, North Carolina's Land-of-Sky Regional.

The use of this regional assessment is not to usurp the importance of a micro assessment of each corridor but merely to reiterate the importance of examining both the micro and macro context of a study area. Investment in the improvement and redevelopment of existing cities, suburbs, and town while preserving natural areas and farm land is vital for a sustainable future. The City of Asheville's *Sustainability Management Plan* states that being sustainable means "making decisions that balance the values of environmental stewardship, social responsibility and economic vitality to meet our present needs without compromising the ability of future generations to meet their needs" and it is with that idea in mind that this category is considered to be a prerequisite for an urban corridor to be considered for development, redevelopment and/or investment. If the answer is no, then another corridor should be considered.

The Findings:

A majority of the study areas are identified on the Land-of-Sky Regional Council's *Linking Land and Communities' Water Quality Assessment Map* as Low Value. Although not directly located along the corridor these southern areas located in the Tunnel Road Study Area are identified as Medium Value and should therefore be studied at a more detailed level should any regulatory changes be brought into consideration that might impact these environmentally sensitive land areas.

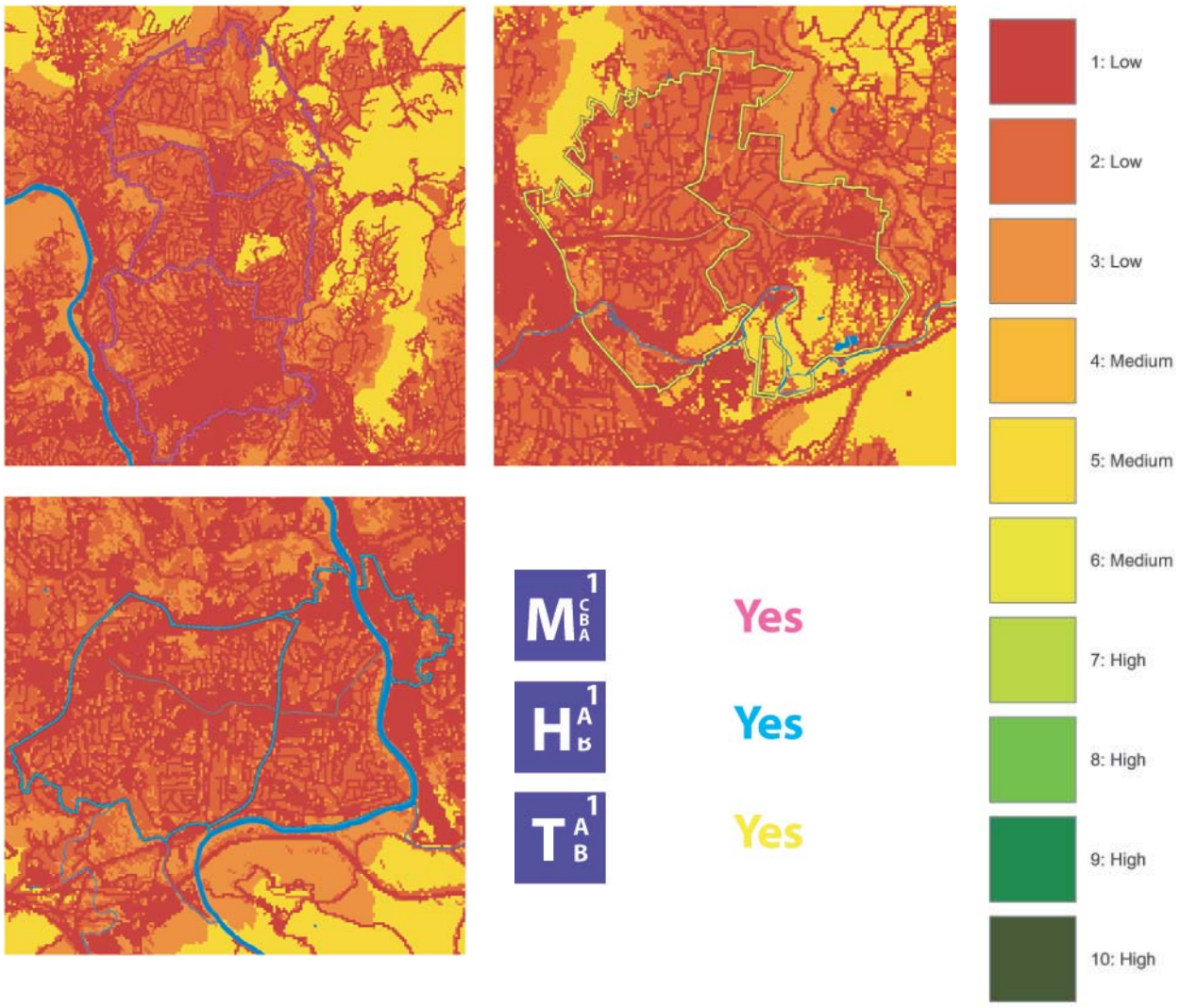


Figure A.8: Findings for THEblue, ELEMENTone: Environmentally Sensitive Land; Water Quality.[52] [53]

[52] Based on information from GIS data from the City of Asheville.

[53] Council, Land-of-Sky Regional. *Linking Lands and Communities in the Land-of-Sky Region.* Asheville, 2010. Ed. Council, North Carolina's Land-of-Sky Regional. <http://www.linkinglands.org>.

Impervious Surface and Water

Girling and Kellett's *Skinny Streets & Green Neighborhoods: Design for Environment and Community* state that:

> The term 'neighborhood' is frequently used to describe the urban 'building blocks' of complementary land uses, transportation networks, services and amenities. Grey Infrastructure (Impervious Surface) contributes to 20-30 percent of the land area of most neighborhoods. Such networks require a significant investment both in land area and in capital and operating tax dollars for most jurisdictions. Paved= water pollution. Impervious surface is land covered by roads, rooftops, parking lots, driveways, sidewalks, patios and any other surface that prevents water penetration into the soil. When land is covered with these surfaces, rainwater cannot follow its natural drainage cycles. Instead, precipitation runs off rooftops, over paved surfaces, along street gutters, and eventually into the stormwater systems. Impervious surface generates far more runoff than natural areas because none of it is stored or infiltrates into the ground. Runoff generated from an undeveloped watershed can increase by about 500 percent once the area is developed. The street system typically represents more than half of residential area's total impervious surface coverage and, thus contributes significantly to urban runoff. A direct correlation exists between urban runoff volumes and amounts of stormwater pollution. Pollutants, such as oil, grease, and metals coming from automobiles and phosphorus and nitrogen coming from fertilizer and natural decomposition accumulate on impervious surfaces between rainstorms. Rainfall then washed pollutants along the streets, into stormwater systems, and into natural waterways. Because most urban stormwater is untreated, high percentages of impervious surfaces yield high rates of stormwater- related pollutants.
>
> Seattle's land use code in 1993 defined this approach as 'green street', 'a street right-of-way, that through a variety of treatments, such as sidewalk widening, landscaping, traffic calming, and pedestrian oriented features is enhanced for pedestrian circulation and open space use. This usually occurs when significant new development occurs.' A better designed street can lower impact on natural water resources, reduce the negative impacts on streams and associated habitats.[54]

It is important to maintain regulatory buffers to environmental sensitive areas such as rivers, streams, wetlands and flood plain because 25% of development of impervious surface is a precedent of the degradation of streams. The need to encourage development within and near existing communities/neighborhoods and the need to preserve water quality is just another example of the delicate balance and understand that is required for a sustainable future.

[54] Kellett, Cynthia Girling and Ronald. *Skinny Streets & Green Neighborhoods: Design for Environment and Community*. Washington DC: Island Press, 2005. Print.

Encouraging and providing incentives for use of pervious pavements, shared parking scenarios, reducing parking requirements which reduces the amount of paved parking coverage, encouraging redevelopment and low impact developments as well as 'greening' streets are just some ways to reduce runoff, protect and enhance water quality and natural hydrological systems.

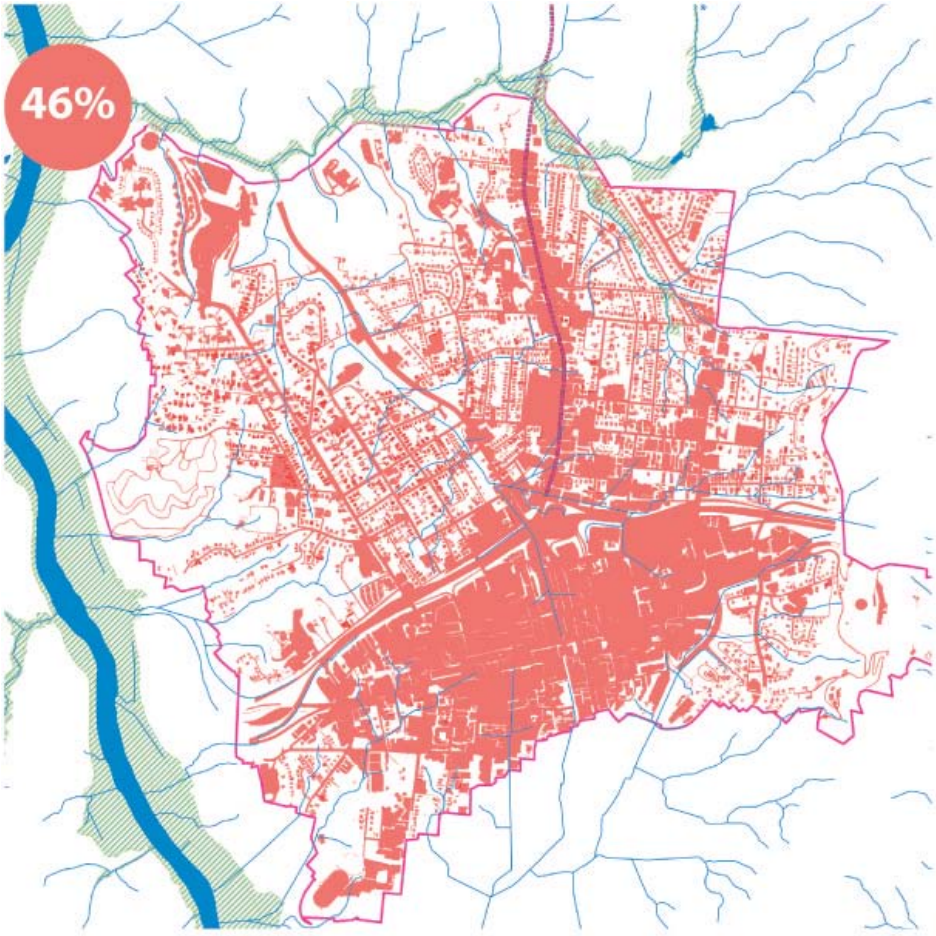


Figure A.9: Merrimon Avenue Study Area A's Impervious Surface.[34] [35]

[34] Based on information from GIS data from the City of Asheville.
[35] Created By L. Graham Stewart.

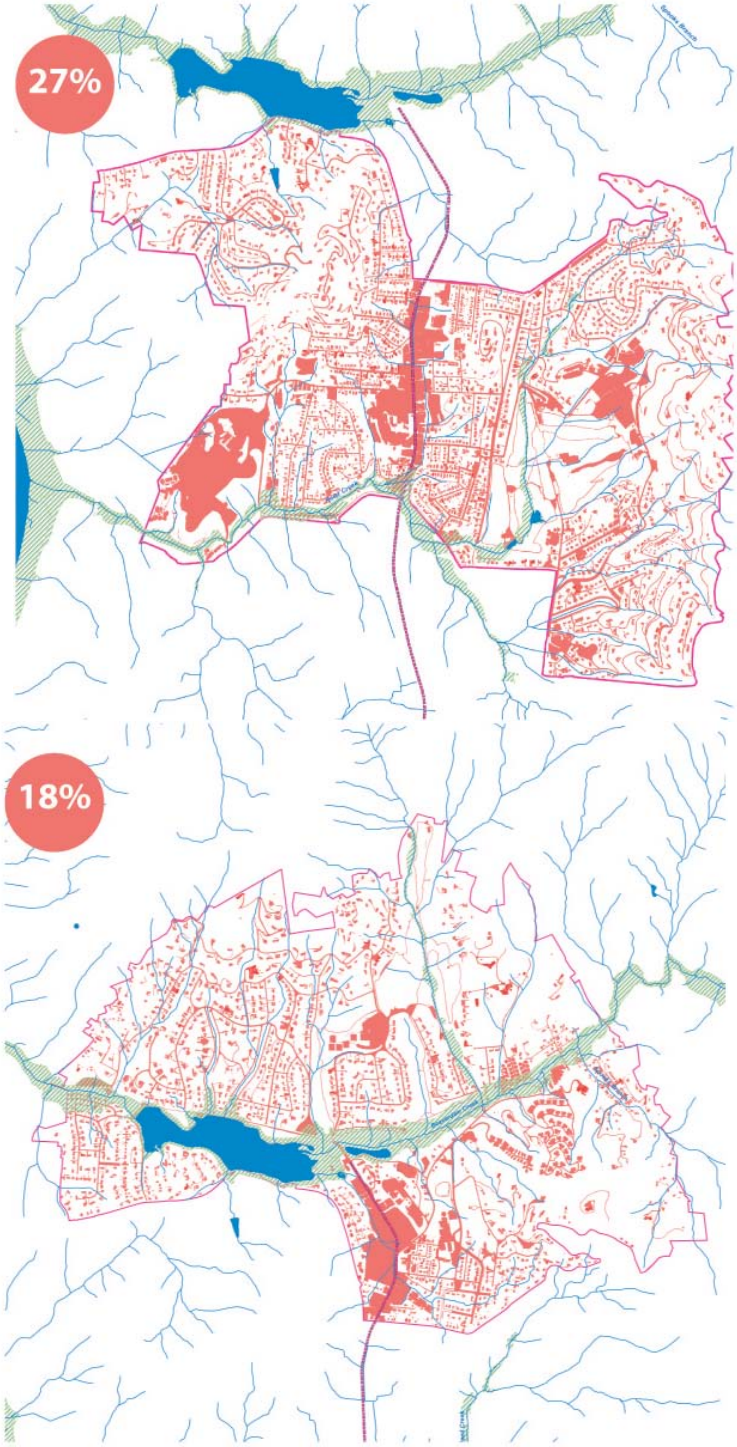


Figure A.10: Merrimon Avenue Study Area B & C's Impervious Surface.[36] [37]

[36] Ibid.
[37] Created By L. Graham Stewart.

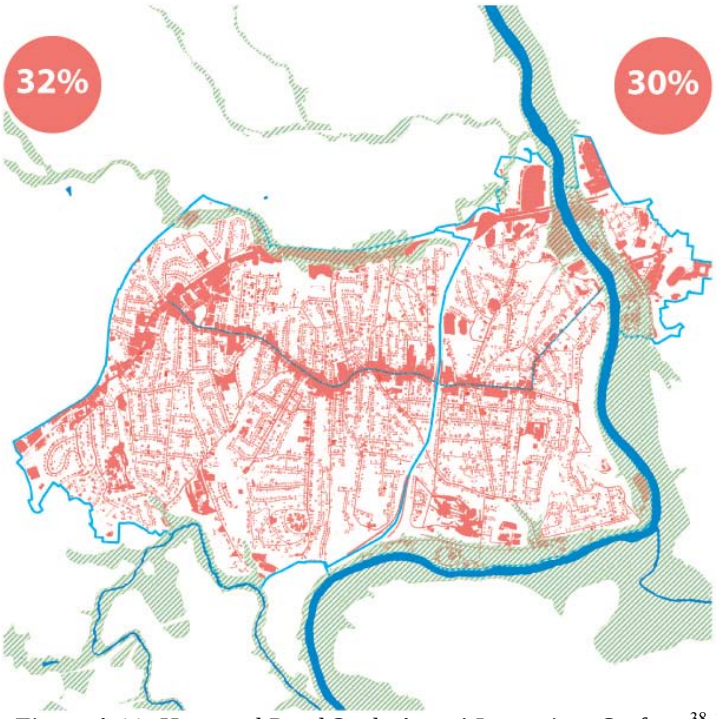


Figure A.11: Haywood Road Study Areas' Impervious Surface.[38] [39]

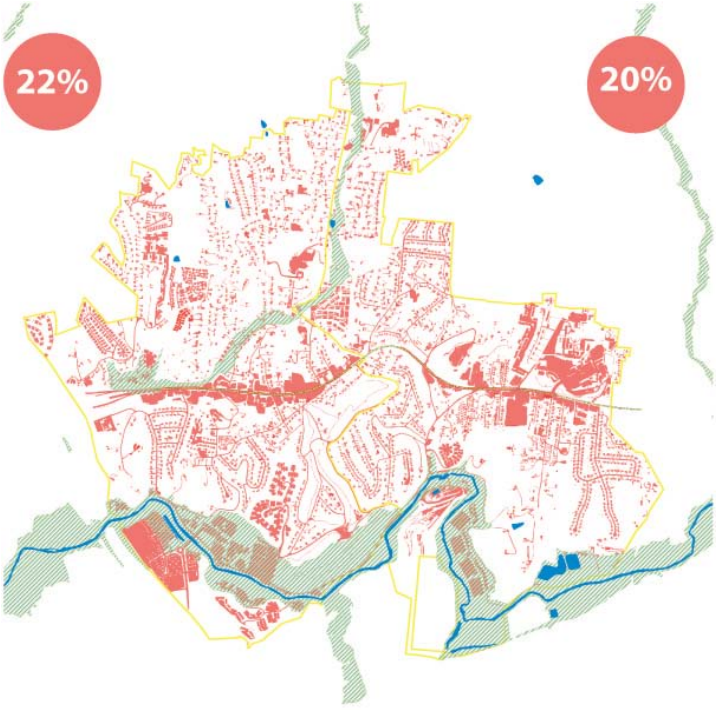


Figure A.12: Tunnel Road Study Areas' Impervious Surface.[40] [41]

[38] Based on information from GIS data from the City of Asheville.
[39] Created By L. Graham Stewart.
[40] Based on information from GIS data from the City of Asheville.
[41] Created By L. Graham Stewart.

B: THE INDEX: LAND USE

Density

Planning and Urban Design Standards states that "residential density refers to the number of housing units per acre of land. The most common measure of residential density is dwelling units per acre (du/ac). Density for may also be measured by floor area ratio (FAR), commonly used for commercial structures." Floor Area Ratio (FAR) is the ratio of the floor area of a building to the area of the lot on which the building is located. The term density can trigger strong reactions for the public; therefore design plays an important role in its success. Aesthetics and human scaled design features can create a successful development with higher densities. Population density and employment density are others ways of measuring density in an area.

"Newman and Kenworthy (1989, 1999) famously developed the relationship between higher density and lower energy consumption for major world cities. A number of principles can be derived, with a focus on raising the density of development, particularly around public transport nodes:

- Transport energy consumption and CO2 emissions are generally lower at higher densities.
- Higher densities lead to greater scope for viable public transport services.
- Density can be an important factor in reducing car use in terms of both mode share and distance travelled." [42]

[42] "Planning for Sustainable Travel - Key Themes - Density." *Planning for Sustainable Travel - Home*. Web. 24 Jan. 2011. <http://www.plan4sustainabletravel.org/key_themes/density/>.

According to the City of Asheville's *Code of Ordinance* a "dwelling unit means one or more rooms physically arranged so as to create an independent housekeeping establishment for occupancy by one family with separate toilets and facilities for cooking and sleeping. In no case shall a dwelling unit be rented or leased for intervals of less than one month."

*Figure **B**.1: Study Area's Zoning & Density*.[43] [44]

[43] Overlay, Historic districts and other factors were not considered.

[i] Only if 7.8.24.f (14) Community Incentive Table is met.

[ii] Maximum residential density shall not be limited, except by other standards such as building height, parking, landscaping and buffering, open space, and traffic impact analysis.

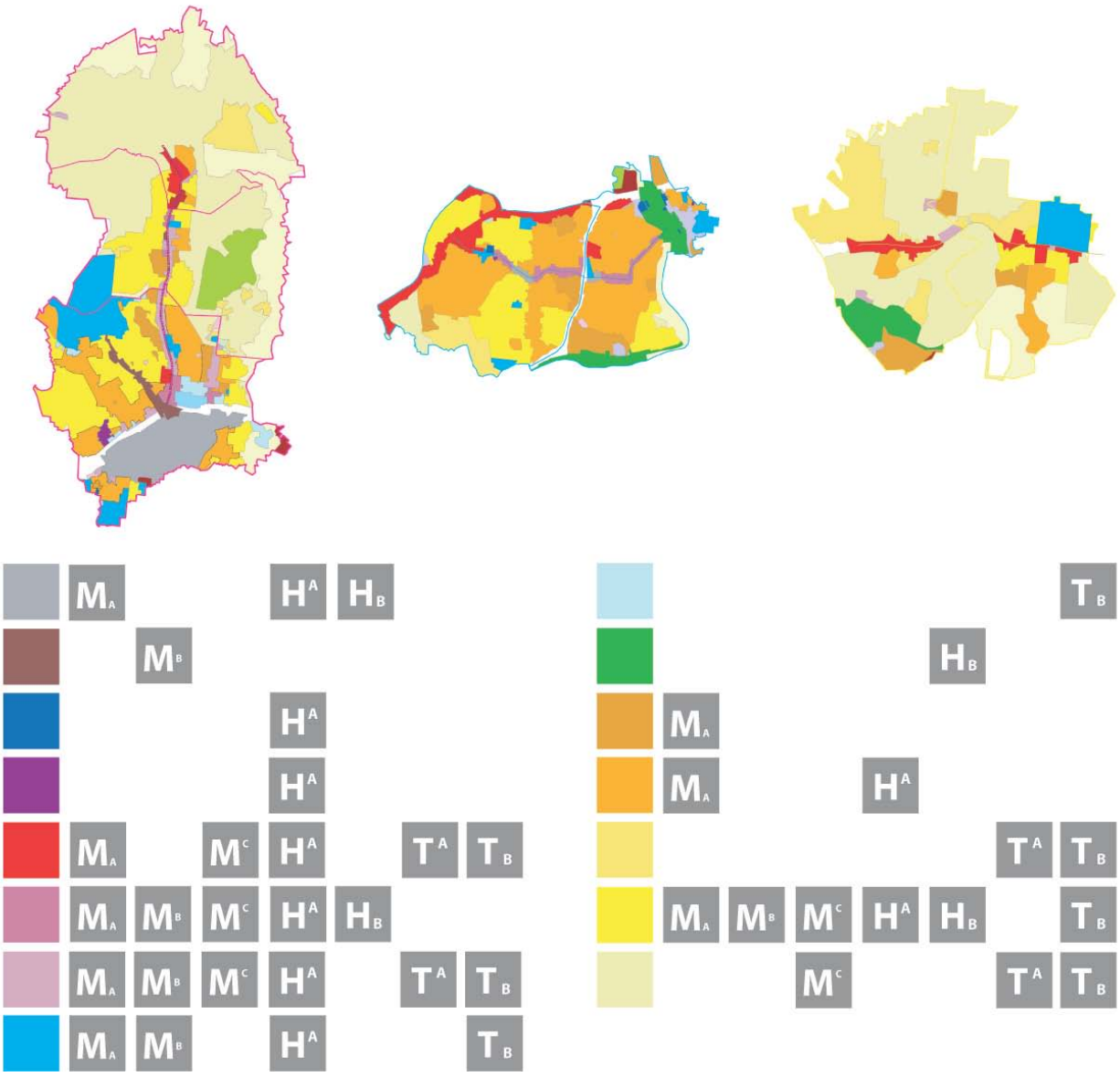


Figure B.2: Zoning Districts Along the Corridors.[45] [46]

[iii] This density standard shall not apply to dormitories constructed on the campus of an educational institution.

[iv] Square foot of lot area.

[44] B Created By L. Graham Stewart.

[45] Based on information from GIS data from the City of Asheville.

[46] Created By L. Graham Stewart.

THEgray, ELEMENTfour: Access to Jobs and Residence

The Intent:

To encourage development within and near *existing* communities and public transit infrastructure as well as to reduce vehicle trips and *vehicle miles traveled* (VMT). To reduce the incidence of obesity, heart disease, and hypertension by encouraging daily physical activity associated with walking and bicycling.[47]

The Measure:

Total number of jobs and residences per acre. [48]

The Explanation:

A new urbanist saying is that "there are two things that Americans dislike: density and sprawl"[49] Most often if an increase of density is discussed in the public realm, neighborhoods will oppose a development with intense fervor. The debate usually centers on preconceived notions of inevitable traffic congestion, expanses of parking and the aesthetics of the building rather than the actual increase in population. Perhaps the resistance comes from a lack of understanding of the benefits higher densities can bring such as walkablility; a broad mix of uses, less dependency on the automobile, the list just goes on and on. According to *Sustainable Urbanism: Urban Design with Nature* by Douglas Farr "the average density of most new developments in the United States is two dwelling units per acre, which is too low to support walk to destinations (1/4 mile radius)." Density is a key component in the shaping of the built environment and is typically expressed as a number of dwelling units per acre. Asheville and

[47] Council, Land-of-Sky Regional. *Linking Lands and Communities in the Land-of-Sky Region*. Print. Asheville, 2010. Ed. Council, North Carolina's Land-of-Sky Regional.
[48] Development, Center of Transit-Oriented. *Twin Cities Ctlus Initiative: Identifying and Evaluating Regionally Significant Walkable Urban Places.* (2009). Print.
[49]Farr, Doug. *Sustainable Urbanism: Urban Design with Nature*. Hoboken, New Jersey: John Wiley & Sons, Inc., 2007. Print.

many other municipalities, there are historic settlement areas characterized by high-density development. These places were built before five miles became a ten-minute car trip, so they had to be compact.

"Based on Peter Newman and Jeffrey Kenworthy, *Cities and Automobile Dependence: An International Sourcebook* persons per acre include residents and jobs, and is a gross measure over all land area. There is a threshold at 35 persons/hectare (~14.2 persons/acre) below which driving increases markedly."[50] Most indexes' low range for persons per acre starts at 14. However Asheville highest ratio of people per acre within the study area was 8; so measurement ranges were adjusted accordingly. Data was gathered from the 2009 Longitudinal Employer-Household Dynamics (LEHD) dataset and Census data.[51] When considering future transit investment, it is important to reinforce existing employment locations and connect them to high-density residential neighborhoods.

*Figure **B**.3: Inflow/Outflow Job Counts in Asheville (2009).*[52]

[50] Development, Center of Transit-Oriented. *Twin Cities Ctlus Initiative: Identifying and Evaluating Regionally Significant Walkable Urban Places.* (2009). Print.
[51] http://lehd.did.census.gov/led/
[52] Ibid.

The Measurement:

High: > 8 persons/ acre

Moderate: 4-8 persons/ acre

Low: > 4 persons/ acre

The Findings:

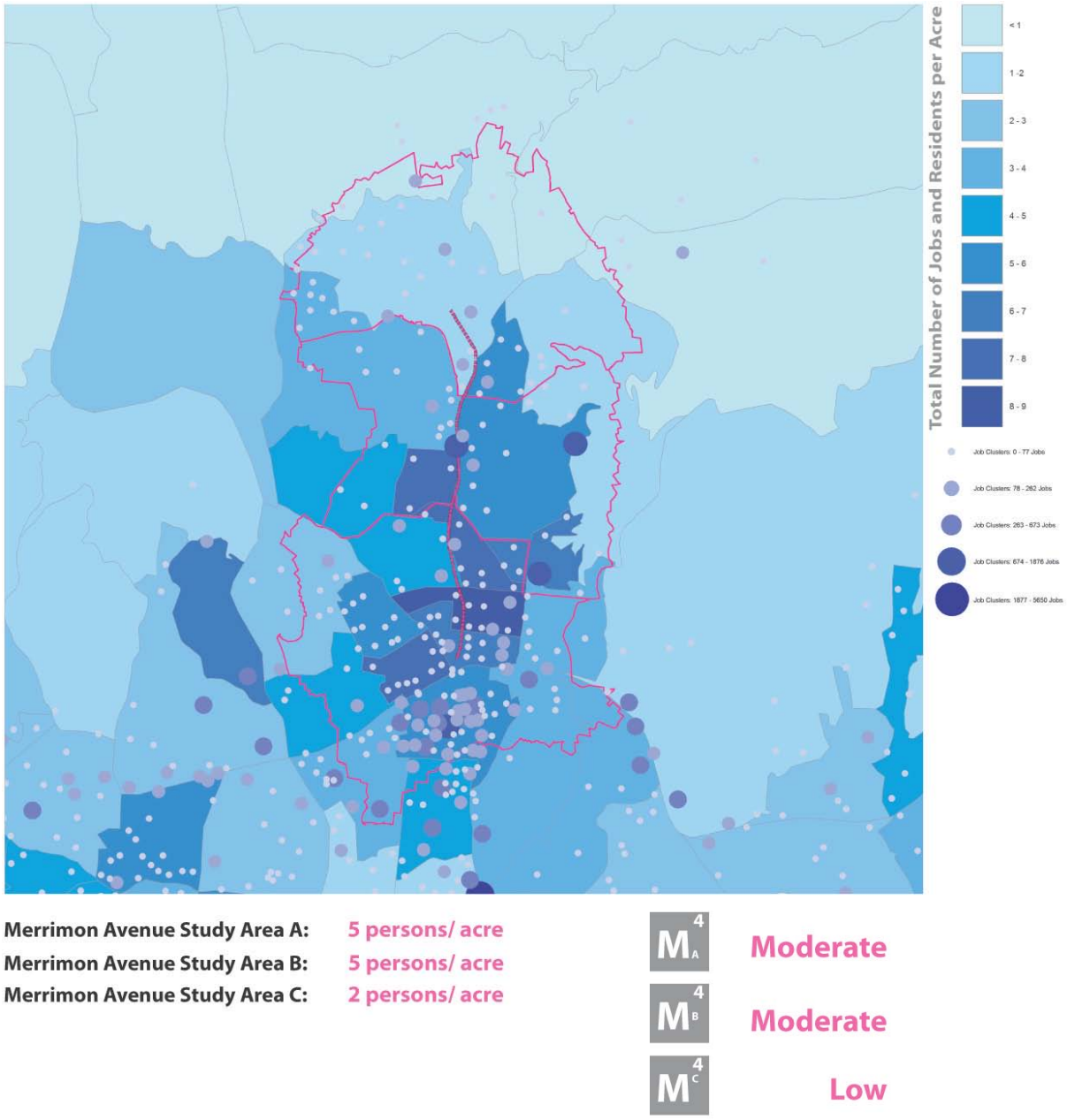


*Figure B.4: Merrimon Avenue Findings for THE**gray**, ELEMENT**four:** Access to Jobs and Residence.*[53]

[53] http://lehd.did.census.gov/led/

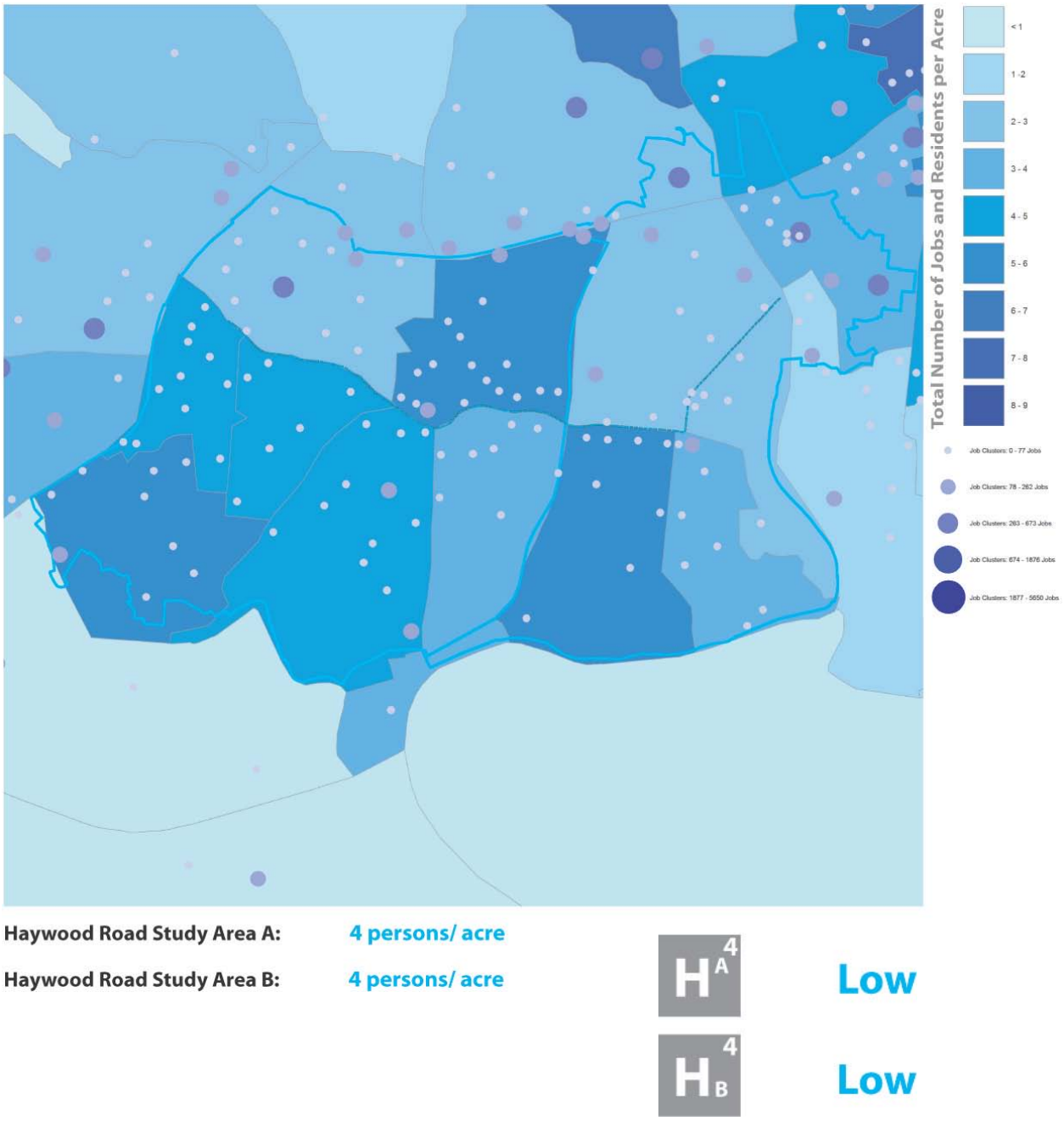


Figure B.5: Haywood Road Findings for THEgray, ELEMENTfour: Access to Jobs and Residence.[54]

[54] http://lehd.did.census.gov/led/

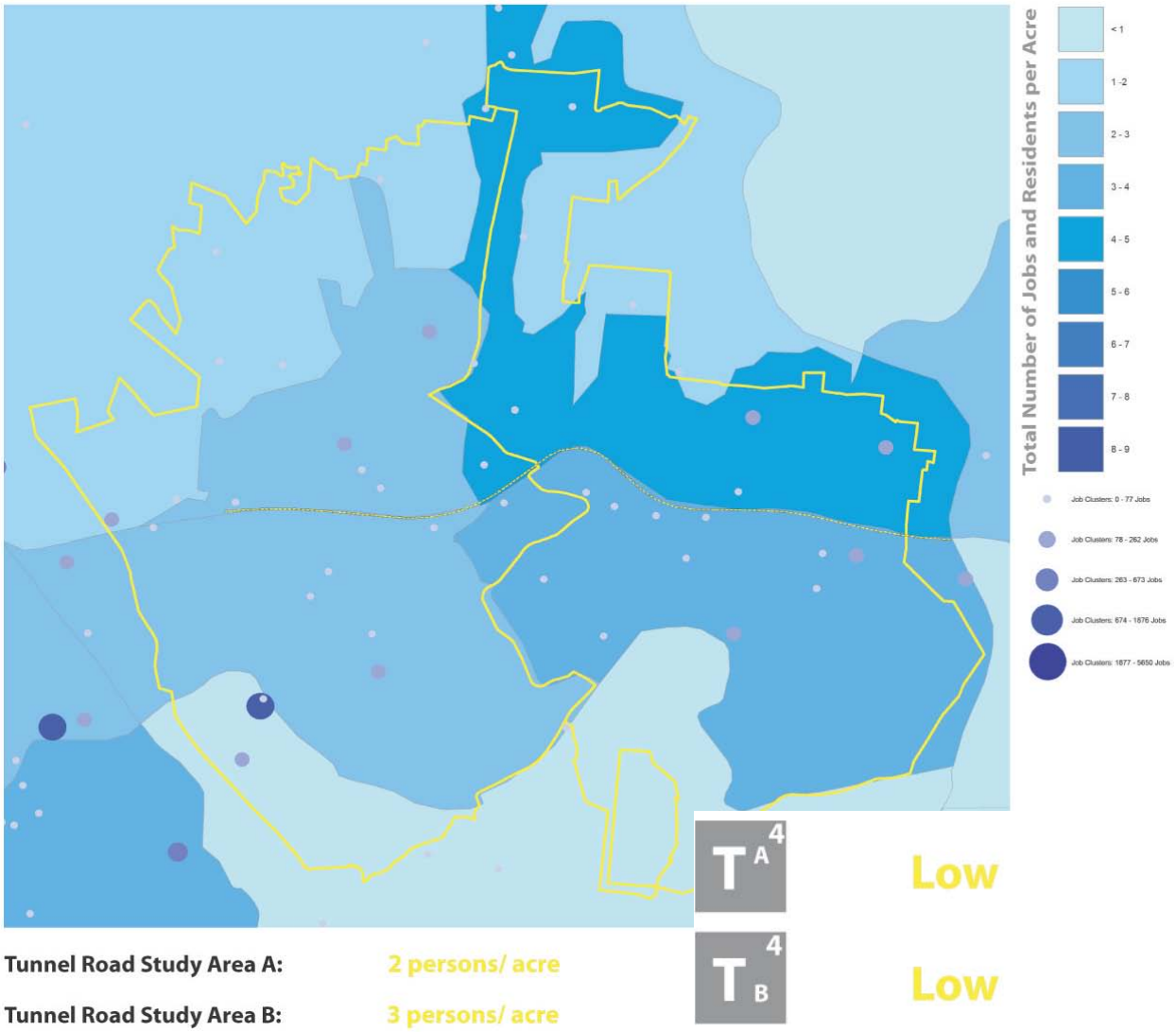


Figure B.6: Tunnel Road Findings for THE**gray**, ELEMENT**four:** Access to Jobs and Residence.[55]

[55] http://lehd.did.census.gov/led/

THEgray, ELEMENTfive: Access to Diverse Housing Types

The Intent:

To encourage development within and near existing communities and public transit infrastructure as well as encourage improvement and redevelopment of existing cities, suburbs, and towns while limiting the expansion of the development footprint in the region to appropriate circumstances.[56]

The Measure:

Percentage of diverse housing types.

The Explanation:

Housing diversity means providing multiple housing types (single family, detached townhomes, apartments, etc.) within a community. Housing diversity promotes housing choices for the entire community; it enables neighborhoods to provide for changing demographics, lifestyles and life stages.

The LEED Neighborhood Development uses the measures proposed related to housing diversity in communities. A specific measure of housing diversity has been Housing Diversity and Accessibility developed, based on an extensive list of housing categories set forth in the LEED ND policies, and works as such:

- Housing categories are listed (detached residential, duplex, multi-family, live/work unit, ADU, etc.) and differentiated by size.
- An index score for a development is used, where points are earned based on the number of different housing categories included in the development.

[56] Adapted from Congress for the New Urbanism, Natural Resources Defense Council, and the U.S. Green Building Council. *LEED 2009 for Neighborhood Development Rating System*. 2010 ed, Updated 2010. Print.

Score = 1-Σ (n/N)

n = the total number of dwellings in a single category, and

N = the total number of dwellings in all categories.

However due to a lack of information on the number of dwelling units in each category, the diversity of housing types could not be generated using this method. But it was important to include this method because of the important role this plays in sustainability. Perhaps the above measure could be calculated in a later study. Although this standard measure was not utilized in this study the diversity of housing types were generated for each study area. Merrimon Study Area A had the greatest mix of housing types; this area is the densest of all the corridors and study areas. Merrimon Study Area C was the least diverse of the all the corridors' study areas.

The Measurement & The Findings:

The following are the corridor's study areas diverse housing types from highest to lowest:

Merrimon Study Area A

Tunnel Study Area A

Haywood Study Area A

Haywood Study Area B

Tunnel Study Area B

Merrimon Study Area B

Merrimon Study Area C

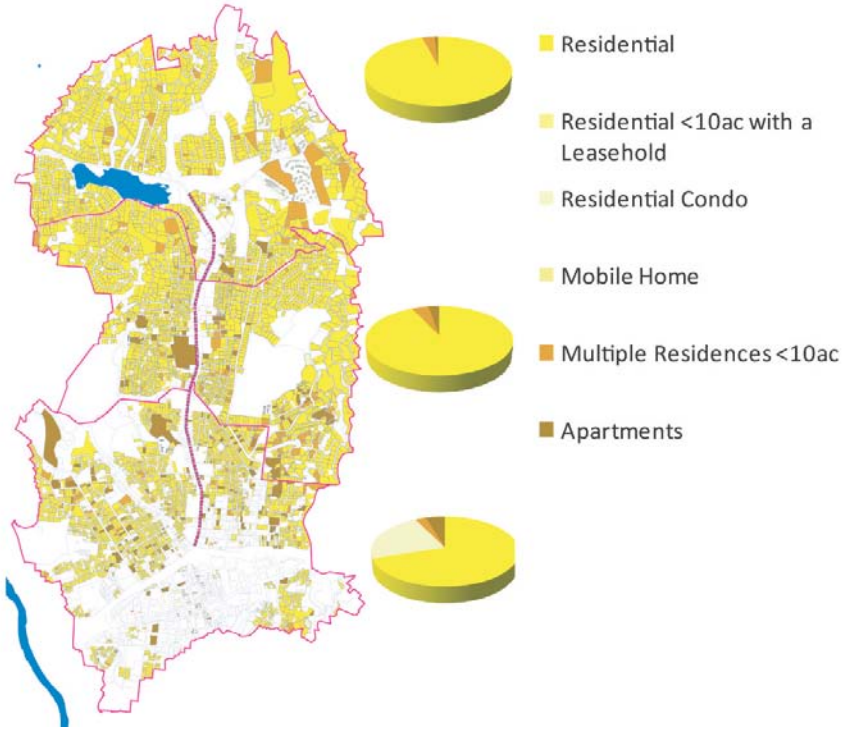


Figure B.7: Merrimon Avenue Findings for THEgray, ELEMENTfive: Access to Diverse Housing Types.[57] [58]

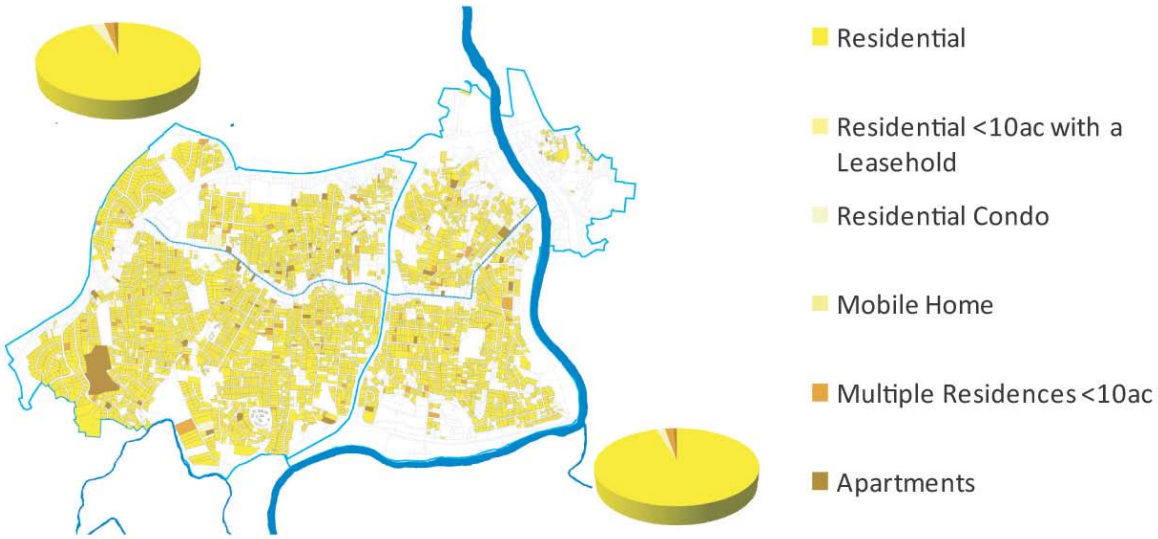


Figure B.8: Haywood Road Findings for THEgray, ELEMENTfive: Access to Diverse Housing Types.[59] [60]

[57] Based on information from GIS data from the City of Asheville.
[58] Created By L. Graham Stewart.
[59] Based on information from GIS data from the City of Asheville.
[60] Created By L. Graham Stewart.

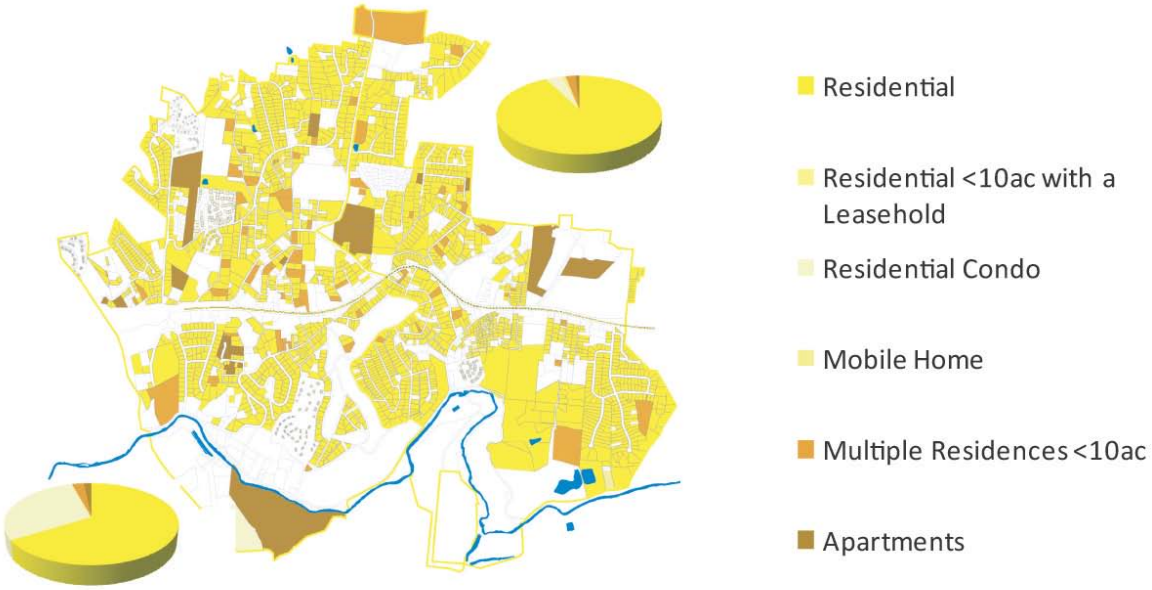


Figure B.9: Tunnel Road Findings for THEgray, ELEMENTfive: Access to Diverse Housing Types.[61] [62]

[61] Based on information from GIS data from the City of Asheville.
[62] Created By L. Graham Stewart.

THEgray, ELEMENTsix: Access to Density

The Intent:

To encourage development in *existing* areas to conserve land and protect farmland and wildlife habitat as well as promote livability, walkability, and transportation efficiency, including reduced *vehicle miles traveled* (VMT) and to improve public health encouraging daily physical activity associated with alternative modes of transportation and compact development.[63]

The Measure:

Floor Area Ratio

The Explanation:

Floor Area Ratio (FAR) is the ratio of the floor area of a building to the area of the lot on which the building is located. Higher densities make it possible for people to walk, bicycle, or use the bus. One important way to increase development densities is to increase the allowable floor area ratio (FAR). Figure 36 illustrates three different buildings with the same floor area ratio (FAR 1.0).

[63] Adapted from Congress for the New Urbanism, Natural Resources Defense Council, and the U.S. Green Building Council. *LEED 2009 for Neighborhood Development Rating System*. 2010 ed, Updated 2010. Print

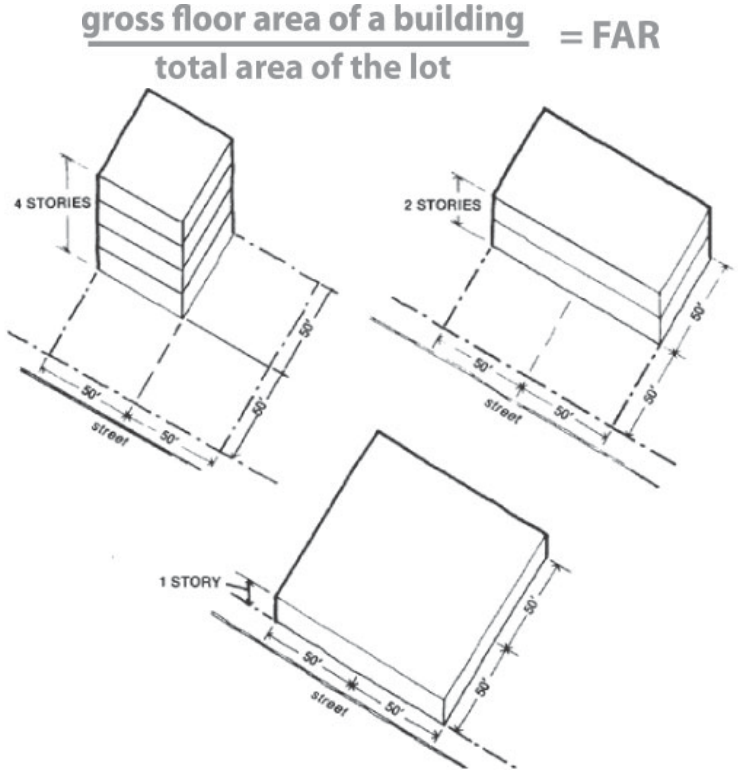


Figure B.10: Floor Area Ratio. Data Source. "New York City Handbook, Appendix D." Web. Accessed 6. Dec. 2010.http://www.tenant.net/Other_Laws/zoning/zonap-d.html.

The Measurement:

The information utilized to generate the FAR for parcels along the corridors were from the City of Asheville GIS data and Buncombe County's Tax Assessors' website: http://www.buncombetax.org. It should be noted that not all properties gross floor area of the building were listed; therefore their FAR was unable to be calculated. Those properties and those with an FAR of 0 are outlined in red. Many indexes start their ranges for FAR at as 0.75.

High: > 1.0 FAR

Moderate: 0.5-1.0 FAR

Low: < 0.5 FAR

The Findings**:**

The following are the corridor's study areas with the largest amount of parcels with a 1.0 or higher FAR from highest to lowest:

Haywood Study Area B

Haywood Study Area A

Merrimon Study Area B

Merrimon Study Area C

Merrimon Study Area A

Tunnel Study Area B

Tunnel Study Area A

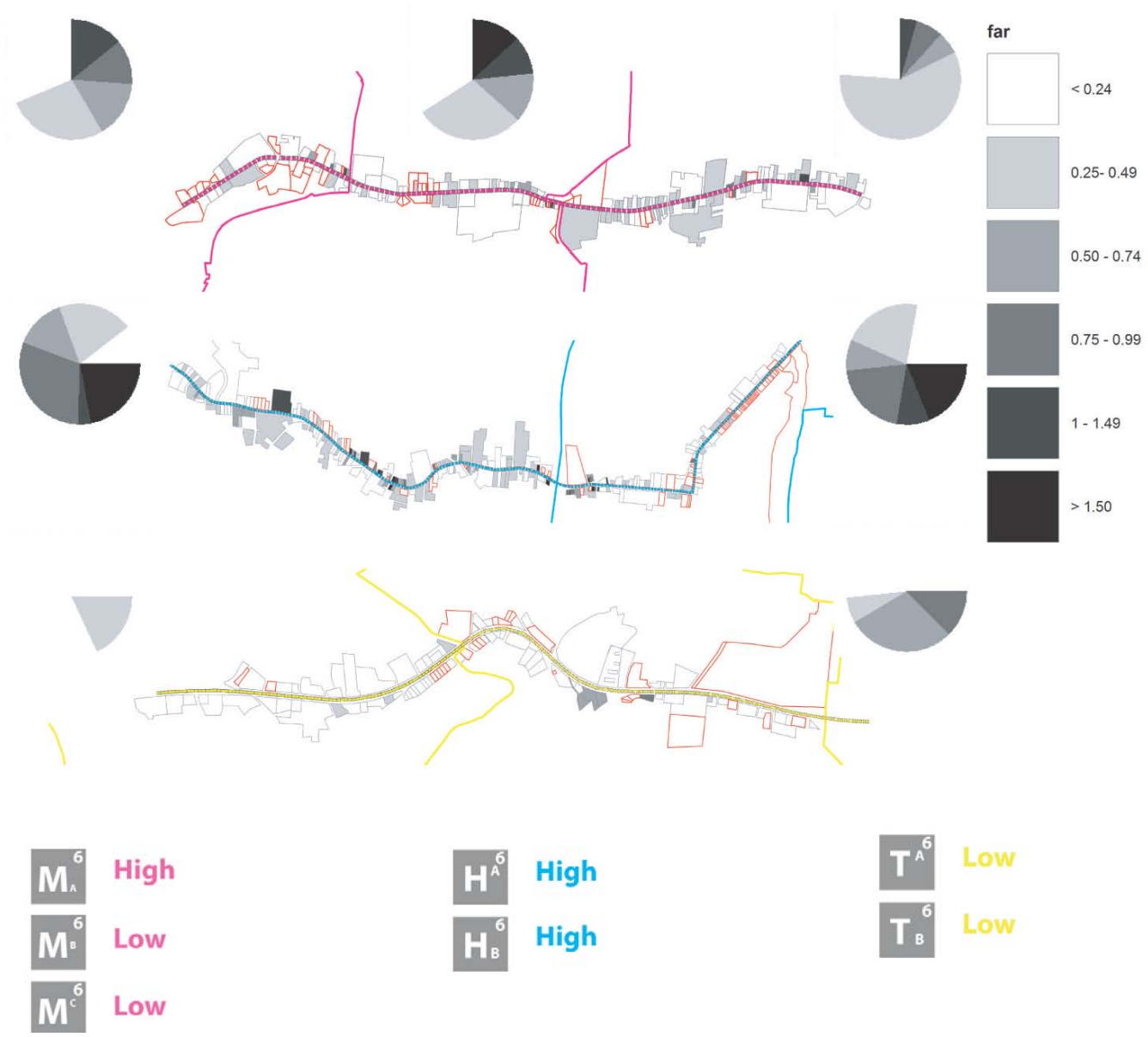


Figure B.11: Road Findings for THEgray, ELEMENTsix: Access to Density.[64] [65]

[64] Based on information from GIS data from the City of Asheville.
[65] Created By L. Graham Stewart.

Mixed-Use

"A mix of uses is often integral to the vitality of a neighborhood; the mix can include not only residential and commercial but also a variety of retail, services, community facilities, and other 'diverse uses,' whether available within the neighborhood or adjacent. Urban theorist Ray Oldenburg would classify diverse uses as 'Third Places'—small neighborhood grocers, coffee shops, pubs, or post offices that allow residents and workers to mingle and have social interactions. A mix of active and diverse retail uses on a walkable street can create a place that is alive day and night, and not closed down at 6 p.m."[66]

> According to The Arroyo Group , a land planning firm "mixed-use development is development that integrates compatible residential, commercial, office, institutional or other uses within the same structure, or in separate buildings on the project site as a single, unified development. The uses can be integrated horizontally or vertically, depending on the zone and location, however, a typical mixed-use project often consists of ground floor retail with either housing or office space above. Some mixed-use projects are not limited to uses within one building and may include entire neighborhoods where different uses are mixed together in close proximity. Many planners see mixed-use projects that have a housing component as an important factor in reviving urban and industrial areas. Mixed use is merely one possible component in development that can help achieve objectives such as increasing density, reducing the number of vehicles, creating localized employment, gentrification of urban neighborhoods, and providing dynamic living environments. Mixed-used development was the most prominent style of

[66] "LEED ND" *USGBC: U.S. Green Building Council*. N.p., n.d. Web. 2 Dec. 2010. <http://www.usgbc.org/ShowFile.aspx?DocumentID=3357>.

development during the large majority of the history of cities and towns. Because people walked for daily transportation, it was most convenient to locate the uses in proximity.

People often have worked from their own homes. This was particularly true in urbanized areas, where the bottom floor was devoted to some sort of commercial use, and living space was upstairs. Mixed-used development fell out of favor during the Industrial Age in favor of more efficient manufacturing in dedicated structures. Many of these buildings produced substantial industrial pollution, detrimental to those who lived nearby. These factors were important for the push in zoning that separated land uses. To protect both public health and residential property values, early zoning focused on separating different uses and buffering them from each other to minimize nuisances. This separation however, was extended to commercial uses as well, setting the stage for the suburban style of life that is common in America today. This type of single-use zoning was widely adopted by municipal zoning codes. Completely separate zoning created isolated "islands" of each type of development. In many cases, the automobile became a requirement for transportation between areas of residential neighborhoods and the separate commercial and office strips. Throughout the late 20th century, it became apparent to many urban planners and other professionals that mixed-use development had many benefits and should be promoted again. As American cities deindustrialized, the need to separate residences from dangerous factories became less important. Many professionals and citizens alike now argue that a mixture of uses is vital and necessary for a healthy urban area.

Different communities choose mixed use development for different reasons. Some see it as an excellent way to incorporate a mix of housing types on a small scale while

enhancing traditional town character. Others see it primarily as a vehicle for revitalizing struggling areas and spurring economic development. Still others use it to create or enhance downtowns or village centers, particularly when located near transit. Whatever the reason for choosing mixed-use development, it has many potential benefits.

Mixed-use development:

- Fosters pedestrian-oriented activity nodes by providing a mix of uses in compact, walkable areas.
- Spurs revitalization of deteriorating urban areas by integrating residential uses and public institutions into the commercial fabric to create an active street scene.
- Increase the viability of local shops and facilities and offers convenience to residents.
- Allows for greater variety of land uses and structures, including adaptive reuse of existing structures and flexibility in site planning.
- Promotes efficient use of land and infrastructure, particularly parking and transit.
- Promotes pedestrian & bicycle travel.
- Reduces auto dependency, roadway congestion, and air pollution by collocating multiple destinations.
- Increases the area available for residential development and provides more housing opportunities and choices.
- Provides more “eyes on the street” thereby increasing public safety in the area.

• Enhances an area's unique identity and development potential (e.g., village centers, locations near transit).

• Promotes a sense of community by fostering social equity through a spectrum of housing and jobs."[67]

The program Wordle (http://www.wordle.net/) and the Buncombe County Property Class Code feature of parcels along each corridor were used to generate the below graphics illustrates the uses along the corridor. The size of the word directly correlates to the number of times that the word appears in a list.

Figure B.12: Uses Along the Corridors.[68] [69]

[67] Group, The Arroyo. *Santa Fe Depot Specific Plan Update.* Web. Accessed 19 Mar. 2011. <http://www.arroyogroup.com/santafedepot/OR-FactSheet-MixedUse.pdf>.
[68] Based on information from GIS data from the City of Asheville.
[69] Created By L. Graham Stewart.

THEgray, ELEMENTseven: Access to Services

The Intent:

To reduce vehicle trips and vehicle miles travelled (VMT) as well as to reduce the incidence of obesity, heart disease, and hypertension by encouraging daily physical activity associated with walking and bicycling. To encourage improvement and redevelopment of existing cities, suburbs, and towns while limiting the expansion of the development footprint in the region to appropriate circumstances.[70]

The Measure:

Ratio of neighborhood shops, services, and facilities along that the corridor is within ¼- mile walk distance of at least five diverse uses.

The Explanation:

The properties along the corridors were first categorized using the Buncombe County Property Class Code and observations into the below categories. The CB Property Class Code is used to numerically designate activities on a property. Properties such as residential uses, industrial and auto-centric uses were not considered in the calculations. Once categorized then existing infrastructure, such as sidewalk and crosswalks were considered to determine the walkablility from the uses to one another. It should be noted that direct pedestrian access through the site (i.e. parking lot) was not considered in this calculations.

Food Retail

Supermarket

Other food store with produce

Community-Serving Retail

[70] Adapted from Congress for the New Urbanism, Natural Resources Defense Council, and the U.S. Green Building Council. LEED 2009 for Neighborhood Development Rating System. 2010 ed, Updated 2010. Print

Clothing store or department store selling clothes

Convenience store

Farmer's market

Hardware store

Pharmacy

Other retail

Services

Bank

Gym, health club, exercise studio

Hair care

Laundry, dry cleaner

Restaurant, café, diner (excluding establishments with only drive-throughs)

Civic and Community Facilities

Adult or senior care (licensed)

Child care (licensed)

Community or recreation center

Cultural arts facility (museum, performing arts)

Educational facility (including K–12 school, university, adult education center, vocational school, community college)

Family entertainment venue (theater, sports)

Government office that serves public on-site

Place of worship

Medical clinic or office that treats patients

Police or fire station

Post office

Public library

Public park

Social services center

In either case the qualifying uses must include at least one food retail establishment and at least one service from each of two other categories, with the following limitations:

a. A single establishment may not be counted in two categories (e.g., a place of worship may be counted only once even if it also contains a daycare facility, and a retail store may be counted only once even if it sells products in several categories).

b. Establishments in a mixed-use building may each count if they are distinctly operated enterprises with separate exterior entrances, but no more than half of the minimum number of diverse uses can be situated in a single building or under a common roof.

c. Only two establishments in a single category may be counted (e.g., if five restaurants are within the required distance, only two may be counted).

The Measurement:

High: >15

Moderate: 7-15

Low: < 5

The Findings:

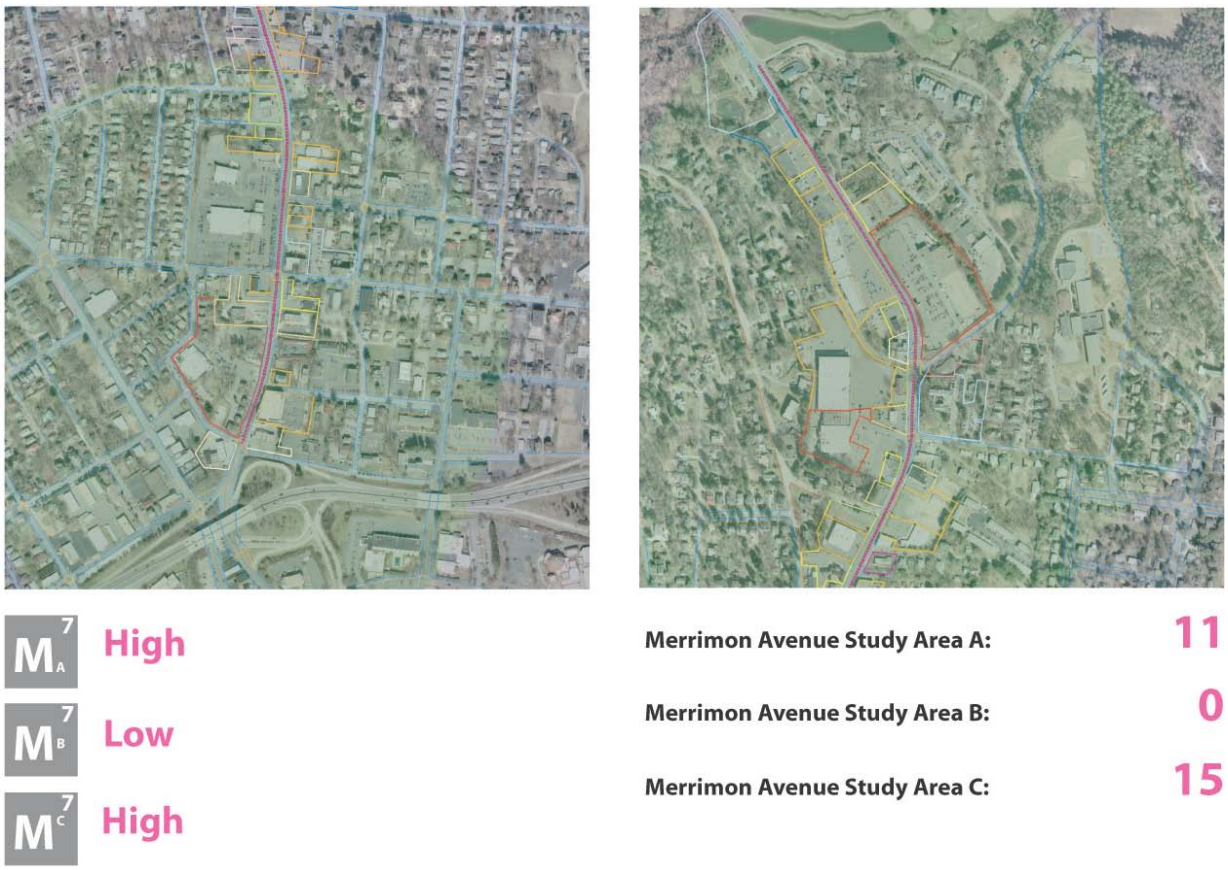


*Figure B.13: Merrimon Avenue Findings for THE**gray,** ELEMENT**seven:** Access to Services.*[71] [72]

Merrimon Avenue had three nodes that meet this criterion. Node 1 (Figure 4.32) is located in Study Area A. This node centers on the Green Life grocery store; there are 11 diverse uses within ¼ mile walk of each other.

Node 2 and 3 (Figure 4.33) are located in Study Area C. These node centers on the Fresh Market grocery store and the Ingles grocery stores, respectively. Node 2 has 16 diverse uses within ¼ mile of each other. Node 3 has 15 diverse uses within ¼ mile of each other.

[71] Based on information from GIS data from the City of Asheville, windshield surveys and site visits.
[72] Created By L. Graham Stewart.

Haywood Road Study Area A: 10

Haywood Road Study Area B: 0

Tunnel Road Study Area A: 0

Tunnel Road Study Area B: 0

H_A^7 Moderate

H_B^7 Low

T_A^7 Low

T_B^7 Low

*Figure B.14: Haywood Road & Tunnel Road Findings for THE**gray,** ELEMENT**seven:** Access to Services.*[73][74]

Haywood Road had two nodes that meet these criteria. Each node had 10 diverse uses within ¼ mile walk of each other. The two nodes were both located in Study Area A and centered on the Ingles grocery store and a small grocery store/ deli.

Tunnel Road had no portions along the corridor that meet this criteria, the lack of sidewalks and crosswalks, lack of diverse uses as well as only one Food Retail (Supermarket and Other food Store with produce) played a role in this determination.

[73] Based on information from GIS data from the City of Asheville, windshield surveys and site visits.
[74] Created By L. Graham Stewart.

THEgrey, ELEMENTeight: Access to Schools

The Intent

To promote community interaction and engagement by integrating schools into the neighborhood as well as to support students' health by encouraging walking and bicycling to school.[75]

The Measure:

Amount of 'needed linkage' in linear feet as identified in the *2005 Update to the City of Ashville Pedestrian Plan* within 1/2-mile walk distance of an existing or planned elementary or middle school or within a 1-mile walk distance of an existing or planned high school.

The Explanation:

The numbers of schools in each study area were calculated then the average amount of 'needed linkage' along the corridor within ½ mile of walk distance of an existing or planned elementary or middle school or within a 1-mile walk distance of an existing or planned high school divided by the number of schools in each study area; the lower the 'needed linkage' the higher the sustainability of that Study Area for this element. No schools are located in Merrimon Avenue Study Area B.

The Measurement & The Findings:

The amount of 'needed linkage' per the above explanation from lowest to highest, the lower the 'needed linkage' the higher the "completeness" of that study area for this element.

Merrimon Avenue Study Area B: N/A

Merrimon Avenue Study Area C: 880 LF

Merrimon Avenue Study Area A: 3486 LF

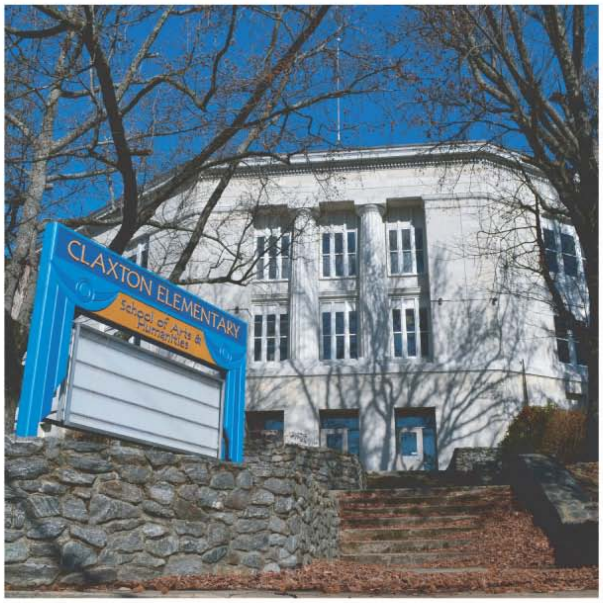
[75] Adapted from Congress for the New Urbanism, Natural Resources Defense Council, and the U.S. Green Building Council. *LEED 2009 for Neighborhood Development Rating System*. 2010 ed, Updated 2010. Print

Tunnel Road Study Area A: 7742 LF

Haywood Road Study Area B: 8733 LF

Tunnel Road Study Area B: 11023 LF

Haywood Road Study Area A: 17466 LF



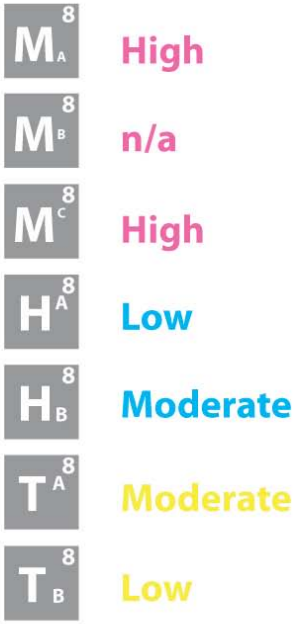


Photo B.1: THEgrey, ELEMENTeight: Access to Schools, taken in Merrimon Avenue Study Area A. Data Source: L Graham Stewart.

Figure B.15: Findings for THEgrey, ELEMENTeight: Access to Schools. [76]

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[76] Based on information from GIS data from the City of Asheville.

THEgray, ELEMENTnine: Access to Mixed-Use

The Intent:

To encourage development within and near existing communities and public transit infrastructure as well as to encourage improvement and redevelopment of existing cities, suburbs, and towns while limiting the expansion of the development footprint in the region to appropriate circumstances.[77]

The Measure:

Number of Mixed-Use developments

The Explanation:

American Planning Association defines *Horizontal Mixed-Use* as single-use buildings on distinct parcels in a range of land uses in one planned development project. This approach avoids the financing and code complexities of vertical layers used while achieving the goal of place making that is made possible by bringing together complementary used in one place. APA defines *Vertical Mixed-Use* as different uses in the same building. The lower floors generally have more public uses, with private uses on the upper level. They can have any number of revenue- producing and mutually supportive uses in the same building. The typical vertical mixed-use building includes residential space on an upper floor and a commercial use on the lower floor.

"Developing more than one use in a project, regardless of the location, can create a synergy between users of that project: The ability to walk to a restaurant at lunchtime rather than driving to the mall; being able to walk to a health club before or after work; taking care of several errands once you've parked your car; and in some instances, living near work and

[77] Adapted from Congress for the New Urbanism, Natural Resources Defense Council, and the U.S. Green Building Council. *LEED 2009 for Neighborhood Development Rating System*. 2010 ed, Updated 2010. Print

minimizing commuting time and hassles."[78] Mixed use is merely one possible component in development that can help achieve a COMPLETEcorridor.

Observation, COA GIS data, and five categories: Residential, Food Retail, Community-Servicing Retail, Services and Civic Community Facilities (established by LEED ND) were used to establish the existence of mixed-use. Limitations are as follows:

a. A single establishment may not be counted as mixed use (e.g., a place of worship may be counted only once even if it also contains a daycare facility, and a retail store may be counted only once even if it sells products in several categories).

b. Establishments in a mixed-use building may each count if they are distinctly operated enterprises with separate exterior entrance.

c. Only one establishments in a single category may be counted (e.g., if five restaurants are within the building, only one may be counted). Strip commercial building, row retail, etc would not be considered if they only have the use of retail.

The Measurement & The Findings:

Merrimon Study Area A has one horizontal mixed-use development; this area is identified as Node1 in THEgray, ELEMENTseven: Access to Services. Residential (Photo 4.2; d), Food Retail (Photo 4.4), Services and Civic Community Facilities (Photo 4.3; a,b,c) uses occurring on one parcel of land. This example of horizontal mixed-use is a great example of redevelopment such as the preservation of existing structures which contribute to the street edge

[78] Jacobsen, Will Fleissig and Vickie. In Collaboration with the Congress for New Urbanism and the U.S. Environmental Protection Agency. "Smart Scorecard for Development Projects." (2002). <http://www.epa.gov/smartgrowth/scorecards/Scorecard_expfleissigjacobsen.pdf>.

(promotes walkablity) as well as the developments unique character. This example also serves as an example of need for pedestrian direct connections and pathways; specifically the lack of direct pedestrian access to Green Life which requires a pedestrian to traverse a large parking lot. Tunnel Study Area B's instances of horizontal mixed-use also suffer from lack of direct pedestrian access.

Haywood Study Area A was four vertical mixed-use developments; this area is identified as Node1 in THEgray, ELEMENTseven: Access to Services. Residential, Food Retail, Services and Civic Community Facilities uses occur in these buildings. Haywood Study Areas A & B and Merrimon Study Area B currently have the structures with opportunities for mixed use but for whatever the reason being there potential is not realized.

The following are the corridors study areas' mixed-use developments results, only parcels with frontage along the corridors were examined. [79]

Tunnel Road Study Area A: 0, 0

Haywood Road Study Area A: 0, 4

Merrimon Avenue Study Area A: 1, 2

Tunnel Road Study Area B: 1, 2

Merrimon Avenue Study Area C: 1, 1

Haywood Road Study Area AL 1, 0

Merrimon Avenue Study Area B: 0, 0

[79] Based on information from GIS data from the City of Asheville, windshield surveys and site visits.

*Photo **B**.2: THE**grey**, ELEMENT**nine:***
Access to Mixed Use: Horizontal Mixed-Use.
Data Source: L Graham Stewart.

*Photo B.3: THE**grey**, ELEMENT**nine:***
Access to Mixed Use: Horizontal Mixed-Use.
Data Source: L Graham Stewart.

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*Photo B.4: THE**grey**, ELEMENT**nine:** Access to Mixed Use: Vertical Mixed-Use.*
Data Source: L Graham Stewart.

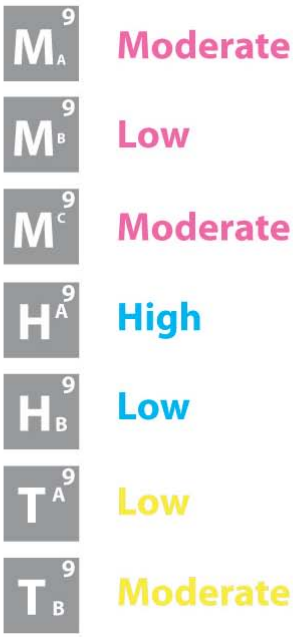

*Figure B.16: Findings for THE**grey**, ELEMENT**nine:***
Access to Mixed Use.

THEgreen, ELEMENTthree: Access to Civic or Passive-Use Space

The Intent:

To improve physical and mental health and social capital by providing a variety of open spaces close to work and home to facilitate social networking, civic engagement, physical activity, and time spent outdoors.[80]

The Measure:

Percentage of study area within ¼ mile of a civic or passive-use space, such as a square, park, paseo, or plaza. [81]

The Measurement

The following are the corridor's study areas percentage within ¼ mile of a civic or passive-use space, such as a square, park, paseo, or plaza from highest to lowest.

High: >75%

Moderate: 50-74%

Low: < 49%

The Findings:

It should be noted that proximity of a 5 min. walk to civic or passive-use spaces does not always translate into walkability. Tunnel Road Study Area A and B has the greatest percentage of civic or passive space per study area and the some of the lowest percentage of existing sidewalk infrastructure. Tunnel Road Study Area A had the highest percentage of 'needed linkage' while Tunnel Road Study Area B has the lowest percentage of 'needed linkage' per the *2005 Update to the City of Ashville Pedestrian Plan*. The lack of crosswalks across collector road (i.e. Swannanoa River Road) reiterates this point.

[80] Adapted from Congress for the New Urbanism, Natural Resources Defense Council, and the U.S. Green Building Council. *LEED 2009 for Neighborhood Development Rating System*. 2010 ed, Updated 2010. Print
[81] Ibid.

Merrimon Avenue Study Area A: 7% of study area consists of civic or passive-use space; 80% of study srea is within a 5 minute walk.

Tunnel Road Study Area B: 24% of study area consists of civic or passive-use space; 74% of study area is within a 5 minute walk.

Tunnel Road Study Area A: 10% of study area consists of civic or passive-use space; 54% of study area is within a 5 minute walk.

Merrimon Avenue Study Area B: 1% of study area consists of civic or passive-use space; 54% of study area is within a 5 minute walk.

Haywood Road Study Area B: 5% of study area consists of civic or passive-use space; 47% of study area is within a 5 minute walk.

Haywood Road Study Area A: 1 % of study area consists of civic or passive-use space; 41% of Study Area is within a 5 minute walk.

Merrimon Avenue Study Area C: 0.01% of study area consists of civic or passive-use space; 5% of study area is within a 5 minute walk.

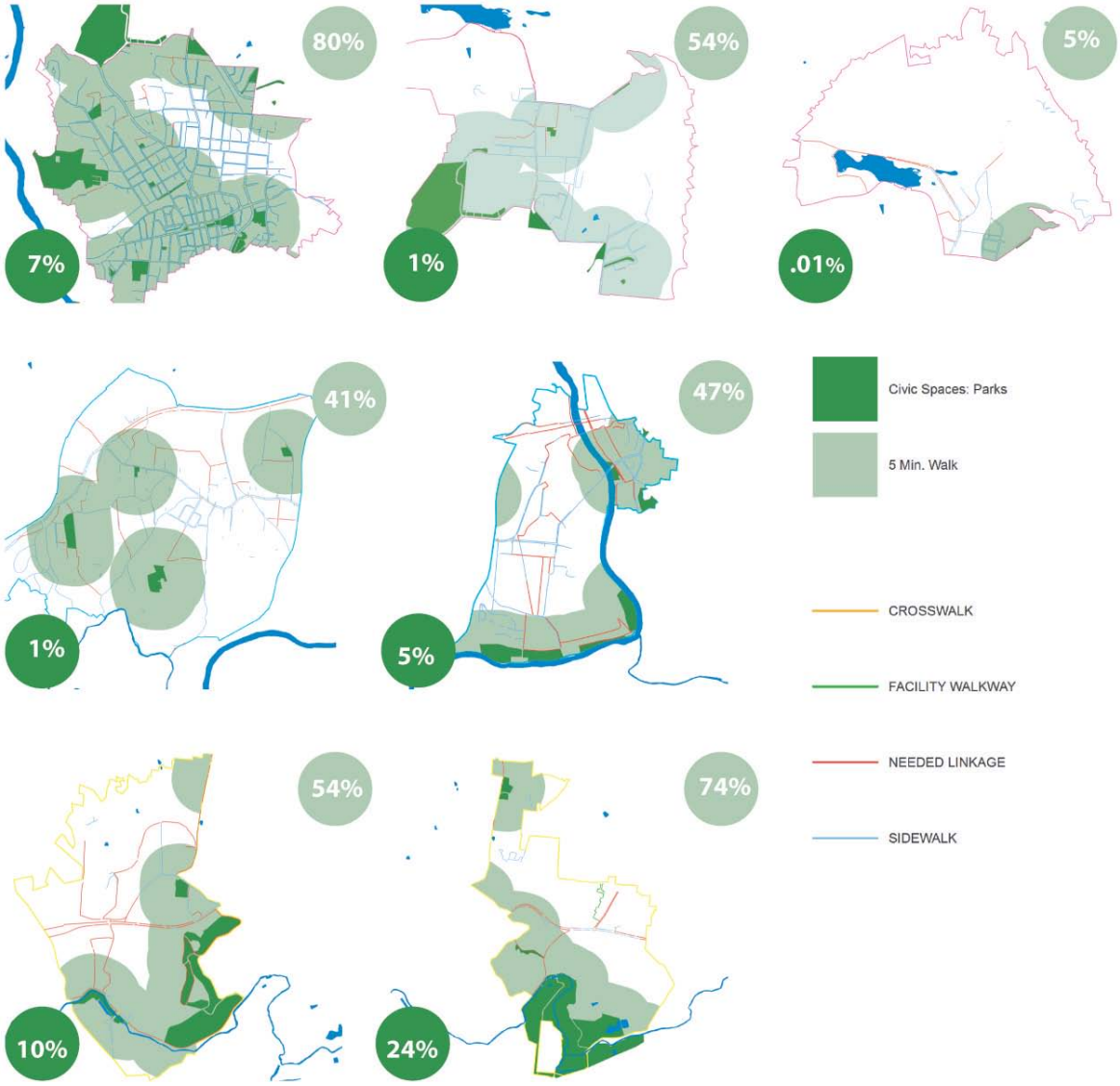

*Figure B.17: Findings for THE**green**, ELEMENT**three:** Access to Civic or Passive-Use Space.*[82] [83]

[82] *Based on City of Asheville's GIS data.*
[83] Created By L. Graham Stewart.

THEgreen, ELEMENTfour: Access to Community-Based Food Production

The Intent:

To promote community-based food production, improve nutrition through increased access to fresh produce, support preservation of small farms producing a wide variety of crops, reduce the negative environmental effects of large-scale industrialized agriculture, and support local economic development that increases the economic value and production of farmlands and community gardens.[84]

The Measure:

Existence of community/ neighborhood gardens within ¼ mile of study area and the existence of farmer's markets within a ½ mile of study area.

The Measurement & The Findings:

The following are the corridor's study areas with ¼ mile of community/ neighborhood gardens and within a ½ mile of farmer's market.[85]

Merrimon Avenue Study Area A's Community Gardens:

Pearson Garden

Demeter's Garden

Claxton Elementary School Garden

Dr. George Washington Carver Edible Garden

Merrimon Avenue Study Area A's Farmers Market:

North Asheville Tailgate Market

[84] Adapted from Congress for the New Urbanism, Natural Resources Defense Council, and the U.S. Green Building Council. *LEED 2009 for Neighborhood Development Rating System*. 2010 ed, Updated 2010. Print

[85] Information and location of gardens and farmer's market made by observations and www.bountifulcitiesproject.com and www.localharvest.org. CSA (food must be grown within 150 miles) drop off location within Study Areas could also be a measure but there was inadequate information available to access and location.

City of Asheville Farmer's Market

Merrimon Avenue Study Area B's Community Gardens:

Grace Covenant Presbyterian Church

Haywood Road Study Area A's Community Gardens:

Burton Street Community Peace Garden

Vance Elementary School Garden

Haywood Road Study Area A's Farmers Market:

West Asheville Tailgate Market

Haywood Road Study Area B's Community Gardens:

Hall Fletcher Elementary School Garden

Joyner Garden

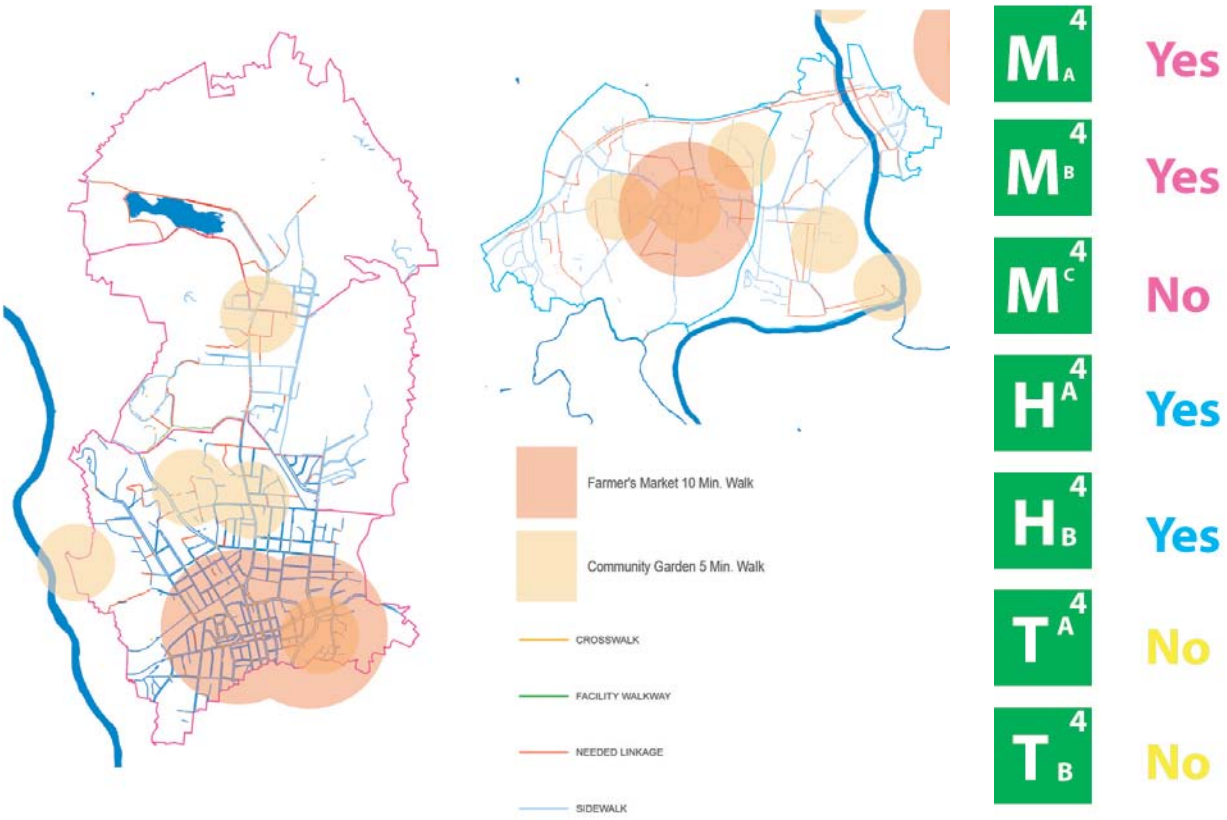

Figure B.18: Findings for THEgreen, ELEMENTfour: Access to Community-Based Food Production.[86] [87]

[86] *Based on City of Asheville's GIS data.*
[87] Created By L. Graham Stewart.

C. THE INDEX: MULTI-MODAL

Transportation Options

"Where there are good transportation options and workers choose to take alternatives to the car, fewer parking spaces are needed, and less public space overall is devoted to the car. This becomes a positive feedback loop, in which public space is used by pedestrians walking to work, transit, lunch, and/or home, and more resources and space can then be allocated to improving the pedestrian realm."[88]

Figure C.1: Photomontage of the corridor's existing transportation choices.
Data Source: L. Graham Stewart.

[88] *Twin Cities Ctlus Initiative: Identifying and Evaluating Regionally Significant Walkable Urban Places*, 2009.

Figure 6.2: Commutes to Work illustrates the commute to work for the following areas: Tunnel Road, Haywood Road, Merrimon Avenue, City of Asheville, Buncombe County, North Carolina and United State of America per U.S. Census Bureau, *2005-2009 American Community Survey*.

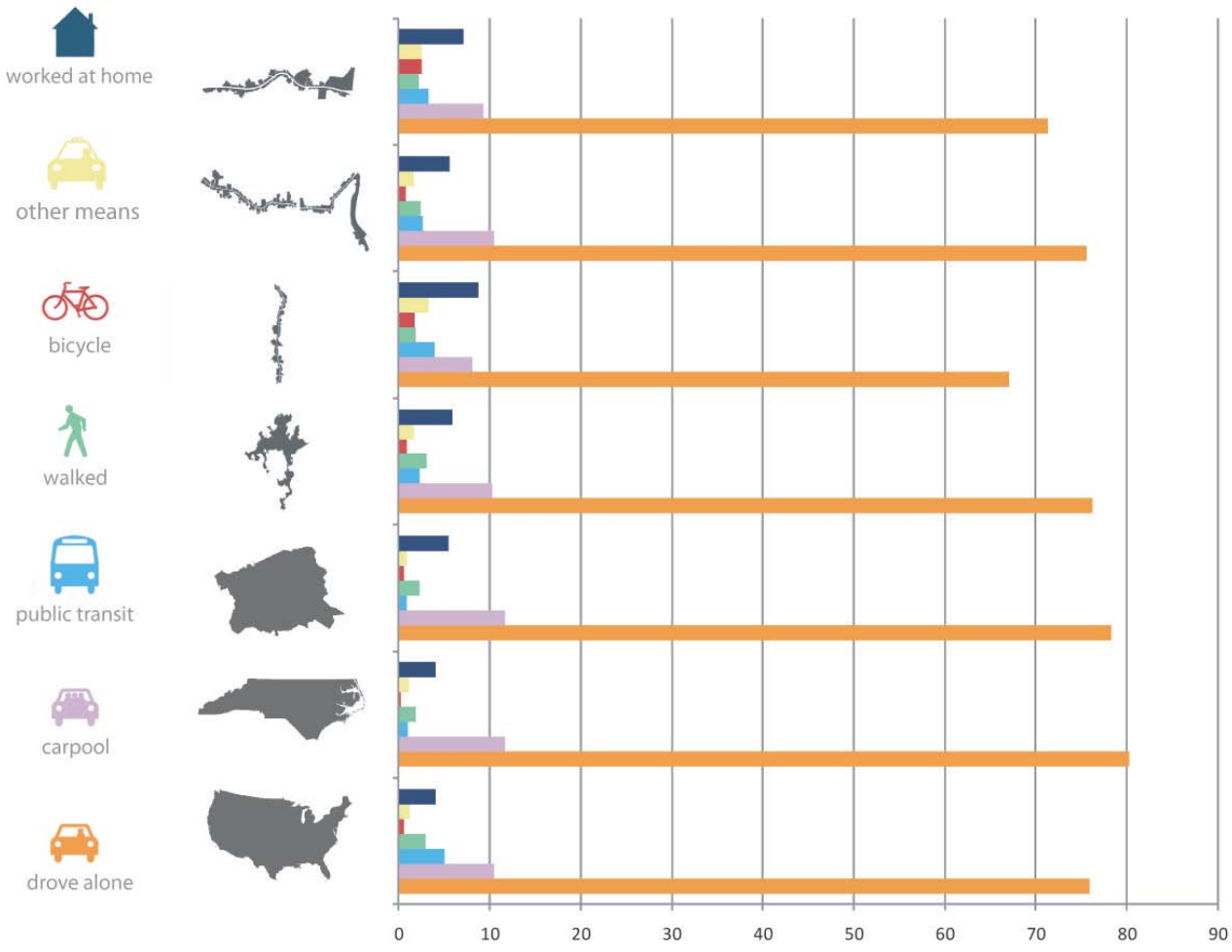

Figure C.2: Commutes to Work [89] [90]

[89] Based on US Census Data, *2005-2009 American Community Survey*.
[90] Created By L. Graham Stewart.

THEgray, ELEMENTten: Access to Transit: Bus Stop

The Intent:

To encourage development within and near *existing* communities and public transit infrastructure. To reduce vehicle trips and *vehicle miles traveled* (VMT). To reduce the incidence of obesity, heart disease, and hypertension by encouraging daily physical activity associated with walking and bicycling.[91]

The Measure:

Percentage of Study Area within a ¼ mile walks of a bus stop. [92]

The Explanation:

Using Census Tract information, the Population Density for each tract is shown in greyscale, the densest area shown in black to the least dense area shown in white. A ¼ mile buffer was generated from each bus stop to illustrate the percentage of each Study Area with a 5-minute walk of transit.

The Measurement:

High: More than 75%

Moderate: 74%- 50%

Low: <50%

The Findings:

Merrimon Avenue Study Area A: 94%

Merrimon Avenue Study Area B: 79%

Merrimon Avenue Study Area C: 65%

Haywood Road Study Area A: 75%

[91] Adapted from Congress for the New Urbanism, Natural Resources Defense Council, and the U.S. Green Building Council. *LEED 2009 for Neighborhood Development Rating System*. 2010 ed, Updated 2010. Print

[92] Ibid.

Haywood Road Study Area B: 60%

Tunnel Road Study Area A: 73%

Tunnel Road Study Area B: 45%

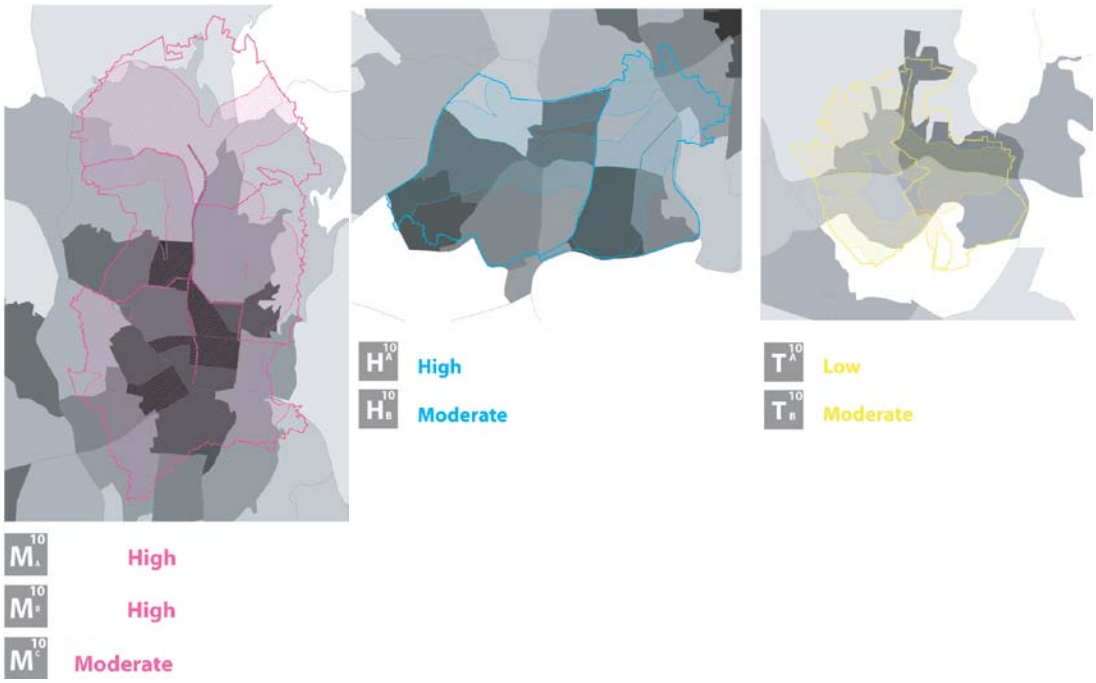

*Figure C.3: Findings for THE**gray,** ELEMENT**ten**: Access to Transit: Bus Stop*[93][94]

[93] Based on City of Asheville's GIS Data.
[94] Created By L. Graham Stewart.

Figure C.4: Bus Stop Amenities[95] [96]

[95] Based on City of Asheville's GIS Data and observations.
[96] Created By L. Graham Stewart.

THEgray, ELEMENTeleven: Access to Transit: Daily Transit Service Trips

The Intent:

To encourage development within and near *existing* communities and public transit infrastructure as well as to reduce vehicle trips and *vehicle miles traveled* (VMT).[97]

The Measure:

Daily Transit Service Trips

The Explanation:

Asheville currently has 24 routes with 60 minute service on each; with the exception of the pulse operation twice per hour at downtown transit center. The transit operates at 6am to 6pm; 24 trips a day. However the *2009 Transit Master Plan* identifies transit routes that will begin to have 30 minute service; 48 transit trips a day. Figure 6.6 shows the transit routes in color and the study areas in grey.

The Measurement:

High: >47 trips per day

Moderate: >23 trips per day

Low: <23 trips per day

The Findings:

All Study Areas has Daily Services Trips of 48.

[97] Adapted from Congress for the New Urbanism, Natural Resources Defense Council, and the U.S. Green Building Council. *LEED 2009 for Neighborhood Development Rating System*. 2010 ed, Updated 2010.

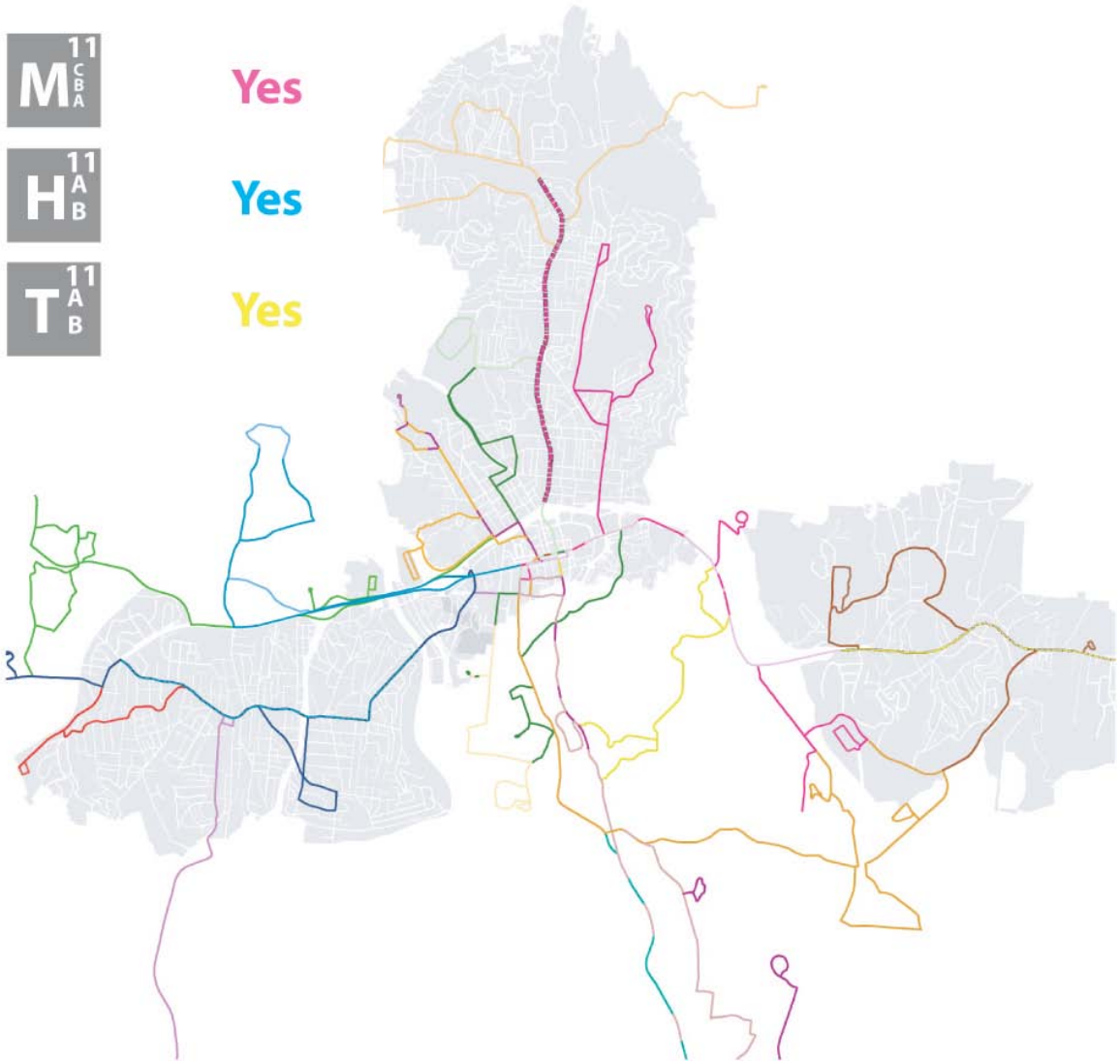

*Figure C.5: Findings for THE**gray,** ELEMENT**eleven**: Access to Transit: Daily Transit Service Trips*[98]

[98] Based on City of Asheville's GIS.

THEgray, ELEMENTtwelve: Access for Bicycles

The Intent:

To encourage development within and near existing communities and public transit infrastructure as well as to reduce vehicle trips and vehicle miles traveled (VMT). To reduce the incidence of obesity, heart disease, and hypertension by encouraging daily physical activity associated with walking and bicycling.[99]

The Measure:

Amount of existing bicycle facilities.

The Explanation:

Using the data generated from the NCDOT website (http://www.ncdot.org/it/gis/DataDistribution/DOTData/default.html) to calculate the existing bicycle infrastructure in each study area. The larger the amount of existing bicycle facilities the higher sustainability of that study area for this element. The larger the amount of existing bicycle facilities the higher the "completeness" of that study area for this element. It should be noted that the types of facilities were not identified, i.e. signs, lanes, etc.

The Findings:

The amount of existing bicycle facilities is as follows, from highest to lowest:

Merrimon Avenue Study Area A: 98712 LF

Merrimon Avenue Study Area B: 70831 LF

Haywood Road Study Area A: 42870 LF

Merrimon Avenue Study Area C: 40155 LF

Haywood Road Study Area B: 35594 LF

[99] Adapted from Congress for the New Urbanism, Natural Resources Defense Council, and the U.S. Green Building Council. *LEED 2009 for Neighborhood Development Rating System*. 2010 ed, Updated 2010.

Tunnel Road Study Area A: 25081 LF

Tunnel Road Study Area B: 17423 LF

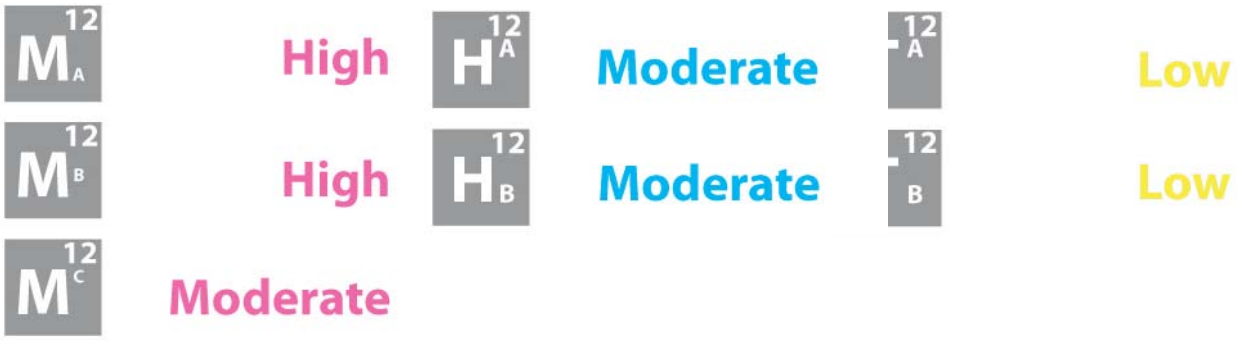

*Figure C.6: Findings for THE**gray,** ELEMENT**twelve**: Access for Bicycles.*[100]

Needed Bicycle Facilities:

The study used the data generated from the City of Asheville's *2008 Comprehensive Bike Plan* to illustrate the percentage of bike improvements needed in each corridor's study area. The information for each study area is also follows from the highest need to the lowest:

Merrimon Avenue Study Area A:	**32%**
Tunnel Road Study Area A:	**32%**
Haywood Road Study Area B:	**32%**
Merrimon Avenue Study Area B:	**23%**
Haywood Road Study Area A:	**21%**
Tunnel Road Study Area B:	**20%**
Merrimon Avenue Study Area C:	**17%**

Figure C.7: Needed Bicycle Facilities.[101][102]

[100] Based on City of Asheville's GIS.
[101] Ibid.
[102] Created By L. Graham Stewart.

Bicycle Amenities:

The number of bicycle racks in each study area is as follows:

Merrimon Avenue Study Area A,B,C:	**57, 2, 0**
Haywood Road Study Area A,B:	**5, 1**
Tunnel Road Study Area A,B:	**4, 0**

Figure C.8: Bicycle Amenities.[103][104]

[103] Based on City of Asheville's GIS.
[104] Created By L. Graham Stewart.

THEgray, ELEMENTthirteen: Access to Sidewalks: Study Area

The Intent:

To encourage development within and near existing communities and public transit infrastructure as well as to reduce vehicle trips and vehicle miles travelled (VMT). To reduce the incidence of obesity, heart disease, and hypertension by encouraging daily physical activity associated with walking and bicycling.[105]

The Measure:

Percentage of study area with sidewalk.

The Explanation:

Data from *the 2005 Update to the City of Asheville Pedestrian Plan* was used to generate the existing sidewalks and the 'needed linkage.' The ideal situation is a sidewalk to be found on each side of the street. Sidewalks width and design should respond to their context, wider sidewalks (7-8') in more urban areas minimum of 5' in other areas.

The Measurement & The Findings:

For this element, the higher the percentage for facilities, the higher the "completeness" of that study area. The amount of existing sidewalks facilities from highest to lowest are as follows:

Merrimon Avenue Study Area A:	48%
Haywood Road Study Area B:	20%
Merrimon Avenue Study Area B:	16%
Haywood Road Study Area A:	14%
Merrimon Avenue Study Area C:	8%
Tunnel Road Study Area A:	5%

[105] Adapted from Congress for the New Urbanism, Natural Resources Defense Council, and the U.S. Green Building Council. *LEED 2009 for Neighborhood Development Rating System*. 2010 ed, Updated 2010.

Tunnel Road Study Area B: 1%

The study used the data generated from the City *2005 Update to the City of Asheville Pedestrian Plan* to illustrate the percentage of 'needed linkage' in each corridor's study area. The information for each study area is also follows from the highest need to the lowest:

Tunnel Road Study Area A: 17%

Haywood Road Study Area A: 10%

Haywood Road Study Area B: 6%

Merrimon Avenue Study Area C: 5%

Merrimon Avenue Study Area A: 3%

Merrimon Avenue Study Area B: 3%

Tunnel Road Study Area B: 3%

Photo C.1: Existing Linkage.

Photo C.2: Existing Linkage.

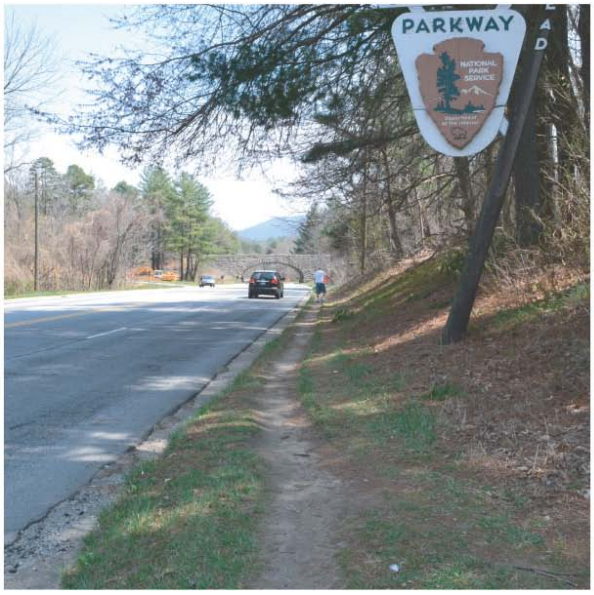

Photo C.3: Needed Linkage.

Photo C.4: Needed Linkage.

The *Photos C.1-C.4* illustrates some of the existing and needed sidewalks along the corridors. *Photo C.1* is located on Tunnel Road. It is a great example of a well-defined pedestrian way. The photograph also represents a great example of a verge or furnishing zone. A Furnishing Zone is defined by the Institute of Transportation Engineers' *Context Sensitive Solutions in*

*Designing Major Urban Thoroughfares for Walkable Communities: An ITE Proposed Recommended Practic*e as "a multi–purpose area of the roadside. It serves as a buffer between the pedestrian travel way and the vehicular area of the thoroughfare within the curbs, and it provides space for roadside appurtenances such as street trees, planting strips, street furniture, utility poles, sidewalk cafés, sign poles, signal and electrical cabinets, phone booths, fire hydrants, bicycle racks, and bus stop shelters." *Photo 6.2* illustrates the absence of a furnishing zone. Clearly Tunnel Road has the least amount of existing sidewalks. A large amount of the right-of-way along Tunnel Road has desire lines (*Photo 6.3*). Desire Lines are a path developed by erosion caused by animal or human footfall. The path usually represents the shortest or most easily navigated route between an origin and destination. The width and amount of erosion of the line represents the amount of demand. *Photo 6.4* depicts stairs that lead to nowhere.

THEgray, ELEMENTfourteen: Access to Sidewalks: Along Corridor

The Intent:

To encourage development within and near existing communities and public transit infrastructure as well as to reduce vehicle trips and vehicle miles traveled (VMT). To reduce the incidence of obesity, heart disease, and hypertension by encouraging daily physical activity associated with walking and bicycling.[106]

The Measure:

Percentage of study area along the corridor with sidewalk.

The Explanation:

Using the data generated from the *2005 Update to the City of Asheville Pedestrian Plan* to illustrate the existing sidewalks along the corridor.

The Measurement:

High: More than 75%

Moderate: 74%- 50%

Low: <50%

The Findings:

Merrimon Avenue Study Area A:	88%
Merrimon Avenue Study Area B:	68%
Merrimon Avenue Study Area C:	84%
Haywood Road Study Area A:	68%
Haywood Road Study Area B:	31%
Tunnel Road Study Area A:	6%

[106] Adapted from Congress for the New Urbanism, Natural Resources Defense Council, and the U.S. Green Building Council. *LEED 2009 for Neighborhood Development Rating System*. 2010 ed, Updated 2010.

Tunnel Road Study Area B: 32%

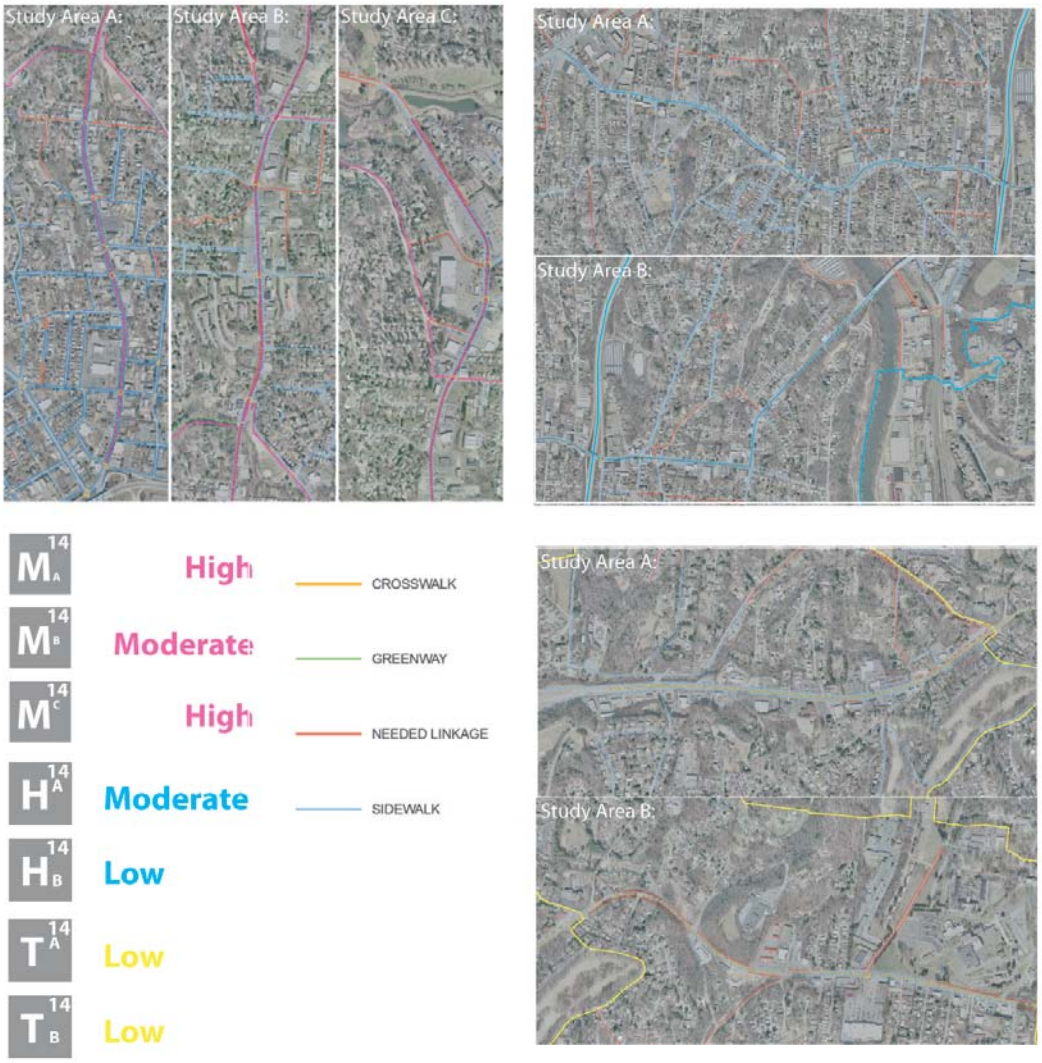

Figure C.9: Findings for THEgray, ELEMENTfourteen: Access to Sidewalks: Along Corridor.[107] [108]

A crosswalk every 800' is ideal however the average distance of crosswalks per study area are as follows:

Merrimon Avenue Study Area A: 1/ 900'

Merrimon Avenue Study Area B: 1/ 917'

[107] Based on City of Asheville's GIS.
[108] Created By L. Graham Stewart.

Merrimon Avenue Study Area C:	1/ 1000‘
Haywood Road Study Area A:	1/ 930‘
Haywood Road Study Area B:	1/ 2970’
Tunnel Road Study Area A:	1/ 4933’
Tunnel Road Study Area B:	1/ 3393’

Figure C.10: Existing Crosswalks Infrastructure. Created By L. Graham Stewart.

D. THE INDEX: NEIGHBORHOOD PATTERN, DESIGN, AND CHARACTER

THEgray, ELEMENTfifteen: Intersections

The Intent:

To encourage development within and near existing communities and public transit infrastructure. To encourage improvement and redevelopment of existing cities, suburbs, and towns while limiting the expansion of the development footprint in the region to appropriate circumstances. To reduce vehicle trips and vehicle miles traveled (VMT). To reduce the incidence of obesity, heart disease, and hypertension by encouraging daily physical activity associated with walking and bicycling.[109]

The Measure:

Average intersections/ square mile as measured with a 1/2-mile distance of the corridor's centerline.[110]

The Explanation:

"Intersection density is commonly used measures in walkability research (Saelens et al. 2003, Ewing and Cervero 2010, Lee and Moudon 2006, Leslie et al. 2005, Berrigan et al. 2010)."[111] When a neighborhood has a robust network of internal streets and good connections to surrounding communities, pedestrians, bicyclists, and drivers can move more efficiently and more safely. Multiple intersections and short blocks also give pedestrians a more interesting environment. LEEDS ND awards the lowest points for 200 intersections per square mile and the

[109] Adapted from Congress for the New Urbanism, Natural Resources Defense Council, and the U.S. Green Building Council. *LEED 2009 for Neighborhood Development Rating System*. 2010 ed, Updated 2010.
[110] Ibid.
[111] Walk Score, Find a Walkable Place to Live". <http://www.walkscore.com/how-it-works.shtml>.

highest points was 400 intersections per square mile. Twin Cities CTLUS Initiative's low range is from 150, and there high range is 300 intersections per square mile.

The Measurement:

Average intersections/ square mile

High: <200

Moderate: 200- 150

Low: >150

The Findings:

Merrimon Avenue Study Area A:	225
Merrimon Avenue Study Area B:	129
Merrimon Avenue Study Area C:	54
Haywood Road Study Area A:	251
Haywood Road Study Area B:	129
Tunnel Road Study Area A:	77
Tunnel Road Study Area B:	61

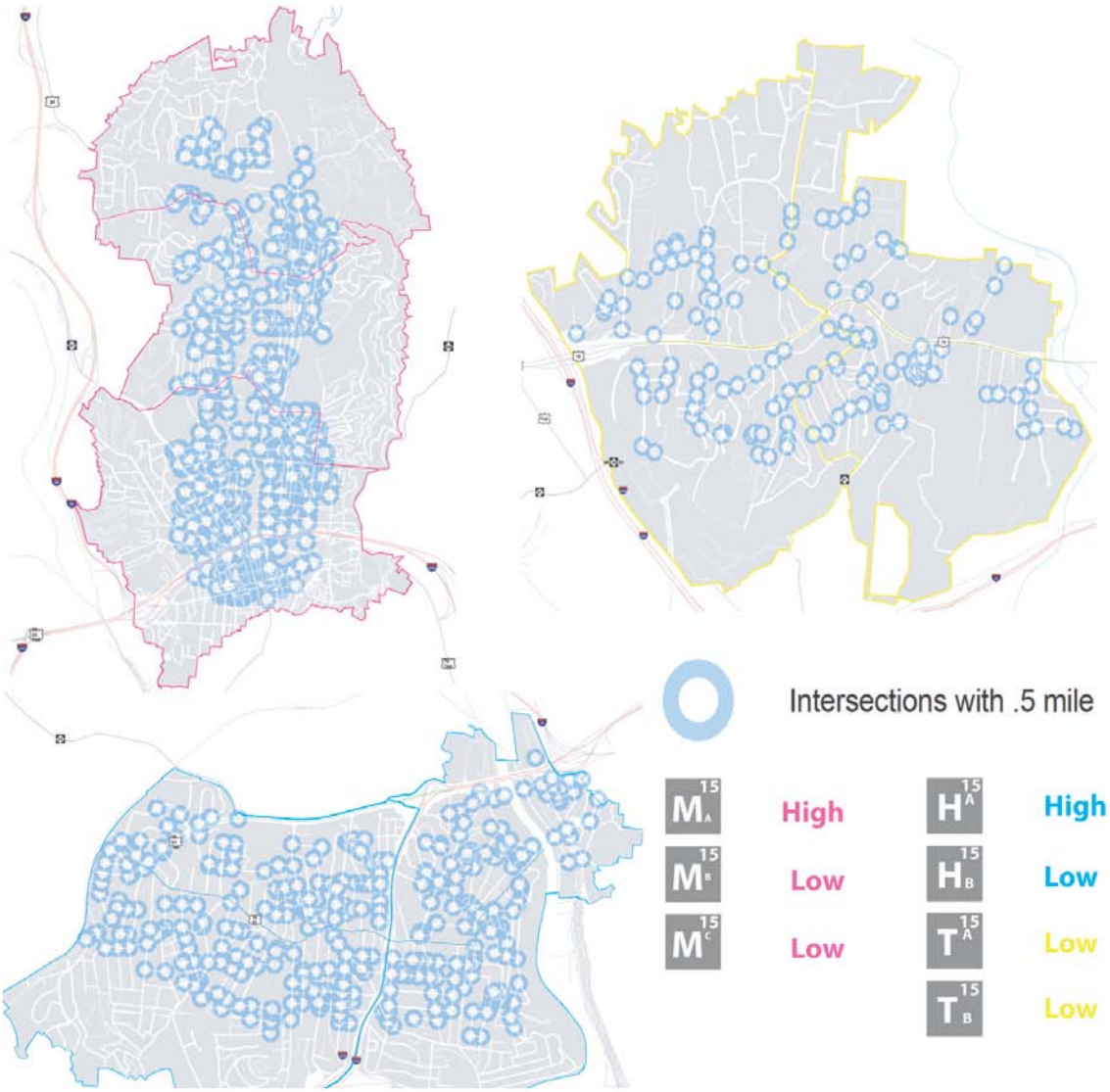

*Figure D.1: Findings for THE**gray**, ELEMENT**fifteen**: Intersections.*[112] [113]

[112] Based on City of Asheville's GIS data.
[113] Created By L. Graham Stewart.

THEgray, ELEMENTsixteen: Block Average

The Intent:

To reduce vehicle trips and vehicle miles traveled (VMT). To reduce the incidence of obesity, heart disease, and hypertension by encouraging daily physical activity associated with walking and bicycling.[114]

The Measure:

Average block lengths within the study areas.[115]

The Explanation:

Block length are commonly used measures in walkablility research (Saelens et al. 2003, Ewing and Cervero 2010, Lee and Moudon 2006, Leslie et al. 2005, Berrigan et al. 2010). (Get Your Walk Score - A Walkablility Score For Any Address.10 Dec. 2010.)."When a neighborhood has a robust network of internal streets and good connections to surrounding communities, pedestrians, bicyclists, and drivers can move more efficiently and more safely. Multiple intersections and short blocks also give pedestrians a more interesting environment.

The Measurement:

Average Block Lengths within the study area

High: <5 acres / block

Moderate: <5-8 acres / block

Low: > 8 acres/ block8

[114] Adapted from Congress for the New Urbanism, Natural Resources Defense Council, and the U.S. Green Building Council. *LEED 2009 for Neighborhood Development Rating System*. 2010 ed, Updated 2010.

[115] Development, Center of Transit-Oriented. "Twin Cities Ctlus Initiative: Identifying and Evaluating Regionally Significant Walkable Urban Places." (2009). Print

The Findings:

Merrimon Avenue Study Area A:	5ac
Merrimon Avenue Study Area B:	10ac
Merrimon Avenue Study Area C:	15ac
Haywood Road Study Area A:	5ac
Haywood Road Study Area B:	5ac
Tunnel Road Study Area A:	18ac
Tunnel Road Study Area B:	22ac

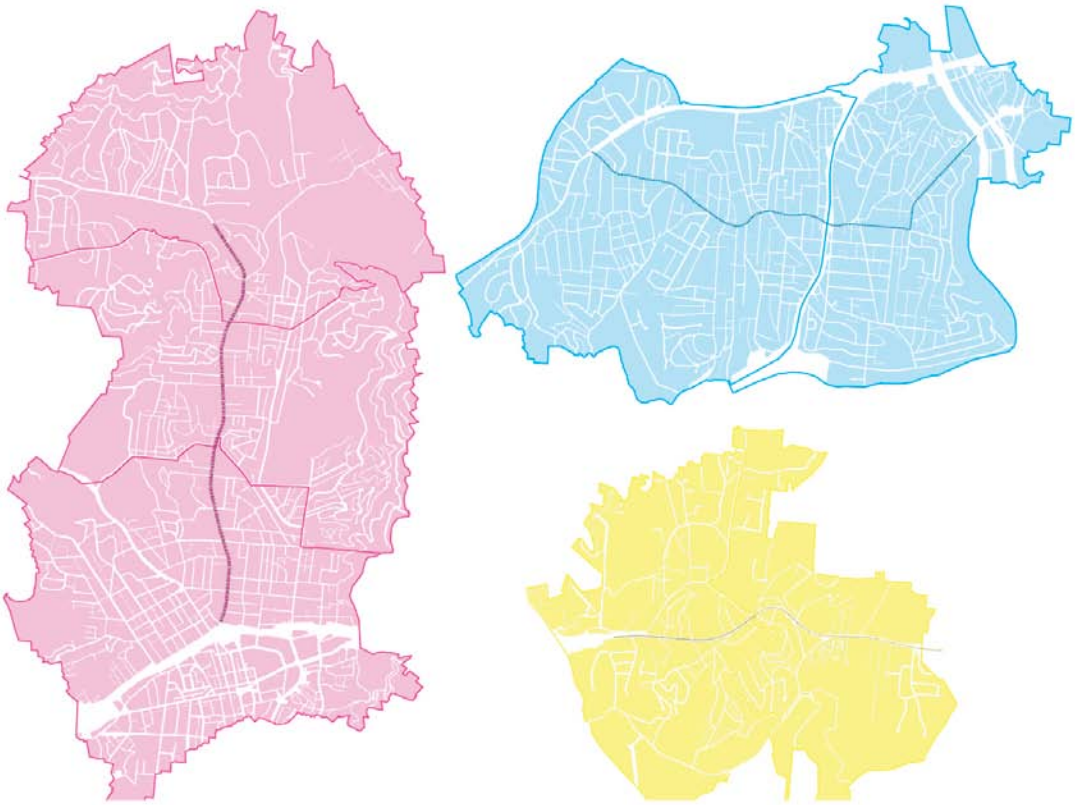

*Figure D.2: Findings for THE**gray**, ELEMENT**sixteen**: Block Lengths.*[116] [117]

[116] Based on City of Asheville's GIS data.
[117] Created By L. Graham Stewart.

THEgrey, ELEMENTseventeen: Access to On-street Parking

The Intent

To design parking to increase the pedestrian orientation and minimize the adverse environmental effects of parking facilities as well as to reduce public health risks by encouraging daily physical activity associated with walking and bicycling.[118]

The Measure:

Existence of on-street parking.

The Explanation:

On-street parking that serves multiple purposes: provides convenient access to building entrances, buffers pedestrians on the sidewalks from vehicular traffic. LEED ND requires that on-street parking is provided on a minimum of 70% of both sides of all new and existing streets in order of a project to receive points. Haywood Avenue is the only corridor that has on-street parking. The study recognizes that on-street parking is not appropriate along all corridors but other traffic calming measures could be utilized.

[118] Adapted from Congress for the New Urbanism, Natural Resources Defense Council, and the U.S. Green Building Council. *LEED 2009 for Neighborhood Development Rating System*. 2010 ed, Updated 2010.

The Findings:

*Figure D.3: Findings for THE**gray**, ELEMENT**seventeen**: Access to On-Street Parking.*[119] [120]

[119] Based on City of Asheville's GIS data and observations.
[120] Created By L. Graham Stewart.

THEgray, ELEMENTeighteen: Access to Parking

The Intent:

To design parking to increase the pedestrian orientation and minimize the adverse environmental effects of parking facilities as well as to reduce public health risks by encouraging daily physical activity associated with walking and bicycling.[121]

The Measure:

Percentage of parking lot located between the building and the street, along the corridor.

The Explanation:

"Businesses often want parking to be as readily visible and easily accessible as possible so that potential patrons arriving by car will know that they will be able park nearby quickly and easily. Building parking in front of buildings where it is most visible from the street, however, seriously detracts from the pedestrian environment and makes the area less comfortable to spend time in. When buildings front directly on the street, they create a lively and inviting environment where people can feel comfortable walking from store to store, rather than getting back in the car to drive a block or two to their next destination. To balance these concerns, one strategy is to require that new buildings when appropriate to locate their parking behind the building, away from the street, but ensure that there is adequate signage directing drivers to available parking. In more auto-oriented areas, a few 'teaser' spaces can be provided along the side of the building on the driveway that takes drivers to the lot in back".[122] In lieu of redevelopment on-street parking (when appropriate), shared parking facilities, direct access from the building to the street, tree

[121] Adapted from Congress for the New Urbanism, Natural Resources Defense Council, and the U.S. Green Building Council. *LEED 2009 for Neighborhood Development Rating System*. 2010 ed, Updated 2010.

[122] "Locate Parking Strategically-Metropolitan Area Planning Council." *Metropolitan Area Planning Council | Promoting Smart Growth and Regional Collaboration*. N.p., n.d. Web. Accessed 22 Feb. 2011. <http://www.mapc.org/resources/parking-toolkit/strategies-topic/locate-strategically>.

islands, use of pervious pavement, amenities for walkers, bicyclist and transit users are also ways to combat the large swathes of pavement.

The Measurement & The Findings:

Percentage of parcels along the corridors with parking between the building and the street (residential parcels not included in calculation); listed from lowest to highest. The lower the percentage of parking lots located between the building and the street, the higher the "completeness" of that study area for this element.

Merrimon Avenue Study Area A:	24%
Merrimon Avenue Study Area B:	29%
Merrimon Avenue Study Area C:	46%
Haywood Road Study Area A:	48%
Haywood Road Study Area B:	51%
Tunnel Road Study Area A:	54%
Tunnel Road Study Area B:	91%

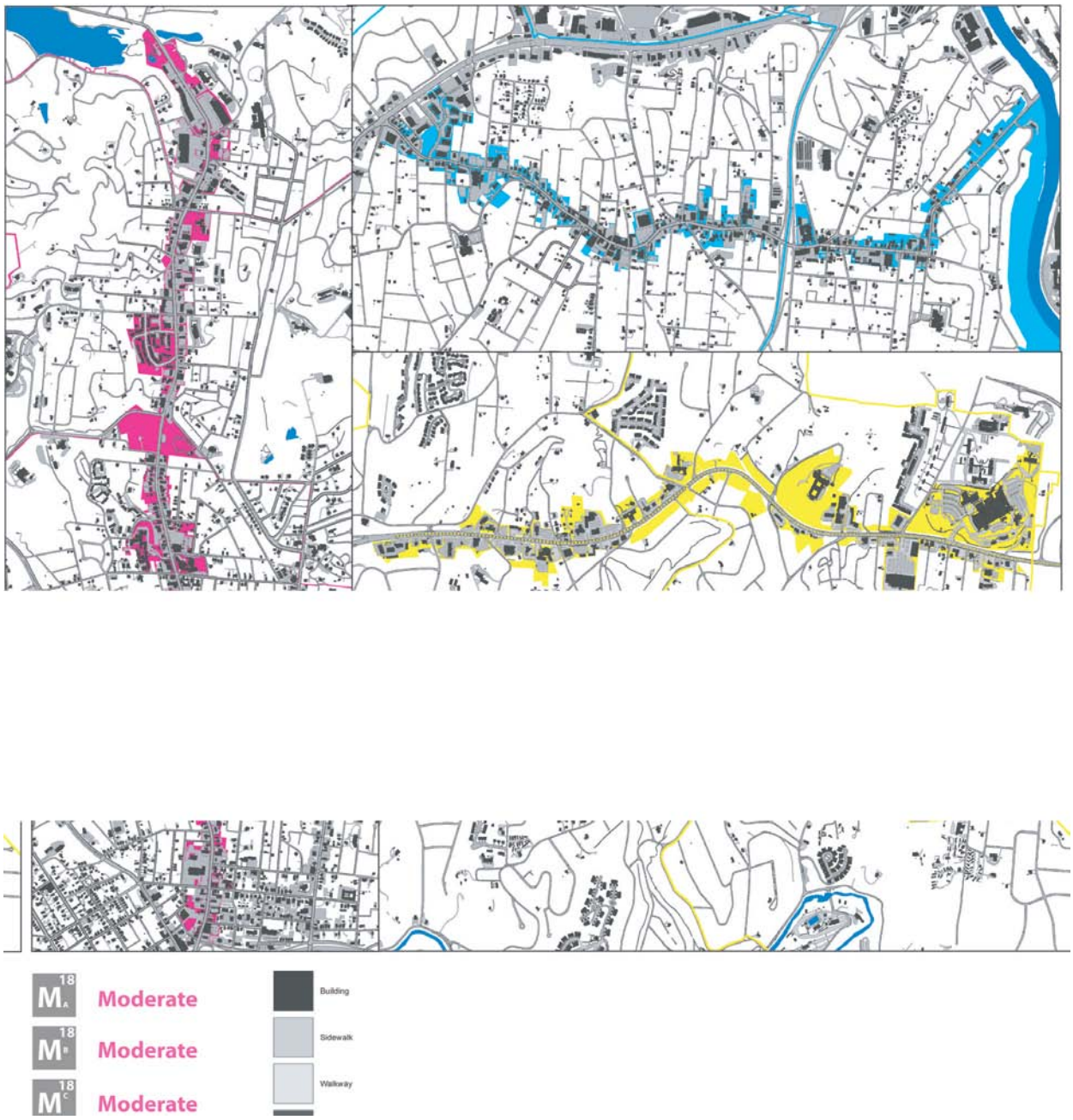

*Figure D.4: Findings for THE**gray**, ELEMENT**eighteen**: Access to Parking.*[123] [124]

[123] Based on City of Asheville's GIS data and observations.
[124] Created By L. Graham Stewart.

Walkability

Walkablility is a measure of how easy it is to walk around in an area easily and safely. Walking and walkablility provide a variety of benefits, including basic mobility, consumer cost savings, cost savings (reduced external costs), efficient land use, community livability, improved fitness and public health, and economic development.

According to a study conducted by the Carolina Transportation Program University of North Carolina at Chapel Hill's Carolina *Transportation Program: Walkable Environments and Walking Activity* the common elements in walkable neighborhoods are:

- "Pedestrian facilities (i.e. sidewalks typically at least 5 feet wide), trails, crosswalks, and other infrastructure and street treatments)
- Accessibility and convenience (proximity of multiple destinations)
- Mixed land uses
- Connectivity (i.e. short block lengths, grid pattern with many intersections and few culs-de-sac, efficient connections to many destinations (schools, parks, services, etc.)
- Parks, plazas and open space- ample supply of well-designed parks and greenways within a short walk of majority of residences
- Aesthetics (i.e. pleasant atmosphere, attractive architecture, landscaping and trees on majority of streetscape, well-lit public areas, outdoor seating in residential and commercial areas)
- Traffic calming and street safety- (i.e. streets designed to limit speeds [curb extensions, street narrowing, tree canopies, mini-circles, on-street parking], 15-20 mph around schools, 15-25 on most residential streets, 30-35 on collectors)
- Transit access – (i.e. transit stops within ½-mile of origins, ample routes and stops, activities walkable to transit)

- Street orientation - (i.e. efficient street orientation, shallow setbacks)
- Residential density – (i.e. at least 6-7 dwelling units/acre, higher density for multi-family homes to promote efficiency use of urban land)
- Neighborhood schools - elementary schools within ½ mile of most children, middle schools within 1 mile of most children, pedestrian access points, traffic calming features and low posted speeds
- Americans with Disabilities compliance - (i.e. new walkways, trails, and sidewalks ADA-compliant, 2 curb ramps/corner, 1 curb ramp on each side of marked mid-block crossing) ."[125]

This study will examine some of these criteria along each corridor.

Defined Pedestrian Way

A defined pedestrian way is important to pedestrian safety. For the purposes of the study, the quality of the pedestrian way is defined by the clarity of this pedestrian route and its visual and/or physical separation or distinction from vehicular paths. A well-defined pedestrian way will be separated from vehicular traffic, drives and parking areas. Where they intersect, pavement markings, textural change or coloration will alert drivers to the pedestrian path. A somewhat-defined pedestrian way will have some separation or clear distinction but not consistently across the property. An undefined or poorly defined pedestrian way will lack clear distinctions and separation between vehicular and pedestrian traffic.

Along all corridors there was a capacious amount of parcels with poorly defined pedestrian way. Frequent and wide curb cuts and parking across parcels creates a hazardous environment for pedestrians. This was most prevalent along Merrimon Avenue and Tunnel Road.

[125] Elizabeth Shay, Steven C. Spoon, Asad J. Khattak. *Walkable Environments and Walking Activity* University of North Carolina at Chapel Hill's Carolina Transportation Program, 2003. Print.

Photo D.1: Defined Pedestrian Way

Photo D.2: Somewhat-Defined Pedestrian Way

Photo D.3: Un-Defined Pedestrian Way

Photo D.4: Pedestrian Way Obstruction

THEgray, ELEMENTnineteen: Quality of Pedestrian Way

The Intent:

To encourage development within and near existing communities and public transit infrastructure as well as to reduce vehicle trips and vehicle miles travelled (VMT). To reduce the incidence of obesity, heart disease, and hypertension by encouraging daily physical activity associated with walking and bicycling.[126]

The Measure:

(a) Direct Access:

Percentage of principal functional entry on the front façade faces a public space, such as a street, square, park, paseo, or plaza, but not a parking lot, and is connected to sidewalks or equivalent provisions for walking.

(b) Building Setback:

Percentage of parcels along corridor within 25' of property line.

(c) Fenestration:

Percentage of parcels along the corridor within 25' of property line, with at least 60% of fenestration.

(d) Drive-thru:

Percentage of drive-thru facilities along corridor.

(e) Height-to-Street ratio of 1:3 (i.e., a minimum of foot of building height for every 3 feet of street width).

The Measurement & The Findings:

(a) Direct Access:

[126] Adapted from Congress for the New Urbanism, Natural Resources Defense Council, and the U.S. Green Building Council. *LEED 2009 for Neighborhood Development Rating System*. 2010 ed, Updated 2010.

The optimal situation would be for all uses, when appropriate, along the corridor to have a delineated path from the sidewalk to entrances to reduce pedestrian exposure to automobile movement.

Haywood Road Study Area A:	43%
Merrimon Avenue Study Area A:	38%
Merrimon Avenue Study Area C:	27%
Haywood Road Study Area B:	27%
Merrimon Avenue Study Area B:	19%
Tunnel Road Study Area B:	2%
Tunnel Road Study Area A:	1%

*Figure D.5: Findings for THE**gray**, ELEMENT**nineteen**: Quality of Pedestrian Way: (A) Direct Access.*[127] [128]

[127] Based on City of Asheville's GIS data and observations.
[128] Created By L. Graham Stewart.

The Measurement

(b) Building Setback:

When pedestrian details such as shallow setbacks are present, pedestrians are more comfortable using the sidewalk facilities, neighborhoods are safer because there are more people out in the community, and commercial areas thrive. The importance of this measure in walkablility is demonstrated in LEED ND suggestion that that new developments or redevelopments have at least 80% of the total linear feet of street-facing building façades in the project is no more than 25 feet from the property line and at least 50% of the total linear feet of street-facing building façades in the project is no more than 18 feet from the property line in order to be considered walkable. However the ability for these corridors to currently meet such measures is unlikely therefore the measure has been adjust to Asheville's context. *Figure 7.6* illustrates the building setbacks along the corridors.

High: >40%

Moderate: 15-39%

Low: <15%

The Findings:

The following are the percentage of parcels along the corridors study area within 25 feet of the right-of-way.[129]

Merrimon Avenue Study Area A: 48%

[129] Adapted from Congress for the New Urbanism, Natural Resources Defense Council, and the U.S. Green Building Council. *LEED 2009 for Neighborhood Development Rating System*. 2010 ed, Updated 2010.

Haywood Road Study Area A:	38%
Haywood Road Study Area B:	36%
Merrimon Avenue Study Area C:	14%
Merrimon Avenue Study Area B:	13%
Tunnel Road Study Area B:	7%
Tunnel Road Study Area A:	2%

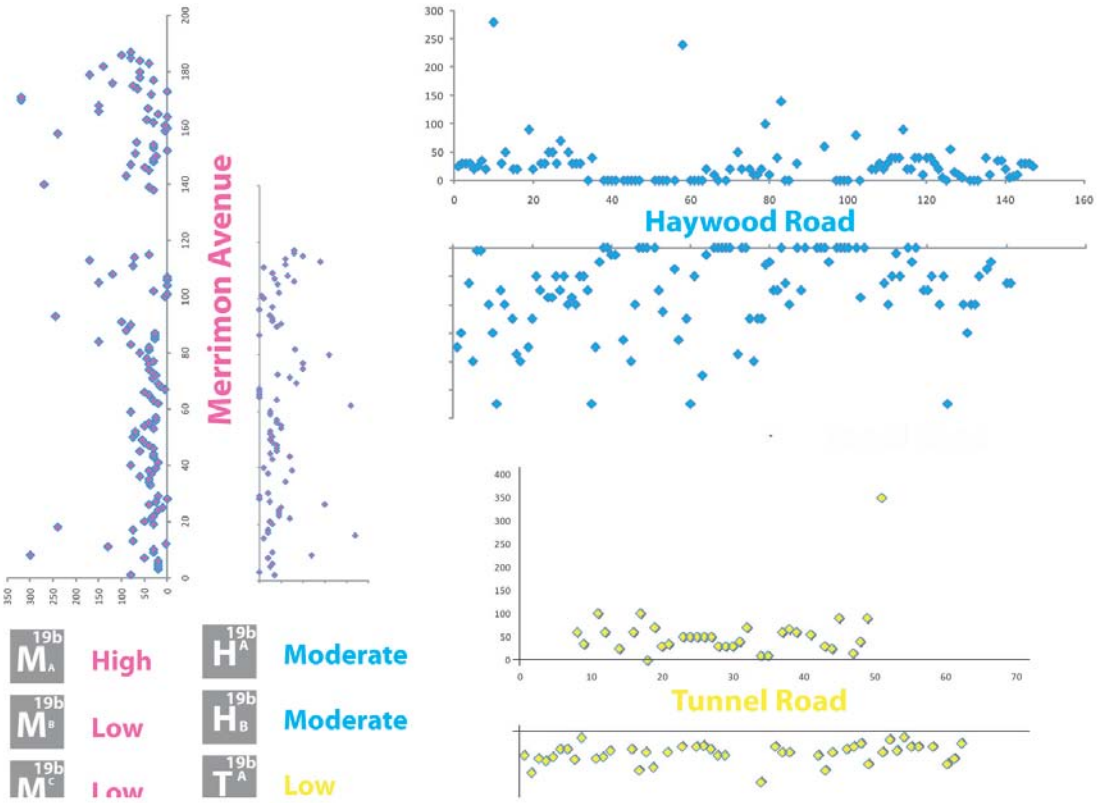

*Figure D.6: Findings for THE**gray**, ELEMENT**nineteen**: Quality of Pedestrian Way: (B) Building Setback.*[130] [131]

[130] Based on City of Asheville's GIS data and observations.
[131] Created By L. Graham Stewart.

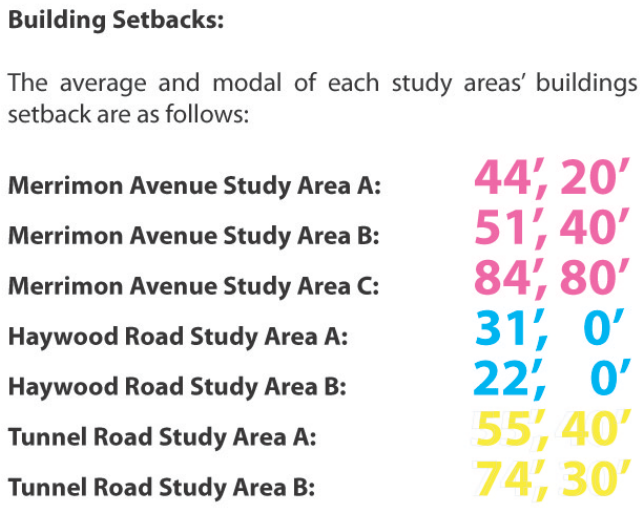

Figure D.7: Average and Modal Building Setbacks for the corridors' study areas.[132] [133]

The Measurement & The Findings:

(c) Fenestration:

When pedestrian details such as windows and doorways are present, pedestrians are more comfortable using the sidewalk facilities, neighborhoods are safer because there are more people out in the community, and commercial areas thrive. All ground-level retail, service, and trade uses that face a public space have clear glass on at least 60% of their façades between 3 and 8 feet above grade. The following are the number of parcels along the corridor's study areas with the 60% or more fenestration on buildings that are within 25' of property lines from highest to lowest.

Merrimon Avenue Study Area A:	8
Haywood Road Study Area A:	25
Haywood Road Study Area B:	10
Merrimon Avenue Study Area C:	6

[132] Based on City of Asheville's GIS data and observations.
[133] Created By L. Graham Stewart.

Merrimon Avenue Study Area B:	4
Tunnel Road Study Area B:	1
Tunnel Road Study Area A:	0

Photo D.5: Fenestration Example from Haywood Road Study Area A. Data Source: L. Graham Stewart

*Figure D.8: Examples of Fenestration Percentages in the corridors' study areas & Findings for THE**gray**, ELEMENT**nineteen**: Quality of Pedestrian Way: (C) Fenestration.*[134] [135]

[134] Based on City of Asheville's GIS data and observations.
[135] Created By L. Graham Stewart.

The Measurement & The Findings:

(d) Drive-thru:

Reducing pedestrian exposure to automobile movement can increase the quality of the pedestrian way. Some municipalities limit these uses in specific area and/ or requiring pedestrian safety measures when there is opportunity for conflict. The following is the percentage of drive-thru along the corridor's study areas; listed from highest to lowest. The lower the percentage of drive-thru along the corridor, the higher the sustainability of that study area for this element.

Tunnel Road Study Area B:	15%
Merrimon Avenue Study Area B:	11%
Merrimon Avenue Study Area C:	9%
Tunnel Road Study Area A:	2%
Merrimon Avenue Study Area A:	1%
Haywood Road Study Area A:	1%
Haywood Road Study Area B:	0%

Photo D.6: Drive-thru.

Photo D.7: Drive-thru.

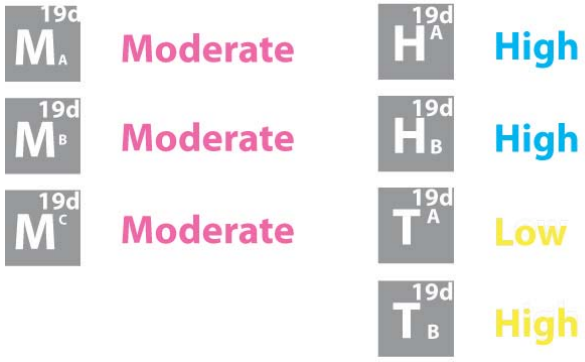

*Figure D.9: Findings for THE**gray**, ELEMENT**nineteen**: Quality of Pedestrian Way: (D) Drive-thru.*[136] [137]

[136] Based on City of Asheville's GIS data and observations.
[137] Created By L. Graham Stewart.

The Measurement:

(e) Height-to-Street ratio:

The height-to-street-width ratio of 1:3 (i.e., a minimum of 1 foot of building height for every 3 feet of street width) is the optimum measure for promoting a street frontage that creates of sense of closure and promotes walkablility.[138]

- Street frontage is measured in linear feet.
- Building height is determined by using the Buncombe County's Tax Assessors' website (http://www.buncombetax.org) to determine the number of stories of each structure along the corridors. The average building height in each study area was determined by taking the average number of stories per study area, 12' per building story. It should be noted that not all properties building information was listed, therefore their other tools such as aerial photos and site visits were used.
- Each study areas' modal building setback was then used to create the typical height-to-street-width ratio section of the corridor's each study area.

[138] Adapted from Congress for the New Urbanism, Natural Resources Defense Council, and the U.S. Green Building Council. *LEED 2009 for Neighborhood Development Rating System*. 2010 ed, Updated 2010.

The Findings:

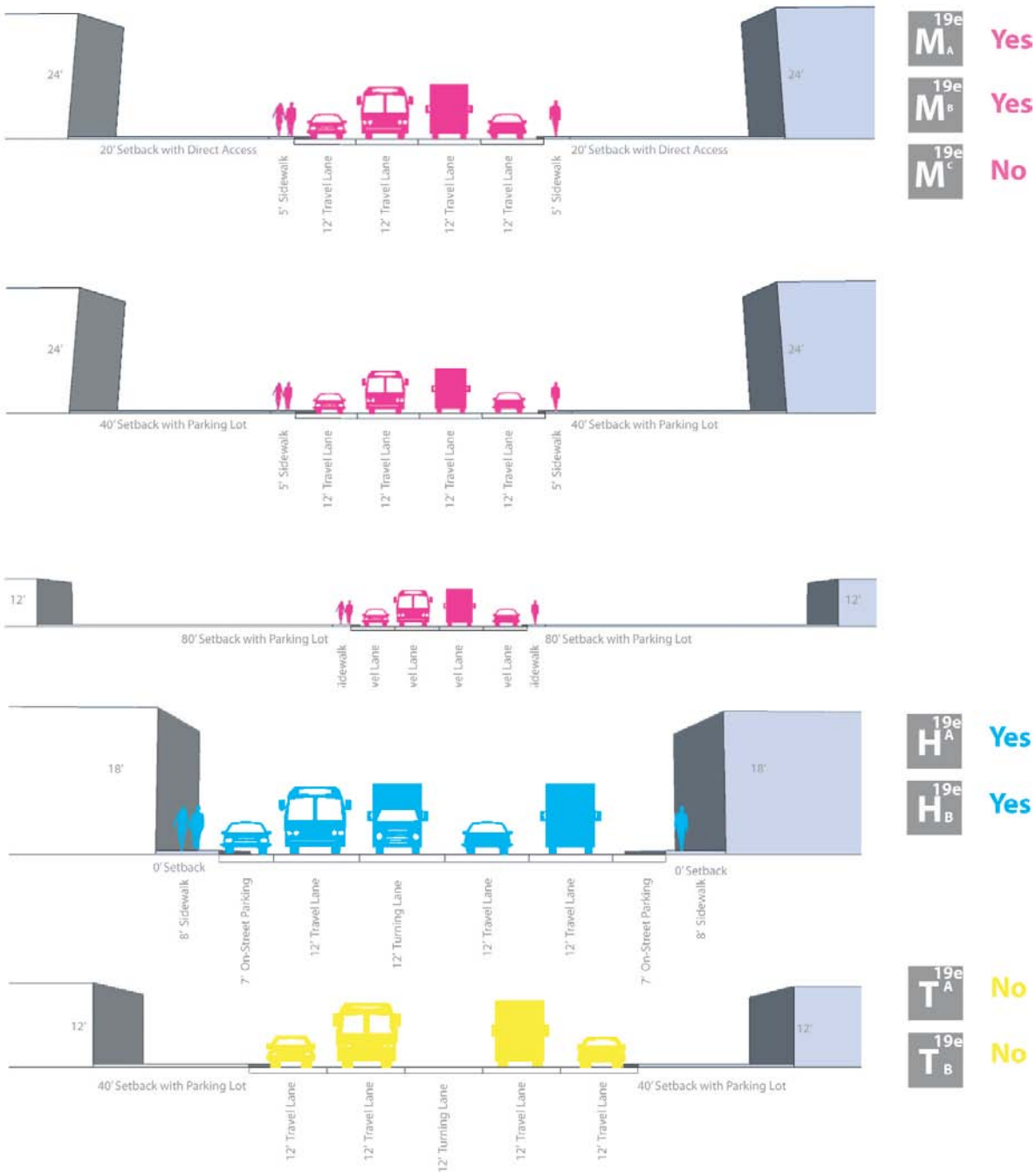

*Figure D.10: Findings for THE**gray**, ELEMENT**nineteen**: Quality of Pedestrian Way: (E) Height-to-Street Ratio.*[139] [140]

[139] Based on City of Asheville's GIS data and observations.
[140] Created By L. Graham Stewart.

Design Speed

AASHTO: A Policy on Geometric Design of Highways and Streets defines design speed as a "selected speed used to determine the various geometric design features of the roadway. The assumed design speed should be a logical one with respect to the topography, anticipated operating speed, the adjacent land use, and the functional classification of highway." In the *AASHTO Green Book* also defines it as…"the maximum safe speed that can be maintained over a specified section of highway when conditions are so favorable that the design features of the highway govern.

Design speed is influenced by the following:

- The functional classification of the highway,
- The character of the terrain,
- The density and character of adjacent land uses,
- The traffic volumes expected to use the highway,
- The economic and environmental considerations.

According to Context Sensitive Solutions.org, "typically, an arterial highway warrants a higher design speed than a local road; a highway located in level terrain warrants a higher design speed than one in mountainous terrain; a highway in a rural area warrants a higher design speed than one in an urban area; and a high-volume highway warrants a higher design speed than one carrying low traffic volumes.

Designers need to weigh the benefits of a higher vehicle operating speed, against a higher design speed and the flexibility lost in design. It may be more important to retain the maximum possible flexibility, so that a context-sensitive roadway that is more in tune with the needs of a community is designed using a lower design speed. As used here, the

term “context sensitive” refers primarily to the land use and environmental conditions adjacent to the highway. For example, for any particular highway other than a freeway or major arterial, as land use density increases, the design speed would typically decrease. The design speed of an urban collector street passing through a residential neighborhood should be appreciably lower than that for a rural highway with the same functional classification. This also recognizes the fact that bicycles and pedestrians would be more likely to use a route located in an urban area.

Similarly, in areas that have significant historic interest or visual quality, a lower design speed may be appropriate in recognition of lower average operating ,speeds and the need to avoid affecting these historic or aesthetic resources. The Green Book agrees with this philosophy: Above-minimum design values should be used where feasible, but in view of the numerous constraints often encountered, practical values should be recognized and used. Along arterial streets, the controlling factor of design speed applies to a lesser degree than on rural highways or high-type urban facilities, such as freeways or expressways. On many of the arterial streets located in large urban areas, maximum vehicle operating speeds for several hours of the day may be limited to those at which the recurring peak period traffic volumes can be accommodated. Thus, speeds may be governed by the presence of other vehicles traveling en masse both in and across the through travel lanes and by traffic control devices, rather than by the physical characteristics of the street. During off-peak periods of low-to-moderate traffic demand, vehicle operating speeds are governed by such factors as speed limits, mid-block turns, intersection turns, number of driveways and entrances, traffic signal spacing, and signal timing. As a result, when arterial street improvements are being planned, the selection of

the appropriate design speed must be balanced against such factors as speed limits, physical and economic constraints, and the probable running speeds that can be attained during off-peak hours. Although most States have adopted a range of allowable design speeds appropriate for each of the various functional classifications for use in the design of new or reconstructed highway facilities, situations may arise where even the use of the lowest typically acceptable value would result in unacceptably high construction or right-of-way costs or unacceptable impact on adjacent properties." [141]

Observations made during the study suggests that Merrimon Avenue has the most disproportionate design speed, posted speed and travel speed out of the corridors that were examined. Haywood Road is an serves as a great example of a context sensitive road design; the road responds to its context; i.e. shallow building setback and on-street parking.

Road Diet

"A road diet is a treatment given to an urban roadway in which the number of lanes is reduced, and the freed space converted to parking, bike lanes, landscaping, walkways, or medians. Road Diets are implemented to provide additional pavement and safety for bicyclists and pedestrians, reduce speeding, and to make room for parking.

Road diets are anathema to traditional traffic engineering principles because they tend to reduce roadway capacity. However, in practice, road diets can cause vehicle speeds to readjust to a more optimal speed, increasing the throughput of vehicles per lane. For this reason, road diets sometimes reduce congestion, and generally always increase

[141] "Design Speed: Context Sensitive Solutions.org - A CSS Support Center for the Transportation Community." *Welcome to CSS | Context Sensitive Solutions.org - A CSS Support Center for the Transportation Community.* Web. 26 Mar. 2011. <http://contextsensitivesolutions.org/content/reading/design-speed-2/>|

safety for all users of the roadway. Studies in Seattle found that road diets decreased the rate of crashes by 6%.

The need for road diets comes from the fact that multi-lane urban roads are built to handle large volumes of traffic during the morning and evening rush hours. Generally, during the other 22 hours of the day, the road is larger than necessary. This abundance of spare pavement encourages speeding, and places bicyclists and pedestrians at far higher risk than a typical two-lane road.

When the public or local merchants lining the road perceive that serving rush hour through-traffic is not worth the negative impacts of the off-peak excess capacity, a road diet may make sense. Redesigning urban arterials to increase off-peak safety is emerging as a goal – known by some as "traffic taming."

The most frequent type of conversion is four lanes to three, with the middle lane serving as a two-way turn lane (TWTL). Alternatively, the middle 'lane' can be a raised median with breaks or left turn pockets for turns. Studies show that road diets involving streets serving up to 23,000 vehicles per day substantially improve safety without significantly reducing roadway capacity. Most road diet projects result in the same or greater traffic volumes, but at a slower speed.

Dan Burden, of *Walkable Communities, Inc.*, notes that virtually every urban community in the U.S. has four lane roads that are overbuilt -- in a manner that encourages speeding, documents a number of U.S. and Canadian road diet projects in Road Diets: Fixing the Big Roads. As Burden explains, the capacity of a three-lane road is almost equivalent to that of a four-lane road, because it operates more efficiently, and

because left-turning vehicles are removed from the flow of traffic, reducing delay. A well-studied conversion confirms these observations.

Three-lane roads are inherently safer because the speed is set by the most prudent driver, because there is only a single lane of on-coming traffic to monitor when turning left, and because the two directions are separated by the TWTL or median."[142]

Merrimon Avenue and Tunnel Road could use a 'diet'.

[142] "Road Diet." *Streetswiki*. N.p., n.d. Web. Accessed 15 Feb. 2011. <http://streetswiki.wikispaces.com/Road+Diet>.

THEgreen, ELEMENTfive: Access to Shade

The Intent:

To encourage walking, bicycling, and transit use and discourage excessive motoring speeds. To reduce urban heat island effects, improve air quality, increase evapotranspiration, and reduce cooling loads in buildings.[143]

The Measure:

The percentage of shade along the corridor.[144]

The Explanation:

"Street trees have many benefits:

- Cars drive more slowly on streets with trees.

  In his book *Great Streets*, the internationally known urban planner Alan B. Jacobs notes that wide streets where the buildings are small and set back lose their definition, unless this effect is mitigated by lining the street with trees. Otherwise it feels like primarily like a transportation corridor, not a place where people live. Jacobs also cites research showing that for many people trees are the most important single characteristic of a 'good street'.

- Street trees cut traffic noise.

  Street trees reduce the amount of engine noise created because drivers go more slowly. But a line of large leafy trees can also absorb a great deal of noise. Even a line of smaller trees can be enough of a buffer to block traffic noise from reaching private yards and homes.

[143] Adapted from Congress for the New Urbanism, Natural Resources Defense Council, and the U.S. Green Building Council. *LEED 2009 for Neighborhood Development Rating System*. 2010 ed, Updated 2010.
[144] Ibid.

- Trees improve air quality.

  Trees consume carbon dioxide and emit oxygen. In general, the more trees we plant, the better air we breathe.

- Residents walk more on streets with trees.

  When cars drive more slowly, pedestrians feel safer. In addition, curbs and trees provide a physical and psychological buffer between sidewalk and car traffic that increases this feeling of safety. The busier the street, the more this safety buffer is needed. And of course, trees provide an environment in which it is more pleasant to walk - something attractive and green to look at, shade in the summer, a canopy from rain in the winter. Another thing that happens when we plant trees is that people can no longer park their cars up on the sidewalk. How often have you tried to walk down a street where a car has pulled up onto the planting strip and sidewalk, forcing you onto the street? The whole neighborhood benefits when people get out of their houses to walk. Residents are more likely to meet up regularly with their neighbors, to keep an eye on each other's property, to use their local parks and to patronize local businesses.

- Street trees increase property value.

  In his book *City Comforts*, urban planner and author David Sucher says, 'Even streets of modest houses gain a grandeur and presence when treed. Old money need not be the only ones to have old trees.' Streets with trees look more stable and prosperous. Families with children are more attracted to a neighborhood where they can picture themselves going for walks and letting kids play on the sidewalk. A neighborhood that looks cared for, with visible sidewalk activity, experiences less crime and

> especially fewer break-ins. Of course, it is important to select a tree species that will thrive with minimal maintenance and will not block sunlight and views. Sucher estimates that street trees can boost the value of each home on the street by at least $1000 to $5000. In their pamphlet Benefits of Trees, the International Society of Arboriculture estimates that the improvement in curb appeal due to street trees increases real estate values by 5-20%." [145]

As noted earlier these corridors, or portions of the corridors, are state roads meaning that there are designed, controlled and maintained by NCDOT. NCDOT follows American Association of State Highway and Transportation Officials (AASHTO) standards. Although there is a movement for a more context sensitive roadway design standards many of our roadway systems where built during period that largely contrast the current movement. Kenneth Stonex's statement from the Highway Safety Hearing of 1966 summaries the mentality of traffic engineer's what built and are building our roadways "What we must do is to operate the 90% or more of our surface streets just as we do our freeways… [converting] the surface highway and street network to freeway road and roadside conditions." Combating the status quo of street design philosophy is a constant battle. It is known that "wider lanes and shoulders may invite higher speeds." - AASHO, 1940, p. 2. There is a perception that street trees decrease motorist safety which has influenced regulation that do not allow for street trees. This perception whether it be perceived or absolute may have contributed to the street tree infrastructure along the corridor. But in urban areas street trees are not the hazard they are commonly believed to be, and may even be beneficial to safety.

[145] Dunn, Liz. "Benefits of Street Trees." *Friends of Frink Home*. N.p., n.d. Web. Accessed 1 Mar. 2011. <http://www.frinkpark.org/trees.

These corridors in this study also have existing utilities that may have contributed to the placements or placement of street trees. This played into using the City of Asheville's Code of ordinance to set the parameters of the ideal measure to for trees to create or enhance an attractive streetscape pattern while contributing to Asheville's urban forest and a more comfortable pedestrian environment of one small maturing tree (less than 35 feet in height at maturity) for every 30 linear feet of property abutting a street when overhead utilities are present. The City also allows existing trees to be counted if there are within 20' of the right-of way. Therefore existing trees within 20' of the row along the corridor were considered; with the exception of trees located on residential vacant land. LEED ND recommends that trees or other structures provide shade over at least 40% of the length of sidewalks on streets within or contiguous to the project. This is calculated using the estimated crown diameter (the width of the shade if the sun is directly above the tree) to calculate the shaded area. Crown diameter can vary with species. Tree species were not noted in this study therefore a 30' crown diameter was applied to each of the existing trees. Many trees along there corridors are located on vacant residential land; these trees were not used to calculate the percentage of shade however they are shown in the findings.

The Measurement:

The percentage of shade along the corridors' study areas.

The Findings:

The higher the percentage of shade provided by street trees along the corridor, the higher the sustainability of that study area for this element. However all these percentages are low when compared to the LEED ND requirement of 40%.[146] The following is the percentage of shade along the corridor's study areas; listed from highest to lowest:

[146] Based on information from GIS data from the City of Asheville, site visits and aerial photography.

Merrimon Avenue Study Area C:	19%
Merrimon Avenue Study Area A:	16%
Haywood Road Study Area A:	15%
Merrimon Avenue Study Area B:	12%
Tunnel Road Study Area B:	11%
Tunnel Road Study Area A:	5%
Haywood Road Study Area B:	2%

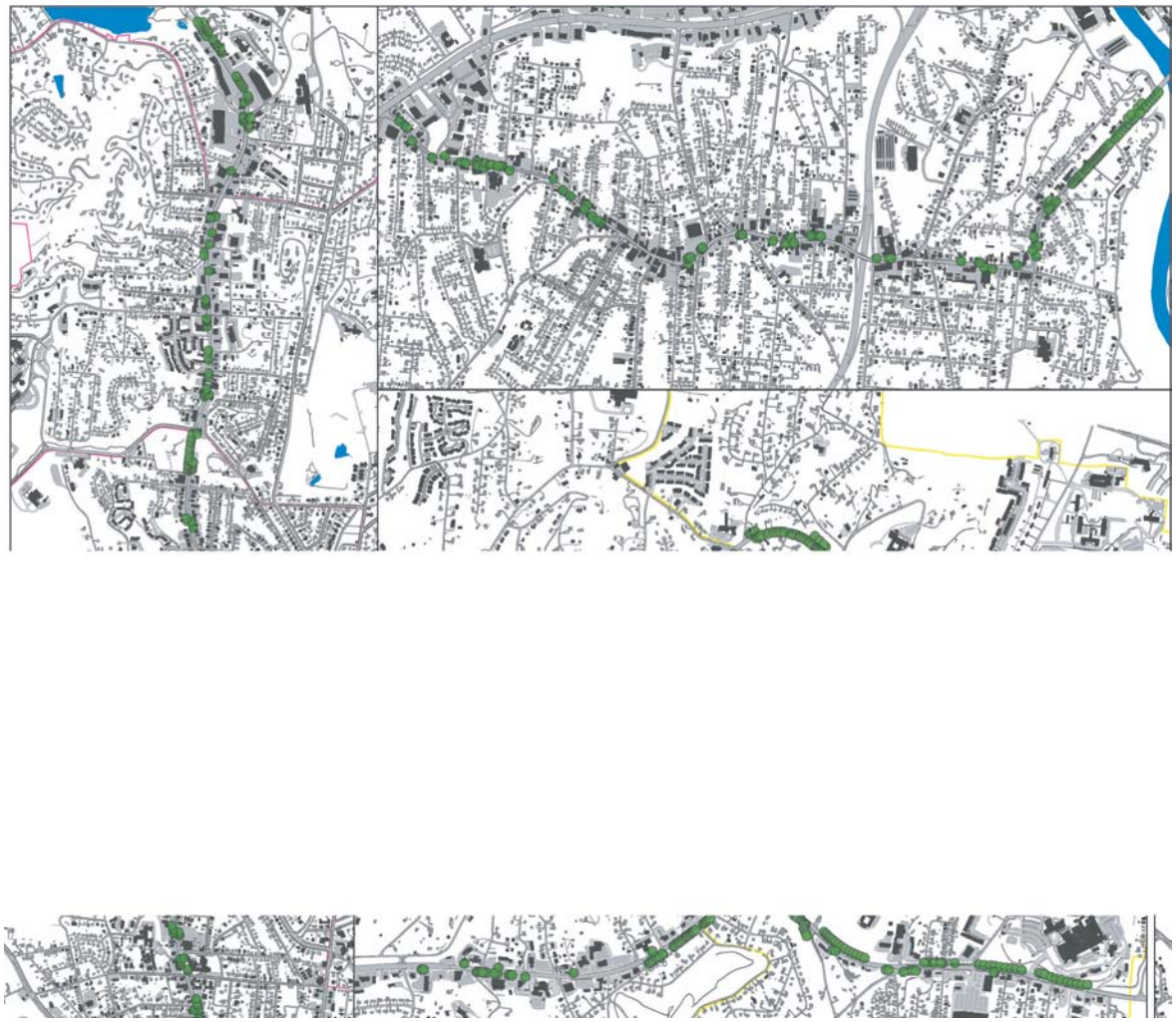

*Figure D.11: Findings for THE**green**, ELEMENT**five**: Access to Shade.*[147] [148]

[147] Based on City of Asheville's GIS data and observations.

Greening of the Streets

All corridors were deficient of street trees. Median, planted pedestrian refuges and verges along sidewalks could be elements used to contribute to the Community's goals identified in the *Asheville City Development Plan 2025* of Urban/Neighborhood Corridor and Gateway Boulevard, decrease stormwater runoff, increase the quality of pedestrian, and countless other benefits. The photos show examples of possible 'greening of the street' measures.

Photo D.8: Street Trees with a Verge.
Data Source: L. Graham Stewart.

Photo D.9: Planted Pedestrian Refuge.
Data Source: L. Graham Stewart.

[148] Created By L. Graham Stewart.

Photo D.10: Planted Median.
Data Source: L. Graham Stewart.

THEneighborhoodCHARACTER, ELEMENTone: Established Boundaries

The Intent:

Acquire and foster a sense of neighborhood identity and community.[149]

The Measure:

Existence of recognized neighborhood.

The Explanation:

Neighborhood groups and registered associations are an important part of community. They can play an important part in planning efforts. Usually boundaries have to be established for a neighborhood to be recognized by a municipality. Boundaries are integral and can provide information about a place. There is a connection between social and spatial: "social life structures territory… and territory shapes social life." [150]

The Measurement & The Findings:

All study areas have recognized neighborhoods.[151]

Figure D.12: Findings for THEneighborhoodCHARACTER, ELEMENTone: Established Boundaries.[152]

[149] Adapted from Congress for the New Urbanism, Natural Resources Defense Council, and the U.S. Green Building Council. *LEED 2009 for Neighborhood Development Rating System*. 2010 ed, Updated 2010.
[150] Hayden, Dolores, The Power of Place: Urban Landscapes as Public History. MIT Press, 1995.
[151] Based on City of Asheville's GIS data and observations.
[152] Ibid.

THEneighborhoodCHARACTER, ELEMENTtwo: Existence of Art

The Intent:

Acquire and foster a sense of neighborhood identity and community.[153]

The Measure:

Existence of Art.

The Explanation, The Measurement & The Findings:

Neighborhood organizations help build an identity through programs that celebrate the history and character of the community through art, theatre, murals, etc. Haywood Road was found to have the highest level of art along the corridors. Merrimon Avenue also had art along the corridor but only in Study Areas A & B, while Tunnel Road has no visual art along the corridor from the study's observations.

[153] Adapted from Congress for the New Urbanism, Natural Resources Defense Council, and the U.S. Green Building Council. *LEED 2009 for Neighborhood Development Rating System*. 2010 ed, Updated 2010.

Figure D.13: Findings for THEneighborhoodCHARACTER, ELEMENTtwo: Existence of Art.[154] [155]

[154] Based on observations.
[155] Created By L. Graham Stewart.

THEneighborhoodCHARACTER, ELEMENTthree: Existence of Gateways/ Wayfinding Signage

The Intent:

Acquire and foster a sense of neighborhood identity and community.[156]

The Measure:

Existence of gateways/ wayfinding signage.

The Explanation:

"Kevin Lynch states that wayfinding is 'the original function of the environmental image and the basis on which its emotional associations may have been founded. But the image is not only useful in this immediate sense in which it acts as a map for direction of movement; in a broader sense it can also serve as a general frame of reference within which the individual can act or to which he can attach his knowledge. In this way it is like a body of belief or a set of social customs: it is an organizer of facts and possibilities.'"[157]

The Measurement & The Findings:

Haywood Road was the only corridor that had a gateway sign and wayfinding signage specific to that area. The photos depict the gateway signage found on Haywood and an example of the wayfinding signage that can be found throughout Asheville.

[156] Adapted from Congress for the New Urbanism, Natural Resources Defense Council, and the U.S. Green Building Council. *LEED 2009 for Neighborhood Development Rating System*. 2010 ed, Updated 2010.
[157] Hufford, Mary. *One Space, Many Places: Folklife and Land Use in New Jersey's Pinelands National Reserve.* American Folklife Center: Library of Congress, 1986. Print.

Photo D.11: Gateway Example.

Photo D.12: Wayfinding Signage Example.

Figure D.14: Findings for THEneighborhoodCHARACTER, ELEMENTthree: Existence of Gateways/ Wayfinding Signage.[158] [159]

[158] Based on the study's observations.
[159] Created By L. Graham Stewart.

THEneighborhoodCHARACTER, ELEMENTfour: Past on Display

The Intent:

Acquire and foster a sense of neighborhood identity and community.[160]

The Measure:

Presence of History.

The Explanation:

"Lousie Erdrich writes that in a tribal view of the world 'the landscape itself is enlivened by a sense of group and family history. What keeps the landscape alive is not the strict preservation of that history, but the continual reweaving of the past into the present.'"[161] Jane Jacobs, an urban writer and activist argued that every neighborhood needed a mixture of newer and older buildings to allow for a variety of uses, income levels, and even ideas within the neighborhood.

The Measurement & The Findings:

Merrimon Avenue Study Area A & B have historic districts. Haywood Road has areas that would most likely meet the criteria for a historic district but are not formally recognized.

[160] Adapted from Congress for the New Urbanism, Natural Resources Defense Council, and the U.S. Green Building Council. *LEED 2009 for Neighborhood Development Rating System*. 2010 ed, Updated 2010.

[161] Hufford, Mary. *One Space, Many Places: Folklife and Land Use in New Jersey's Pinelands National Reserve.* American Folklife Center: Library of Congress, 1986. Print.

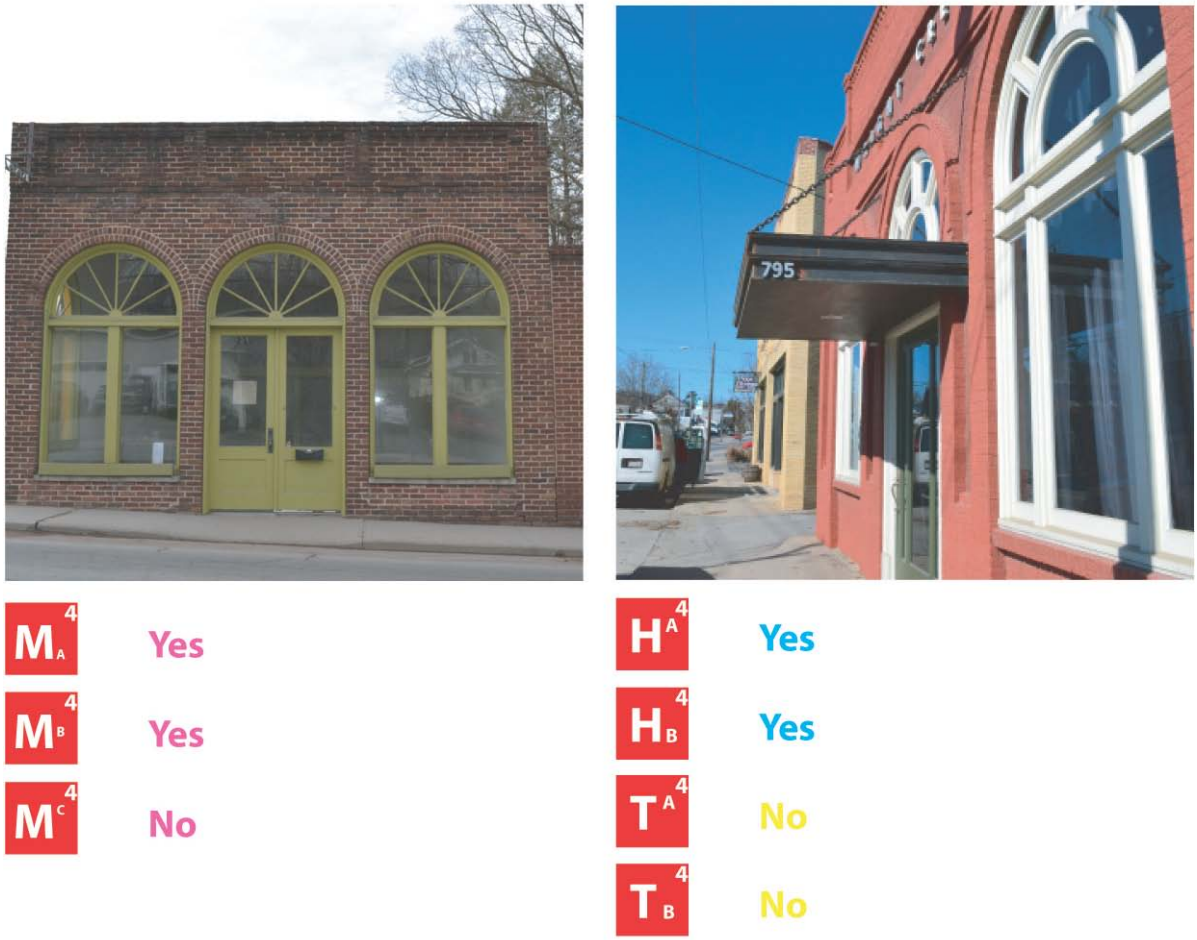

Figure D.15: Findings for THEneighborhoodCHARACTER, ELEMENTfour: Past on Display.[162] [163]

[162] Based on the study's observations.
[163] Created By L. Graham Stewart.

E. EXISTING PLANS & POLICIES

City Plan 1925

Asheville has a strong history of city planning; the *City Plan 1925* was prepared for Asheville by the famed city planner John Nolen. Asheville's *City Development Plan 2025 Comprehensive Plan* showcased elements of famed city planner John Nolen's *City Plan 1925* that are still relevant today. John Nolan's observations about Asheville brought to light the issues facing Asheville yesterday and today. These issues and themes persist through decades attesting to their importance in shaping a city. Of those, below are those that are relevant to the study:

- "Asheville stands today on the threshold of a new state in its evolution.
- The automobile is changing the radius of city life.
- Asheville needs a better street system, more parks, a (new) Civic Center.
- (The) French Broad (River) divides (the) City into two distinct localities.
- A Passenger Rail Station in Biltmore is advocated.
- A diagram of the main thoroughfare system of Asheville does not present the same orderly uniform appearance that a similar diagram of rectangular or more level cities would show…. State highways are the backbone of Asheville's thoroughfare system.
- Pack Square is and probably always will be the center of activity for Asheville.
- Pack Square is the geographical Center of the City.
- A well organized, well maintained City Market will greatly stimulate…{the local economy}.

- The main lines of the {greenway} system follow the banks of the French Broad River and the Swannanoa River….
- {Regarding native arts and crafts industries of the mountains,}(t)here are no disadvantages—in fact, there is everything to gain—in encouraging this type of indigenous industrial life and providing for its legitimate extension.
- Biltmore Village is a fine example of town planning.
- Zoning is no panacea for all the evils of shortsighted city building nor an alternative for constructive city planning. At its best, it can only prevent and restrict undesirable building and this acts more in a negative than positive way. Much of the present zoning is being done without a city plan and in such cases it has a tendency to perpetuate existing conditions rather than make possible right future growth.
- We also believe that there should be a certain amount of flexibility in the {zoning} ordinance making more allowance for change and growth." [143]

[143] Asheville, City of. *Asheville City Development Plan 2025 Comprehensive Plan. (*2007). Web. Accessed 5. Dec. 2010. <http://www.ashevillenc.gov/business/development_services/planning_zoning/default.aspx?id=1144>.

Smart Growth Land Use Policies

In 2000 the Asheville City Council adopted *Smart Growth Land Use Policies*:

- "Mixed use developments and buildings should be encouraged.
- Compatible, higher density commercial and residential infill development should be encouraged.
- New development should promote a sustainable land development pattern.
- Traditional neighborhood development patterns should be recognized and encouraged.
- Discretionary block grant and local funding for affordable housing and economic development should be used to support a Smart Growth development pattern.
- Industrially-zoned land should be reserved for industrial uses.
- Areas with steep slopes and environmentally sensitive areas should be identified and preserved while allowing alternatives to development that protect private property rights.
- Existing neighborhoods near Downtown Asheville should be strengthened through infill development, housing rehabilitation, proactive enforcement of zoning and building standards, and housing code enforcement.
- City staff is directed to develop new zoning tools and use existing zoning tools to promote compatible land use projects, protect industrial and environmentally-sensitive land, and allow flexibility in site design to achieve the above policies. These tools may include revision of subdivision regulations to incorporate traditional neighborhood and

conservation development practices, as well as continuing existing innovative regulations such as our accessory apartment code provisions. Additionally, capital projects and economic development incentive funding should be supportive of a Smart Growth development pattern where appropriate."[145]

[145] Asheville, City of. *Sustainablity Management Plan*. (2009). Web. 5. Dec. 2010. <http://www.ashevillenc.gov/docs/sustainability/AVL.Sust.Plan.pdf>

2005 Update to the City of Asheville Pedestrian Plan

The original *City of Asheville's Pedestrian Plan* was adopted in 1999. The *2005 Update* of the plan identified almost 110 miles of needed linkage. The following information is applicable to this study.

"Goals: Asheville will develop and maintain a pedestrian network that includes sidewalks, pedestrian crossings, and greenways that …

- Offer convenience, safety and connectivity to citizens and visitors,
- Encourage and reward the choice to walk and use transit,
- Improve access for those with disabilities, and
- Add to the quality of life and unique character of the City of Asheville."

The plan used six criteria areas identified for measuring project impact and priority:

(1) Zoning jurisdiction;

(2) Proximity to Schools, Parks, and Community Centers;

(3) Proximity to Transit Stops;

(4) Needed linkages that complete a pedestrian thoroughfare or address a safety concern;

(5) Feasibility of construction; and

(6) Major Thoroughfares and Connector Roads." [146]

In the interest of time and no interest in duplicity, the information gathered from the *2005 Update to the Pedestrian Plan* was utilized in the study.

[146] Asheville, City of. *2005 Update to the City of Asheville Pedestrian Plan*. Web. Accessed 5. Dec. 2010. <http://www.ashevillenc.gov/uploadedFiles/Residents/Transportation/Bike_and_Ped_Services/2005PedestrianPlanChapters1-2PlanPurposePlanningContext.pdf>

Asheville City Development Plan 2025

The *Asheville City Development Plan 2025* was completed in 2007. It serves as a visioning document "that reflects and unifies the direction desired citizenry for the future development of Asheville"; some of these desires were applicable in this Study. "Public comments and independent analysis of land use, transportation, air and water quality and economic development trends indicated that the need and desire for the following growth:

- Skilled workforce, particularly high-tech and medical;
- Entrepreneurship, especially local small businesses and home occupations;
- Increased property investment, particularly along our commercial corridors;
- Increased accommodation of population growth within the City, particularly along commercial corridors, in compatible neighborhood infill, and in urban villages;
- Mixed-use land use pattern;
- Multi-modal transportation opportunities;
- Development reflecting the character of Asheville;
- Development that occurs in a pattern that is sensitive to air and water quality concerns."[147]

Future Land Use and Transportation a component of *the City Development Plan 2025* identifies corridors in the study as the following:

"Haywood Road:

- Urban/Neighborhood Corridor from Hillside Street to Colonial Place
- Gateway Boulevard from Ridgelawn Avenue to French Broad River

Merrimon Avenue:

[147] Asheville, City of. *Asheville City Development Plan 2025 Comprehensive Plan. (*2007). Web. Accessed 5. Dec. 2010.<http://www.ashevillenc.gov/business/development_services/planning_zoning/default.aspx?id=1144> .

- Urban/Neighborhood Corridor from Hillside Street to Colonial Place

Tunnel Road:

- Urban/Neighborhood Corridor from Hillside Street to Colonial Place
- East Tunnel Road: Gateway Boulevard." [148]

[148] Asheville, City of. *Asheville City Development Plan 2025 Comprehensive Plan. (*2007). Web. Accessed 5. Dec. 2010. <http://www.ashevillenc.gov/business/development_services/planning_zoning/default.aspx?id=1144>

2008 Comprehensive Bike Plan

The following information is from the *2008 Comprehensive Bike Plan* that that is applicable to this study. The critical issues and concerns in the Plan are:

- Access and connectivity
- Lack of adequate bicycle facilities
- Driver behavior
- Safety
- Road width (narrow roads)
- Traffic
- Large arterial roads
- Dangerous intersections and roads
- Lack of shoulders
- Disconnected areas and key destinations
- Problematic bicycle and car interactions
- Maintenance practices

"The Short-Term Bicycle Facilities and Operational Improvements in the Plan are: Provide bicycle lanes on the following streets:

- Haywood Road (from Riverside Drive to Beverly Road West)

Provide shared lane pavement markings (described in Chapter 4) on Charlotte Street north of I-240 to encourage bicycling and build public awareness. Haywood Road in Downtown West Asheville may also be an appropriate location for shared lane markings in the near term. Recommended locations for shared lane markings in the short-term are included below.

- Haywood Road (in downtown West Asheville)
- Montford Avenue

The Medium-Term Recommendations in the Plan are:

- Provide bicycle lanes in the following locations:
- Tunnel Road

Provide shared lane markings in the following locations:

- Merrimon Avenue (US 25)

Provide climbing lanes in the following locations:

- Merrimon Avenue
- Tunnel Road

Provide a safer facility for bicyclists to cross the I-240 entrance ramp when traveling east on Tunnel Road.

Improve conditions for bicyclists on bridges in Asheville."[149]

In the interest of time and no interest in duplicity, the information gathered from the *2008 Comprehensive Bike Plan* was utilized in the study.

[149] Asheville, City of. *Comprehensive Bike Plan.* (2008). Web. Accessed 5. Dec. 2010. <ftp://www.ashevillenc.gov/Web/TransportationEngineering/Transportation/Asheville_Plan_Final_Adopted_022608.pdf>

2009 Downtown Master Plan

The *Downtown Master Plan* was created in 2009. Issues and opportunities identified in the plan that are applicable to the study are as follows:

- "Sustain Downtown's dynamic and diverse culture and economy.
- Maintain an eclectic mix of creative, innovative businesses and the employment opportunities they provide.
- Build on the strong and diverse arts community.
- Encourage mixed-use development.
- Balance the needs of tourists and residents.
- Strengthen Downtown's identity as a series of residential neighborhood.
- Create neighborhood centers within a network of parks, services, and transportation options.
- Build housing that suits a variety of household incomes, sizes, ages, and lifestyles.
- Provide good, interconnected for better access and better health.
- Provide Downtown with continuous bicycle and pedestrian routes tied to regional bicycle and pedestrian systems.
- Improve transit service to and within Downtown.
- Investigate an auto-free zone on periodic weekends.
- Add parking spaces sparingly and develop new unified parking management strategies.
- Highlight the public health benefits of walkablility, fitness, and safety."[150]

[150] Asheville, City of. *Asheville's Downtown Master Plan*. (2007). Web. Accessed 5. Dec. 2010. <ftp://www.ashevillenc.gov/web/FinalPlan5.pdf>

2009 Transit Master Plan

The *2009 Transit Master Plan* stated that "currently there is a 60 minute service on each Route Three of the 5 corridors served by transit are in the study. Top routes include corridors in study: (1) Haywood, (2) Merrimon, (13) Tunnel Road/ Oteen/ Haw Creek."[151]

Other information applicable to this study indentified in the Plan are the requested changes and Short-term results:

"Requested Changes

- Sunday service (most requested)
- More frequent service (second most requested) [major reason for non-riding]
- Sidewalks and shelters [also issue for non-riders]
- More evening service until midnight
- Additional transfer points without having to come downtown
- New routes, including express [also issue for non-riders]

Short-Term Results

- 5 corridors gain 30 minute service Monday – Saturday; hourly service until 10 PM;
- Tunnel, Biltmore, Haywood, Patton, Merrimon
- Evening services combined with daytime routes
- Significant expansion in sidewalk and shelter construction." [152]

[151] Asheville, City of. *2009 Transit Master Plan.* Web. Accessed 5. Dec. 2010. <http://ashevillenc.gov/uploadedFiles/Residents/Transportation/City_Bus_Service/Transit%20Master%20Plan%20-%20Final.pdf>
[152] Ibid.

2009 Sustainability Management Plan

The *2009 Sustainability Management Plan* identified the following Sustainability Goals that are relevant to this study:

"Management Practices:

- Incorporate sustainability into the City decision making process.

Land Use:

- Developed and Redesign land use policies to support regional sustainable growth.
- Support sustainable projects, patterns and building practices.
- Sustainability planning extends beyond the building level to neighborhoods and regions.

Transportation:

- Reduce Vehicle Miles Travelled (VMT) for city Employees for commuting
- Increase Transit ridership
- Support the reduction of Vehicle Miles Travelled by City residence and visitors
- Support transit options."

The Plan "recommends that city planners employ Complete Streets practices in corridor planning due to the ability to reduce automobile use and the increase of bicycle and pedestrian activity helping to achieve several of Asheville's sustainability goals. It also notes that many of Asheville's transportation corridors are not accessible or accommodating to forms of transportation other than automobiles."[153]

The Plan also indentifies next steps in the Complete Street Process:

[153] Asheville, City of. *Sustainablity Management Plan*. (2009). Web. 5. Dec. 2010. <http://www.ashevillenc.gov/docs/sustainability/AVL.Sust.Plan.pdf>

- "Review US DOT Guidance and state roadway improvement policies to determine legal support and examples for a local policy.
- Coordinate with local MPO to identify partnerships and current multi-modal transportation initiatives and funding sources.
- Write and adopt a City policy for inclusion of pedestrian and bicycle ways in new design and construction. Prioritize corridors for implementation.
- Reach out to transportation department and public works department to discuss feasibility of bike lane and sidewalk improvements.
- Update zoning codes to reflect multiple uses along key corridors." [154]

A product of the plan is an amendment to the ordinance; "Sec. 7-16-1(c): Sustainable Development Projects- This section of the code provides incentives for the construction of high quality, sustainably based development projects that are reasonably compatible with the natural and built environments of the city. *Sustainable Development Project Eligibility Map* identifies properties with 1/8 mile of a high frequency transit corridor with make them possible eligible for incentives such as density bonuses, parking reduction, etc. All of the corridors in the Study are identified on the map." [155]

[154] Asheville, City of. *Sustainablity Management Plan*. (2009). Web. 5. Dec. 2010. <http://www.ashevillenc.gov/docs/sustainability/AVL.Sust.Plan.pdf>

[155] Ibid.

Linking Lands and Communities Study

Land-of-Sky Regional Council has been collaborating with local and regional interests to design regional framework for conservation and development that will strategically guide future growth for Madison, Buncombe, Henderson, and Transylvania counties while respecting the integrity of the region's ecosystems. The *Linking Lands and Communities Study* has created data and maps that identify valuable ecological systems and resources, important working lands, and areas most suited for future growth and development. The Council's goals were to help to link urban and rural communities and protect the area's rich natural and cultural heritage.

The purpose of the Wildlife Habitat and Biodiversity Assessment is to identify lands that:

Provide wildlife habitat,

Support high levels of biodiversity, and

Provide associated ecosystem services and functions.

In addition to providing habitat for wildlife, intact natural systems identified in this assessment also provide important ecological functions and services, including:

- Filtering pollutants from air and water
- Creating and maintaining fertile soil
- Pollination of plants and seed distribution
- Flood control
- Carbon storage
- Erosion control.

The *Wildlife Habitat and Biodiversity Assessment Map* was created from several data sets and sources like NatureServe, The Nature Conservancy, NCDENR Natural Heritage Program,

Audubon Society, U.S. Fish & Wildlife Services, etc. More information about the data, its sources can be found at this website: http://linkinglands.org/docs/WHASUMDataDefinitions.pdf.

The *Agricultural Lands Assessment Map* identifies lands that are the most valuable for agriculture, including farming and forestry practices. The goal of this map is to understand the location and condition of lands that support or could potentially support farming and forestry practices throughout the region. The *Agricultural Lands Assessment Map* was created from several data sets and sources like National Land Cover Dataset, etc. More information about the data, its sources can be found at this website: http://linkinglands.org/docs/AgMapDataDefinitionsFinal.pdf.

The purpose of the Water Quality Assessment is to identify lands in the region that are valuable for producing clean water.

The three primary components used in developing the Water Quality Assessment are:

1. Watersheds
2. Land Use
3. Streams

The *Water Quality Assessment Map* was created from several data sets and sources like National Land Cover Dataset, NC Division of Water Quality etc. More information about the data, its sources can be found at this website: http://linkinglands.org/docs/WaterQualityDataDefinitions.pdf.

F. EXISTING INDEXES & STUDIES

Walk Score

Walkscore is a website that generates a 'walkscore' for any address that the user enters. Their website states that "walkable neighborhoods offer surprising benefits to the:

- Environment: Cars are a leading cause of climate change. Your feet are zero-pollution transportation machines.
- Health: The average resident of a walkable neighborhood weighs 7 pounds less than someone who lives in a sprawling neighborhood.
- Finances: One point of Walk Score is worth up to $3,000 of value for your property.
- Communities: Studies show that for every 10 minutes a person spends in a daily car commute, time spent in community activities falls by 10% ."[156]

According to the site the elements that make a "neighborhood walkable include:

- A center: Walkable neighborhoods have a center, whether it's a main street or a public space.
- People: Enough people for businesses to flourish and for public transit to run frequently.
- Mixed income, mixed use: Affordable housing located near businesses. Parks and public space:
- Plenty of public places to gather and play.

[156] *Get Your Walk Score - A Walkability Score For Any Address*. Web. 10 Dec. 2010. <http://www.walkscore.com/how-it-works.shtml>

- Pedestrian design:
- Buildings are close to the street, parking lots are relegated to the back.
- Schools and workplaces: Close enough that most residents can walk from their homes.
- Complete streets: Streets designed for bicyclists, pedestrians, and transit." [157]

Walk Score measures "how easy it is to live a car-lite lifestyle—not how pretty the area is for walking. It uses a patent-pending system to measure the walkablility of an address. The Walk Score algorithm awards points based on the distance to amenities in each category. If an amenity is within .25 miles (or .4 km) Walkscore assigns the address the maximum number of points. The number of points declines as the distance approaches 1 mile (or 1.6 km)—no points are awarded for amenities farther than 1 mile. The points are summed and normalized to yield a score from 0—100. The number of nearby amenities is the leading predictor of whether people walk.

Walkscore uses 'as the crow flies' distances rather than walking directions. This means if you live across the lake from a destination, they are assuming you will swim. And if you live in a subdivision with long curving streets with few intersections, we hope your neighbors don't mind you walking through their back yard." [158]

The limitation of Walk Score is that "it just an approximation of walkablility. There are a number of factors that contribute to walkablility that are not part of their algorithm: Street width and block length: narrow streets slow down traffic. Short blocks provide more routes to the same destination and make it easier to take a direct route. Street design: sidewalks and safe crossings are essential to walkablility. Appropriate automobile speeds, trees, and other features also help.

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[157] *Get Your Walk Score - A Walkability Score For Any Address*. Web. 10 Dec. 2010. <http://www.walkscore.com/how-it-works.shtml>
[158] Ibid.

Safety from crime and crashes: how much crime is in the neighborhood? How many traffic accidents are there? Are streets well-lit? Pedestrian-friendly community design: are buildings close to the sidewalk with parking in back? Are destinations clustered together? Topography: hills can make walking difficult, especially if you're carrying groceries. Freeways and bodies of water: Freeways can divide neighborhoods. Swimming is harder than walking. Weather: In some places it's just too hot or cold to walk regularly." [159] This study finds that Walk Score's use of the 'as the crow flies' distance is a limitation.

Some of the factors that Walk Score uses to calculate will be visible in the COMPLETEcorridor's Study, however Walk Score itself was not used. It was discovered that Walk Score was used as a measure in some similar studies. But due to the linear nature of the corridors and the Walk Score requirement that a particular address be used to generate the walkablity score, the measure was not used to evaluate the corridors. Nevertheless, it will also be visible that some of the factors listed as limitations of the Walk Score algorithm were applied independently as deemed relevant in this study's index.

[159] *Get Your Walk Score - A Walkability Score For Any Address*. Web. 10 Dec. 2010. <http://www.walkscore.com/how-it-works.shtml>

Walkshed

"Walkablility is the first step to urban sustainability. It makes neighborhoods more economically robust, reduces our impact on the environment, and improves the health of our citizens. Walkablility is about making cities better. Sustainable Development does not just mean a cleaner environment; it also requires establishing local economies that are economically viable and socially responsible. It will involve a shift in mindset in terms of how approach individual life, business, and government is approached. And it will require the transformation of both public policy and the technologies we use to operate our community systems. At the heart of it all is geography. Measuring a city's walkablility is just the beginning. Planning water sources, land use, optimal public transit routes, better sidewalk networks and bike lanes, traffic light timing, and distance from diverse habitats are just a few of the ways that geographic technology can help us make towns and cities operate in a more sustainable manner." [160]

Walkshed does not think it is helpful to calculate walkablility based on amenities that you can't actually walk to. "Many communities are close to amenities 'as a crow flies' but those amenities are cut off from pedestrians by barriers and disconnected street networks. Walkshed works by using 'friction-based' (aka 'cost-based') distance calculations in lieu of straight-line distances for the best accuracy. Walkshed friction calculations work by laying a grid of hundreds of thousands of cells over the entire city and determining how much 'friction' a pedestrian would encounter for each cell. For example, cells on interstates and rivers have very high walking friction while cells on the street grid and parks have very low friction. This has important effects on walkablility. Barriers will have a negative impact on walking distances since people typically don't walk through highways or on water. Street connectivity matters. Cul-de-sacs and winding

[160] *Walkshed- Personal and Precise Walkability Mapping*. Web. 3 Jan. 2011. <http://walkshed.org/>.

suburban streets will have longer walking distances than an urban street grid. By determining the walking friction of the entire city, Walkshed can calculate the optimal and actual walking distance from every point in the city to the closest amenity in every category.

Walkablility means different things to different people. Empty nesters may enjoy being near a wide variety of restaurants and theaters. Runners and families might prefer easy access to parks and playgrounds. Young professionals and students may like the nightlife in certain neighborhoods. All of these people love and value walkablility, but they all have different preferences that shape it" [161] which led to their development of the Azavea's Decision Tree.

"Using Azavea's DecisionTree calculation engine, Walkshed is able to dynamically account for each person's preferences by giving relative weights to each factor before combining the data. This means that giving a +1 to everything is no different than giving everything a +5 since there is no difference from factor to factor. This also means that a +2 is twice more important than a +1, a +3 is 1.5 times more important than a +2, and so on.

DecisionTree is a set of web-based planning and prioritization tools. It is able to prioritize locations based on custom weighted geographic preferences. Based on its calculations, DecisionTree generates a 'hot spot' or 'heat' map displaying the locations that best match users' selected preferences and weights.

The result is a graphical representation of spatial data, where values are represented as colors along a spectrum—a heatmap. For example, areas that best meet a user's defined priorities may be colored green, while poorly suitable areas are shaded red. Heat maps present complex quantitative and spatial information in a form that is easy to understand without technical

[161] *Walkshed- Personal and Precise Walkability Mapping*. Web. 3 Jan. 2011. <http://walkshed.org/>.

skills."[162] Walkshed calculates the optimal and actual walking distance from every point in the city to the closest amenity in every category but the data must be first created for the entire city to generate the DecisionTree. Currently New York City and Philadephia are the only cities what have WalkShed.

WalkShed was not used in this study due to its current lack of accessibility in Asheville. However factors like barriers and street connectivity were used in the COMPLETEcorridors' index.

[162] *Walkshed- Personal and Precise Walkability Mapping*. Web. 3 Jan. 2011. <http://walkshed.org/>.

LEED for Neighborhood Development

"The LEED for Neighborhood Development Rating System integrates the principles of smart growth, urbanism and green building into the first national system for neighborhood design. LEED certification provides independent, third-party verification that a development's location and design meet accepted high levels of environmentally responsible, sustainable development. LEED for Neighborhood Development is collaboration among USGBC, Congress for the New Urbanism, and the Natural Resources Defense Council." [163]

LEED Neighborhood Design rating system is divided into five categories: Smart Location and Linkage, Neighborhood Pattern and Design, Green Infrastructure and Buildings, Innovation and Design Process, Regional Priority Credit. Each of the categories has a prerequisites and possible credits. These prerequisites and credits range from density, block averages to requirements for building water efficiencies.

"LEED for Neighborhood Development is a voluntary rating system that recognizes development projects that successfully protect and enhance the overall health, natural environment, and quality of life of our communities. The certification system encourages smart growth and new urbanist best practices, promoting the location and design of neighborhoods that reduce vehicle miles travelled and communities where jobs and services are accessible by foot or public transit. It promotes more efficient energy and water use—especially important in urban areas where infrastructure is often overtaxed." [164] USGBC states that they are "committed to facilitating the development and retrofit of neighborhoods by integrating the combined principles of smart locations, neighborhood design, and green infrastructure and building."

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[163] "LEED ND" *USGBC: U.S. Green Building Council*. N.p., n.d. Web. 2 Dec. 2010. <http://www.usgbc.org/ShowFile.aspx?DocumentID=3357>.

[164] Ibid.

Not all the categories, credits, credit's measures and ranges for LEED ND were applicable to this study.

LEEDS ND rating system was used the most often in the COMPLETEcorridors' index due to the applicability and ease in implementation. However some measurements and ranges had to be modified due to the linear nature of corridors and the context of Asheville.

Twin Cities CTLUS Initiative

As part of an effort to promote walkable, transit-oriented places in the Twin Cities, the center for Transit Oriented Development conducted a study outlining an approach for transforming existing activity centers into walkable places. This study was done in partnership with the Urban Land Institute in Minnesota and the ULI/Curtis Regional Infrastructure Project and called the *Connecting Transportation and Land Use Systems Initiative.*

In defining a "walkable urban place" the CTOD considered several measures:

- whether a place has a multi-modal transportation system and how well it performs
- the "employment gravity" of job clusters and the mix of uses – to determine how many hours out of the day people actively use a place
- the intensity of uses -- how many people use the area
- the area's "walkscore" – a measure of the amenities within walking distance
- a connectivity index that measures the connectedness or "permeability" of the street network – because connected street networks support increased walking and biking as well as other benefits
- block sizes and intersection density
- origin mode split and destination mode split
- land opportunity and the potential for walkability.

Twin Cities Ctlus Initiative: Identifying and Evaluating Regionally Significant Walkable Urban Places was site specific, not all the categories, measures and ranges were applicable to this study.

The COMPLETEcorridors' index utilized the measures and some of the ranges to calculate completeness.

Portland's 20 Minute Neighborhoods

The report describes a 20-minute neighborhood "as a place with convenient, safe, and pedestrian-oriented access to the places people need to go to and the services people use nearly every day: transit, shopping, quality food, school, parks, and social activities, that is near and adjacent to housing. In other words, a 20-minute neighborhood is another name for a walkable environment." They used the term 20-minute neighborhood because they thought it was easier to understand—it is where people go within twenty minutes of their dwelling.

20-minute neighborhoods have the following three basic characteristics:

- A walkable environment
- Destinations that support a range of daily needs (i.e., shops, jobs, parks, etc.)
- Residential density

"The impetus of the report is an increased interest in improving sustainability—responding to challenges posed by climate change by reducing car trips and decreasing energy use in general, the need for affordable housing and to reduce housing-related costs, the need to stay physically fit and live healthily and wants to support local businesses—has renewed interest in walkable environments or 20-minute neighborhoods. While some aspects of a walkable environment are obvious: They are compact, with good walking surfaces. They have direct, obvious and safe routes with frequent connections to attractive destinations—places to which people need and want to go. Other aspects of 20-minute neighborhoods or walkable environments many not be immediately obvious. However, a growing body of national and international research agrees on a basic set of features and elements that make walkable environments or 20-minute neighborhoods. According to the research, walkable environments—or 20-minute neighborhoods—generally include the following:

- building scales that are comfortable for pedestrians;
- mixed-use and dense development near neighborhood services and transit;
- distinct and identifiable centers and public spaces;
- a variety of connected transportation options;
- lower speed streets;
- accessible design; and a street grid or other frequently connected network of local streets.

Twenty-minute neighborhoods offer direct and indirect benefits. The most direct benefit of 20-minute neighborhoods is that they allow residents to drive less and thus reduce their overall household transportation expenditures, which at this time averages 16% of one's income. According to the 1995 Oregon Bicycle and Pedestrian Plan 'walking will help reduce traffic congestion, air and noise pollution, wear and tear on roads, and consumption of petroleum; it will reduce the number of pedestrian-motor vehicle-related crashes, injuries, and fatalities; and it will reduce the need for additional roads, travel lanes and parking.' Economic benefits frequently include an increase in housing values, attraction of new economy workers, offer business relocation opportunities, reduce commuting costs, decreases infrastructure investments (which ultimately affects the taxpayer), and they attract tourists." [165] The report noted that the preliminary analysis included distance, destination, density and other factors described as the " 'least common denominator' type of definition— one that was simple and straightforward and would include the minimum elements that could be applicable to the largest area of the city. We recognize that this definition leaves out a key characteristic of most successful 20-minute

[165] Portland Plan's *Status Report: Twenty-Minute Neighborhoods*. N.p., n.d. Web. 14 Feb. 2011. <http://www.sanjoseca.gov/planning/gp_update/documents/20_Minute_Neighborhoods.pdf>

neighborhoods—they each have a special character that reflects the people who live in the area, its history, and its physical features." [166] The findings were weighted and 'Hot Spots' of businesses, grocery stores, open spaces, appropriate infrastructure, intersections, and transit identified.

Portland's 20 Minute Neighborhood study is in the beginning stages.

COMPLETEcorridors' index utilized the factors that contribute to '20 minute neighborhood' to calculate the completeness of Asheville's urban corridors.

[166] Portland Plan's *Status Report: Twenty-Minute Neighborhoods*. N.p., n.d. Web. 14 Feb. 2011. <http://www.sanjoseca.gov/planning/gp_update/documents/20_Minute_Neighborhoods.pdf>